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FINANCIAL AND ECONOMIC REVIEW

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Foreword

The crisis presented a challenge rarely seen in the field of economics, especially to those involved in economic policy, business decision-making, decision planning and macroeconomic analysis. It has also affected economists engaged in areas farther from daily practice, including those specialised in applied and theoretical economics. Theory had played an increasingly important role in economic policy decision-making during the years preceding the crisis. Besides theory, professionally sound empirical analyses had become an indispensable basis for policy advice. This was a welcome development, as academic soundness and the application of an extensively discussed analytical and decision-making framework widely accepted by the professional community can guarantee that decisions affecting the public good are made on the basis of the best possible knowledge available. With that in mind, policy-makers, including central banks, increasingly relied on the opinion of the most highly respected representatives of the profession, even supporting with the means available to them the enhancement and creation of such expertise by offering academic and training forums and publication opportunities for economists. Decision-makers and their staff advisers are often active members of the profession themselves, and the boundaries between practical and academic positions have become fluid.

Before the crisis, all of these progressive changes had contributed to the establishment of a theoretical and analytical framework of economic policies – in particular, monetary policies which appeared to resolve the macroeconomic and decision-making problems that had mired the profession in previous decades. First and foremost, the swings of the business cycle were successfully contained, and double-digit inflation was brought under control, first in developed economies and gradually in emerging countries as well. Many in the professional community believed that the larger issues of macroeconomic policy, especially those faced by monetary policy, had been essentially resolved for the foreseeable future.[1]

As a result, the global financial crisis that erupted in 2007–2008 caught many professional economists off guard. Since then, numerous attempts have been made to explore the reasons that led to this professional fiasco and to determine what can be done to safeguard economies from turbulences of such magnitude in the future. At present, we are far from being able to draw all of the conclusions of this crisis. Full consensus on the theory's responsibility, if any, in the crisis is not expected to be reached for years to come. However, practising economists cannot wait until the formation of a new consensus. If a long-term perspective is taken and one examines the last great shock preceding the current crisis –

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1 Lucas (2003), Bernanke (2004).

the global crisis of 1929–1933 – it is apparent that explanations for the causes of the crisis and the difficulties of recovery have changed over time. As evidenced in this context, the perception of the past changes with the accumulation of knowledge.

It is a specific aspect of economics that professional knowledge is not always amassed linearly. Indeed, in other academic disciplines, especially in natural sciences, we can reasonably assume that all new knowledge integrates and exploits previously accumulated expertise; while it eventually surpasses its predecessor, it still develops, for the most part, on the basis of what has come before. By contrast, in economics previous knowledge is much more often discarded, marginalised or even pronounced useless or preposterous, only to be rediscovered as new knowledge decades later. The case of Hyman Minsky is a good example. Apart from a handful of followers, he was nearly unknown to mainstream economics until he was suddenly propelled into the limelight during the crisis.[2] Minsky's example, however, offers some other lessons to consider as well. His most important theory – namely, that modern economies were inherently characterised by instability, and only the "Big Government" (i.e. fiscal policy) and the "Big Bank" (i.e. a stability-focused central bank) could protect it from extreme swings – was practically ignored, as the decades in which he conceived it happened to be a period of relative financial stability. This financial stability, however, was an exceptional period when, precisely as a response to preceding episodes of financial instability, in the 1950s and 1960s rather meticulous and all-encompassing financial regulations were enacted. At the same time, macroeconomic uncertainty, oil crises, fiscal deficits and simultaneously rising unemployment and inflation gave rise to the most severe problems. While macroeconomic policy concentrated on stabilising growth and prices, the restoration of financial stability was increasingly attributed to the natural, rational and equilibrium-oriented behaviour of the markets, whereupon external and internal regulations were considered to be superfluous and looked upon as an obstacle to the efficient functioning of markets.

For a long time, experience appeared to vindicate the opinion of those who claimed that as soon as macroeconomic stability – namely, moderate business cycles and price stability – was regained, financial sectors would be able to play their resource-allocating role efficiently and contribute to social welfare with sound operations. Paradoxically, however, precisely as Minsky had asserted decades earlier, macroeconomic stability created the right conditions for the accumulation of previously unprecedented financial imbalances. Evidently, economists have failed after all to learn from the experiences of previous, long-forgotten crises. One would have thought that it would be different this time around. Past fears, which had been very palpable as long as the experiences of the crisis were still fresh, started to fade away, and in the end they seemed like old wives' tales. The old set of decision-makers and market agents was replaced by new generations with

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2 It is now called a "Minsky Moment" when over-indebted investors, spooked by an abrupt change in market sentiment, trigger widespread panic selling. The term was coined by the managing director of PIMCO Bond Fund and leading Fed commentator Paul McCulley to describe the 1998 Russian financial crisis and the default of LTCM.

different experiences that overrode earlier ones. In education, the history of economics and economic theories were relegated to the background.

If one asks "to what extent will post-crisis macroeconomics differ from pre-crisis macroeconomics?", the following picture emerges. First and foremost, macroeconomic stability – in its narrower sense, limited to national income and price stability – will be seen as a necessary but insufficient condition for sustainable macroeconomic development. Likewise, financial stability will be considered as an indispensable condition, but one that requires special attention and effort to secure, as it does not materialise automatically as a mere "by-product" of macroeconomic stability.[3]

Future macroeconomics will certainly not push the financial sector to the sidelines of analyses as a passive intermediary system between savers and borrowers. The analytical framework should incorporate the reality that the financial sector has its own dynamics, and lending activity does not simply mean the allocation of previously accumulated savings. It means selecting an investment project that promises a return and finding the right form of financing in an environment where the decisions of creditors and borrowers are made in conditions of uncertainty. The economics of the future will acknowledge that it is not only the banking sector that is exposed to market frictions, uncertainty and other equilibrium-disturbing developments that threaten stability, but also – as learned from experience – financial markets.

The consensus economics of the future will almost certainly not handle imbalances and volatile fluctuations in the business and financial cycle as exogenous shocks but as the outcome of endogenous trends in which the real and financial sectors can both play their role. It is one of the lessons of the crisis that the financial sector, too, contributed to the overheating of the real economy and to the allocation of real resources among sectors that proved to be unsustainable over the long term. This poses a great challenge because macroeconomic and financial stability and the relationship between business and financial cycles, is not mechanical: from time to time, they may reinforce, offset or cancel out each other, depending on the circumstances.[4]

The basic assumptions of pre-crisis consensus economics have been widely criticised, including the hypothesis of rational expectations and representative agents. The assumption of rational expectations is useful in and of itself, but it led to the false conclusion that each agent understands the true and reliable model of macroeconomy and, consequently, its self-centred behaviour will ultimately serve the attainment of a general equilibrium. The crisis will put research in the limelight that does not assume that macroeconomic balance will be ensured by individual decisions *intended* to be rational, provided that

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3   The concept of financial stability as a by-product of macroeconomic stability was conceived by Anna J. Schwartz, an economist who worked with Milton Friedman and co-authored some of his work. She was also among those who asserted that financial instability can primarily be linked to banks, while financial markets are less vulnerable.

4   Borio (2012).

actors are not otherwise hindered by "frictions" or "imperfections". Individual decisions are made amid more or less uncertainty, the true model of the economy is not necessarily understood by everyone, and agents themselves are heterogeneous; consequently, the sum of individual rationalities does not by definition equal a general equilibrium. An old and well-known theory, the Keynesian "paradox of thrift", is the biggest challenge of contemporary economic policy. If each agent, including the state and the rest of the world, follows individual rationality and increases its savings in an attempt to repay its debts and reduce indebtedness, it may happen that, because of the resulting weak aggregate demand, economic performance may lag far behind expectations and, eventually, no one's original plans will be realised. Furthermore, the hypothesis of representative agents is overly simplistic because it does not merely assume the average behaviour of individual agents, but surmises that each individual agent *behaves identically.* However, numerous macroeconomic phenomena will be unintelligible if the heterogeneity of the actors is disregarded. Some decisions are made by a certain group of participants, and some decisions are made by others. Using the previous example, an economy will always include savers and investors. If these actors are not identical, it is easier to explain what is currently being seen – namely, that savings may significantly exceed investments overall. Based on the assumption of representative agents, one would expect that the purpose of savings is investment and, hence, more future consumption. This should not give rise to a protracted situation where savers resort to zero or even negative interest rates, while investment remains at low levels. In summary, consensus economics is expected to focus more resolutely on specifically macro-level correlations that cannot be simply deduced from the sum of micro-level individual behaviours.

The examples given above are far from being brand-new discoveries; in reality, they have been present in economic thinking for a long time. There were periods when they were a part of mainstream theory, but over time they were pushed to the sidelines of the profession, partly because the satisfactory functioning of economies did not pose a problem and partly due to technical reasons: incorporating them into the models proved to be too difficult. It can also be expected, however, that the future consensus will also incorporate new knowledge and relations that have limited antecedents in economics or none at all. They will emerge mainly as a result of the advancement of technical tools and available databases, which will facilitate the discovery of relations that could not be examined by the previously available toolkit. Such innovations include approaches capable of handling complex interactions based on the calculation-intensive, detailed analysis of massive databases. At present, we often have to resort to *a priori* assumptions because we simply do not have a sufficiently detailed database or the computing capacity required for analysing existing databases.

In a broader context, economics is expected to pay more attention in the future to issues which were once an integral part of economic thinking – until the professional

field narrowed the interpretation of its scope. Such issues include income or wealth inequalities and environmental problems. While these issues raise important social and ethical questions, it will become less and less possible to disregard their macroeconomic causes and consequences. Most economists have refrained from examining these issues for a long period of time, as they felt that in their analysis they would not be able to avoid value choices, which is against the spirit of "purely scientific" or "valueless" research. Experts who did tackle these problems could not expect undisputed recognition from the professional community, because these questions and the answers to them are potentially divisive, depending on individual value preferences. Finally, it is important to call attention to the most severe consequence of the crisis, which perhaps should have been mentioned at the very beginning: intolerably high unemployment, which unfortunately was well above long term average even before the crisis. Inevitable efforts to reduce unemployment to a minimum level will call for fundamentally new solutions in the future. We cannot expect the pressing problem of unemployment to be resolved automatically once economies have returned to a sustainable growth path.

In summary, a distinctively "macro" characteristic can be envisaged as emerging in the consensus macro-economics of the future, one with a more solid empirical foundation that is capable of addressing more complex relations between the actors in general and between the real and the financial sectors in particular. In this Foreword, I have only been able to touch on some of the significant changes expected to take place in economic thinking in the wake of the crisis. This new publication of the MNB is intended to foster a renewal of Hungarian economic thinking by offering a publication opportunity for those wishing to participate in this process. The MNB would like to facilitate the dissemination of international renewal efforts in Hungary and provide a forum for the relevant work of both in-house and external authors.

György Matolcsy

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Credit crunch in Hungary between 2009 and 2013: is the creditless period over?

Ádám Balog – György Matolcsy – Márton Nagy – Balázs Vonnák

This article provides a review of the Hungarian credit crunch between 2009 and 2013, including its causes and its nature, with particular regard to a factor playing a crucial role in growth: SME-lending. It is argued that, although the indebtedness of the corporate sector was much less excessive and unhealthy in structure than that of the household and the public sectors, the disruptions of the financial intermediary system resulted, to a large degree, in the decline in corporate lending. The article then goes on to present the Funding for Growth Scheme (FGS) and the economic logic behind its operating mechanism. Finally, it assesses the impact of the first phase of the programme on lending and economic growth, and it concludes that the FGS helped the Hungarian economy extricate itself from the downward spiral of the credit crunch.

1 Introduction

The countries most severely hit by the outbreak of the global financial crisis in 2007–2008 were those where financial imbalances and vulnerabilities had built up during the years preceding the crisis. Lessons from past crises demonstrate that the deleveraging of individual sectors (public, private, and corporate) may be an especially lengthy and even self-reinforcing process in an excessively indebted economy with an unhealthy debt structure: in response to the deterioration of growth prospects, market participants restrain their spending to reduce the indebtedness they deem sustainable, and this, in turn, decreases output even further. The adverse feedback loop may be fuelled by the behaviour of the banking sector as well: the deterioration of profitability caused by credit losses, the rising costs of external funds and exchange rate depreciation give rise to capital adequacy and liquidity problems, which, coupled with the increased risks arising from

poor growth prospects, curtail credit supply and, in extreme cases, lead to the collapse of lending (i.e. a credit crunch).

During the years of the crisis, the vulnerability of Hungary resulted from its high external debt and the high ratio of short-term and foreign currency financing. The real economy and the financial system were both shaken by the depletion and rising costs of external funds, the depreciation of the exchange rate and the downturn in external demand. Although financial markets stabilised relatively quickly and liquidity strains eased, bank lending continued to contract and impeded corporate sector activity even as late as mid-2013.

The Funding for Growth Scheme (FGS) launched by the MNB in 2013 is an endeavour that can be considered unique, both in terms of its purpose and its size. Under the first phase of the programme, which was expressly intended to address the problems of corporate lending in general and lending to SMEs in particular, small- and medium-sized enterprises borrowed funds in the range of more than 2 per cent of annual GDP. To a great extent, it is due to the lending scheme that, after years of decline, the contraction in corporate lending has practically come to an end.

This study gives an account of the Hungarian credit crunch between 2009 and 2013 , including its causes and its nature, with special attention to a factor that plays a crucial role in growth: SME-lending. It can be argued that, although the indebtedness of the corporate sector was much less excessive and unhealthy in structure than that of the household and the public sectors, the disruptions of the financial intermediary system resulted, to a large degree, in the downturn in corporate lending. Next, the study presents the Funding for Growth Scheme and the economic logic behind its operating mechanism. Finally, it assesses the impact of the first phase of the programme on lending trends and economic growth, and it concludes that the FGS helped the Hungarian economy extricate itself from the downward spiral of the credit crunch.

The study is structured as follows: the next section describes the phenomenon of the credit crunch and provides an overview of the relevant literature. The third section presents Hungarian lending trends between 2009 and 2013. The fourth section elaborates on the Funding for Growth Scheme and its direct impact on corporate lending. The fifth section attempts to outline the changing trends in corporate lending and the effects they exert on economic growth. This is finally followed by conclusions.

2 The credit crunch phenomenon

The term "credit crunch" is widely used to denote a drastic meltdown or collapse of lending. Although its concept is easy to interpret intuitively, there is no consensus on a formal definition in the literature.[1] The only point of agreement is that the concept fundamentally attributes the credit squeeze to a disturbance emerging – due to endogenous or exogenous reasons – on the supply side.

It is important to distinguish between credit rationing and a credit crunch. The former refers to a situation[2] where, due to high interest rate levels, only riskier potential debtors can benefit from getting indebted, or debtors are forced to embark on projects that promise higher yields but are less likely to be successful. As a result, banks do not extend the amount of credit that would satisfy market demand. By contrast, a credit crunch denotes a steep fall in credit supply that is not necessarily induced by rising interest rates. That said, the two terms partly overlap with each other in that the meltdown of credit supply is usually accompanied by credit rationing.

Bernanke and Lown (1991) define a bank credit crunch as a significant leftward shift in the supply curve with the risk-free interest rate and the credit risk being constant,[3] which is manifested in the fact that the same customer either gets a smaller amount of credit with a higher premium or none at all. The authors identified the severe lending slowdown observed in the early 1990s in the USA as a credit crunch in view of the fact that credit growth was significantly higher in the previous five recessions. In their interpretation, the phenomenon does not necessarily imply a decline in loans outstanding; indeed, a more sluggish credit expansion is a sufficient condition in itself. The study attributes the emergence of a credit crunch to the supply shock resulting from a change in the banks' capital position.

In addition, the term is used differently in the literature, depending on whether it is perceived to be an isolated and rare phenomenon or a natural feature of business cycles. Wojnilower (1980) found that business cycles in general and recessions in particular are driven by credit crunch episodes, and not only banks, but also regulatory authorities play a role in the emergence of such episodes.

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1   Among others, see Bernanke and Lown (1991), Clair and Tucker (1993), Wojnilower (1980), Hancock and Wilcox (1998), Iyer et al. (2010), Albertazzi and Marchetti (2010), Campello et al. (2009), and Tong and Wei (2009).

2   See Jaffee and Russell (1976), Baltensperger (1978), Stiglitz and Weiss (1981), and Bester (1985).

3   Bernanke and Lown (1991), p. 207: "a significant leftward shift in the supply curve for bank loans, holding constant both the safe real interest rate and the quality of potential borrower".

2.1 Real economy effects

Shrinking credit supply ultimately leads to a decline in investment and output and rising unemployment. Besides definition problems, quantification of the macroeconomic effect is thwarted by the fact that the credit crunch seldom occurs as an isolated phenomenon; typically, numerous effects materialise simultaneously.

Buera et al. (2014) developed a calibrated model to estimate the impact of the 2007–2008 crisis on the economy of the United States, with special regard to the labour market. In their study, they examined a shock resulting from the tightening of collateral constraints, which generated, in line with the observations, a 6–8 per cent drop in the ratio of external finance to capital stock. As a result, GDP fell by nearly 5 per cent, while unemployment rose by 3 percentage points. They found that the effects were substantially stronger in an environment of wage rigidities.

Gerali et al. (2010) estimated a model for the euro area with Bayesian techniques in order to study the significance of the credit crunch experienced during the recent crisis. The results of their historical decomposition suggested that the main culprit behind the fall in GDP observed during the crisis was the financial system, while macroeconomic shocks played a much smaller role.

Similarly, Brzoza-Brzezina and Makarski (2011) estimated the macroeconomic implications of the recent global crisis in the Polish economy. According to the simulation performed by the authors on a model developed for a small, open economy, the crisis lowered GDP by 1.5 per cent through the Polish banking sector (i.e. the impact was smaller in magnitude than that presented in the previous study). The authors explained this by pointing out that the banking sector plays a less important role in the Polish economy; moreover, it was shaken by the crisis to a lesser degree than its peers in the euro area.

Besides general equilibrium models, structural vector-autoregression (VAR) models can be also used to gauge the impact of the credit crunch on the real economy. Tamási and Világi (2011) estimated the growth effect of credit supply on Hungary by using a sign restriction approach. They found that a 10 per cent drop in credit supply (as measured by the volume of corporate loans) reduces output by nearly 2 per cent. In line with the labour intensity of Hungarian GDP,[4] this translates into a 0.3–0.4 per cent decline in employment. Using a comparable methodology, Franta et al. (2011) arrived at a similar conclusion in respect of credit supply shocks and GDP in the Czech Republic.

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4   According to the expert estimates of the MNB, a 1 per cent rise in GDP increases employment by 0.15–0.2 per cent on average.

The experience of the phenomenon known as creditless recovery[5] is somewhat related to the real economy effect of the credit crunch. Recoveries from economic recessions are "creditless" when GDP growth takes place without the revival of credit growth. There is consensus in the literature that these recoveries are slower than those accompanied by an upturn in lending. Darvas (2013) found that median real GDP growth – the average of three years after the trough – was 4.5 per cent during creditless recoveries, compared to 6 per cent in the case of "with-credit recoveries". When compared to the growth rate of trading partners, the difference in speed between the two recovery types is 1.1 percentage points, which, although somewhat smaller, is still significant.

3 Credit crunch in Hungary between 2009 and 2013

The Hungarian financial system is dominated by banks' (or, more precisely, MFIs) intermediation, with capital markets playing a secondary role in corporate finance. While larger corporations have access to foreign bank loans or inter-company loans, smaller, Hungarian-owned companies rely on domestic bank loans. Therefore, the lending activity of the banking system is a crucial factor in economic growth.

Before the crisis, the outstanding borrowing of the private sector grew dynamically – even as a percentage of GDP; however, this was a typical trend in Europe at the time (Fábián and Vonnák 2014). In Hungary, loans to households accounted for the largest portion of the increment; this growth, however, had an unfavourable composition as it was generated driven by a surge in foreign currency and foreign currency-based loans. Corporate lending did not see such accelerated growth, although there was a clear shift towards project financing (which subsequently demonstrated a high default ratio) and foreign currency lending to smaller companies with no natural hedge. Nevertheless, while households were overly indebted by 2008, this applied to corporations to a lesser degree, as the GDP-proportionate loan portfolio was not excessively high by international standards before the crisis (Chart 1).

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5   The phenomenon and the related literature are discussed in Darvas (2013).

Chart 1
Corporate sector bank credit stock as a percentage of GDP

Note: Club Med countries: Spain, Portugal, Greece, Italy
Source: ECB, Eurostat
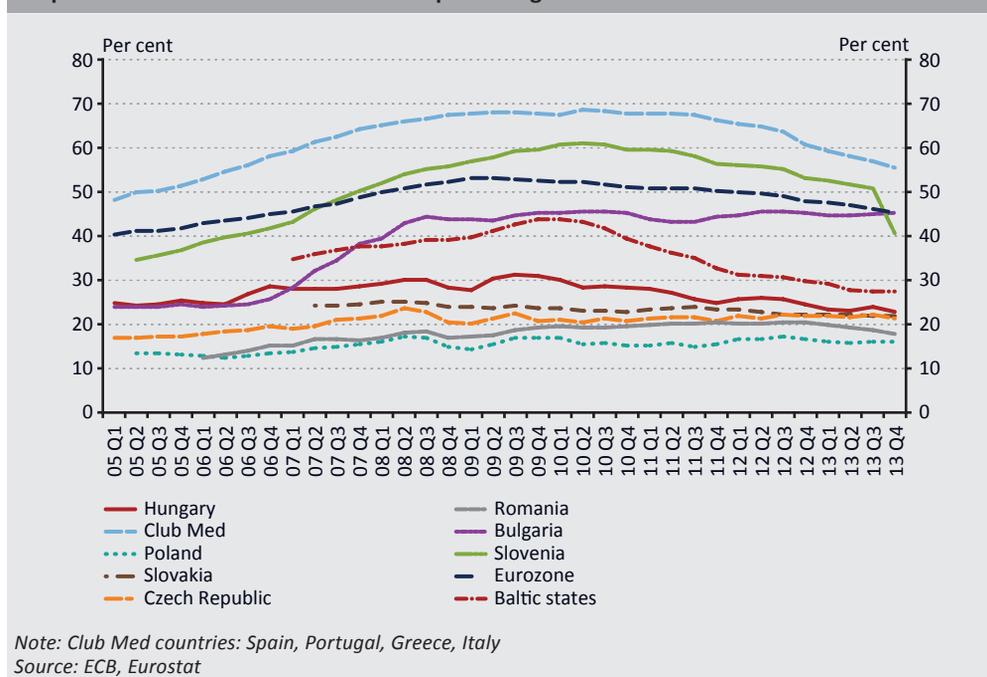
During the years of the crisis, household and corporate borrowing alike was consistently restrained. The downturn began on a transaction basis as early as 2009; however, the portfolio did not initially reflect this, due to the revaluation of foreign currency loans. Indeed, the decline manifested itself only from 2011.

The slump was similar in magnitude to that seen in other countries hit by the financial crisis earlier, especially those that had faced the crisis with high public debt and/or currency mismatch. However, historic data suggest that the contraction in lending was, in most cases, over in the fifth year following the crisis; the outstanding borrowing of the Hungarian private sector continued to decline as late as 2013 (Chart 2).

In the case of households, demand may have also fallen markedly in view of the fact that the already high debt-to-income ratio was further increased by the drastic depreciation of the forint against the Swiss franc and the decline in disposable income, forcing the sector to carry out balance sheet adjustments. In addition, intensifying precautionary motives may have also contributed to the contraction of credit demand.

At the same time, besides demand factors, supply had also become a bottleneck in the corporate sector, partly due to the ability of the banking sector to adjust faster in corporate loans with a shorter average maturity. According to the estimate of Sóvágó (2011), supply factors accounted for at least a half of the drop in the corporate credit portfolio. Based

Chart 2
Changes in GDP-proportionate private-sector debt during financial crises

Average
Countries with high level of government debt
Countries indebted in foreign currency
Hungary
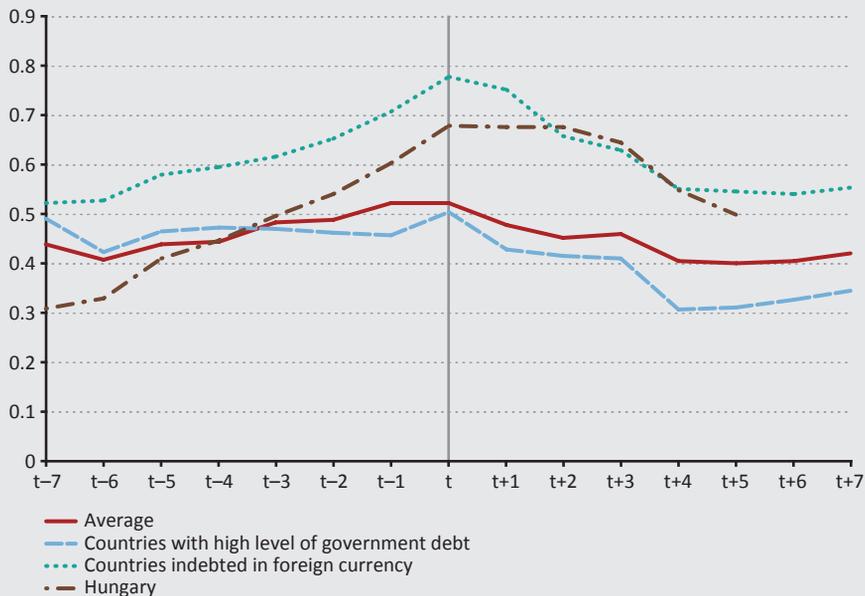
Source: IMF IFS, authors' own calculations based on the methodology of Laeven and Valencia (2008), and Felcser and Körmendi (2010)

Chart 3
Annual growth of corporate loans outstanding
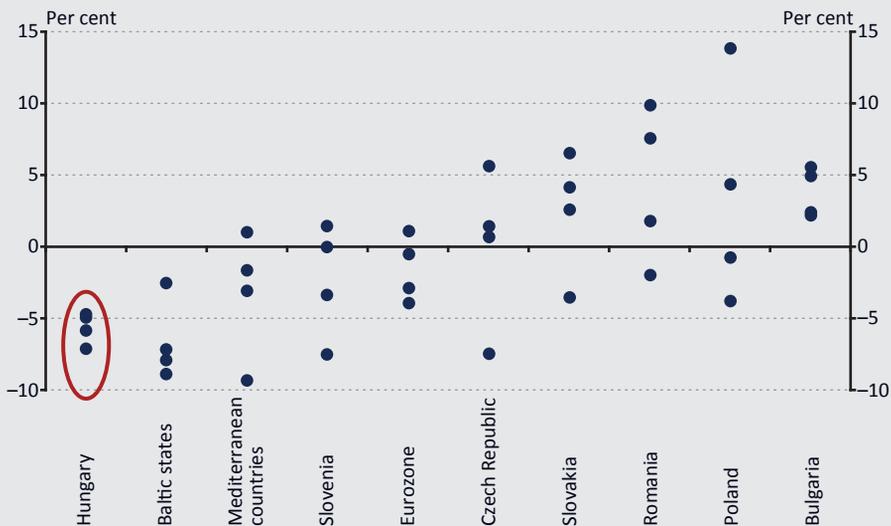
Source: National central banks

on the Financial Conditions Index of the MNB, the banking sector decelerated economic growth by 1 per cent annually on average (MNB 2014), resulting in the loss of around 20–25 thousand jobs in the private sector. Only the Baltic States saw a comparable rate and steady decline in loans outstanding in Hungary's wider region (Chart 3).

According to the univariate trend filters,[6] as a result of the continuous contraction of the portfolio, the cyclical position of corporate lending resided persistently in the negative range in 2010–2011, which suggests that the loan portfolio fell short of its "equilibrium" or "normal" level. By the end of 2013, the credit gap (i.e. the deviation of the credit-to-GDP ratio from the trend) ranged between -5 and -10 percentage points. A similar process was taking place in the euro area and in Mediterranean countries; however, as mentioned before, contraction in those regions was not even and started in earnest only after the sovereign crisis (Chart 4).

Chart 4
Corporate credit gaps

Note: cyclical components derived from exchange rate adjusted stock data by using the Hodrick-Prescott filter.
V4: the group of the Visegrád countries, excluding Hungary (Czech Republic, Poland and Slovakia).
Source: ECB, authors' calculation based on Eurostat

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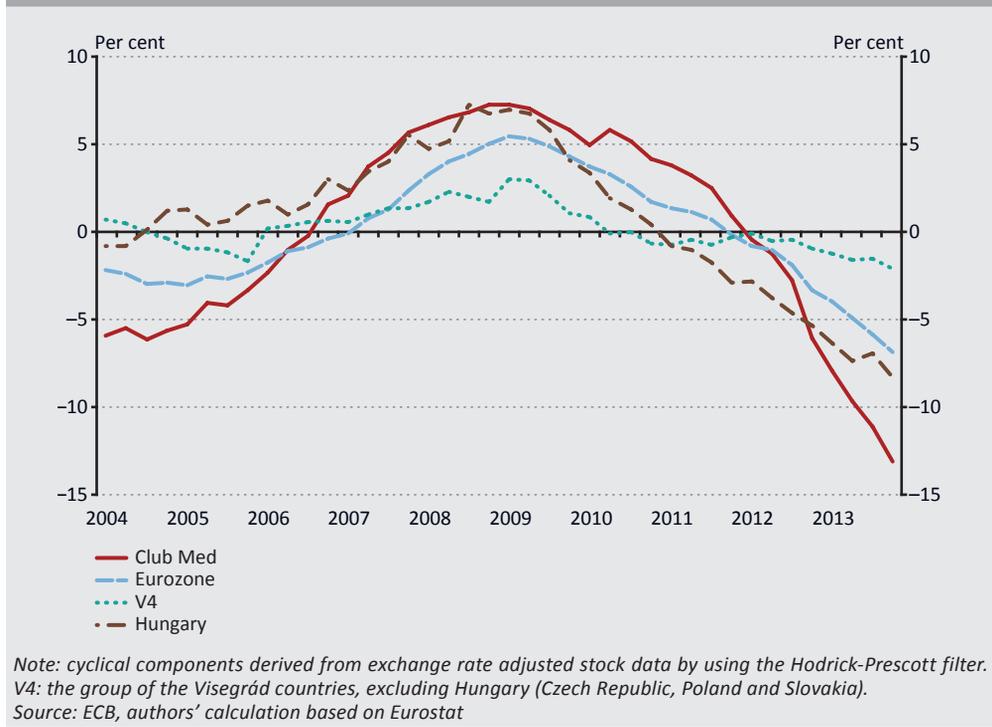
6   This document presents the Hodrick-Prescott filter only, but both the one-sided Christiano-Fitzgerald filter and the so-called band-pass filter reveal a similar result in quantitative terms. The results are available upon request. In evaluating the estimates, it should be taken into account that although statistical trend filtering methods are widely used due to their easy applicability, the exclusion of fundamental factors may be misleading in certain cases.

Based on the relevant literature, a credit crunch occurs when there is a severe contraction in lending due to factors that undermine banks' lending capacity (viz. capital adequacy, liquidity) and, consequently, they curtail their credit supply drastically. The credit crunch hitting Hungary after 2008 has two specificities that should be described in more detail.

As opposed to numerous episodes analysed in the credit crunch literature, the recession in Hungary lasted for years. However, as shown above, this protracted credit contraction is typical at a time of financial crisis, especially in excessively indebted countries with large open foreign currency positions.

The other specificity that distinguishes the developments in Hungary from "classical" credit crunch situations is the fact that – apart from a few short periods – the banks' lending capacity (e.g. capital adequacy, liquidity) appeared to be adequate. This, however, was only an appearance, simply reflecting the continuous capital injections that foreign-owned banks dominating the banking sector received from their parent institutions for covering current and expected losses. Parent banks limited their withdrawal of funds to such a degree that it did not cause severe liquidity constraints in their subsidiaries, which were operating mostly with high loan-to-deposit ratios. Consequently, to all appearances, capital and liquidity were available for banks to extend credit; this, however, did not improve their willingness to lend, although it did reinforce the stability of the banking system.

In point of fact, this situation is comparable to a credit crunch situation emerging in a capital- and/or liquidity-deprived environment. Indeed, parent banks were forced to provide capital injections in order to absorb the losses and not in order to increase the lending activity of their subsidiaries. In all probability, domestic banks would not have been able to receive funding from the market, as most of them were producing losses. As another important element of balance sheet adjustment, they restrained new lending and attempted by restructuring to mitigate and conceal the risks of outstanding loans that financed non-viable projects. This may have weakened the credit channel of monetary transmission significantly. It can be stated overall that Hungary experienced a protracted credit crunch between 2009 and 2013, and even though the banking sector was solvent and liquid during this period, their deleveraging efforts were carried out through the continuous downsizing of their corporate and household portfolios.

3.1 Credit crunch and enterprise size

The tightening of credit constraints affects individual corporations differently. In times of a crisis or an economic slowdown, investors and banks are often prone to a "flight to quality", when creditors attempt to find debtors with the highest credit rating and avoid even the smallest measure of risk-taking. In corporate lending, this means that banks shift lending to more stable, easy-to-monitor companies in order to achieve economies of scale, while

smaller – and thus riskier – firms have no access to loans or face higher premia. Given that small- and medium-sized enterprises in Hungary are more dependent on bank lending, this phenomenon often renders their operation impossible.

With the gaining ground of micro-databases and surveys, numerous studies have been dedicated to the dispersion of credit constraints among countries and corporations. Access to (bank) financing is defined, in most cases, by perceptions; in other words, the dependent variable is the credit constraint perceived by the company. The most frequent explanatory variables include the age, size, indebtedness, profitability and ownership structure of the firm.

Beck et al. (2006) relied on the World Bank's World Business Environment Survey, which was conducted between 1999 and 2000 and includes responses from companies in 80 countries. They found that older, larger (in terms of revenues) and foreign-owned firms reported fewer financing obstacles. It was a particularly interesting result of their study that the effect of age tended to be significant in developed countries, while firm size proved to be significant in less-developed countries.

Ferrando and Griesshaber (2011) utilised data obtained from the 2009 ECB-European Commission "SAFE" Survey on the access to finance by small- and medium-sized euro area enterprises. While the authors' findings regarding the significance of ownership structure and age were consistent with the previous study, they did not find the effects of firm size and sectoral classification to be robustly significant.

Holton et al. (2012) also relied on the SAFE database in an attempt to explain not only perceived credit constraints, but also the rejection of loan applications on the basis of corporate and country characteristics. While the age and size of firms significantly correlated with the rejection of loan applications, this was not true for perceived credit constraints. Of all corporate characteristics, this latter was found to be significantly related to ownership structure, as well as a firm's current and expected profitability.

In order to gain better insight into domestic credit constraints, an estimate was performed for this study that resembles those referred to above. It was done by using data from the MNB's corporate lending survey made in 2014.[7] As the role of the Funding for Growth Scheme in putting an end to the credit crunch is elaborated on in the next section, the analysis here focuses on the role of firm size and indebtedness.

The dependent variable used was the companies' response to the following question: "to what extent does access to finance hamper the business activity of your firm"? Respondents had to assess their answers on a scale of 1 to 10, where 10 meant the most serious problem. The source of the explanatory variables was the same survey. The regressions used the following variables: logarithm of years elapsed since the foundation, a logarithm of the number of employees, revenue (classified into 33 categories),

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7 For details of the survey, see the June 2014 issue of the MNB's publication entitled Trends in Lending.

indebtedness, as well as regional[8] and sectoral[9] dummy variables, and dummies indicating the presence of revenue from exports and majority foreign ownership. Due to the nature of the dependent variable, the estimate was prepared by using an ordered probit model.

Table 1		
Main statistics of the regressions explaining financial constraints		
Dependent variable: Financing constraints perceived		
	(1)	(2)
Turnover category	-0.0274 ***	
	-3.195	
Logarithm of number of employees		−0.0901 ***
		−3.250
Logarithm of age	-0.0899	−0.0724
	-1.425	−1.268
Indebtedness	0.3200 ***	0.3163 ***
	6.225	6.448
Export	0.0707	0.0635
	0.512	0.510
Foreign ownership	-0.5637 ***	−0.4700 ***
	-3.442	−3.269
East Hungary	0.0247	−0.0373
	0.218	−0.360
West Hungary	0.0400	0.0444
	0.345	0.435
Manufacturing	0.3030	0.2787
	1.217	1.176
Construction	0.2375	0.3315
	0.785	1.219
Trade and repair	0.1703	0.1565
	0.668	0.652
Other services	0.0873	0.1032
	0.358	0.447
Other activities	0.7900 **	0.6948 **
	2.093	2.084
pseudo R^2	0.0341	0.0266
Number of observations	555	664
Source: Own calculations		

8   Three regions can be distinguished: Eastern Hungary, Western Hungary and Central Hungary. The latter was applied as a benchmark category.

9   Agriculture (benchmark category), manufacturing, construction, trade and repair, other services, other.

There were two strongly correlating variables that captured firm size: employee number and revenue. If they were used together in a regression, due to multicollinearity, both variables became insignificant; separately, however, they had a high explanatory power, especially the revenue variable. Therefore, the results of two different specifications are presented in Table 1.

In addition to size, the indebtedness and foreign ownership variables were found to be significant even at 1 per cent. Signs were intuitive and identical with the referenced estimates in all cases. Of the regional and sectoral dummies, only the "other activity" proved to be significant; however, since very few companies fell into this category (a mere 23 out of 750), less relevance was attached to it.[10]

The findings suggest that smaller, Hungarian-owned and indebted companies face the tightest financing constraints, which reconfirms that alleviating the credit crunch problem in the SME sector and the burdens of indebtedness may help improve the creditworthiness of the sector.

4 Defeating the credit crunch: the Funding for Growth Scheme

In response to persistent credit supply problems in the corporate segment, in April 2013 the Magyar Nemzeti Bank announced that the Funding for Growth Scheme would be launched in June. Under the first phase of the programme that lasted until the end of September 2013, commercial banks concluded contracts with small- and medium-sized enterprises to disburse a total amount of HUF 701 billion. The second phase commenced in October 2013 and will last until the end of 2014 (or, in the case of investment loan disbursements, until the end of June 2015).

The Funding for Growth Scheme is intended to facilitate access to credit for small- and medium-sized enterprises (i.e. the companies affected the most by financing constraints) through the easing of non-price credit supply constraints on one hand and through pushing down lending rates on the other hand. With that in mind, the MNB provides funding to the credit institutions participating in the programme at a fixed interest rate of 0 per cent, which they can then disburse at an interest rate of up to 2.5 per cent for investment, working capital financing EU-subsidy pre-financing purposes. The maximum term of

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10 Consistent with the studies cited above, the pseudo R2 values are rather low; however, these are limited-information statistics in respect of the goodness of fit (i.e. the explanatory power). Moreover, without intending to produce a comprehensive model of perceived financing constraints, the primary goal was to identify causal relationships, for which the significance of the estimated coefficients is the relevant indicator.

investment loans is 10 years. In the second phase of the programme, loan redemption cannot exceed 10 per cent of total recourse, and thus new loans must represent at least 90 per cent. Beyond the central bank eligible collaterals, with appropriate haircut, the SME loan itself may serve as collateral. Credit institutions must report to the MNB all of the loans granted by them, even if they do not wish to take recourse to the latter option; therefore, the MNB has information on each individual loan agreement.

In recent years, two central banks have launched credit stimulation programmes that are similar to the FGS in many respects: the Bank of England commenced its Funding for Lending Scheme (FLS) on 13 July 2012, and the ECB announced its Targeted Longer-Term Refinancing Operations (TLTRO) in June 2014, with the first allotment available on 18 September 2014. Both programmes are aimed at stimulating bank lending by providing central bank funds at more favourable rates than the market rate. One important difference, however, that the Hungarian programme is aimed exclusively at SMEs. Access to the refinancing of the Bank of England and the ECB is conditional upon the participants' net lending activity. In contrast, there is no requirement in the FGS regarding a change in outstanding borrowing; however, at least 90 per cent of the loans granted under Phase II must be new loans. The other marked difference is that the interest rate on the loans provided by banks under the FLS and the TLTRO is not restricted, while it is maximised at 2.5 per cent in the FGS.

In view of the unique nature of the Hungarian credit programme, it is worth identifying its place among the theoretical models of unconventional central bank interventions, which may be helpful in understanding the impact mechanism.

4.1 The Funding for Growth Scheme vs the theoretical models of unconventional central bank tools

A key study on the subject was done by Gertler and Karádi (2011). Their model is based on the assumption that during financial crises, banks' ability to obtain funds is significantly compromised and, given the risks due to costly enforcement, if they are to raise funds from the market for new disbursements, they will face high premium levels. In such situations, the role of the best debtor (i.e. the state) may appreciate, as it can access cheaper financing and, therefore, can alleviate the negative credit supply shock reflected in rising premia and shrinking bank lending. On the other hand, the downside of public financial intermediation is the fact that the state lacks the resources and experiences required for the assessment and management of credit risks and the resulting sub-optimal allocation of resources entails a welfare loss. According to the authors, in the case of severe disturbances of the financial system, the welfare gains from state intervention may outstrip the costs.

In the model developed by Curdia and Woodford (2011), the financial intermediary system produces a welfare loss by pricing in operating expenses and expected credit losses in the interest rate spreads. During severe disturbances in the financial system when risk spreads increase steeply, a central bank may reduce social losses by lending to the private sector directly. Indeed, this leads to the crowding out of the banking sector which, faced with smaller costs, can offer financing, albeit in smaller volumes, but with lower spreads.

Williamson (2012), as well as Gu and Haslag (2014), analyses the implications of security purchases on the secondary market. By purchasing securities, a central bank can push down spreads by increasing market liquidity. They found that central bank security purchases could be effective in cases where the rise in spreads was due to liquidity shocks rather than real shocks. In the model of Gu and Haslag (2014), in the former case, the intervention improves wealth.

Correia et al. (2014) examine the economic policy combination of interest rate policy and interest rate subsidising in a model featuring a financial intermediary system burdened with Gertler and Karádi's (2011) costly enforcement problem. Interest rate subsidisation, as an instrument, may supplement a lax interest rate policy during the disturbances of the financial system. The former reduces firms' financing costs through the reduction of interest rate spreads, while the latter does the same through the reduction of banks' cost of funds. Their results indicate that a combination of interest rate subsidisation and central bank base rate cuts would be the optimal policy to pursue, provided that the state finances the interest rate subsidisation by a lump sum tax. Interest rate subsidisation is preferred to direct central bank lending from a welfare perspective as well, as long as the latter entails sub-optimal resource allocation.

The structure and the operating logic of the Funding for Growth Scheme (FGS) do not correspond to the direct central bank lending shown either in Gertler and Karádi (2011) or in Curdia and Woodford (2011). In the models mentioned, central bank intervention disconnects the resource allocation know-how of the financial intermediary system, which may generate a welfare loss. By contrast, the FGS entrusts the banks with the assessment of loan applications (provided that the applicant company complies with the criteria laid down by the MNB). Even during the term of the loan, banks are expected, for the most part, to handle all administrative and monitoring tasks. On the other hand, since the state's cost of funds was not significantly lower than that of the banking sector, the Gertler and Karádi (2011) study is not relevant to the Hungarian situation, either in terms of advantages or disadvantages. It is another important difference that the interest rate on FGS loans is independent of market lending rates: it is maximised at 2.5 per cent, which means that loan supply constraints are eased not only through controlling the quantity, but also price.

The Funding for Growth Scheme is not commensurate with security market intervention models either, as the MNB does not recognise direct credit risks in its balance sheet; the risk remains with the banks (which is also true when it is compared to the Gertler-Karádi and the Curdia-Woodford models). Moreover, although the partial acceptance of SME loans as collateral increases available liquidity, fundamentally this is not the main channel of the lending scheme; indeed, since the Hungarian banking sector remained largely liquid during the years of the crisis, it was not the liquidity situation that caused a bottleneck in lending. More importantly, the FGS exerts its influence through facilitating bank competition, increasing banks' willingness to lend, and boosting credit demand in the context of declining interest burdens.

Of the studies mentioned above, the model developed by Correia et al. (2014) is the most comparable to the impact mechanism of the FGS, despite the fact that, in their model, the optimal reduction of funding costs is achieved by a combination of central bank interest rate cuts and fiscal interest rate subsidisation. The lending scheme of the MNB is an example of targeted monetary easing carried out by monetary policy instruments, while at the same time – since the zero interest rate FGS refinancing loan is financed by 2-week MNB bills/deposits, the interest rate on which equals the MNB's key policy rate – it also imposes direct costs on the consolidated government budget. From the perspective of companies, "foregoing" the central bank base rate entails the effects described above. Nevertheless, even the model mentioned above lacks one specificity of the first phase of the FGS: namely, that the possibility of loan redemptions intensified bank competition and, hence, increased credit supply through another channel.

Finally, the lower limit of nominal interest rates (the "zero lower bound") also deserves mentioning. There is consensus among the studies cited above on one point: when the central bank is unable to reduce its key policy rate any further, the role of unconventional instruments appreciates in value, and its welfare improving effect becomes more obvious. While the MNB's base rate has not reached the zero lower bound, interest rate policy during the years of the crisis was often restrained by the financial stability risk arising from the open foreign currency position of the domestic sectors. This meant that although in technical terms it would have been possible to reduce the interest rate quickly and substantially, the ensuing drastic exchange rate depreciation would have set off such severe disturbances in the financial system that the implications would have either offset the stimulating effect of the monetary easing or generated an outright contraction. It can be partly attributed to these risks that the sequence of the Monetary Council's interest rate cuts between 2012 and 2014 was characterised by extreme caution, as demonstrated by the fact that the size of the interest rate cuts was smaller than 25 basis points from August 2013. In this sense, the Hungarian interest rates also had a time-varying lower bound, which may underpin the justification for the lending scheme and enhance its social gain.

4.2 Impact of the FGS on corporate lending

The high utilisation of the first phase of the FGS was surprising in light of corporations and banks' limited time to apply for and disburse the loan.[11] Of the HUF 701 billion available, corporations borrowed HUF 229 billion to refinance foreign currency loans and HUF 182 billion to refinance forint loans, while the volume of new loans totalled HUF 290 billion. As a result of the new loans, the net change of the corporate loan portfolio in the third quarter was close to HUF 600 billion, the highest value recorded since the outbreak of the crisis. The annual change of corporate credit improved spectacularly, even by international standards, especially in the SME segment (Chart 5).

Chart 5
Changes in annual growth rate of the corporate loan portfolio between 2012 and 2013

Source: ECB, MNB
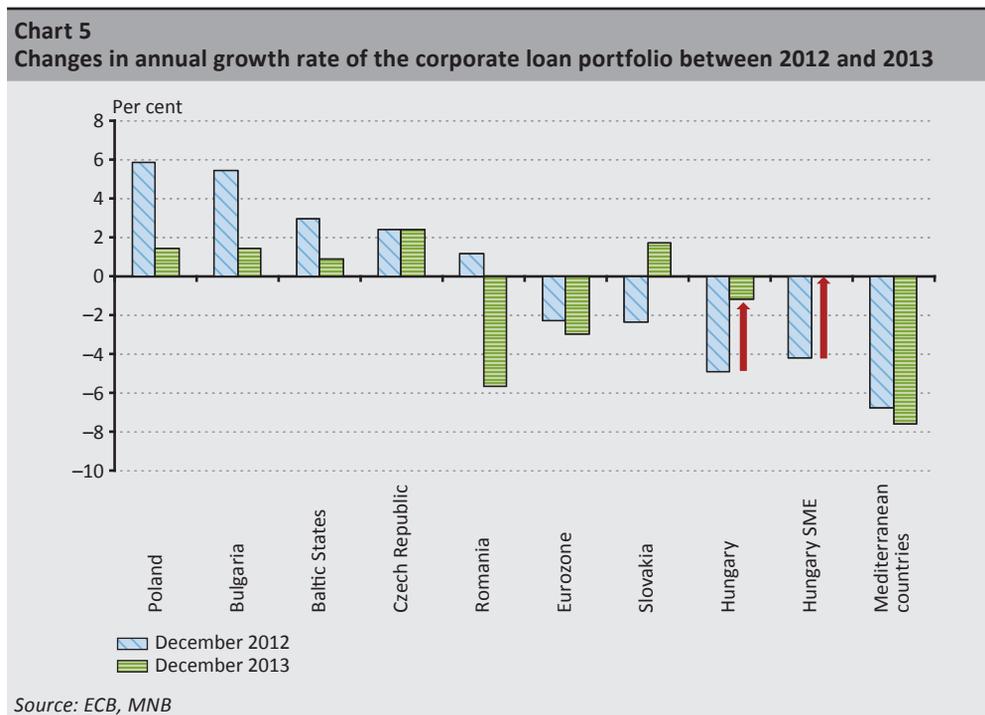
As loan redemptions played a significant role in the first phase of the FGS, a short overview is presented here on the various ways in which specific loan purposes may – in theory – influence lending trends.

New loans (i.e. working capital loans, investment loans) increase the outstanding borrowing of corporations immediately and directly; this, however, does not mean that the FGS will continue to contribute to corporate lending to the same extent over the long term. On

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11 In the case of investment loans, a part of the disbursements may have been drawn out to the first quarter of 2014.

one hand, part of these loans would presumably have been disbursed even without the central bank's lending programme, even if at market conditions (crowding-out effect; in other words, the FGS replaces the market). On the other hand, new investment projects will increase future credit demand (for instance, for working capital loans or other short-term loans), which, after the conclusion of the FGS, can be satisfied on a market basis (multiplier effect).

The crowding-out effect would be reflected in monthly/quarterly lending data in two possible ways: either lending trends would not indicate any significant changes even during the FGS or, alternatively, a temporary, larger credit outflow would be subsequently followed by a comparable slowdown as solvent companies carry forward their borrowing in view of the more favourable conditions. Given that the dynamics of corporate lending were enduringly and significantly altered by the first phase of the FGS (on a year-on-year growth or cumulated transaction basis; see Fábián, 2014), the crowding-out effect was presumably weak. This assumption is supported by the fact that more than half of new loans were directed to those three sectors (manufacturing, trade and real estate transactions) where lending declined most drastically during the years of the crisis (Chart 6).

Chart 6:
Changes in the credit stock before the FGS and new loans in the first phase of the FGS
(broken down by sector)

Source: MNB
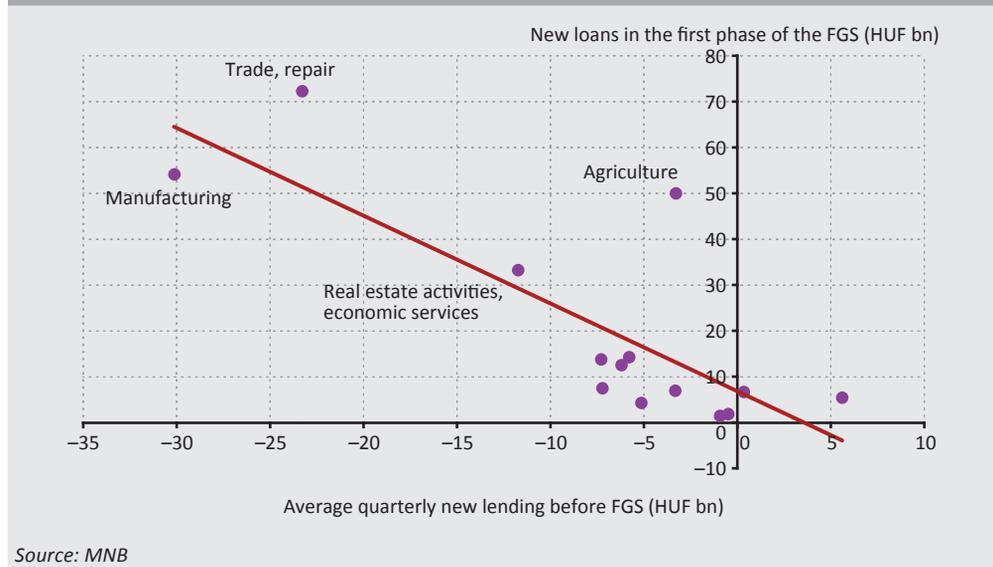
The effect of the refinancing of existing loans influences lending trends indirectly through the improvement in the repayment ability of debtors. The redemption of forint loans reduces the debt-service burden; therefore, the company concerned is capable of repaying

even a larger volume of loans. The redemption of foreign currency loans may also improve cash-flow; in their case, however, it is primarily the elimination of the exchange rate risk that becomes a channel through which the company's risk rating and, hence, access to loans improves. The magnitude of these effects is hard to gauge from lending data; however, based on the estimate presented above in Section 3.1, it is a significant channel from the perspective of credit constraints and, accordingly, redemptions may play an important role in escaping the clutches of the credit crunch.

5 New trends in corporate lending in 2014

Although the large outflow of credit seen in 2013 Q3 did not repeat itself in subsequent quarters, and in Q4 banks scrambled to shore up their balance sheets in anticipation of the ECB/EBA comprehensive portfolio assessment programme scheduled for 2014, the new SME loans offered in the first phase increased the loan portfolio and practically put an end to the credit crunch, the massive contraction that had mired corporate lending for years. The annual change of the total corporate sector's transaction-based outstanding borrowing improved to around -1 per cent from the previous 4–5 per cent decline, and the SME segment boasted even a slight growth year on year (Chart 7).[12] According to the MNB's forecast, which assumes full utilisation of the HUF 500 billion announced so far for the second phase, corporate lending is not expected to contract further in the coming two years either, and the increase in SME lending will become permanent.

Sectoral lending dynamics suggest that, in addition to the effects of central bank interest rate cuts and improving economic activity, the Funding for Growth Scheme may have played a crucial role in putting an end to the contraction of corporate lending. When average quarterly changes in the loan portfolio of individual sectors preceding the announcement of the FGS (2009 Q1 – 2013 Q3) are compared with the period after the commencement of the first phase (2013 Q3 – 2014 Q1), one finds that the upswing in lending is closely related to the volume of new FGS loans (Chart 8). The lending turnaround combined with a high participation rate is especially reflected in the new loans disbursed to the sectors of agriculture, manufacturing and trade in the first phase of the FGS.

The FGS induced a marked improvement not only in lending volumes, but also in the structure of the loan portfolio and, hence, the riskiness of SME borrowers. Loans disbursed under the FGS are long term, denominated in forint and have a fixed interest rate. Under Pillar 2 of the first phase, banks disbursed HUF 229 billion to refinance outstanding foreign

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12 Trends in Lending, June 2014.

Chart 7
Annual growth rate of loans to the corporate and SME sectors

Per cent

Corporate sector (MFI)
SME sector (banking sector)
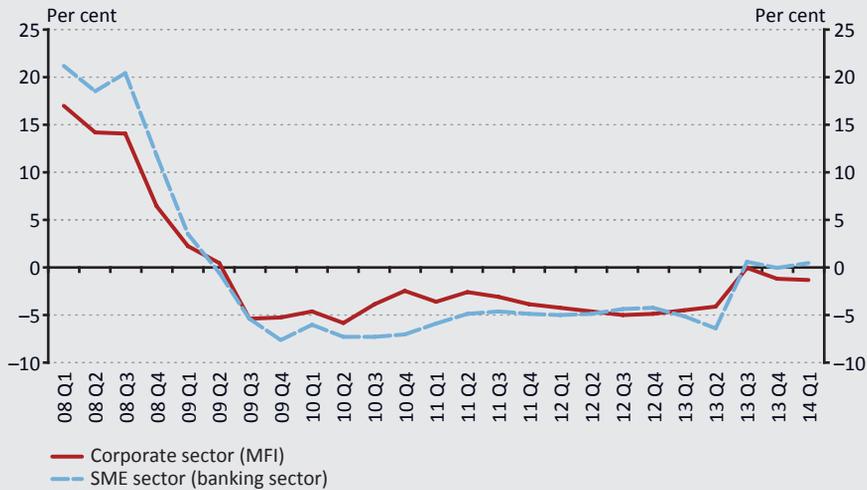
Source: MNB.

Chart 8
New loans in the first phase of the FGS and changes in lending dynamics
(broken down by sector)

Change in the quarterly dynamics of loans outstanding (HUF bn)

Trade, repair

Agriculture

Manufacturing

Real estate activities, economic services

New loans in the first phase of FGS (HUF bn)
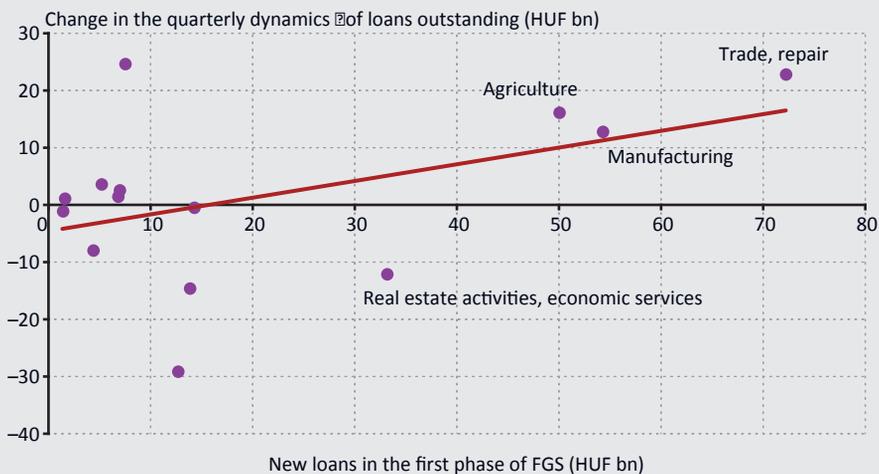
Source: MNB.

currency loans. The average maturity of loans extended in the first phase was 6.9 years, significantly longer than that of the outstanding SME borrowings (barely more than two years) at the time. As a result, the share of forint loans in the SME loan portfolio rose to

Chart 9
Share of forint loans and average maturity in the SME loan portfolio

Source: MNB.
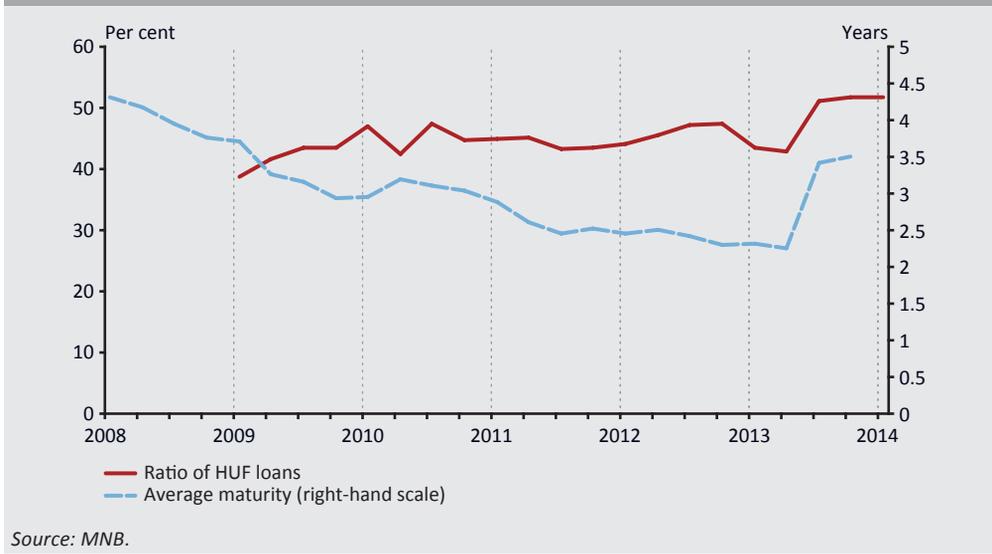
51 per cent from 43 per cent, while average maturity increased to 3.5 years, approaching pre-crisis values (Chart 9). The fixed lending rate of FGS loans, in turn, implies a highly predictable debt-service burden over the long term.

5.1 Estimate of the real economy impact of the first phase of the FGS by using the structural VAR model of Tamási and Világi (2011)

Although the second phase of the FGS has not concluded yet and even the full results of the first phase have presumably not yet been reflected in GDP data, by using the model developed by Tamási and Világi (2011) it is possible to estimate the contribution of the first phase on economic growth, based on the trends unfolding in corporate loan volume and interest rate data. The assessment of the overall impact of the programme will only be possible after some time has elapsed and the relevant corporate-level data have become available.

In their study, the authors identify three shocks (risk assessment, credit spread, monetary policy) that are potentially suitable for capturing the effect of the FGS. After selecting the shock that fit the purpose here, it was taken into account that the FGS cannot be viewed as a classical monetary policy measure. This is because, instead of inducing a change in the interest rate environment that determines the economy as a whole, the FGS is only intended to ease lending conditions for (a smaller segment of) corporations over the term

of the programme. It was also an important consideration that the FGS does not affect the risk appetite of the banking sector directly (indirectly, however, it does); accordingly, of the two credit supply shocks, the spread shock was chosen to estimate the effects of the FGS.

The size of the shock was calibrated in two different ways. In the first approach, from aggregate corporate credit rates were decomposed the effects caused by new loan disbursements under the FGS between 2013 Q2 and 2014 Q1,[13] and from the surmised lending rates thus received the actual aggregate lending rates were deducted. The difference is the shock realised on credit spreads within total disbursements as a result of new FGS loans. It is very likely that the full effect was overestimated with this procedure, as the first phase of the FGS did not provide unrestricted access to loans significantly smaller than those available in the market, but only up to the amount (albeit increased, in view of the large demand) of the facility announced. Therefore, the shock was also calibrated in such a way that its impact on corporate lending volumes was identical with the difference between the MNB's forecast (March 2013) before the announcement of the FGS and actual data pertaining to the period between 2013 Q2 and 2014 Q1. This approach can be also considered as an upper estimate, given that, besides the FGS, several other factors (central bank interest rate cuts, improvement in economic outlook, etc.) may have contributed to the improvement in lending trends.

According to the results of this study, based on the first approach, the first phase of the FGS increased GDP by 0.8 per cent; however, in consideration of the estimation bias mentioned above, the actual effect may range between 0.4 and 0.8 per cent, which, given the higher labour demand of production in the SME sector, is equivalent to the creation of 3,000–8,000 new jobs (or the preservation of a corresponding number of endangered jobs) in the private sector. Based on the second approach, the GDP effect (including the estimation bias) ranges between 0.2 and 0.5 per cent, which is equivalent to the creation and preservation of 1,500–5,000 jobs. Thus, a considerable real economy effect was quantified in both cases.

6 Summary

This study demonstrates that the Hungarian economy experienced a protracted credit crunch period between 2009 and mid-2013, which, through the freezing-up of corporate lending in particular, deepened the economic recession and impeded recovery. Compared to previous credit crunch periods observed in other countries, the specificity of the Hungarian situation lies in the fact that – largely due to parent bank behaviour – the capital adequacy

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13 Although the second phase of the FGS was launched already at the end of 2013, since the amount disbursed until the end of March 2014 is negligible compared to the first phase, the results practically reflect the impact of the first phase.

and liquidity of Hungarian banks could have been sufficient, in theory, to jump-start lending; however, in reality, parent institutions provided capital and liquidity not for lending purposes, but in order to ensure compliance with regulatory provisions and to absorb expected losses. Consequently, from the perspective of lending, there were capital and liquidity constraints in Hungary. According to the study's estimate based on a questionnaire survey, smaller, Hungarian-owned, indebted firms bore the brunt of the credit squeeze.

The MNB launched its Funding for Growth Scheme in 2013 in an attempt to address credit market disruptions. In general, literature published during the crisis provided evidence of the social gain of unconventional central bank instruments aimed at the stimulation of corporate lending during severe disturbances in the financial system. Due to a number of specificities, however, the FGS does not fit in any other theoretical model. On one hand – as opposed to other forms of intervention analysed in the studies cited in this paper – the MNB leaves the resource allocation function with the banking sector and does not recognise direct credit risks in its own balance sheet. On the other hand, the central bank controls lending rates not only through volumes, but also directly by maximising the interest rate at 2.5 per cent. Due to these specificities, even despite the predominance of market mechanisms, the FGS influences lending conditions more efficiently.

The launch of the Funding for Growth Scheme in mid-2013 put an end to the contraction in corporate lending, and SME lending embarked on a slow growth path. The borrowing possibilities offered in the first phase of the programme primarily reached those sectors of the national economy that suffered the largest contraction in lending. In these sectors, a strong turnaround was observed in lending dynamics even after the conclusion of the first phase. Besides the corporate sector's improved access to credit, the increased share of long-term, fixed interest-rate forint loans improved the structure of the loan portfolio. The upturn in lending trends suggests that the first phase of the programme contributed to GDP growth by a total of 0.2–0.8 per cent in 2014 and 2015, and it improved employment by 2,000–8,000 jobs.

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Inflation targeting in the light of lessons from the financial crisis

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This paper surveys the changes triggered by the financial crisis and the theoretical and practical options for the renewal of the inflation targeting framework. While a comprehensive overview would be impossible to provide, it seeks to present the changes in the monetary strategy of Magyar Nemzeti Bank against this wider context. First, it describes in brief the inflation targeting framework, its key elements and the principles of how it operates in practice. The paper then explains criticisms of the inflation targeting framework in light of the financial crisis and the practical, strategic and theoretical innovations that these have led to. On this note, there follows a discussion of the options most widely adopted as solutions to the challenges and what proposals were made but never used. Finally, the paper provides an overview of the practical lessons learnt in recent years regarding these instruments in advanced and emerging economies. International experience demonstrates that inflation targeting continues to be one of the best practices of monetary policy and that its transformation during the crisis reflects heightened interest in considerations (e.g. financial stability) beyond the primary goal of the inflation target. Rather than including greater flexibility in its goals, the changes to the earlier framework of inflation targeting resulted in a transformed and augmented toolkit and institutional system that may remain an integral part of monetary policy and central bank practice. To prepare this survey for information purposes, the authors relied on working documents produced by the Monetary Strategy Department at the Monetary Policy and Financial Market Analysis Directorate of Magyar Nemzeti Bank.[1]

JEL-codes: E42, E52, E58.

Keywords: forward guidance, inflation targeting, quantitative easing, unconventional monetary policy, zero lower bound.

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[1] The working documents used were written by Orsolya Csortos, Dániel Felcser, Kristóf Lehmann, Gergő Motyovszki, Zoltán Szalai and Máté Tóth.

1 Introduction

The purpose of this paper is to give an overview of key changes, triggered by the crisis, in the strategy and toolkit of the inflation targeting (IT) monetary policy framework. This study describes the challenges and dilemmas caused or exacerbated by the crisis, which currently represent the greatest difficulties for central banks using inflation targeting or similar frameworks. Felcser et al. (2014) discuss in detail the generic features of the inflation targeting framework (e.g. the basic components of strategy, the importance of transparency and accountability), its theoretical background (e.g. the role of interest rate rules), and the aspects of its flexibility.

Inflation targeting frameworks are used in a number of advanced and emerging economies all over the world. They owe their popularity to their relative simplicity and the positive results achieved by the central banks that pioneered them. Abo-Zaid and Tuzemen (2012) have shown that inflation targeting is a favourable framework for advanced and emerging economies alike. This is demonstrated by the fact that rates of inflation are considerably lower and more stable in emerging economies using IT and that, compared to the pre-IT period, the rate of economic growth is higher in advanced and emerging economies than in non-IT countries.[2]

The financial crisis did not, however, leave the monetary policy framework intact, as it has highlighted the fact that merely creating price stability does not secure macroeconomic and financial stability. The crisis has resulted in changes to institutional structures as well as the toolkits employed.

Several central banks turned to unconventional instruments to manage the serious consequences of the financial crisis once they ran out of opportunities to cut interest rates (Shirai, 2014). When the conventional tools (e.g. the interest rate policy) were exhausted, new monetary policy instruments and other measures to shape expectations were needed in order to implement monetary easing by what is called "quantitative and qualitative easing". These tools included changes in bond purchasing and the communication practices of the central banks of advanced economies, but the overall picture is highly varied and complex, reflecting different national idiosyncrasies, but offering several lessons for emerging economies as well.

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2 Felcser et al. (2014) discuss this in detail.

2 The system of inflation targeting

Inflation targeting is a monetary policy framework encompassing the intentions and behaviours of a central bank aiming for price stability. One driver behind the inflation targeting systems introduced in the 1990s was the understanding that the **maintenance of price stability** was a precondition for the efficient and stable operation of the economy and for achieving maximum social welfare. When first adopted, the inflation targeting framework was initially called "direct inflation targeting" (DIT), and it was predicated on the idea that while creating price stability had been a key objective for monetary policy in the past, intermediate target variables such as the exchange rate or monetary aggregates had proven unsuccessful in reducing inflation to the required level, meaning that the choice of nominal GDP as an intermediate target did not appear to be a relevant alternative (Krzak and Ettl, 1999). In the inflation targeting framework, the inflation forecast serves as the intermediary target, providing guidance for the final target (inflation) and also capturing the changes of as many factors outside the central bank's scope as possible, even before they can actually influence the final target. A key communication tool in the system is the (usually quarterly) inflation report, which provides in-depth analyses of inflation and real economy trends, as well as the macroeconomic forecasts of the central bank to underpin decision-making, help explain the decisions of the central bank to the wider public, and shape expectations.

2.1 The theoretical considerations of inflation targeting

The main building blocks of the inflation targeting framework are the primacy of the price stability mandate, the designation of a numerical inflation target, the independence of the central bank, the transparency of central bank operations and an environment of accountability. Of the above, the key components of inflation targeting are the **primacy of price stability** (none of the other targets should hinder the achievement of price stability) and the **publicly announced, numerical inflation target**, which also serves as the nominal anchor. Price stability is generally set at a low – but not zero – rate of inflation, as deflation and high inflation both have negative effects on the real economy. Besides price stability, it also helps successful adaptation if the implementation of price changes does not deplete resources unnecessarily. This also simplifies adaptation to changes in demand, as companies are better able to consider the unique supply-and-demand characteristics of their operations and inflation-related uncertainties do not prevent them from predicting the consequences of their decisions. In an environment where inflation is stable and low, they will be more confident to conclude long-term agreements, which will reduce

the uncertainty of the business environment, drive down long-term interest rates and incentivise investment. As another positive side effect, government debt can be financed at better terms if the excess return expected by investors to offset inflation uncertainty is lower. Lower interest rates on loans may cause companies and households to shift their borrowing to the domestic currency, thus reducing the risk of financial stability originating from exchange rate risk on foreign currency loans and deals.

Acting as a nominal anchor, a declared numerical inflation target can anchor the expectations of economic agents for future inflation. If the nominal anchor is credible and the economic agents are therefore confident that the monetary authority will deliver on its target, they will then set their inflation expectations accordingly. The more confident economic agents are that the central bank will in fact provide price stability, the more likely they are to formulate their price-setting and wage-setting decisions accordingly. This then makes it much simpler for the central bank to achieve and maintain the target, with far fewer sacrifices in the real economy.

The independence of the central bank, the transparency of its operations, and its accountability represent the basis for the efficient functioning of any inflation targeting system. Therefore, it is vital for the **central bank** to operate in a way that is **credible**, with forward-looking measures to achieve the target, as this allows the inflation target to serve as a guidance for households and corporations in their price and wage setting. The central bank can achieve this effect via a number of transmission channels and thus ultimately deliver on its primary mandate of providing price stability.

Monetary transmission is a complex, multi-phase mechanism that central banks use to shape output and inflation by changing the nominal interest rate. Monetary transmission has several channels through which monetary policy measures can influence demand in the real economy and the consumer price index. The interest rate channel facilitates that an increase in the nominal interest rate may lead to changes in consumption and the investment decisions of households and corporations, leading to a contraction in domestic demand and an alleviation of demand-side inflationary pressure (intertemporal substitution). Through the exchange rate channel, a higher central bank base rate will make instruments denominated in the domestic currency more attractive, causing an appreciation of the currency, a fall in import prices, and lower inflation (imported inflation, exchange rate pass-through). In addition, the change of exchange rate affects the real economy by means of two conflicting effects on inflation. First, a stronger exchange rate may impair the competitiveness of resident corporations, which in turn diminishes economic activity and reduces inflation (rechannelling of spending). Second, if domestic economic agents have debt denominated in foreign currency, a stronger exchange rate will boost the incomes available and thus drive up inflation (balance sheet channel). The expectations channel captures the forward-looking nature of monetary policy. This means that monetary policy measures exert their influence not only through developments

in a given period, but also by shaping economic agents' expectations. Also, economic agents make their decisions mindful not only of current economic trends, but also future projections for such; therefore, if economic agents consider the central bank to be credible, they will expect inflation to approximate the inflation target in the medium term, even if the current rate of inflation differs from the target. This allows inflation to return to the target without interference from the central bank (Krusper and Szilágyi, 2013).

2.2 Inflation targeting in practice

Inflation targeting is always **flexible** in practice, as the central bank will focus on more than solely shaping inflation in its inflation targeting framework (Svensson, 2008). The primacy of price stability does not imply that inflation should be at the target at all times; even central banks following an inflation targeting practice allow inflation to deviate from the announced target from time to time. Inflation targeting is a flexible framework that takes into account factors beyond price stability, such as those of the real economy or even financial stability, and in fact lasting price stability is achieved in this way. Its objective is to mitigate volatility in the real economy, which suggests that even central banks with a regime of inflation targeting are unwilling to cause excessive sacrifices in the real economy to achieve their primary objective. One way of giving greater weight to real economic criteria is for the central bank to respond to medium-term changes in inflation rather than current processes or one-off shocks that do not affect the underlying processes (Krusper and Szilágyi, 2013).

It follows from the above that a key characteristic of inflation targeting is that it is **forward-looking**. Decision-makers respond to expected future trends rather than the latest data published. One reason for this lies in the fact that monetary policy has a delayed effect on key macroeconomic variables and is typically strongest after three or four quarters. Another reason lies in the assumption that economic agents adopt their decisions in a forward-looking manner (i.e. on the basis of their expectations for the future). If inflation expectations are anchored, then changing the interest rate to offset temporary inflation shocks would involve real economy sacrifices that are unnecessary to maintain price stability. As a result, inflation targeting central banks with sufficient credibility may choose not to respond to temporary price shocks (i.e. disregarding the impacts of higher indirect taxes or one-off energy price shocks that drive up prices). In addition, however, they will pay special attention to potential indirect "second-round effects" that may occur via expectations or wage setting.

3 Potential monetary policy responses to the crisis

In the period of Great Moderation preceding the crisis, relatively long-lasting, stable growth with price stability characterised advanced and emerging economies alike. Accordingly, the pre-crisis consensus held that inflation targeting offered monetary policy the right framework for achieving price stability and, in a wider sense, sustainable prosperity. Nevertheless, in this stable macroeconomic environment of low inflation, there were increasingly frequent occurrences of symptoms of macro-level financial instability, which ultimately contributed to the outbreak of the financial crisis. Through recognition of this fact, a new consensus has emerged in recent years: namely, that the inflation targeting of that period was not suitable for creating long-term macroeconomic stability. Apart from strategic mistakes, there were implementational errors – especially regulatory and supervisory errors – that led to the financial crisis. These included the use of inappropriate financial market stimuli or information problems,[3] along with certain special circumstances (such as the US mortgage market problem) (Svensson, 2010).

Matters of microprudential regulation, macro-level financial stability and monetary policy strategy tended to be treated separately prior to the crisis. The crisis has demonstrated that these branches of economic policy must be treated jointly, with due consideration of their mutual interactions at the theoretical and modelling level (see Box 1), as well as in practice (i.e. joint consideration of strategic and institutional matters) (Borio, 2014). All this has suggested that a reform of inflation targeting approaches and toolkits was imperative.

Box 1

Financial imbalances, financial cycles and estimation of potential output in light of the financial crisis

It follows from the above that a new approach in modelling is required in order to incorporate financial considerations in monetary strategy, which should explicitly include the relation between the cyclical movements of financial variables and cyclical shifts in the real sector.

The starting point for output-gap estimation accepted in the literature and in practice rested on a macroeconomic analytical framework in which financial variables (e.g. credit aggregates) and the financial sector in the wider sense did not play a substantial role. Accordingly, the empirical output-gap estimates were intended to capture the cyclical position of the real sector with the help of real variables. The simplest univariate approaches took the output time series as their basis to establish whether the output gap was

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3   For instance, the risks of complex investment vehicles were inappropriately gauged and the level of systemic risk was underestimated.

positive or negative, compared to its own trend. If the output gap is positive, then higher inflation pressures may be expected; if negative, then lower ones may be expected. Although the method is simple and transparent, it has a major disadvantage, as it is unable to provide a real-time estimate of the most important question concerning turning points: it is able to signal changes in output direction only with a delay, meaning that decision-makers may rely on a wrong assessment of the situation for extended periods. Subsequent estimates based on new data points then considerably revise the cyclical position of the economy and potential output as well.

In order to address this problem, referred to as "endpoint uncertainty", further variables were added to the univariate estimations, which carry information about, and are indeed in a causal or functional relation with, the cyclical position of output (structural estimates). Underlying this was the desire for facilitating the timely forecasting of turning points and a more accurate real-time estimation of the economy's cyclical position. One of these widely used relationships is the Phillips curve. It reflects the idea that as the labour market tightens (i.e. unemployment falls) or, in a wider sense, as capacity utilisation increases, inflationary pressure will increase gradually and price stability will eventually be at risk.

Structural estimates that also capture other relationships are more suitable for monetary policy assessments than univariate ones. The crisis has, however, thrown light on other related problems, as the Phillips curve has also proven to be an unstable relation, creating difficulties in estimating NAIRU (non-accelerating inflation rate of unemployment). The instability of these additional structural relationships highlights fundamental issues rather than mere technical or measurement problems. This suggests that modern economies have gone through structural changes to the extent that in a boom period, the main issue is not merely inflation, but financial instability and the sustainability of financing. Accordingly, changes in inflation no longer provide sufficient information regarding the sustainable rate of output growth: a path of growth may prove unsustainable from a financial equilibrium perspective, even if inflation is stable.

BIS economists (Borio et al., 2013a, 2013b and 2014) have therefore introduced the concept of a "finance-neutral" output gap, as opposed to the traditional ("inflation-neutral") output gap. In conventional estimation practice, the output gap closes when the requirement for price stability is reached (i.e. forward-looking inflation is in line with the inflation target). The new gap indicator is analogous with this in the sense that it compares the actual situation in the economy to a sustainable output path, but it also adds that indebtedness and property price changes should not lead to overheating and then suddenly to a dangerous degree of overcooling. Observable variables are used to gauge the condition of the real economy, such as unemployment and other capacity utilisation indicators, which detect overheating not only when they measure an upward pressure on prices. In other words, the estimation is not reliant on the Phillips curve, which has proven unstable. There is a key difference between the inflation-neutral and the finance-neutral output gap. If inflation-neutral output-gap estimation is used, financial imbalances may build up, even if there is price stability. The finance-neutral output gap seeks to control for this factor as well, as it relies both on inflation processes and financial variables to estimate the output gap and overheating in the economy. The new output gap is estimated in a single step, resulting in a more transparent and smaller model, which requires less revision in light of new data. This provides economic policy decision-makers with more reliable and current information.

The real economic and deflation risks of the protracted recession caused by the crisis have made it necessary to use new instruments. Consumption and investment demand has contracted in the wake of the crisis, and inflation has retrenched (with deflationary risks appearing in certain cases); production has also fallen. All of this has justified cutting interest rates quickly. In advanced economies, central banks swiftly cut interest rates close to zero, but even so they were unable to prevent recession and an undershooting of the inflation target. Eventually there remained no additional scope for further cutting of real rates of interest. As long as an instrument like cash is present, which provides at least zero nominal return, nominal interest rates would not fall below zero significantly and for extended periods. This zero lower bound (ZLB) of nominal interest rates thus became an obstacle to continued use of the conventional toolkit to provide the monetary easing still needed by the economy. In response to these challenges, the central banks of advanced economies started on a course of intense unconventional monetary easing.

Reaching the ZLB thus represents a challenge for monetary policy, as its conventional toolkit is exhausted and it is forced to turn to new, unconventional methods to boost the economy. The liquidity trap, a problem closely tied with the zero lower bound, entails risks additional to the central bank's inability to prevent recessions and avoid undershooting the inflation target. A liquidity trap occurs typically at the zero nominal interest rate, when the markets do not expect further rate cuts (or when further nominal rate cuts are no longer even possible) and, consequently, demand for cash increases and demand for long-term bonds disappears. Economic agents may incorporate the inflation rate into their expectations and, in the event of sufficiently great shocks, deflation expectations may also develop. As soon as inflation expectations decouple from the central bank's inflation target, the real rate of interest starts to rise and move yet further from the level that the economy would need in order to stabilise, which further aggravates the crisis. This exerts further downward pressure on prices and then feeds through into an ever-deepening deflationary spiral,[4] where conventional monetary policy instruments are ineffective to facilitate recovery.[5] The following chart outlines the options for tackling the challenges posed by the zero lower bound; the main points are discussed in detail in later sections.

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4 Ábel, Lehmann, Motyovszki, and Szalai (2014)

5 In such a case, unconventional instruments practically replace and substitute for the conventional tools that have proven inefficient. If, however, low liquidity on the financial markets or unjustifiably high spreads jeopardise monetary transmission, the unconventional instruments may involve restoring transmission to supplement monetary policy, so that their use may prove justified even when the rate of interest is above zero (Krekó et al., 2012).

Chart 1
Possible solutions for challenges represented by the zero lower bound and acute problems caused by the crisis

Approach of Zero Lower Bound ⬌ Additional monetary easing is needed

Unconventional tools – expansion of the IT tools

- Quantitative and qualitative easing, Q(Q)E
  - Asset purchases
  - Direct intervention on the credit market
  - Liquidity expansion tools
- Forward guidance
- Exchange rate policy (depreciation)

Reform of monetary policy strategy?

- Rethinking of inflation target
  - It does not work in acute problem solving
- History-dependent monetary policy rules (nGDP/price level targeting)
  - Merely theoretical option
  - Difficulties in the practice

It arises in line with achievement of ZLB in developed economies

Source: MNB.

3.1 Quantitative and qualitative easing (QQE), credit market interventions and liquidity expansion

By entering the securities market in longer maturities, the central bank is able to shape long-term returns by *direct intervention*. In **quantitative easing**, the central bank boosts its balance sheet and buys the right instruments to influence market yields directly. It is important to emphasise that the growth of the central bank's balance sheet – and thus of the monetary base –would not provide further monetary easing in this case.[6] The result of asset purchases is a decline in the market yields of the instruments in question. In a liquidity trap, the increase in liquidity via asset purchases does not represent further easing that would lead to credit expansion. The surplus liquidity is added to the reserves placed with the central banks. In such a case, banks accumulate a surplus quantity of money, which resembles the characteristic scenario of a liquidity trap in which money ends up with various private economic agents without generating demand or supply.

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6 In the traditional theory of money, money and credit expansion results from the increase of the central bank's balance sheet (i.e. the monetary base), and this is how easing boosts the economy, assuming that the money multiplier does not collapse. In contrast to this, quantitative easing does not necessarily lead to money creation, since it translates into deposits (reserves) at the central bank, while the money multiplier shrinks. For details, see McLeay, Radla and Thomas (2014).

Direct intervention on the credit markets operates on a principle similar to quantitative easing, but is more specifically targeted on lending. It involves the central banks purchasing corporate securities and mortgage bonds, or lending directly to financial institutions. The central bank thus establishes a direct link to the non-financial private sector and assumes some of its credit risk. The objective of these interventions is to support the credit markets, to reduce the risk and liquidity spreads on the credit markets, and ultimately to improve the credit conditions for the private sector. In a recessionary environment, the small- and medium-sized enterprise (SME) sector faces major financing difficulties, which cannot be managed substantively by relying only on direct purchases of corporate securities; the solution lies either in supporting asset-backed securities (ABS) incorporating SME loans or by acting directly via government agencies.

Central banks are able to supply liquidity to the financial system in normal periods as well, but after the outbreak of the crisis the **provision of liquidity** was required in considerably higher volumes and different structures. The purpose of the new liquidity-providing instruments is to help refinance banks when their funding costs are much higher than the policy rate, if a large proportion of assets in banks' balance sheets becomes illiquid, or perhaps if the availability of foreign currency liquidity is limited on the market. For this reason, these instruments will be effective only if the banks are grappling primarily with liquidity issues rather than the constraints imposed by their capital positions, or if bank lending contracts due to liquidity reasons rather than increased risk aversion.

3.2 Forward guidance[7]

While transparent central bank operations and clear communication (regarding monetary policy target variables, the background of decisions, underlying argumentations, and expected macroeconomic trends) became increasingly widespread even before the onset of the crisis at the central banks using IT best practices, the role of forward guidance gained prominence after the zero lower bound was reached. In normal times, central bank communication allows economic agents to deduce from the previous decisions and systematic behaviour of the central bank how it would respond to various economic processes and shocks in the future. However, if uncertainties surrounding the economic outlook intensify, the importance of communicating the future direction of monetary policy increases as the economic situation becomes more unpredictable and the zero lower bound restricts the manoeuvrability for monetary policy.

Several central banks turned to forward guidance to shape the long end of the yield curve during the crisis. Managing expectations is an important transmission channel, since

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7 Csortos, Lehmann and Szalai (2014) discuss the theoretical considerations underlying forward guidance (e.g. forecast-based versus commitment-based guidance), its transmission mechanism and practical experiences.

consumption and capital investment decisions tend to depend on longer-term (real) interest rates. It is less the current level of the base rate, but rather expectations for the path of the base rate and the medium-term inflation outlook that play a dominant role in determining longer-term yields.

Most analysts and economic policy-makers have welcomed forward guidance as a new communication instrument of central banks. The interpretations discussed above hold that the main objective for a central bank that has reached the zero nominal lower interest rate bound is to reduce expected real interest rates by raising inflation expectations to near the target and thus to stimulate the economy through the expectations channel. Another view holds that the expected real interest rate cannot be lowered and current expenditure thereby stimulated by raising inflation expectations. Forward guidance can, however, keep increases in long-term nominal yields under control and prevent real interest rates from suddenly rising, which would lead to an overreaction in bond markets. This approach highlights the role of forward guidance in mitigating bond market uncertainties linked to the beginning of the tightening cycle and in preventing the panic-driven selling of bonds (for further details, see Csortos, Lehmann and Szalai, 2014).

Csortos, Lehmann and Szalai (2014) demonstrate that forward guidance was widely adopted as a communication tool during the crisis and has become an integral part of the monetary policy toolkit. Although the strategic importance of this communication tool may decrease following the crisis and as the zero lower bound loses its relevance, the experience of recent years shows that this tool has improved the efficiency of monetary policy.

3.3 Rethinking (raising) the inflation target

The crisis has revealed that the economy may be subject to major disinflationary shocks. This raises the prospect of monetary policy setting a higher inflation target to allow it more room for manoeuvrability in the event of a future round of new shocks and to reduce the likelihood and costs of a liquidity trap occurring. There are, however, numerous arguments against raising the inflation target. While inflating real debt away may appear attractive, it entails a decrease in real interest rates, real wages and real property prices, which would necessitate another costly macroeconomic adjustment.

In the long run, it would incur considerable costs as a result of a permanently higher and more volatile inflation. One of the most important problems is that higher inflation may change the structure of the economy, magnify inflationary shocks and reduce the efficiency of monetary policy. Furthermore, even if the central bank considers raising the inflation target only temporarily, there is great risk in that the credibility of the central bank and its role as a long-term anchor will be questioned, with potential repercussions for central

bank decision-making going forward. Thus, this type of solution does not appear suitable for managing an acute problem; none of the central banks have changed their frameworks in this way.

3.4 History-dependent strategies[8]

In theory, history-dependent monetary policy strategies going beyond the framework of inflation targeting may be suitable for managing a liquidity trap (although this is a subject of lively debate), but its practical implementation would certainly be difficult and costly. It should be noted that rather than their differences in considering real economic criteria, the main divergence between inflation targeting and nominal GDP-targeting systems lies in the fact that nominal GDP targeting shoots at a level variable; therefore, so-called "history dependence"[9] applies to it.

In a theoretical model framework, temporarily increasing inflation expectations may be desirable if the zero lower bound is near, as it would offer a feasible means for reducing the real interest rate. Shaping expectations is possible, in theory, by using a history-dependent monetary policy target framework (price-level targeting, nominal GDP targeting) that may imply temporarily higher inflation. These approaches may guarantee long-term price stability even as another nominal variable (nominal GDP, price level) than inflation acts as nominal anchor. Thus, in this sense these solutions go beyond the framework of inflation targeting.

Nevertheless, these history-dependent political strategies raise countless practical problems that raise questions about the benefits of their implementation. Most of their advantages apply only if forward-looking expectations are assumed, and they also represent a concept that is hard to communicate and understand. And if the targets are not understood well, the inflation expectations may become entrenched instead of rising temporarily. Selecting the starting point for the target path also causes a problem, and wrong estimates of potential output level may result in permanently higher inflation if nominal GDP targeting is followed. A further disadvantage of another history-dependent strategy, price-level targeting, is that one-off price shocks cannot be disregarded, which would make the monetary policy more expansionary in the case of disinflationary or deflationary shocks and tighter in the case of inflationary shocks than under inflation

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8   See Csermely and Tóth (2013) for details.

9   In contrast to inflation targeting, history-dependent monetary policy rules are not forward-looking; instead, historic changes in the target variable also influence interest rate policy, which may have an influence on shaping inflation expectations. History dependence is achieved normally by selecting the level, rather than the rate of growth, of a nominal variable as the intermediary target (nominal anchor) of monetary policy; in this sense, these solutions point beyond the framework of inflation targeting (Felcser et al., 2014).

targeting. In the context of all of the above, history-dependent strategies have been raised merely as theoretical options.

4 Changes in the IT frameworks of advanced and emerging economies after the crisis

Although the financial crisis posed countless challenges for the various inflation targeting regimes, some studies have pointed out that the consequences of a crisis are less harsh in countries operating under an IT framework. For example, Mollick, Cabral and Carnerio (2011), who analysed figures only prior to the global financial crisis, incorporated in their sample a number of regional and national crises. They found that countries that followed inflation targeting recovered faster after a crisis. This result is presumably related to the fact that inflation targeting can be implemented only if the institutions safeguarding economic stability are present and the financial markets are sufficiently developed, which, by itself, increases the resilience of an economy against external shocks.

4.1 Advanced economies

During the crisis, the central banks of advanced economies actively used the unconventional instruments described in the previous section. Every central bank of global importance or with a reputation for best practice used schemes of liquidity provision against collateral, often for long maturities or in foreign currency. Fewer central banks used quantitative easing and credit-market interventions. Yet none of the central banks of advanced economies considered raising the inflation target or stopping inflation targeting and opting for a different variable as their target (e.g. targeting the price level or nominal GDP) (Table 1).

Table 1

Monetary policy instruments used in advanced economies after the crisis

Country	Forward guidance	Unconventional tools			Raising inflation target	Other target
		Quantitative easing	Direct intervention on the credit market	Liquidity expansion		
EZ	X	X	X	X		
J	X	X	X	X		
US	X	X	X	X		
AU	X			X		
CA	X			X		
NO	X			X		
NZ	X			X		
SE	X			X		
UK	X	X	X	X		

Note: EZ: Eurozone, J: Japan, US: United States, AU: Australia, CA: Canada, NO: Norway, NZ: New Zealand, SE: Sweden, UK: United Kingdom

In January 2012, the Federal Reserve announced an explicit inflation target of 2 per cent, whereas the Bank of Japan, albeit with weaker commitment, also took a step towards IT by setting a medium- or long-term objective of 2 per cent or below. In spite of having an explicit inflation target, the European Central Bank does not follow an inflation targeting monetary policy, but its instruments and the way they are employed – as well as its strategy and the way it is communicated – make the ECB one of the globally important central banks most committed to price stability. The bottom half of the table contains the countries with inflation targeting central banks using best practices.

To summarise, the toolkit of central banks has changed, the objectives have shifted as a result of the crisis, and focus has been redirected on financial stability and certain real economic indicators. It should be remembered that increased emphasis on certain real economic variables has been suggested merely as a supplementary component of forward guidance and did not involve changing the target variable. Experience from the advanced economies has demonstrated the ability of flexible inflation targeting frameworks to rise to the challenges posed by the zero lower bound; therefore, flexible inflation targeting should continue to be considered as a monetary policy best practice. This is also evidenced by the fact that globally important central banks (such as the Federal Reserve) have tended to shift towards using the inflation targeting framework. Accordingly, instead of a more flexible target system, the renewal of the earlier framework of inflation targeting means having an expanded toolkit to help respond to challenges.

Given the large number and complex scope of the monetary policy instruments employed by the advanced economies in the crisis, they have been summarised in a table and the factors motivating their use have not been described in detail. It should be noted that these instruments have predominantly been responses to the challenges posed by the zero lower bound in the advanced economies, whereas different factors have led to the need for reforming the inflation targeting toolkit and employing further monetary policy instruments in emerging countries such as Hungary.

4.2 Emerging economies

4.2.1 Impact of the financial crisis on monetary policy in the emerging economies

The unprecedented monetary easing by the central banks of advanced economies significantly reduced the yields available on advanced markets, which also had a considerable impact on the emerging markets. The search for yields resulted in considerable capital inflows into these countries, as investors shifted their savings from the advanced countries to these markets in the hope of higher returns. This buoyed the currencies of the emerging economies and reduced their financing costs. In some countries, the high capital inflows even raised certain financial stability concerns regarding potential macroeconomic imbalances, overheating banking systems or a financial bubble, which some attempted to offset with capital constraints. Elsewhere, increased global liquidity and risk appetite, as well as resulting lower risk premiums, allowed for a more expansionist monetary policy in support of recovery from the crisis than would have been possible otherwise.

Emerging countries typically chose to satisfy some of their financing demand from foreign currency (this is referred to as the "original sin" problem). Whereas currency exposure may not be high on the macroeconomic level (as currency liabilities are coupled with some economic agents' currency assets), it may be high at the level of the individual economic agent. If households and the corporate sector both have high currency exposures, this will have an impact on monetary transmission.[10] Furthermore, the increased focus on financial stability criteria may constrain the central bank's manoeuvrability.

Since the crisis, several emerging central banks have reviewed their assumptions regarding the role that financial stability plays in addition to price stability, and thus the role that

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10 Foreign currency debt diminishes the effectiveness of the exchange rate channel of monetary transmission, which is the most important channel of emerging, typically small, open economies, since a positive and a negative impact occur simultaneously. See the previous section.

macroprudential policy has in addition to monetary policy. As a result, the view is becoming more prevalent that maintaining financial stability is essential for long-term price stability and the effectiveness of monetary policy actions (Billi and Vredin, 2014). Several central banks have added macroprudential regulation to their responsibility and toolkit, and financial stability was set as the second important objective of monetary policy besides the primary goal of achieving and maintaining price stability.

The following describes the extent of the various responses to the crisis discussed in the previous section, as well as the forms in which they have appeared in the practice of central banks in certain emerging countries that use, or are shifting to, inflation targeting.

4.2.2 Practices of central banks in emerging countries after the crisis

The emerging countries analysed also applied certain unconventional instruments, but they did so under conditions and in ways different from the advanced economies (Table 2).

Table 2							
Monetary policy instruments used by emerging economies after the crisis							
		Unconventional tools					
Country	**Forward guidance**	**Quanti-tative easing**	**Direct in-tervention on the cre-dit market**	**Liquidity expansion**	**Raising inflation target**	**Other target**	**Other measures**
CL	X			X			
CZ	X			X			X
HU	X	X		X			X
PL	X			X			
RO				X	↓		
RU	X			X	↓		X
TU	X			X	X		
Note: CL: Chile, CZ: Czech Republic, HU: Hungary, PL: Poland, RO: Romania, RU: Russia, TU: Turkey.							

All the countries analysed except Romania used some sort of **forward guidance**, but less of an Odyssean type than the central banks in advanced countries. The Czech central bank committed itself to a low interest rate and declared that it would stay at that level as long as inflationary pressures do not rise considerably. Their guidance is made all the more credible by the fact that they also publish their interest path forecast as a fan chart in their inflation report. In Poland, it was communicated that the interest rate level after the cycle of interest rate cuts in 2012–2013 ended (2.5 per cent) would be held unchanged;

the time horizon kept being extended.[11] The Magyar Nemzeti Bank employed forward guidance already in the easing cycle (August 2012 – July 2014) by providing more and more information about the extent of the interest rate cuts and the end of the easing cycle. In its forward guidance message after the end of the easing cycle, the MNB emphasised that, pending certain conditions stated in the forecast, reaching the medium-term inflation target requires maintaining expansionary monetary conditions. In Chile, the policy rate decreased to 0.5 per cent by the end of 2009 and the central bank declared its commitment to maintain this low interest rate until the second quarter of 2010. In contrast to these countries, Turkey has communicated that it will maintain tight monetary conditions until the inflation outlook has substantively improved. Russia has also used forward guidance, declaring that they would not cut the rate of interest in the second quarter of 2014.

The MNB was the only emerging economy central bank to carry out **quantitative easing**: it purchased government bonds for HUF 250 billion on the secondary markets in the last quarter of 2008. This was necessary, as market liquidity had contracted considerably. In parallel with the MNB's quantitative easing, the banks also boosted their government bond holdings pursuant to an agreement, so that excess liquidity grew from the tight level prevailing in the autumn of 2008.

A variety of **liquidity-providing measures** were used widely in the emerging countries as well; the details of these, however, go beyond the scope of this paper. (For details on the unconventional instruments used in Hungary during the crisis, see Krekó et al., 2012, Box 3, pp. 32–34.) Of the emerging economies analysed here, only the Czech Republic reached the zero lower bound of the nominal interest rate (the policy rate has stood at 0.05 per cent from November 2012 to the present day), but instead of the instruments employed by the central banks of the advanced economies, the Czech central bank opted for currency market interventions. At the end of 2009, Chile had a policy rate (0.5 per cent) that was near but not yet at the zero lower bound.

Only the Turkish central bank decided to **raise the inflation target**.[12] The inflation targets were reduced in Romania as the credibility of its inflation targeting grew and in Russia as it phased in inflation targeting.[13] In the case of Romania, this may be seen as a measure necessary for introducing the euro, for which it set an official target date after the inflation target was cut.

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11 One year after closing the easing cycle, they abandoned the guidance they had employed until then, as the likelihood of long-term low external and internal inflation grew.

12 The Turkish central bank raised the inflation target from 4% to 7.5% in 2009.

13 Romania set an inflation target of 7.5% with a band of ± 1 percentage point in 2005. The year-end targets were reduced gradually: they were set at 3.5% in 2009–2010, then 3% from 2011 onwards and finally at 2.5% with a ± 1 percentage point tolerance band from 2013.
Russia set a 5–6% target band in 2013, and then set a 5% target in 2014, with 4.5% for 2015 and 4% for 2016. In each case, a ± 1.5 percentage point tolerance band was set around the points target.

Other measures include the Czech central bank's use of the koruna exchange rate as a monetary policy tool to ease monetary conditions. This involved the central bank using the exchange rate as a temporary and alternative monetary policy instrument in the inflation targeting framework. It is an asymmetrical intervention that involves, in essence, not allowing the exchange rate to strengthen beyond the EUR/CZK 27 level, but letting market processes determine the exchange rate at its weaker side. The Funding for Growth Scheme launched by the MNB in 2013 is a country-specific and unconventional instrument in the "other" category, which specifically targets the SME sector to remedy the damage done to monetary transmission in the crisis and thus to support corporate lending. Another new measure is the MNB's strategy of self-financing to increase the proportion of domestic sources in financing government debt, in order to reduce gross foreign debt and thereby the country's vulnerability to external shocks. All this is consistent with the MNB's overall strategy of supporting the maintenance and strengthening of financial stability without jeopardising its primary objectives.

In discussing other measures above, it was noted that the Russian central bank is currently at the stage of introducing the IT framework; the central bank intends to complete this transition in 2015. Another strategic change is seen in the new monetary policy strategy employed by the central bank of Turkey since late-2010: reaching and maintaining price stability will remain its primary objective, but financial stability is now a supplementary objective that will underpin it.[14]

This shows that none of the emerging economies analysed have switched from inflation targeting to any different framework; on the contrary, these countries have tended to reaffirm their commitment to IT by making a shift towards the framework. Furthermore, the option of raising the inflation target tended not to apply in the emerging countries, as most of them did not face the challenges of the zero lower bound; in fact, there were some examples of reducing the inflation target as per nominal convergence. It is clear, however, that these countries were also forced to resort to unconventional monetary policy instruments or to introduce new measures to manage the problems caused by the financial crisis. In summary, the changes in the framework did not mean much change in the goals, but rather a significant change in toolkit and institutional arrangement in response to the challenges posed by the crisis. The spirit of the inflation targeting frameworks has remained intact. In light of experience gained from the crisis, these new instruments may remain integral to monetary policy and central bank practices in the future, especially as part of the unified monetary policy strategy and macro- and microprudential policy framework.

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14 The Turkish central bank has introduced a large number of new instruments (e.g. asymmetric interest rate corridor, reserve-option mechanism), but the motives for employing these instruments are often vague and the transmission they facilitate is not transparent. The use of such instruments and their inadequate communication is weakening the predictability of Turkish monetary policy and the credibility of its central bank.

5 Summary

Supplemented with certain unconventional instruments, flexible inflation targeting frameworks have been able to rise to the challenges posed by the crisis. Since the financial crisis broke out, criticisms have been directed towards the inflation targeting framework, yet international experience demonstrates that none of the central banks renounced their inflation targeting regimes; on the contrary, there are numerous instances of shifts towards such a regime, indicating that it should continue to be considered as one of the best monetary policy practices. **Upgrading the existing framework of flexible inflation targeting does not imply making goals elastic, but extending the toolkit in a way that can help identify responses to the challenges of the zero lower bound and other acute structural problems caused by the financial crisis**. As a result, the shift in flexible inflation targeting strategies during the crisis offers a framework that, besides the primary objective of price stability, allows central banks to take certain other factors (real economy, financial stability etc.) into consideration in order to meet the inflation target or to avoid deflation risks. Experience from the financial crisis has revealed, however, that working towards meeting the inflation target may, by itself, prove insufficient for maintaining long-term macroeconomic stability if financial instability is at risk. The augmented central bank toolkit offers a solution for this conflict, as it aims to reduce imbalances, vulnerabilities and risks appearing in certain segments of the financial system. In this context, the new instruments of flexible inflation targeting may remain integral parts of monetary policy and central bank practice looking forward.

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Recovery from crises and lending

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During the recovery from the recent crisis, the general role of lending in economic growth, and particularly in the recovery from financial crises, has become an important issue. In this paper, we review the major differences between creditless recovery episodes and recoveries accompanied by growth of credit. Based on the literature, we find that creditless recoveries are relatively frequent phenomena: a quarter or one-fifth of all real economy recoveries take place without the growth of credit. The rate of economic growth is permanently lower during creditless recoveries than in episodes accompanied by credit expansion. Thus, lending activity of the financial intermediary system is usually necessary for fast recovery. When analysing the recovery from the current crisis, we find that a number of factors exist that predispose to creditless recovery. The current growth, the rate of which is lower than before the crisis, is taking place – both in the Member States of the European Union and in Hungary – with a decrease or stagnation of the credit stock. In the medium and long term, it is essential for the sustained growth of the real economy that loans granted by the financial intermediary system once again start to increase.

1 Introduction

During the six years that have elapsed since the global financial crisis of 2007–2008, recovery has been slower than in previous crisis episodes and the economic growth rate is generally lagging behind the values experienced before the crisis. In order to understand and analyse the recovery period following the crisis, it is important to perceive the differences compared to former financial and real economy crisis episodes. The ongoing crisis resulted in a larger downturn than other episodes previously examined by the literature, it appeared in a synchronised manner, and it is followed by a slower recovery. The slower recovery may also be attributable to the fact that lending does not support economic growth in several countries, thus the recovery is creditless. According to international experiences, during creditless recoveries the rate of GDP growth is lower than episodes with credit (i.e. a creditless recovery is characterised by a loss of growth).

The recovery of the domestic economy from the crisis is accompanied with a low level of lending, and it may take a longer time to reach the turning point of lending, than in to former crisis episodes. In the pre-crisis years, the private sector significantly increased its indebtedness. The revaluation of the foreign currency loans, the increase of unemployment, the decline of external demand, the government's fiscal consolidation need and the deterioration of the external financing conditions during the crisis resulted in a material decline of both credit demand and credit supply. Deleveraging of the private sector is still in progress, with both households and corporations being net loan repayers. For this reason, it is important to examine the relationship between lending and growth during the recovery from the crisis, as well as the features characterising creditless recovery episodes. This paper seeks to identify factors that may support growth and the way in which economic growth may develop when the recovery continues with a low level of lending.

This article reviews the relationship between lending and economic growth, and also the literature on creditless recoveries. It provides a summary of the differences between creditless recoveries and recoveries that were accompanied by credit expansion. Based on the literature, it also describes factors that may be responsible for the fact that lending does not start to increase during the recovery as well as factors explaining the growth of GDP despite the decrease of the credit stock. An examination of the European Union Member States' recovery from the current crisis is followed by an analysis of the factors that may have led to a creditless recovery in Hungary. Finally, it presents the characteristics of the current economic growth.

2 Summary of literature

2.1 Relationship between lending and economic growth

Lending causes economic growth; the main channel of this is the reduction of information and transaction costs, and the linking of the savers and borrowers. There is a rich body of literature on the theoretical[1] and empirical relationship between financial development and economic growth. The presence of this relationship, as well as its direction (if it is financial development that causes economic growth or the relationship goes the other way), has long been a debated topic among economists. Empirical analyses have been able to prove a causal relationship from lending to economic growth (for example, see Rajan and Zingales, 1998; Beck at al., 2000). Levine (2005) differentiates five functions

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1   For a detailed review of the theoretical literature, see Levine (2005).

of the financial system: 1) it produces information *ex ante* about possible investments and allocates capital, 2) it monitors investments and exerts corporate governance after providing finance, 3) it facilitates diversification and management of risk, 4) it mobilises savings, and 5) it facilitates the exchange of goods and services. By fulfilling these functions, the financial sector increases both the level and the efficiency of the investments, and thereby also economic growth (Cecchetti and Kharroubi, 2012).

Apart from the improvement of capital allocation, research has identified multiple channels between credit and economic growth (Beck, 2012):

- **Entrepreneurship increases as external financing becomes more easily available, more new companies are established and companies are more innovative.** For example, Klapper et al. (2006) find that the regulation that facilitates the development of financial systems also facilitates the establishment of new companies in the industries that depend on external financing.

- **Financial intermediation also contributes to helping companies reach a larger size, thereby capitalising on the economies of scale.** Beck et al. (2006) find that the existence of more advanced financial systems is the precondition of the appearance of large enterprises. Larger enterprise size may be the source of efficiency advantages, which may contribute to economic growth.

- **Lending also influences growth through exports.** Having examined the crisis of 2008–2009, Chor and Manova (2012) found that the credit channel had a significant role in the decrease in the volume of foreign trade. The external financing requirement of exporting sectors is higher than that of industries producing for the domestic market; pre-financing needs, as well as the risk thereof, may also be higher, and therefore the decline and the rising costs of financing restrain the volume of exports. Based on the findings of Amiti and Weinstein (2011), the impact of financing shocks on the volume of foreign trade may be substantial: as much as a fifth of the decline may be attributable to this.

- **A higher level of financial development contributes to the efficiency of economic policy** (IMF, 2012). The credit channel is one of the most important elements of the transmission of monetary policy, the efficient operation of which is conditional upon the development of the financial system. Thus, more developed financial systems enable monetary policy to manage macroeconomic shocks efficiently. In addition to this, financial development is correlated with the exchange-rate regime and the cyclical character of fiscal policy, both of which also influence economic growth.

The functioning of financial systems also impacts the volatility of economic growth. Financial systems facilitate intertemporal optimisation of consumption and investment, thereby decreasing the volatility of business cycles (Beck, 2012). For example, households may react to shocks that are seen as temporary by reducing their consumption to a lesser extent than justified by changes in income, and they may finance this by loans or already

accumulated domestic savings. By increasing borrowing and reducing savings, households are able to smooth their consumption. Similarly, corporations may soften the impacts of the short-term fluctuations of their incomes and profits through external financing, which may result in less volatile output and investment. At the same time, financial systems may also strengthen the swings of business cycles (Bethlendi and Bodnár, 2005). Based on empirical experience, in the rising phase of a business cycle, the increase of GDP affects lending: with decreasing unemployment and increasing corporate income and profit, both financial intermediaries and borrowers perceive the risks to be lower. Therefore, lending conditions may be eased, accompanied by a decrease of interest rates, resulting in higher lending. On the other hand, in the downward phase of a business cycle, due to rapidly deteriorating credit quality, both credit demand and credit supply may decrease to a larger extent than justified by the situation of the real economy. Financial intermediaries and actors in the private sector become overly cautious, which further deepens the downturn.

The link between credit developments and economic growth is not linear. In the long run, financial development increases potential growth; however, according to the latest research, this holds true only up to a certain level. When financial systems grow over a certain point, there are no more positive impacts, and the link to growth may even turn negative (for discussion of the inverted U-shape link, see Cecchetti and Kharroubi, 2012; Arcand at al., 2012). This may be attributable to several reasons:

1. The financial sector draws away resources from the rest of the economy. If it draws away too much resource, the efficiency of production may decline.

2. In economies that are close to the full utilisation of their efficiency limits, lending in larger volumes no longer generates any benefit. Credit growth may have positive growth impact in those economies that are farther from these limits.

3. In the larger financial systems, the weight of consumer credits – which do not support growth – is higher. Economic growth may be more tightly related to the investment loans.

4. A larger financial system is more likely to generate financial crises, after which economic growth becomes more moderate.

According to the literature, financial development may have a positive impact on the economy only up to a certain level. The relationship also depends on the level of development of the countries: Arcand et al. (2012) found that financial development supports economic growth particularly in low- and middle-income countries. Law and Singh (2014) evaluated several indicators of financial development and found that growth is impacted most of all by loans taken by the private sector, until their level reaches 90–100 per cent of GDP. At the same time, the strongest negative impact was experienced when the ratio of resident bank loans exceeded the threshold value (irrespective of the

fact whether or not those were taken by the private sector). However, the fact that the existence of a threshold value – under which a positive relationship was observed between the size of the financial sector or the credit stock and GDP-growth – was justified by several empirical works does not mean that the threshold value is to be reached as quickly as possible. An overly quick increase in indebtedness alone may carry risks (e.g. due to the deteriorating banking portfolio (Kiss, 2006), even if the credit portfolio to GDP ratio has not yet reached the threshold value.

After crises, the link between lending and recovery may weaken. As mentioned earlier, constraints may appear both in credit supply and credit demand after crises, which may slow down or postpone the expansion of credit. On the other hand, if the crisis was preceded by fast credit growth, the credit stock must decrease due to the debtors' need to deleverage. Due to these factors, the credit portfolio may permanently decrease or its increase may lag behind the expansion of the real economy. However, newly disbursed loans may even then still have a tighter relationship to GDP growth (Biggs et al., 2009).

2.2 Creditless recovery

Creditless recovery occurs when after a recession the real economy grows without a pick-up in credit. Lending is generally understood in terms of bank credit to the private sector. Recovery refers to the period when, after a downturn, GDP gets over its trough and approaches the pre-crisis level. In creditless recovery periods, GDP increases while real credit stock decreases or does not expand.

2.2.1 Frequency of creditless recovery

According to the empirical literature, about a quarter to a fifth of all recoveries take place without a rebound in credit (the ratio varies with the range of countries and the definition of creditless recovery; Table 1 presents the definitions appearing in the literature). It was Calvo et al. (2006) who first documented the phenomenon. Their study summarises the experiences of financially integrated, emerging countries that suffered a huge collapse in output (GDP fell by more than 4.4 per cent) upon the systemic sudden stop of external financing, and during the recovery they could achieve fast growth without the increase of credit, capital inflows or investments. Such episodes are also referred to as "Phoenix miracles". Subsequent research has also examined the downturns and recoveries of business cycles, not only those that were preceded by a sudden stop of external funding. These researches found only a few episodes where after the downturn an economy could achieve extremely fast growth without recovery of lending (some of these episodes are presented in Subsection 2.2.4).

Table 1
Frequency of creditless recoveries under different definitions

Study	Definition of creditless recovery	Frequency
Abiad et al., 2011	The annual growth rate of real bank credit to the private sector is zero or negative in the first 3 years of the recovery	20%
Bijsterbosch and Dahlhaus, 2011	The average annual growth of the real credit is negative for 2 years after the trough of the crisis	22%
	The average annual growth of the real credit is negative for 3 years after the trough of the crisis	23%
	At the end of the 2nd year following the trough of the crisis, the level of the real credit is lower than at the trough	24%
	At the end of the 3rd year following the trough of the crisis, the level of the real credit portfolio is lower than at the trough	26%
Sugawara and Zalduendo, 2013	The average annual growth of the real bank credit is negative or zero for 8 quarters following the trough of the crisis	over 25%
UniCredit, 2012	The level of the real credit in the 3rd year following the trough of the crisis is lower than at the trough of the crisis	19%

Existence of creditless recoveries is denied by Biggs et al. (2009). Since GDP is a flow-type indicator, they compare it to the change of credit stock instead of its level. According to their results, following the crises studied by Calvo et al. (2006), the flow of credit – defined as a change of credit stock – started to increase simultaneously with GDP (Chart 1). Coricelli and Roland (2011) compared recoveries[2] based on the definitions of Calvo et al. (2006) and Biggs et al. (2009). They found that when credit stock fails to recover, economic growth is not hampered, while a decline in the flow of credit slows down economic recovery.

2.2.2 Determinants of the probability of creditless recoveries

The international literature classifies as determinants of creditless recovery: 1) financial crises, 2) credit or real estate market imbalances preceding the recession, 3) large-scale decline in GDP during the crisis period, and 4) the current account deficit. In addition to this, the development of the economies may also influence the probability of creditless recovery.

Creditless recoveries can often be observed after recessions accompanied by financial crises (e.g. by banking or currency crises).[3] Bijsterbosch and Dahlhaus (2011) show that in case of *banking crises*, the frequency of creditless recovery doubles: in their total

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2   Coricelli and Roland (2011) identify economic recovery on the basis of the added value of certain manufacturing sub-sectors.

3   There are different types of financial crisis, including banking crisis, currency crisis, sovereign debt crisis or crisis accompanied by extremely high level of inflation. See Kiss-Szilágyi (2014).

Chart 1
Credit stock and flow of credit around crisis periods in emerging countries

Note: On the above charts the continuous lines illustrate the average level of real GDP observed during the crisis periods examined by Calvo et al. (2006). On the left-hand panel, the dashed line shows the average level of the credit stock, while on the right-hand panel the dotted line illustrates the flow of credit defined as the annual change of the credit stock. The average real GDP and the average credit stock are presented as a percentage of their value in period „t", being the trough of the crisis.
Source: Biggs et al. (2009)

sample, every fourth – and in their sub-sample restricted to banking crises,[4] every second – recovery occurred without a rebound in credit. Similarly to this, following the crisis periods of OECD countries between 1960 and 2010, the growth rate of domestic credit stock decreased more markedly on average after banking crises than after other recessions (ECB, 2012). According to averages calculated from data of these countries, following recessions linked to banking crises the growth rate of credit stock was negative for two years (ECB, 2012), which may suggest the presence of creditless recovery. The link between banking crises and creditless recoveries may be attributable to the fact that banking crises increase the ratio of non-performing loans, weaken banks' capital position and decrease their profitability, thus hampering lending through a decline of the credit supply. Similarly to banking crises, *currency crises* also increase the probability of creditless recoveries. Based on descriptive statistical analysis of Bijsterbosch and Dahlhaus (2011), after currency crises every second – and according to Abiad et al. (2011), every third – recovery takes place without a pick-up in credit.[5] A currency crisis may increase the probability of creditless

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4   See the definition of bank crisis in Laeven and Valencia (2008: 5).

5   The relative frequency may differ in the two studies, as the sample examined by Abiad et al. (2011) contains not only the data of emerging economies, but also the advanced economies.

recoveries, because it can result in a decline of foreign funds, may have an unfavourable impact on the liquidity and capital position of the domestic banking system, and can also increase the credit risk of borrowers with outstanding foreign currency loans (Hudák, 2012).

Credit booms preceding the recession also double the relative frequency of creditless recoveries. According to the results of Abiad et al. (2011), the impact of a credit boom is greater if it coincides with a banking crisis: in this case, creditless recovery can be observed in about 80 per cent of episodes. Based on the estimation results of Bijsterbosch and Dahlhaus (2011), the credit-boom variable identified by the credit-to-GDP ratio is a significant explanatory variable of creditless recoveries. This may be attributable to the fact that after periods of build-up of excessive credit stock, there is a greater need for debt reduction, and the deleveraging might as well support economic growth. Such episodes are usually preceded by the fast build-up of a portfolio of bad loans, which no longer contributes to productive investments, and thus their reduction may have a positive impact on economic growth. The burst of a real estate market bubble may also increase the risk that the recovery takes place without the pick-up of credit. Such events, resulting in the decline of real estate prices, may force borrowers to deleverage. Having analysed the financial cycles of advanced economies, Claessens et al. (2011) found that when the downturn phase of the credit cycle took place simultaneously with a fall in real estate prices, the decrease of credit stock was larger and its recovery lasted longer.

Based on the literature,[6] **a large-scale decline in GDP during recession may also increase the probability of creditless recoveries**. Abiad et al. (2011) identify the extent of a downturn as the percentage change in GDP from peak to trough, while Bijsterbosch and Dahlhaus (2011) identify real GDP growth rate as a significant explanatory variable of the phenomenon. The larger the downturn, the easier it is for the economy to expand even without any increase in credit stock, as firms can increase their production by utilising unused capacities without borrowing or investment. This is referred to as the rebound effect. At the same time, due to a sharp economic downturn, lending constraints may also become stronger at the beginning of the recovery period: the supply of bank credit may decrease due to their weaker lending capacity (e.g. deteriorating credit portfolio, more unfavourable capital position due to the recession), and their willingness to take risks may also decline.

A current account deficit preceding the crisis increases the probability of economic recovery without a rebound in credit. A permanent current account deficit may imply an increased dependency on foreign capital inflows and the presence of a credit boom (Bijsterbosch and Dahlhaus, 2011). A sudden stop of foreign funding following economic downturns can hamper lending. Economic growth can recover in spite of decreasing credit stock (for example, through export as a result of exchange-rate depreciation). During the recovery, this results in an improvement of the current account balance.

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6   See Bijsterbosch and Dahlhaus (2011); Sugawara and Zalduendo (2013).

The determinant factors presented above may strengthen each other's impact and not fully independently of each other they increase the probability of creditless recovery. Having reviewed the results of the literature, Hudák (2012) submits that banking crises often occur after credit booms; in addition, fast credit growth and financial crisis episodes can also increase the degree of decline of GDP experienced during the recession.

Finally, according to the literature, the development of economies also influences the probability of creditless recoveries. The frequency of creditless recoveries is lower in developed countries: in the sample examined by Abiad et al. (2011), in developed countries only every tenth recovery took place without the expansion of credit stock, while according to the results of Darvas (2013) in high-income countries, every eighth recovery occurred without a pick-up in credit.

2.2.3 Development of the key macroeconomic indicators during creditless recoveries

The growth rate of output in creditless episodes is usually much lower than in the case of credit growth (Table 2). Abiad et al. (2011) find that average GDP growth in creditless recoveries is almost 2 percentage points lower than in recoveries with credit. A difference of over 5 percentage points in the year of the downturn can also significantly contribute to this. The extent of the difference may also depend on the development of the economies. Bijsterbosch and Dahlhaus (2011) found a difference of 8 percentage points between the growth rate of creditless recoveries and recoveries with credit in middle- and low-income countries. Based on the results of Darvas (2013), in lower-income countries economic growth is 1.6–1.7 percentage points lower in creditless recoveries compared to recoveries with credit, while the difference in growth rates in higher-income countries is not more than 0.9 percentage points. According to the findings of Cerra and Saxena (2008), the growth trend lags behind that observed before the crisis by 4 per cent after currency crises, by 8 per cent after banking crises and by 10 per cent after joint currency and banking crises. However, according to the findings of Takáts and Upper (2013), during recoveries from financial crises preceded by fast credit growth there is no significant difference in economic growth between recoveries with credit and without credit, as debt reduction in such cases may have a positive impact on growth and thus offset the impact of slow credit growth. According to Bech et al. (2012), deleveraging following financial crises increased GDP growth during recovery, rather than decreasing it (a 10 per cent decrease in the credit-to-GDP ratio increases the average of economic growth by 0.6 percentage points during recovery).

During creditless recoveries, a lower GDP growth rate may remain in the long run. Abiad et al. (2011) found that output returns to its pre-crisis trend in less than half of the creditless recovery episodes within three years after the downturn. Sugawara and Zalduendo (2013) also identified a permanent lag in growth in the case of creditless recoveries, both for developed and developing countries.

Investment growth rate is lower during creditless recoveries. According to Sugawara and Zalduendo (2013), during creditless recoveries the growth rate of investments is lower than in cases of recoveries with credit by about 10 per cent in the case of developed countries and by 27 per cent in the case of developing countries. In addition to this, the total factor productivity may also be lower, as more productive firms with high growth potential face difficulties when trying to obtain financing (Abiad et al., 2011).

Table 2
Average GDP growth rate in different recoveries

Study	Examined category of countries	Recovery with credit expansion	Creditless recovery	Difference in percentages
Abiad et al., 2011	Developing and developed countries	6,3 %	4,5 %	−29%
Bijsterbosch and Dahlhaus, 2011	Middle- and low-income countries	14,2 %	6,4 %	−55%
Darvas, 2013	Lower-income countries	6 %	4,5 %	−25%
Darvas, 2013	Higher-income countries	4,1 %	3,2 %	−22%

Creditless recoveries were usually also accompanied by considerable current account adjustment, as declines in external financing and weak internal lending activity resulted in an inevitable correction of the financing capacity of the various sectors in a previously over-indebted country.

### 2.2.4 Individual episodes – high economic growth without lending

Creditless recoveries are rarely accompanied by fast economic growth. The literature uses the term "Phoenix miracle" to refer to episodes during which an extremely fast rebound occurs in economic performance without substantial credit expansion following the sudden stop of global capital flows.

In the last decades, truly unusual economic recoveries were observed in the case of four South American countries, which may be deemed as special cases. The said phenomena were experienced in the mid-1980s in Chile and Uruguay, at the end of the 1990s in Mexico, and in the first half of the 2000s in Argentina. In these Latin-American countries, the economies were hit by three negative shocks. Foreign interest rates increased quickly, which increased the interest expenses of the general government, having been indebted in foreign currency. In addition to this, significant deterioration in the terms of trade, as well as capital outflows, were experienced, which substantially contributed to an unsustainable increase in government debt.

In these countries, substantial downturns were followed by very strong economic growth without material cumulative credit growth. The weakening of the exchange rate, which

could improve the profitability of the exporting companies, was characteristic of the creditless recovery episodes in these low-income countries as well. Furthermore, creditless recoveries in these countries were also accompanied by considerable current account

Chart 2
Creditless recoveries in Latin-American Countries
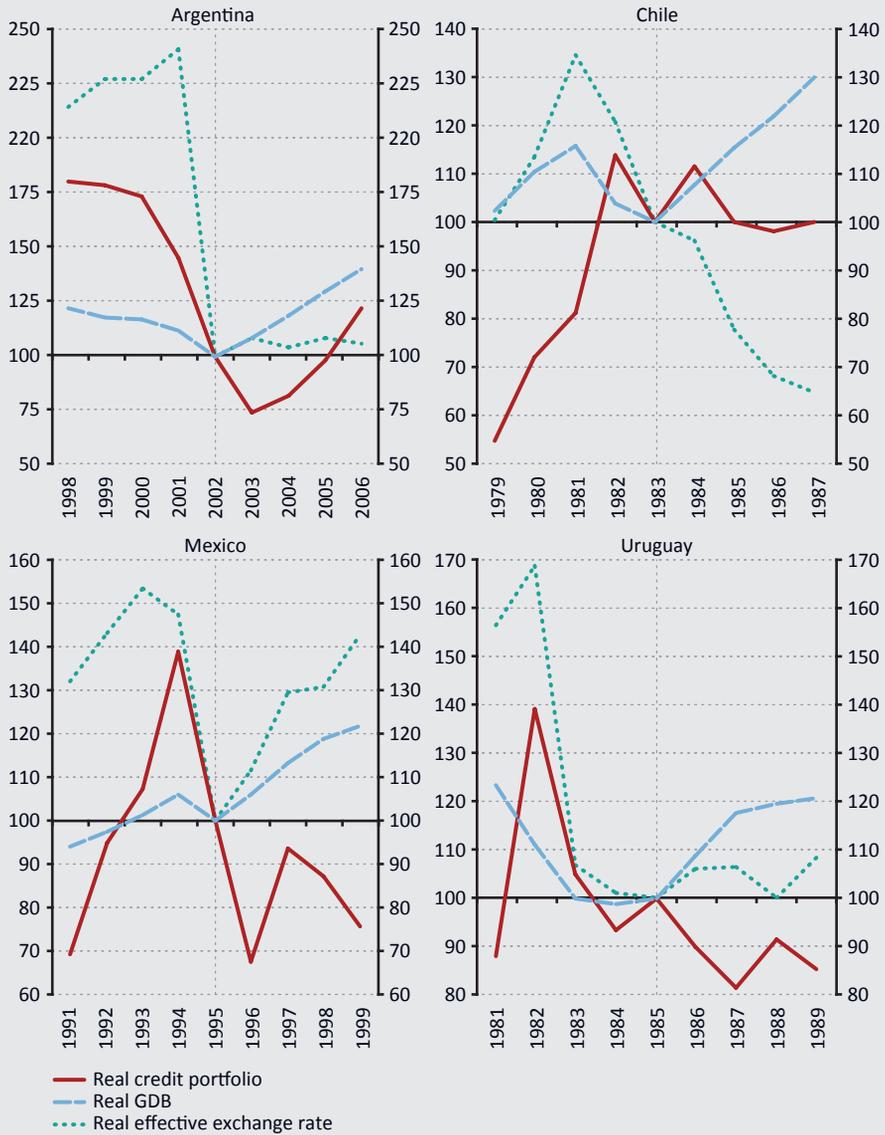
Note: The dashed line indicates real GDP, the continuous line indicates the real credit stock, and the dotted line indicates the real effective exchange rate (expressed as the percentage of their value in period "t", indicating the trough of the crisis).
Source: IMF IFS

adjustment, as the decline of external financing and poor internal lending activity resulted in an inevitable adjustment in the previously overindebted countries.

Presumably the phenomena referred to as a Phoenix miracle are primarily attributable to the rebound effect. One sees examples of abrupt and swift recoveries following a very deep crisis in such a clearly identifiable form only in these few countries. The fact that the rebound effect – usually following the crisis and explainable by the base effects – could play a significant role both in the rate and pace of the recovery, however, makes these episodes less miraculous.

2.2.5 What could be the cause of creditless recovery?

It is possible to examine the reasons behind creditless recoveries in terms of two aspects. One aspect is the cause for the credit portfolio not picking up during the recovery. The other one includes the factors that, in the absence of lending, still contribute to the growth of the economy, even if this represents a slower growth rate than in the case of credit expansion. The two aspects cannot be fully separated from each other, but still they are treated separately, as one contains the financing and the other the real economic explanations.

2.2.5.1 Why does credit not grow during the recovery?

During recoveries, the credit portfolio does not increase when the downturn was preceded by a fast build-up of the credit portfolio. The fast growth of credit portfolios is often accompanied by a quick increase of asset (e.g. real estate, shares) values (asset price bubble). During the crisis, the value of these assets decreases, while the debt value remains constant or increases. Due to the depreciation of assets, the economic agents reduce their outstanding debt. (The process is described in detail, broken down into sectors, by Kiss and Szilágyi (2014).) The reduction of outstanding debt (deleveraging) may explain why lending does not start to grow. However, creditless recovery may also occur in the case of downturns not attributable to financial crises. The magnitude of the decline of GDP also appears in the literature as one explanation for this: the higher the rate of the downturn, the greater the probability of a creditless recovery. Downturns of a higher degree significantly reduce both credit demand and credit supply. The credit quality and the collateral value considerably deteriorate, and financial intermediaries' willingness to take risk declines. In addition to this, write-downs also reduce the credit stock.

Lending expands less slowly after banking crises. This is also supported by the fact that – according to Gambacorta et al. (2014) – in the economies dominated by bank financing the soundness of the banks (e.g. credit portfolio quality or capital stock) influences the

response to crises. Financially sound banks are able to soften the impacts of shocks and provide support to the real economic agents to recover from the crisis (to a greater extent than the capital markets); however, if during the crisis the banks' shock-absorption capacity is compromised, economies depending on the banks suffer higher output losses and the banks themselves also deepen the crisis.

The low level of lending may be attributable to credit demand or credit supply reasons. Following crisis episodes, the decrease in corporate investments may result in poor corporate credit demand, which may be attributable to a lower demand for products and services or to the need to improve liquidity situations (Calvo et al., 2006). The moderate credit demand of households may be attributable to lower income expectations and the strengthening of precautionary behaviour due to an unfavourable labour market environment, or deleveraging. The strengthening of credit supply constraints may be linked to lending capacity or the lending willingness of the financial intermediaries. Following the crisis, the lending capacity may become unfavourable due to the banks' deteriorating credit portfolio, and also due to the banks' weaker liquidity or capital position. The willingness to lend, which can be captured by the volume of credits an institution wishes to place, may decrease due to the banks' low risk appetite.

Based on the empirical literature, it is not straightforward whether during the recovery following the latest global crisis it is the credit demand or the credit supply that is more responsible for the credit contraction. In its analysis in 2012, UniCredit examined whether the probability of creditless recovery is increased primarily by credit demand or credit supply constraints. The output gap and the investment demand measured at the trough of the crisis were identified as credit demand factors, while the bank crisis before the downturn and the access of the banking system to external financing were identified as proxies of credit supply, and they found that all factors are significantly responsible for the occurrence of creditless recoveries. When examining creditless recoveries, Abiad et al. (2011) attributed a larger role to the credit supply restraints: according to their findings, the added value of industries depending more strongly on external financing increases at a rate that is 1.5 percentage point lower during creditless recoveries than during other recoveries. In the case of industries that are less dependent on bank financing, the growth difference between the two types of recovery is merely 0.4 percentage points (Abiad et al., 2011).

2.2.5.2 What factors facilitate economic growth when credit stock is declining?

In the case of creditless recoveries, varying growth rates are observed. Certain economies are capable of relatively fast growth, even in the absence of credit expansion, while others (particularly the developing countries) may have to face a low GDP growth rate in the long run.

According to the literature that examines large international panels, the sources of growth in terms of the real economy may be as follows:

• Due to the rebound effect, the higher the rate of the downturn is, the easier the economy can grow: in such a case, there is more unutilised capacity and companies can thus expand production, even without investments.

• Depreciation of the real exchange rate may improve the profitability of the exporting companies, thereby providing funds for their growth.

• Companies producing for external markets may be less impacted by the decrease of domestic bank loans.

• Companies may look for alternative financing sources, thus replacing bank loans with commercial loans, bond or share issuance, direct capital investment, intercompany loans and so forth (Hudák, 2012).

• If growth commences in industries that are less dependent on external financing, the structure of the economic growth changes. However, if the industries that are less dependent on external financing have lower productivity, it may lead to suboptimal growth.

3 Why is this recovery different? recovery since the crisis of 2007–2008

3.1 Crisis and recovery in the European Union and in the advanced economies

A synchronised crisis, hitting the advanced economies severely, commenced in 2007-2008; a slow recovery from this is still currently in progress. One of the deepest recessions of past decades was set off by the financial crisis of the advanced economies, and it has resulted in a temporary standstill of the entire global financial system and the collapse of world trade. The crisis pushed the majority of the advanced economies almost immediately into deep recession, and it also had a negative impact on the developing economies; however, its extent and nature materially varied among the individual regions and countries. Based on its financial and real economic aspects, in the global crisis of 2007, several preconditions of creditless recovery, described in detail earlier, could be regarded as

given before the crisis. The rate of recovery from the current crisis in the largest economies of the developed world, as well as in Hungary, is lagging behind those observed after former crisis episodes, and it is taking g longer time for the economies to recover. Based on a comparison of crises of the United States and the European Union, the current crisis is deeper and more prolonged than other downturns observed in previous decades (Chart 3). In developed economies, output generally exceeds pre-crisis levels; however, the growth rate significantly lags behind those, despite the extremely low level of interest rates (Teulings and Baldwin, 2014). In order to understand and analyse the crisis and the subsequent recovery period, it is important to investigate both the similarities and the differences compared to former financial and real economy crisis episodes.

Chart 3
Development of GDP during the current recovery period and former crisis episodes in the United States and in the European Union*
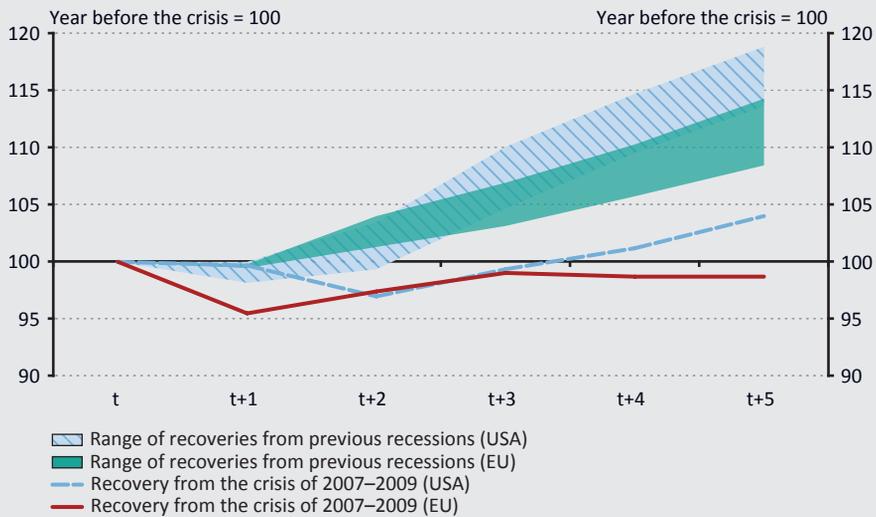
Note: *The bands shown on the chart illustrate the range of the growth paths of the United States' and the European Union's recovery from the recession. The recovery paths show the change measured in comparison with the GDP level of the year preceding the current recession. The bands are the intervals created on the basis of the individual recovery paths.
Source: WDI.

The present growth is hampered by the fact that the traditional recovery channels are not working. During the recovery period, there is less opportunity to rely on the tools that support economic performance, which were formerly used efficiently. The exchange-rate policy's room for manoeuvrability narrowed, and there is limited room for fast real depreciation, as the impacted European countries are either Member States of the euro area (and as such cannot pursue an independent exchange-rate policy) or they did not rely on this tool due to the considerable external exposure accumulated in the

pre-crisis period. Following the synchronised crisis, deleveraging started simultaneously in the indebted countries and, due to the budgetary adjustments, fiscal policy also acted towards the reduction of demand in several countries. Due to the global nature of the crisis, global demand declined and the growth rate of foreign trade may be permanently slower; therefore, exports cannot significantly support growth (Chart 4). Due to the endurance of the low-interest environment, the room for traditional monetary policy manoeuvrability also narrowed. For this reason, the central banks recently applied a number of unconventional methods, which mitigated the rate of output and credit contraction, but were unable to catalyse growth (Lehmann, 2012).

Chart 4
Change in the import-intensiveness of global growth

Source: WTO (2013).
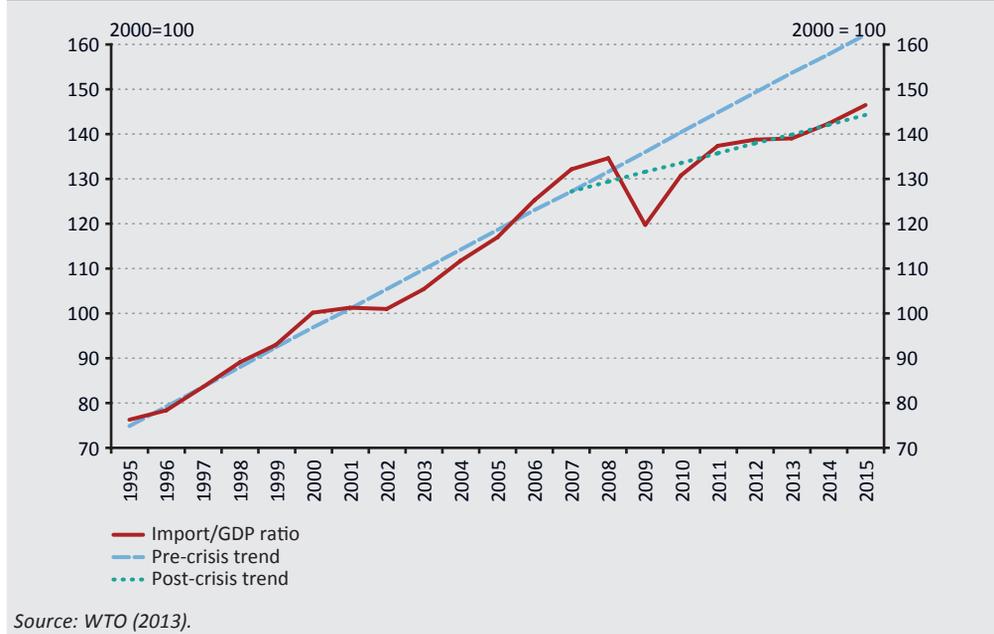
The credit expansion is slower in economies that were significantly indebted before the crisis. Similarly to the previous financial crises, before the global economic crisis of 2008–2009 there was a credit and asset price bubble in several advanced economies. Within the European Union, indebtedness increased and external balance deteriorated, particularly in the peripheral countries (primarily Greece, Portugal and Spain). However, after the outbreak and the deepening of the crisis, the banks' balance sheets deteriorated, even in countries where over-indebtedness was not typical. However, the initial debt levels were determinant in the explanation of differences in the lending processes perceivable since the crisis. In the economies characterised by a high external debt ratio, the net new borrowing materially lags behind that of countries with a favourable external position (Chart 5).

Chart 5
Net credit disbursement (private sector), and pre-crisis external indebtedness
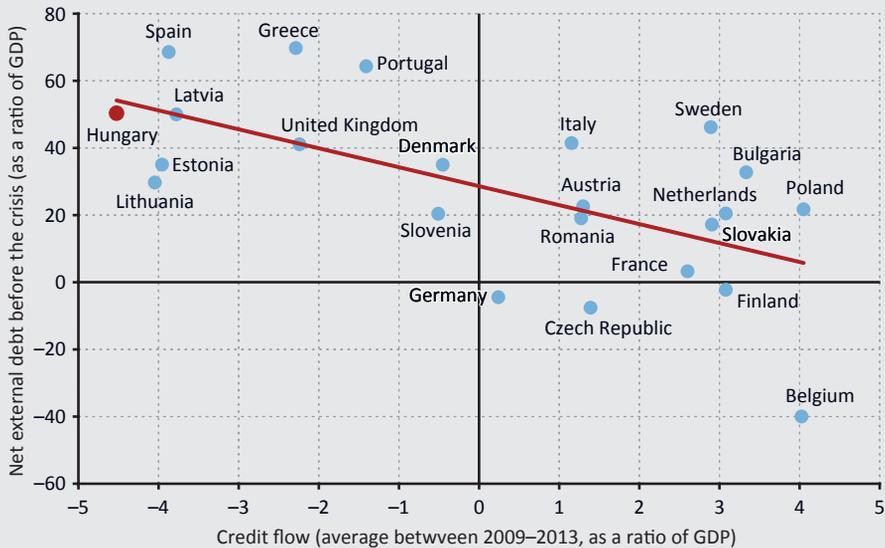
Source: Eurostat.

**The growth of lending activity is hampered by real economy problems, the confidence crisis and the regulatory changes.** During the crisis, the European banking systems suffered considerable losses and the banks' balance sheets were severely hit. In several countries, a bank crisis also occurred, and due to the banks' vulnerability that arose a confidence crisis also emerged. The banking and sovereign crises became phenomena that reinforced each other; this was generated by the banks' exposure to indebted states and the governments' bank rescue measures. Due to the need to remedy balance sheet problems, lending by the financial system is moderate and regulatory changes (the tasks related to the bank union) also point in this direction. The European Union is dominated by bank financing, and the opportunities for drawing in alternative funds are limited,[7] thus the condition of the banking system determines the financing environment. In terms of the real economy, the high unemployment rate and lower demand in the corporate sector are hampering credit expansion. Based on the foregoing, the current recovery takes place in several countries under conditions that are more unfavourable than in previous crisis episodes. The low growth rate of the credit portfolio is accompanied by lower economic growth (Chart 6).

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7 According to ECB (2012), companies in the euro area have increased loans taken from other companies and commercial loans since 2009. However, the volume of these is generally lower than that of loans taken from the banking system.

**Chart 6
Change of the real credit stock (private sector) and GDP during the crisis**

Source: Eurostat.
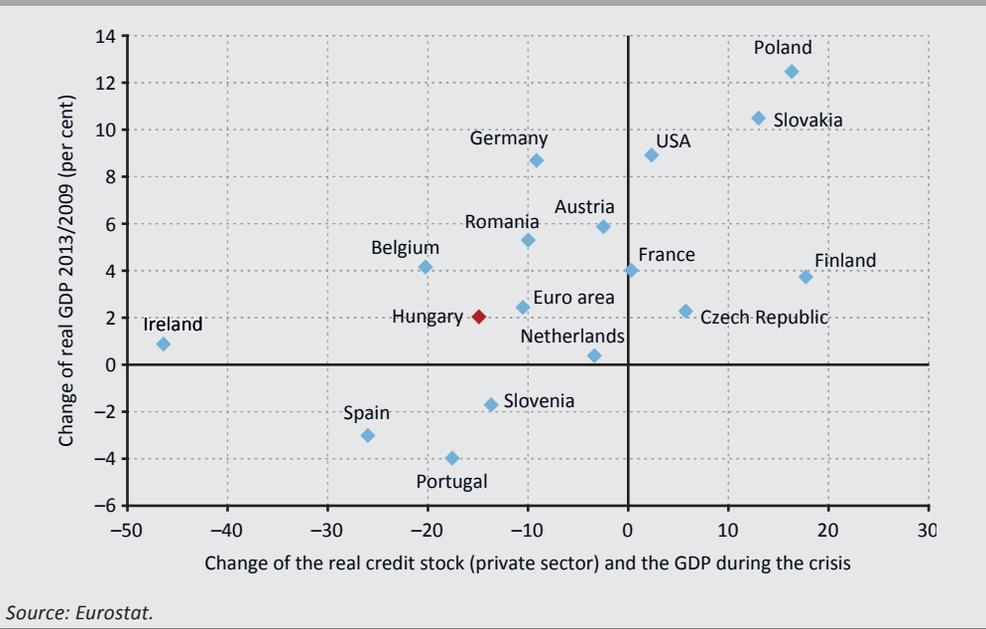
3.2 Recovery in Hungary

Several factors contributed to a creditless recovery in Hungary. Prior to the crisis, the actors of the domestic economy significantly increased their indebtedness. This led to the increase of external vulnerability, which was further raised by the high ratio of foreign currency debts. At the start of the crisis, the decline of external demand and the surfacing of the vulnerability resulted in a considerable decrease of GDP. Although there was no systemic bank crisis in Hungary, the quality of the banks' credit portfolio severely deteriorated which limited the credit supply. As a result of these factors, the expansion of the real economy started at the time of declining credit stock. The following paragraphs examine how the factors predisposing to creditless recovery emerged in Hungary and describe the characteristics of the recovery.

The pre-crisis period was characterised by excessive growth of lending. In the last couple of years before the crisis, the credit portfolio of the private sector increased at a fast pace. Both credit supply and credit demand were high. The spread of the foreign currency loans resulted in a significant easing of liquidity constraints, while the fast credit growth disguised the risks that were about to build up. In the beginning and middle of the 2000s, all three domestic sectors (i.e. households, corporations and the state) contributed to the increase
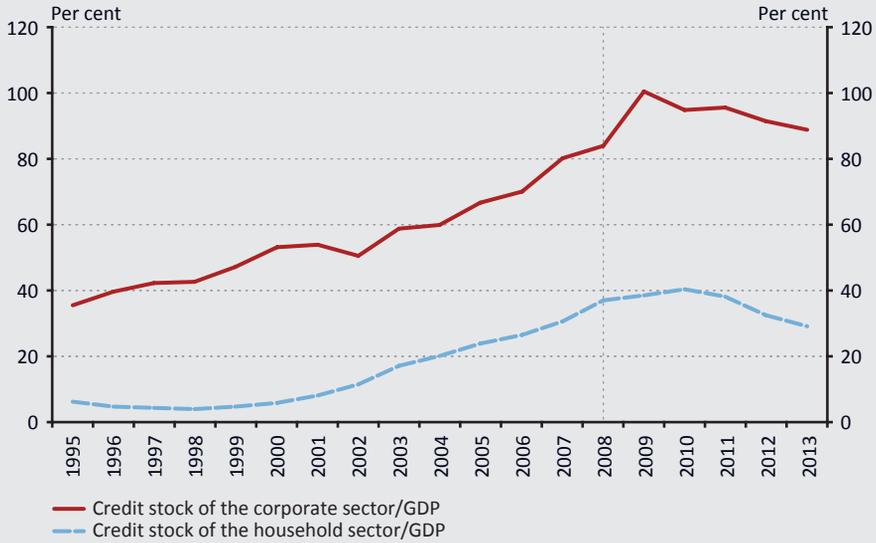
Chart 7
Development of GDP, the total credit stock and the real effective exchange rate compared to the trough of the crisis

- GDP
- Real effective exchange rate
- Credit stock (right-hand scale)

Source: BIS, KSH, MNB.
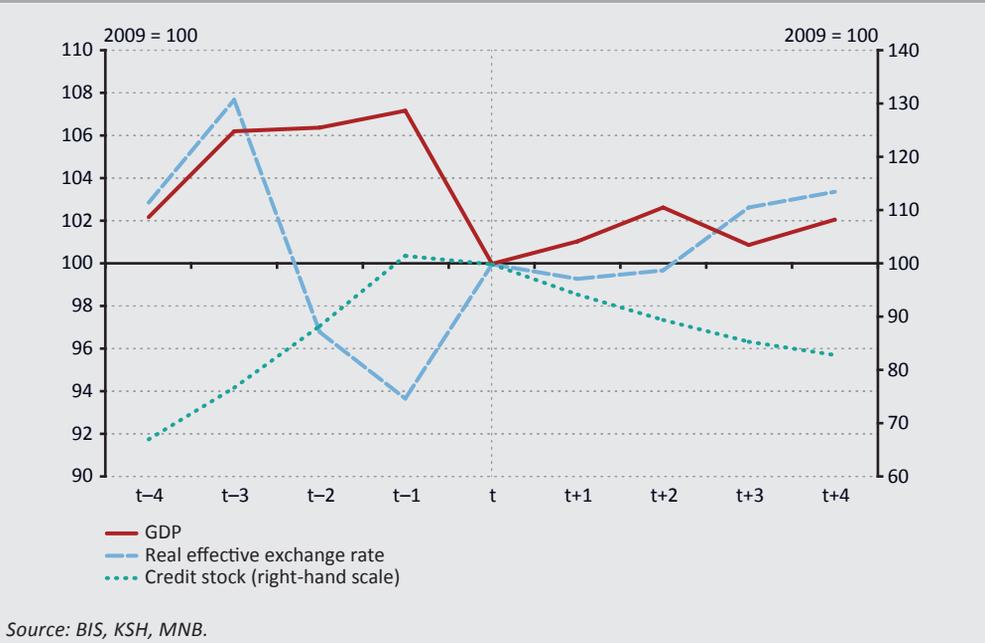
of outstanding debt. During the crisis, the indebtedness problem was further aggravated by indebtedness in foreign currency, as the depreciation of the exchange rate led to a revaluation of loans. In addition to this, the increase of the external risk premium further increased instalments through interest-rate burdens.

There was no real estate market bubble or bank crisis in Hungary; however, due to the material deterioration of credit quality the financial intermediary system suffered severe losses. In the pre-crisis years, there was no classic real estate price bubble; however, the material increase of real estate prices after the 2000s and the price decrease after the crisis were rather similar to the dynamics observed in the developed countries that went through a bank crisis (Chart 9). There was no systemic banking crisis accompanied by bankruptcies and a run on banks,[8] either, but the quality of the credit portfolios deteriorated very quickly after the start of the crisis. As a result of the downturn of the real economy – accompanied by high unemployment, a weakening exchange rate and an increasing interest burden, as well as a rising corporate bankruptcy rate and worsening liquidity position – the ratio of non-performing loans was high after the crisis even in international comparison (Chart

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8   According to Laeven and Valencia (2008), a systemic banking crisis occurs when "a country's corporate and financial sectors experience a large number of defaults and financial institutions and corporations face great difficulties repaying contracts on time." (Laeven and Valencia, 2008: 5).

Chart 8
Credit stock of the corporate and household sectors in proportion to GDP

Per cent

Credit stock of the corporate sector/GDP
Credit stock of the household sector/GDP

Source: MNB, financial accounts.

Chart 9
Development of real property prices in Hungary and in those countries where a banking crisis occurred after 2007

(2005 = 100)

Hungary
United States
United Kingdom
Spain
Ireland
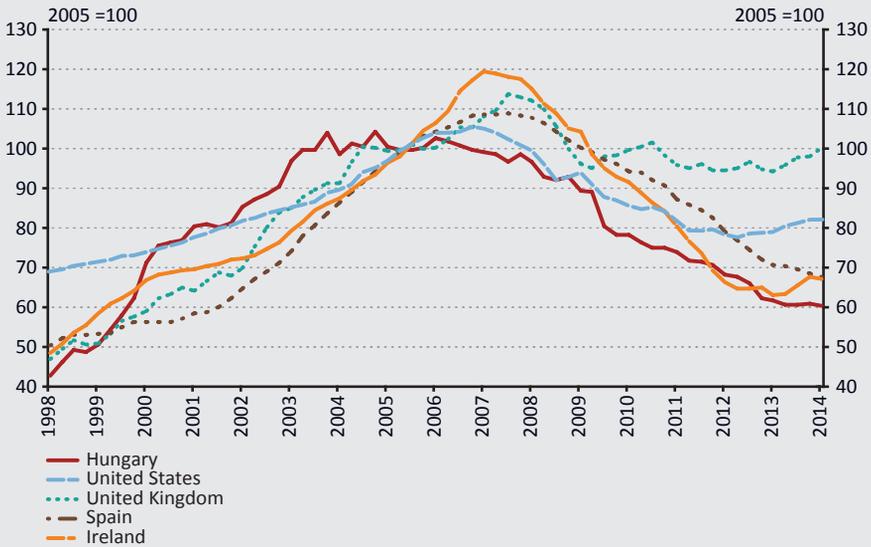
Source: St. Louis FED, FHB.

Chart 10
Ratio of the banking system's non-performing credit portfolio after the crisis

Source: World Bank
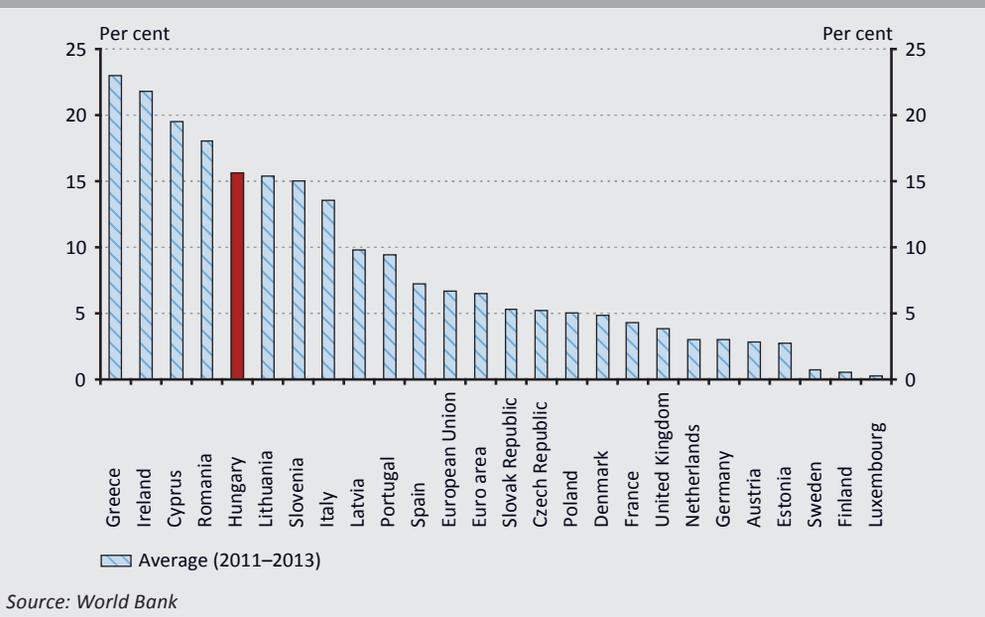
10). By the end of 2013, the non-performing loan ratio was close to 20 per cent both in the corporate and household segments (MNB, 2014); however, this ratio was lower than the NPL ratio observed after the former crisis episodes accompanied by the banking crisis, the maximum of which was 34 per cent on average (Laeven and Valencia, 2008). The banks' profitability decreased in parallel with the increase of the ratio of the loans past due over 90 days. The banking system further retrenched its credit supply when the foreign parent banks also faced problems due to the European real economic and sovereign crisis.

**The current account deficit was material, but it started to improve already before the crisis.** Emerging economies are usually characterised by a current account deficit. Until the beginning of the 2000s, this was financed by considerable capital inflow, which did not result in an increase of external debt. Prior to the crisis, between 2000 and 2007, the current account deficit in Hungary was 7.5 per cent of GDP (Chart 11). Financing was primarily provided by foreign loans, and the economy used the loans for consumption rather than for investments; thus, the growth rate of the economy exceeded the potential growth rate. At the start of the crisis, there was a sudden stop in the inflow of foreign funds due to higher aversion to risk and the increase of risk attached to the country. During the recovery – as a result of the financing and real economic processes – the current account started to improve and the net external debt began to fall (Hoffmann et al., 2013).

There was a huge drop in GDP at the start of the crisis. The global financial and economic crisis hit an ailing domestic economy. As a result of significant external imbalance,

Chart 11
Current account balance
(average of 2000–2007, as the percentage of GDP)
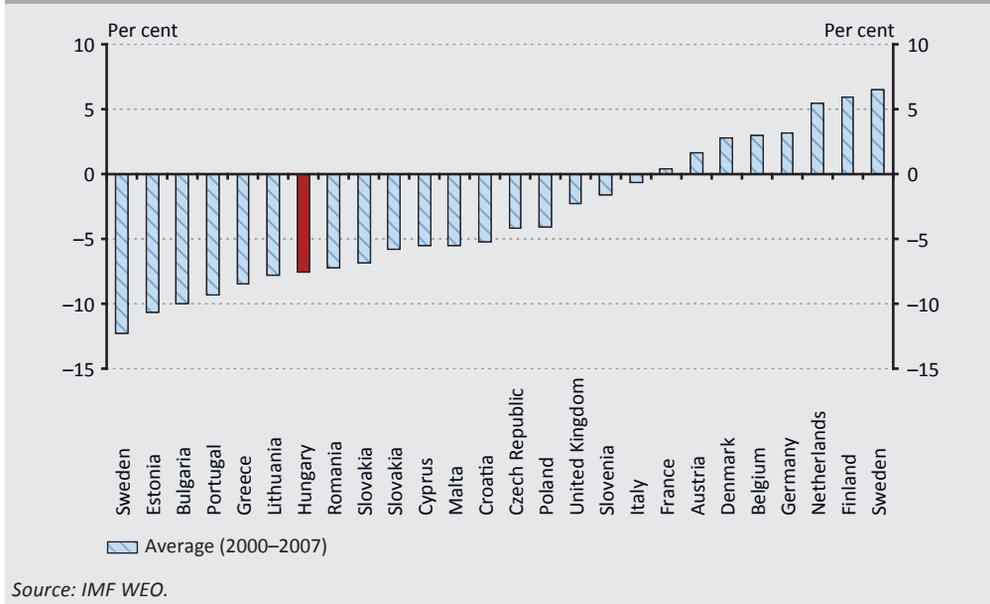
Source: IMF WEO.

indebtedness and government measures, domestic processes were characterised by moderate household consumption and rather sluggish investment activity in the years preceding the onset of global recession. The global economic crises reached Hungary at the end of 2008, as a result of which Hungarian economic growth fell close to zero, and it considerably declined in 2009, by almost 6.3 per cent. During this period, the external demand declined by 4.5 per cent, while almost all components of the domestic demand suffered a material downturn. The dramatically deteriorating external demand conditions and the tightening lending environment generated further adjustment pressure for all economic agents, which was also revealed in the considerable decline of the whole-economy output.

The economic growth started at a low lending activity. As a result of the crisis in Hungary, parallel with severely declining economic growth, lending also decreased materially (Chart 8). After the end of 2009, primarily as a result of external demand, GDP already started to increase; however, the net loan placement remained permanently negative, and thus the credit portfolio of the private sector continued to decline materially. When examining the Hungarian figures, one sees that – in accordance with the episodes presented above – although output started to increase after the trough of the financial crisis, the credit portfolio did not recover. This meant that the turning point of lending was materially postponed compared to international experiences. This is explained by the fact that willingness of banks to take risks as well as their lending capacity remained low, explained

by problems in real economy, problems of parent banks and certain government measures affecting the banking sector. In terms of households' loan demand, the reason could be that due to foreign currency lending, the need for adjustment (i.e. deleveraging) was even stronger than usual. Thanks primarily to government investment, consumption and net export, the growth rate of the Hungarian economy has increased in the recent period and it already approximates the pre-crisis level. An uncertain global environment, continued high government debt, the high borrowing requirement and strong reliance on external funding still represent considerable risks. The banking system is still under the pressure of significant tax burdens and non-performing loans, and thus economic growth is accompanied by a low level of lending.

Net lending is negative due to credit demand and credit supply reasons. All of the credit demand and credit supply factors described before changed in Hungary as a result of the crisis. The corporations' credit demand fell in accordance with decreasing aggregate demand. The households' demand for credit fell at the start of the crisis due to the increased unemployment rate and debt reduction needs, while the precautionary savings motives strengthened. Since the start of the crisis, the banking system lent moderately. In certain sub-markets, the significance of the credit demand and credit supply factor could differ.

Chart 12
Net credit flow of the corporate sector
(exchange rate adjusted value)

Per cent

Actual values
Forecast March 2013 (NHP is not known)
Forecast September 2014

Source: MNB.
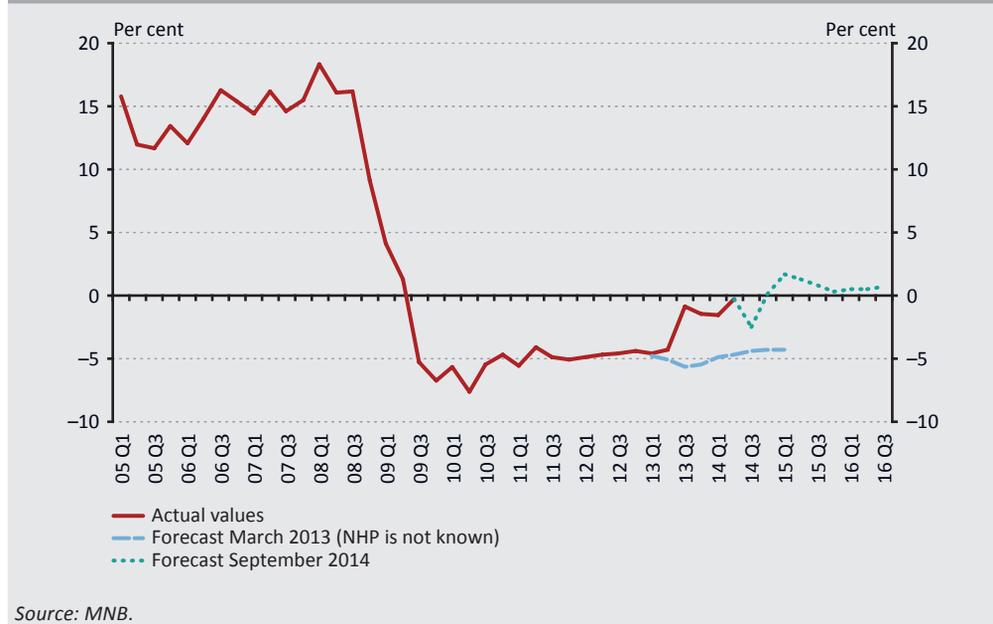
In the case of corporate lending, the downturn after the start of the crisis was primarily explained by credit supply constraints; by the end of 2012, the decline of credit demand and the tightening of the credit supply were already equally responsible for the decrease of the credit portfolio. After the onset of the crisis, the credit contraction was primarily attributable to credit supply constraints; the contraction of the supply lasted until the third quarter of 2009 (Sóvágó, 2011). In 2009, parallel with the economic downturn, credit demand factors started to strengthen gradually, as a result of which at the beginning of 2010 the credit contraction was attributable 50/50 to demand and supply factors (Hosszú at al., 2013). Hosszú et al. (2013) found that in 2011, when credit demand started to increase, credit supply constraints once again played a more dominant role; however, corporate credit demand fell as a result of the GDP decline in 2012; thus, in aggregate, demand and supply were almost equally responsible for the credit contraction. In 2013 and 2014 – as a result of the improving real economic environment, the low interest-rate environment and the Funding for Growth Scheme – the continually declining trend of corporate lending is showing a slow turn (Chart 12).

In the household segment, low levels of lending are due mainly to credit demand constraints (MNB Inflation Report, June 2013). The moderate credit demand of households has been attributable to high unemployment and the strong deleveraging pressure governed by the outstanding debt accumulated before the crisis, mostly denominated in foreign currency. The previous factor resulted in a decline in households' income and an increase in uncertainty, while the latter resulted in an increase in expenditures (through higher monthly instalments). As a result of these, the precautionary behaviour of households has strengthened, leading to a further decrease of loan demand. At the same time, the high ratio of non-performing loans, as well as the regulatory environment, has resulted in a moderate loan supply.

Of the previously listed factors, recovery is led by the rebound effect, export expansion and one-off effects. Since the beginning of 2013, the growth of the domestic economy is accelerating, and it is close to pre-crisis rates. Due to the former significant downturn, there is considerable unutilised capacity in the economy, and thus it is possible to increase production without investments. The output of industries producing for the export markets already exceeds the pre-crisis level, but the performance of the industries producing for the domestic markets is moderate (although it increased in previous quarters and has already made a positive contribution to economic growth). Construction – mainly due to infrastructural investments financed from European Union funds – shows material expansion. The added value of market services is also increasing in line with the households' slowly increasing consumption.

Medium- and long-term growth requires expansion of the banking sector's credit supply. After the lapse of deterministic effects, medium-term growth is expected to be more moderate than the current rate of economic growth. Lending may be hampered in the

short term as the willingness of banks to take risks is normalising only slowly in the post-crisis period, the profitability of the banking sector is low, and there is need to improve capital adequacy in order to decrease vulnerability in vein of the debtor relief package. However, based on the empirical literature of creditless recoveries, with the lack of support from the financial system, growth may remain low permanently, thus, supporting credit supply may remain a priority of economic policy.

4 Conclusions

This article summarised the literature of creditless recoveries and reviewed the recovery from the crisis of 2007–2008. A sound financial system reduces information and transaction costs and eases the implementation of economic transactions, thereby facilitating the mobilisation of savings and making implementation possible of various objectives eligible for financing the more efficient and profitable investment opportunities. In this way, lending contributes to the growth of the economy. However, the financial crises highlighted the fact that the excessive growth of lending also carries risks; this partially explains the non-linearity of the link between lending and economic growth. Creditless recoveries are usually accompanied by lower economic growth, and the increase of investments also lags behind that of observed recoveries supported by lending.

At present, creditless recovery can be observed in several European countries. At the start of the crisis, there were also several factors in Hungary that predisposed to a creditless recovery. Until 2008, the fast-growing indebtedness, the high ratio of unhedged foreign-currency loans, external imbalance, and the significant decline of GDP all contributed to the fact that the net loan disbursement was negative at the start of the crisis. However, by now the growth rate of GDP is already close to the pre-crisis levels (i.e. a creditless recovery is taking place). The sources of the current growth include exports, the increasing utilisation of unused capacities, and one-off effects. However, the expansion of the domestic financial intermediary system's lending activity is essential for medium- and long-term growth.

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Appendix

Table A1					
Summary of the empirical literature					
Study	**Sample period**	**Countries/ episodes included in the sample**	**Inspected credit indicator**	**Length of the reviewed period after the trough of the crisis**	**Other factors**
Abiad et al., 2011	1970–2004	26 developing countries (MSCI EM Index), 23 developed countries (of the OECD members)	cumulative change of the loans to the private sector	maximum 3 years	industry data
Biggs et al., 2009	USA: 1929–1936 Emerging economies: 1982–2010 Developed economies: 1954–2010	USA, Finland, Japan, Norway, Spain, Sweden and 22 developing markets	loan portfolio granted by the banks to the private sector and credit impulse	maximum 2 years	the relationship not only between the levels, but also between the growth rates was analysed
Bijsterbosch and Dahlhaus, 2011	1970–2009	86 countries of middle and low income	outstanding lending of the banks to the private sector	maximum 4 years	
Darvas, 2013	1960–2012	135 countries	Real exchange rate, financial development	maximum 4 years	Transparency of trade, current account
Sugawara and Zalduendo, 2013	1965q1–2011q4	96 countries, developed and developing countries	annual growth of real bank loans	maximum 8 quarters	severity of the decline of GDP, real exchange rate and current account balance, external transparency, fiscal easing, easing of the monetary stance, participation in IMF programme, economic conditions at the trough
Takáts and Upper, 2013	1981–2008	39 financial crises, developed and developing countries	outstanding lending by the banks to the private sector at real value; loan/GDP ratio	maximum 4 years	change of the real exchange rate, government debt/ GDP
UniCredit, 2012	1963–2010	183 developing and developed countries	real credit portfolio	maximum 3 years	output gap, investment demand, banking crisis, change of the domestic banks' external exposure

Resolution Reform[1]

Thomas F. Huertas

Although bail-outs helped contain the financial crisis in 2008, making bail-outs the norm would undermine the public finances and sow the seeds for future crises. To prevent this, policymakers are reforming resolution at both the global and European level. This will assure that banks can fail without significant disruption to financial markets or the economy at large with shareholders and creditors, not taxpayers, bearing the cost. That in turn will improve market discipline and reinforce regulatory and supervisory measures to enhance financial stability.

Introduction

Resolution reform will change the business of banking. Instead of bail-out, bail-in will become the norm. This will assure that investors, not taxpayers, bear the cost of bank failures. That in turn will force banks to revise their strategies and refine their business models.

Within the EU, resolution reform will go hand in hand with banking union. The Banking Recovery and Resolution Directive (BRRD) sets the framework for the EU as a whole, whilst the Single Resolution Mechanism (SRM) implements the regime within the Member States that are part of the banking union.

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1 This article represents a synopsis of the arguments made in the author's recent book (Huertas 2014). In a number of instances, the wording in this article is identical with that used in the book.

Resolution reform is part of the global agenda to sustain financial stability

The financial crisis of 2008 took the world to the edge of economic abyss. In response, governments agreed to take "whatever measures are necessary to ensure the stability of the financial system" (PFUE 2008). Governments and central banks channelled assistance amounting to over €10 trillion to the banking system via equity injections, credit guarantees, asset purchases and various other means. Together with massive monetary and fiscal stimulus, this rapid intervention by authorities across the world averted what might otherwise have become a Great(er) Depression.

But governments, central banks and supervisors also quickly realised that continuing such support was unsustainable. To maintain financial stability, they took steps to make banks less likely to fail, as well as steps to make banks resolvable, or "safe to fail".

Under the first heading ("less likely to fail"), the authorities strengthened regulation and sharpened supervision. Basel III increased capital requirements and introduced a global liquidity standard for the first time. The EU implemented this via CRD IV and banks are moving rapidly to meet the increased requirements.

At the individual bank (micro) level, supervision has become more pro-active and more forward-looking, with an increasing reliance on stress testing and recovery planning as a means to assure that bank can operate safely even in an adverse environment. In the EU this has taken institutional form: under the Single Supervision Mechanism (SSM) the European Central Bank (ECB) has taken responsibility for supervision of banks within the Eurozone. For the 120 largest banks (including practically all those banks with cross-border establishments) the ECB will exercise direct supervision, starting with a rigorous "entrance exam," namely the asset quality review (AQR), combined with the stress test coordinated with the European Banking Authority (EBA).

At the macro-level, systemic risk boards have started to look at the system as a whole and to exercise macro-prudential supervision. At EU level the European Systemic Risk Board (ESRB) exercises this function. Member States have also initiated similar bodies (e.g. the Financial Policy Committee in the UK).

Under the second heading ("safe to fail"), the authorities had to take more fundamental measures. During the crisis governments resorted to bail-out in order to avoid the costs to the economy at large that would have resulted had they simply put banks through normal bankruptcy procedures (as would have been required under the laws prevailing at the start of the crisis).

But bail-out is a policy that is too costly to continue. There are three drawbacks:

1. *Bail-outs promote risk taking*. If the market expects the government to bail out a bank, the market will not necessarily discipline the bank. If the market expects the government to be able and willing to bail out banks when they fail to meet threshold requirements for minimum capital and/or liquidity, then such banks can borrow at lower cost than they would be able to do strictly on the basis of their stand-alone rating (see Figure 1). This encourages risk-taking at the bank, creating what economists term "moral hazard". This increase in risk-taking may make the bank more likely to fail. Thus, bailing out banks could potentially sow the seeds of the next crisis.

Chart 1
Implicit government support raises overall rating
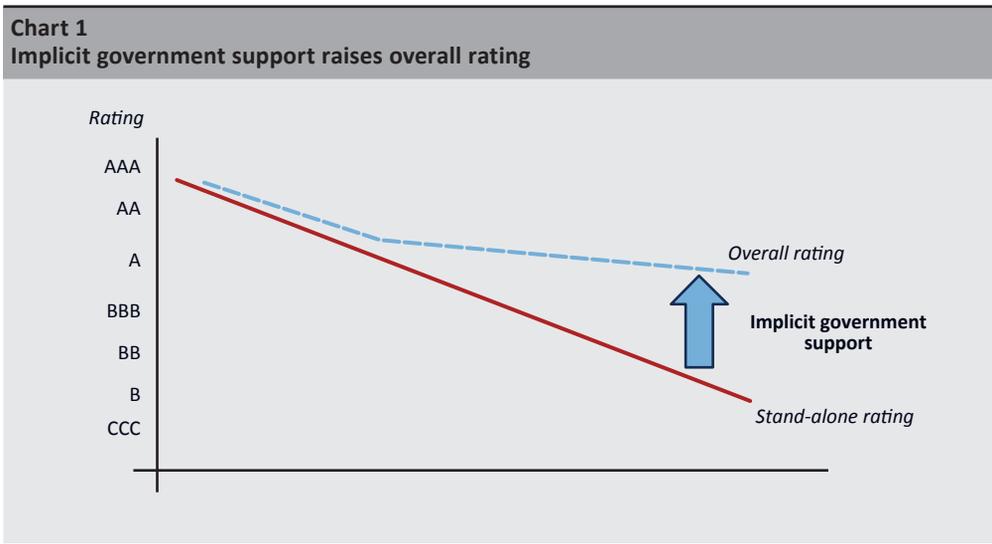
2. *Bail-outs undermine the public finances.* The prospect that a government could be called upon to provide assistance on a massive scale poses the threat that investors will simply transfer their poor regard of a bank to the government of the jurisdiction in which the bank is headquartered. If a government backs its banks, the government's credit will suffer as the condition of its banks deteriorates (Tucker, 2012). Indeed, in the peripheral Euro-zone countries, governments are hostage to the health of the banks in their jurisdiction. Should they have to rescue the banks, fiscal deficits would soar and the credit of the government would deteriorate – Ireland is Exhibit A for this.

3. *Bail-outs distort competition*. Banks likely to be bailed out receive an undue competitive advantage relative to institutions that are not likely to be bailed out. Banks likely to be bailed out can borrow at lower cost. This differential is effectively a subsidy to weak banks in jurisdictions with strong governments (see Figure 2).

Chart 2
Bail-outs benefit weak banks with strong government
Impact on banks overall credit rating of implied sovereign support

		Bank's stand-alone condition			
		Weak		Strong	
Government's credit condition	Weak	◯	Impact limited as government is too weak to be a source of strenght	◯	Impact zero and possibly negative as bank is stronger credit than the sovereign
	Strong	⬆	Impact positive as strong government can prop up weak bank	◯	Impact limited as bank already has strong credit ratingt

This is particularly problematic within a single market environment, such as the EU. Left unchecked, a policy of too big to fail would differentially advantage banks headquartered in large Member States with strong credit ratings, for such Member States would have a greater capacity to come to the assistance of any bank that became troubled.

At the Pittsburgh summit in September 2009 G-20 leaders mandated the Financial Stability Board (FSB) to address the issue of too big to fail. In particular the G-20 (2009) decided that systemically important financial firms should develop internationally-consistent firm-specific contingency and resolution plans. Our authorities should establish crisis management groups for the major cross-border firms and a legal framework for crisis intervention as well as improve information sharing in times of stress. We should develop resolution tools and frameworks for the effective resolution of financial groups to help mitigate the disruption of financial institution failures and reduce moral hazard in the future.

The FSB establishes key attributes for resolution regimes

Building on work undertaken by the Basel Committee (BCBS 2009) and in various national jurisdictions, the FSB has developed what amounts to a global special resolution regime for banks. This is intended

to make feasible the resolution of financial institutions without severe systemic disruption and without exposing taxpayers to loss, while protecting vital economic functions through mechanisms which make it possible for shareholders and unsecured and uninsured

creditors to absorb losses in a manner that respects the hierarchy of claims in liquidation (FSB 2011a).

An institution is therefore resolvable, if three conditions are met:

1. The institution can be readily recapitalised without recourse to taxpayer money;

2. The institution in resolution can continue to conduct normal transactions with customers, ideally from the opening of business on the business day following the initiation of the resolution; and

3. The resolution process itself does not significantly disrupt financial markets or the economy at large.

To meet these criteria, a resolution regime has to possess a number of key attributes (FSB 2011b). First of all, the regime must have the proper scope: it must cover not only banks, but also banking groups, including parent holding companies and non-bank affiliates.

Second, the resolution regime must create or designate a resolution authority. The resolution authority should be a public body with operational independence, sound governance and transparent processes. It should have responsibility for implementing the resolution of the failed bank in line with the provisions of the resolution statute, in the same sense that an administrator or insolvency practitioner takes responsibility for a non-financial corporation upon the commencement of bankruptcy proceedings.

Resolution regimes should mandate that resolution authorities have the objectives outlined above. Resolution authorities should also coordinate and cooperate with one another, both within and across jurisdictions, under the overall guidance of the group resolution authority.

Third, the resolution regime should define the point at which resolution begins. This should be "when a firm is no longer viable or likely to be no longer viable, and has no reasonable prospect of becoming so" (FSB 2011b, p. 7). Generally this will be a point where the bank is still balance sheet solvent: forbearance is discouraged; prompt corrective action, encouraged. This prevents the bank from gambling for resurrection, reduces the loss that creditors are likely to incur and raises the probability that bail-in of investor obligations will be sufficient to recapitalise the bank.

Once resolution begins, the resolution authority should be able to employ, singly or in combination, a full array of resolution tools, including the "bail-in" of liabilities issued by the bank and/or its parent holding company.

Fourth, the resolution regime should assure that the entry into resolution does not itself trigger default in qualified financial contracts such as repurchase agreements and

derivative contracts. At a minimum there should be a stay on such contracts pending their assumption by the bank in resolution (as long as the bank continues to meet payments to counterparties when due). Such an arrangement avoids the losses that would result, both at the failed firm and across the market generally, if counterparties to the failed bank were to conduct a fire sale of the collateral posted by the failed bank.

Fifth, the resolution regime should assure that losses are allocated in accordance with the creditor hierarchy. To the extent that a creditor suffers losses greater than it would have suffered under liquidation, the regime should assure that the investor receives compensation for the difference, a principle called "no creditor worse off than under liquidation" (NCWOL).

Sixth, the resolution regime should assure that mechanisms are in place to avoid reliance on taxpayer support. Where public authorities provide temporary financing to facilitate resolution, provision should be made to recover from the industry any losses the authorities might incur. The resolution regime should also set the basis for such a fund, including the purposes for which such a fund might be used, who should be liable for contributions to the fund, whether funding should be ex ante or ex post, how such a fund would interact with the deposit guarantee scheme and any bank levy, how such a fund should be structured and what claims, if any, does the resolution fund have on the estate of the failed bank.

Seventh, resolution regimes should make provision to facilitate cross-border cooperation among resolution authorities. To accomplish such cooperation (including the sharing of information) authorities should form institution-specific Crisis Management Groups (CMGs) that would draw up institution-specific cooperation agreements outlining how they would handle the resolution of the institution in question, if it were to reach the point of non-viability. The CMG would also be responsible for assessing the institution's resolvability and making recommendations to remove barriers to resolution.

Eighth, resolution regimes should require – as a minimum – that systemically important financial institutions submit recovery plans as well as the information that resolution authorities require in order to develop resolution plans.

The EU is implementing the Key Attributes

In the EU the Banking Recovery and Resolution Directive (BRRD) sets the framework that will enable all EU Member States to implement the FSB Key Attributes. In particular, the BRRD will establish a statutory bail-in regime. The EU has also put the finishing touches to banking union for the Eurozone. This creates a Single Resolution Mechanism (SRM) to supplement the Single Supervision Mechanism (SSM).

The challenge now facing authorities and banks in Member States is how to translate these legislative initiatives into concrete institutional and operational arrangements so that a failing bank could actually be resolved without cost to the taxpayer and without significant disruption to financial markets or the economy at large. This work will include the development of binding technical standards to fill out some key details in the BRRD as well as procedures for the operation of the SRM and other resolution authorities within the EU.

The resolution process involves three stages: (1) pulling the trigger, (2) stabilising and (3) restructuring the bank-in-resolution (see Figure 3).

Pulling the trigger. Resolution regimes generally allocate to the supervisor the responsibility to "pull the trigger" (i.e. make the determination that the bank should enter resolution). Where the resolution authority differs from the supervisory authority, the resolution authority generally has the right to provide its opinion (particularly with respect to the availability of a private sector solution). The SRM goes a step further and gives the resolution authority an independent right to pull the trigger.

As a practical matter, pulling the trigger should be a short and certain process. Steps requiring judicial review or prior approval should be kept to a minimum, so that the authorities can move immediately to the stabilisation phase. If continuity of critical

Chart 3
Resolution has three stages
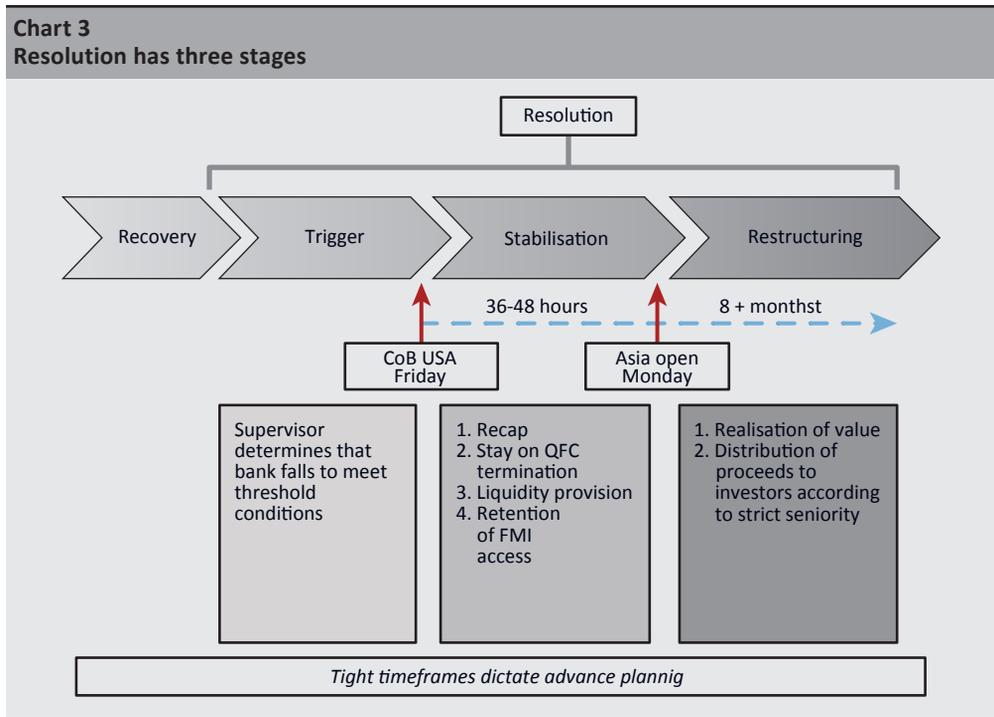
economic functions is to be maintained, stabilisation has to be achieved as a practical matter within the very narrow window between the close of business one day and the opening of business the following business day. This interval has at most thirty-six to forty-eight hours (if resolution is initiated at the close of business on Friday). It is simply impractical to use large portions of that short interval in review procedures. For the resolution authority to stabilise the bank-in-resolution, it must be free to act quickly.

Procedural requirements can impede resolution. This is especially the case under the BRRD, where the directive envisions a period of up to 24 hours during which various parties may object to the resolution plan being proposed. To assure resolution proceeds smoothly, considerable advance planning is required. This includes lining up whatever approvals are required as well as identifying and dealing with objections that participants in the process might raise.

Stabilising the bank-in-resolution. Once the supervisor has pulled the trigger the resolution process moves on to its next and most critical phase: stabilisation. In the case of a bank, this means above all five things: (i) recapitalising the failed bank, (ii) assuring that the bank has adequate liquidity when it reopens for business, (iii) assuring that the bank retains or renews all relevant authorisations in the jurisdictions in which it does business, (iv) assuring that the bank retains access to relevant financial market infrastructures, and (v) the authorities' communicating effectively with each other, with depositors, creditors and investors of the failed bank and with the public at large.

Recapitalising the failed bank. The first step toward stabilising the bank-in-resolution is the most important. This is to recapitalise the failed bank. Without such a recapitalisation, resolution will fail, at least for a G-SIB. That is likely to disrupt financial markets and damage the economy at large.

For resolution to succeed, recapitalisation of the failed bank must be done without recourse to public money. For systemically important banks recapitalization of the bank is likely to succeed if and only if the resources for recapitalisation are already in the bank. This will be the case if enough of the bank's liabilities can be "bailed-in," i.e. written down or converted into equity of the bank.

For bail-in to work effectively within the time frame relevant for preservation of continuity, a number of conditions have to hold: (i) the resolution authority has to have the statutory authority to implement bail-in immediately; (ii) bail-in has to respect the creditor hierarchy; (iii) bail-in of investor instruments should be sufficient to recapitalise the bank (see below); and (iv) bail-in of investor instruments should not trigger cross default clauses (see below).

Assuring adequate liquidity. Recapitalising the bank-in-resolution through bail-in of investor obligations is necessary but not sufficient to stabilise the bank-in-resolution. Continuity of operation can only be assured, if the bank-in-resolution has access to adequate liquidity.

The framework for such a liquidity facility should be put in place well in advance, and should be aligned with the overall resolution strategy for the institution (see international cooperation below). It should assure that such a facility is (i) "super-senior" (i.e. have a first claim on any income the bank may generate and have priority in liquidation over all unsecured creditors) and (ii) collateralised by a charge over the unencumbered assets of the bank in resolution, including without limitation the investments of the parent bank in its subsidiaries. In addition, the framework should make clear how losses, if any, would be allocated, including recourse to resolution fund(s).

Assuring authorisations are maintained. The entry of the bank into resolution should not result in the revocation of the bank's license and a requirement for the bank-in-resolution to reapply for a license. Instead, a process should be in place to treat the entry into resolution as a change in control process, with control passing from the owner of the bank to the resolution authority and pre-approval of the resolution authority as "fit and proper" to run the bank in resolution.

Assuring access to financial market infrastructures. The resolution authority should also assure that the bank-in-resolution continues to have access to financial market infrastructures (FMIs), such as payment systems, securities settlement systems and central counterparties. If the bank-in-resolution is to function normally upon reopening for business on Monday, it will certainly need access to FMIs. Otherwise, it will not be able to make or receive payments, settle securities transactions or conduct derivative transactions.

To assure that continuity is in fact preserved, the resolution regimes for banks should be coordinated with those for the FMIs. In particular, the FMI should not be allowed to exclude a bank from the FMI solely on the basis that the bank has gone into resolution. Provided the bank-in-resolution has continued to make payments as due to the FMI (i.e. there has been no default on a cash obligation by the bank), the FMI should delay excluding the bank-in-resolution from the FMI as well as delay initiating loss allocation mechanisms within the FMI (the "waterfall") for a period to allow the resolution authority to indicate that it has (a) recapitalised the bank and (b) assured adequate liquidity for the bank. With such assurance the FMI can keep in force the membership of the bank in the FMI. That will not only facilitate the resolution of the failed bank, but help assure that the FMI remains robust.

Assuring effective communication. Last but by no means least, the resolution authority has to assure that communication is effective: between the bank-in-resolution and the authorities; between the bank-in-resolution and its clients and counterparties; between the bank-in-resolution and the FMIs to which it belongs as well as among the authorities. However, communication also has to strike a delicate balance between the need to keep material matters confidential until the authorities have reached a decision with the requirement to disclose broadly to all investors the instant a decision has been reached.

Restructuring the bank-in-resolution. Stabilising the bank-in-resolution is the first and most important step toward assuring that the failure of the bank will not significantly disrupt financial markets or the economy at large. But stabilisation is not the end of the story. The resolution authority must then proceed to restructure the bank-in-resolution.

The goal of the resolution authority in the restructuring phase is to work itself out of a job: either to sell the bank to a third party, to return the bank to the private sector or to wind the bank down. This has to be done in a manner that maximises the value of the bank in resolution whilst respecting the creditor hierarchy.

Resolvability: what remains to be done?

In translating the "architect's sketch" of resolution painted above into detailed blueprints for how specific G-SIB could actually be resolved, policymakers and banks have identified and are dealing with three issues, or barriers to resolution, namely (i) how to handle qualified financial contracts; (ii) how to assure banks have adequate amounts of reserve, or back-up capital ("gone-concern loss-absorbing capacity [GLAC]) available to be bailed in, if the bank enters resolution; and (iii) how to assure the bank-in-resolution has access to adequate liquidity. With solutions to these issues, it should be possible to develop institution-specific resolution plans.

Qualified financial contracts. Certain obligations, known as qualified financial contracts (QFCs), may pose a barrier to resolution (Gracie, 2014). Upon an event of default, the claim under a QFC becomes immediately due and payable (it is exempt from the stay on payments to creditors). If the claim is not repaid, the holder of such obligations has the right to liquidate any collateral that the bank may have pledged to it and to use the proceeds of such sale to satisfy the obligation.

The two principal types of qualified financial contracts are repurchase agreements and derivative contracts. Together these instruments account for a significant share of a bank's balance sheet, particularly for banks with heavy involvement in trading activities. The obstacle to resolution stems from the fact that the non-defaulting counterparty (NDC) has the right to sell the securities upon an event of default by the bank-in-resolution. When selling the securities, the NDC is primarily interested in getting a price that will generate proceeds sufficient to repay its claim. Beyond that point any proceeds belong to the bank-in-resolution. As a result, the NDC may be inclined to accept offers for the securities that effectively give up much if not all of the haircut.

The loss of the haircut has two effects – first, it increases the loss that the bank-in-resolution has to incur and increases the probability that bail-in will have to extend beyond investor obligations to unsecured customer obligations such as deposits. That

would compromise continuity. Second, the sale of the securities pledged under QFCs is a source of contagion from the bank-in-resolution to financial markets and potentially to the economy as a whole. If the sale results in the loss of the haircut, it may imply a decline in the market price and a fall in income and capital at all the institutions in the market that hold such securities in their trading (mark-to-market) book or use such securities as a reference point to value other assets.

In the case of derivative contracts this effect is amplified, for the close-out calculation that establishes the claim of the NDC on the bank-in resolution is based on the NDC's replacement cost. In other words, the NDC makes the calculation not at the mid-market rate that the bank-in-resolution had used to value its contracts but at the end of the bid-offer spread that favours the NDC. This increases the amount due to the NDC, and this large(r) amount becomes immediately due and payable upon an event of default by the bank-in-resolution.

To avoid these problems, resolution regimes envision placing a stay on the ability of lenders under repurchase agreements and counterparties to derivative contracts to exercise their rights of termination. The purpose of the stay is to allow the resolution authority to arrange for the bank-in-resolution to be in the position to meet its obligations under the contracts. Either the bank-in-resolution is recapitalised via bail-in, or the resolution authority transfers the contracts to a bridge bank that will continue in operation.

This is at best a partial solution. The stay may not be enforceable in foreign jurisdictions or for transactions concluded under foreign law. Nor does the stay alone cure the complications that arise, if a bank's parent holding company has guaranteed the performance of the bank subsidiary under such contracts. In such cases, the entry of the parent holding company into resolution or bankruptcy can trigger termination of repurchase agreements and/or derivative contracts under the cross-default provisions usually found in such contracts. This gives rise to the adverse effects described above and may obviate the so-called single point of entry approach to resolution (see below).

Perhaps the simplest way to overcome the barriers to resolution posed by qualified financial contracts is to limit the right to terminate to the actual failure by the bank-in-resolution to meet a cash obligation due in full and on time. In any event, steps should be taken to eliminate the ability to terminate contracts at the bank level unless there is a default at the bank level. The entry of a parent holding company into resolution or bankruptcy should not trigger cross-default provisions in qualified financial contracts at the bank level.

Gone-concern loss-absorbing capacity. For bail-in to be effective as a resolution tool, measures need to be taken to assure that banks are likely to have enough "back-up" capital in place to absorb loss, if the bank enters resolution. The FSB is trying to hammer out an agreement that will do just that. This will require banks to maintain a minimum amount

of gone-concern loss-absorbing capacity (GLAC). Once written down or converted into CET1 capital, the bank's GLAC should be sufficient to restore its CET1 ratio to the required minimum.

The open questions are what should count toward the GLAC requirement and where the GLAC should be issued. Some contend that excess CET1 capital should count as GLAC, on the theory that resolution should be initiated at a point where the bank is at or above the minimum requirement (4.5 percent of RWA). Others counter that by the time a bank gets to resolution, practically all the bank's CET1 capital (and certainly any excess CET1) is likely to have evaporated. If the first view is to prevail, measures (such as assuring prudent and prompt valuation) may have to be introduced to assure that the authorities avoid forbearance and trigger resolution promptly.

A consensus is also needed on what other instruments should or should *not* count as GLAC. Some contend that any liability legally subject to bail-in (including uninsured deposits) should count as GLAC. Others maintain that GLAC should be a subset of the instruments subject to bail-in, namely those that investors can expect to be bailed in, if the bank reaches the point of non-viability. At a minimum therefore GLAC would include (in addition to any excess equity that counts toward the definition) the full amount of Additional Tier I and Tier II capital (since this is subject to conversion or write down at the point of non-viability). Extending GLAC beyond subordinated instruments qualifying as Tier II capital may imply either compromising the creditor hierarchy (if senior debt is bailed in ahead of instruments pari passu with such debt) or compromising continuity (if deposits are bailed in alongside the senior debt). Although granting deposits preference partially addresses the problem (effectively this transforms senior debt into a 'mezzanine' obligation), for GLAC to be fully effective in assuring continuity the bank has to have issued instruments subject to immediate bail-in in sufficient quantity to recapitalise the failed bank completely, even if the bank's equity is fully exhausted.

As to where GLAC should be issued, some contend that it is sufficient for the parent holding to issue GLAC, while others argue that GLAC should be "pre-positioned," i.e. that the operating bank subsidiary should be the issuer. If the first approach is adopted, questions will arise as to how the operating bank that had incurred the loss will be recapitalised. Conversion of the GLAC (e.g. subordinated debt) issued by the parent into equity in the parent doesn't change the picture at the subsidiary bank level (where the critical economic functions are actually performed). Unless the parent has cash or assets that it can and actually does inject into the failed bank subsidiary as new CET1 capital, the operating bank will not be recapitalised. As a consequence, continuity cannot be assured. There remains a significant probability of disruption in the financial markets and of damage to the economy at large.

Adequate access to liquidity. Presuming policymakers reach agreement on GLAC, the next step is to decide on how to assure that the bank-in-resolution has adequate access to

liquidity, so that it can meet the demands for cash that are likely to materialise as soon as it opens its doors for business in Asia on the Monday following its "resolution week-end".

Finalising the requirements for GLAC should help to open the door to using normal central bank facilities, such as the discount window, to provide liquidity to the bank-in-resolution. The conversion or write-down of GLAC should assure that the bank is solvent and go a long way toward assuring that the bank is viable. Actually getting cash from the central bank(s) or alternative liquidity providers then becomes a question of how much and what type of collateral the bank can pledge to the liquidity providers in question.

Finalise institution-specific resolution plans. The final task is for the authorities to complete institution-specific resolution plans for each of the global systemically important banks (G-SIBs). This task falls to the G-SIB's crisis management group (CMG). This consists of the relevant authorities (supervisor, central bank, resolution authority) in each of the jurisdictions in which the group has a material subsidiary or systemically important branch. Each CMG should draw up a plan for its respective G-SIB that outlines how, once the trigger to resolution has been pulled, the CMG would conduct the resolution. Such a plan would tackle the issues outlined above as well as establish the basis on which the authorities would cooperate with one another to assure financial stability.

This would result in what might be called "constructive certainty," so that the market, the bank and its investors would know in advance the general principles under which whether the authorities would resolve the bank (if it did fail at some point in the future). Specifically, the authorities should indicate whether they anticipate resolving an institution under:

• *a single point of entry approach* in which the home country resolution authority effectively acts as a dealer/manager of a global syndicate of the resolution authorities from the principal jurisdictions in which the failed entity had done business; or

• *a multiple point of entry approach* in which each of the group's subsidiaries would be resolved separately.

Such "constructive certainty" would underline to investors that they would be at risk in the event the bank fails as well as enable them to form an estimate of the recoveries they might make over time. That in turn should align pricing and risk of instruments counting toward GLAC. This will promote efficiency, as riskier banks will have to pay more to attract investors into instruments such as subordinated debt.

Taken together, the steps outlined above would in fact complete the design job for a new resolution regime. But the job will not be fully complete, until the new resolution regime passes what might be called a "use test," i.e. until a major bank enters resolution and the new regime demonstrates that the bank is indeed "safe to fail". Such a use test may however be some considerable way into the future, for stronger regulation and sharper

supervision are making banks less likely to fail. But, if the time does come when a major bank has to be resolved, the authorities will be able to implement a regime that ends "too big to fail" and begins "safe to fail".

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Crowdfunding – could it become a viable option for Hungarian small businesses?

András Bethlendi – Richárd Végh[1]

Crowdfunding is a financing method in which a large number of private individuals or organisations can contribute small sums of money via web-based platforms to support cultural, sports-related, social, technological or business projects and ideas. Crowdfunding is a potential source of finance for the SME sector, in particular, for start-ups. Although crowdfunding volumes tend to increase rapidly in developed countries, they are still considered marginal in comparison to other forms of finance. The first crowdfunding platforms have emerged in Hungary as well. Investor confidence is a factor that could best facilitate the growth of the market, which requires a well-functioning business structure, transparency and adequate investor-protection rules.

1 Crowdfunding and its types

Crowdfunding is a rapidly growing, innovative, online phenomenon that is playing an increasingly important role worldwide in the implementation of creative ideas, cultural projects or, as the case may be, business concepts. With an explosion in the popularity of social networking sites since the second half of the 2000s, numerous enterprises, budding entrepreneurs and artists have found an opportunity to launch a venture, gain recognition and make a career leap via crowdfunding project platforms. The launch of a new idea or a venture is typically financed by a narrow group of three participants: friends, family and acquaintances who, despite the high risks involved, are willing to fund novel projects primarily by virtue of personal involvement. By gaining new ground with online

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communities, this narrow group expanded spectacularly, opening up the possibility for involving a far more extensive range of people in bringing new ideas to life. The websites created for this particular purpose have propelled the crowdfunding model into the limelight.

Crowdfunding has several types, depending on their proximity to traditional bank and capital market financing forms. Accordingly, there are non-profit (donation or reward-based), unsecured loan (peer-to-peer lending or direct funding of ventures), equity-based or bond-based financing types. In exchange for their contributions to the fundraising campaigns, sponsors receive a return that matches the specific type of crowdfunding:

• Donation-based crowdfunding: there is no return. This type is typically used by artistic or social initiatives to recruit backers.

• Reward-based crowdfunding: most often, donors receive a small-value gift (as a souvenir or token of gratitude, perhaps participation at the event co-sponsored by them, or a copy of the end-product).

• Lending-based crowdfunding: backers are given a predetermined interest rate, which can be also guaranteed by the platform itself.

• Equity-based crowdfunding: supporters acquire a stake in a security. Returns are paid in the form of dividend or capital gain.

Table 1
Crowdfunding models

	Non-profit		Business	
Types	Donation	Reward	Lending – Peer-to-peer – Direct peer-to-business lending	Investment – Capital – Capital type
Characteristics	Philanthropic in nature; funders donate without expecting monetary compensation Unable to raise substantial capital	Promises non-financial gains Limited accountability Unable to raise substantial capital	Loan agreement, whereby the loan is repaid with interest Capable of raising substantial capital High-risk investments	Profit-sharing arrangements; stock or bond-type investment Capable of raising substantial capital High-risk investments

Note: Within the business models, another less common type of financing can be distinguished: royalty-based funding.
Source: ESMA/2014/CFSC/23

At first glance, the equity-type crowdfunding model is very similar in character to the functioning of venture capital. This form of financing is typically (but not exclusively) used by start-ups wishing to raise funds. However, the method of raising capital, the targeted

investors and the entire regulatory environment are all very different, compared to venture capital investment. In the case of equity-type crowdfunding transactions, it is the online platform that announces the campaign and arranges the transaction between the issuer as the capital requestor and (mainly) private individual investors as the source of capital. The entire deal is governed by the rules of the website concerned. If the target amount has been collected, the platform pays it out to the issuer at the end of the prespecified fundraising period. As such, the platform organises the primary issuance only.

Lending-based crowdfunding is commonly compared to microfinance/social lending as well, even though these two models differ in fundamental ways. Microfinance usually targets people in lower social classes, typically implying small-value, low-volume lending. At the same time, the social aspect of microfinance is not very significant in Hungary or other Central and Eastern European countries; basically, it is an important form of access to funding for micro- and small enterprises with a broader range of loan objectives. On the one hand, crowdfunding does not restrict loan objectives and the group of debtors; on the other hand, it has a preference for technology-intensive lending objectives. Thirdly, crowdfunding puts large loan amounts within reach.

One of the greatest advantages of crowdfunding is that it gives the SME sector access to funding. Since the SME sector contributes significantly to GDP and employment worldwide, it is important for innovative, high-growth potential firms to have access to the funds required for their growth. It is no accident that community finance embarked on a rapid growth path in 2008, after the outbreak of the crisis. Indeed, it was then that banks' lending capacity and willingness to lend declined, and capital market borrowing opportunities dwindled.

For investors, the investments available on finance platforms give access to completely new, exposed risks. This creates a new investment instrument class and provides new diversification opportunities. The efficient distribution of risks between investment instruments may contribute to the reduction of systemic risks.

One common feature of the platforms is that they operate on the Internet; therefore, in their case there is no need for physical presence or traditional financial intermediaries. As borrowers are typically rated automatically according to predefined parameters, the labour requirement is also lower, compared to mainstream financing channels. As a result, the platforms can achieve a significant cost advantage, which allows for inexpensive and efficient financial mediation.

As new market entrants, the platforms generate competition for institutions offering traditional financing options, prompting them to improve their services and provide faster and cheaper customer service.

2 How big is the market today?

Since 2008, crowdfunding has been growing rapidly. By 2013, the number of different online platforms exceeded 800 worldwide, with tens of thousands of initiatives having received funds from millions of backers. As regards financing volumes, in 2013 donation-based platforms still accounted for more than half of funds raised. By 2013, the volume of funds provided by the business branch of the industry rose to USD 6.4 billion, and this segment has remained a striving business to this day. It is developing dynamically, doubling the funds raised each year, with the USA (51%), UK (17%) and China (28%) boasting the largest share in the market (ESMA [2014]).

This new form of finance continues its triumphant march across the world, presaging further dynamic growth for the segment. The future success of the industry is largely influenced by the attitude of legislators and supervisions toward crowdfunding. Provided that an adequate level of regulation is enacted, crowdfunding may well become an important segment of the financing of SMEs and start-ups. The typical target amount is quite varied, ranging between USD 1,000–1,000,000. The total market potential of crowdfunding is estimated to grow up to USD 90 billion per year by 2025 (World Bank [2013]).

Owing to a well-developed Internet culture and a large internal market, online-based campaigns for social or fundraising purposes have particularly flourished in the United States, with numerous online platforms involved in announcing projects, promoting the model and communicating successful campaigns. An indicator of the effectiveness of platforms is the percentage of successful projects within their fundraising campaigns (i.e. whether the funding target has been achieved). The most dynamically growing donation-based crowdfunding platform in the United States is Kickstarter. It started operations in 2008, and since then it has raised more than USD 850 billion for approximately 50,000 projects with a project success rate of 44 per cent. The second most successful US crowdfunding platform is Indiegogo, which collected, for example, USD 36,918 for the production of Feel Flux, a new physics-based toy developed by two Hungarian young men.

After the economic crisis of 2009, crowdfunding gained large momentum in Europe as well. In Hungary, the first crowdfunding platforms were launched in 2012 (*Creative Selector* and *Indulj.be*), but so far they have only a handful of successful projects under their belt.

Table 2
Number of crowdfunding platforms in selected countries

Country	# of CFI Platforms	Country	# of CFI Platforms
United States	344	Brazil	17
France	63	Canada	34
Italy	15	Australia	12
United Kingdom	37	South Africa	4
Spain	27	India	10
Netherlands	34	Russian Federation	4
Germany	26	Belgium	1
		Hong Kong SAR, China	1
		China	1
		United Arab Emirates	1
		Estonia	1

Source: World Bank (2013)

3 Significant risk factors

Despite its advantages, crowdfunding comes with significant risks to the investor. Although some of the risks can be mitigated by regulatory protection and adequate platforms, it is still a high-risk product. The most significant risks are lending risks and counterparty risks. These can be partly mitigated by the platform if on the one hand it performs some pre-screening among those offering potential investment opportunities and on the other hand assumes certain settlement services in respect to investment quotes and financial settlements. Although individual platforms have widely diverging practices in this regard, numerous platforms have shifted to a practice aimed at mitigating the risk of the debtor's default or delinquent fulfilment. As a result, on the US-based Lending Club platform, only one in ten requestors gains access to capital. Similarly, different platforms and countries report different default rates. In the USA, the average default rate has dropped significantly from the 30 per cent level recorded in the mid-2000s. The default rate reported by the most successful platforms now ranges between 3 per cent and 7 per cent, according to the International Organisation of Securities Commissions (IOSCO).

The second most important risk is fraud and the investor's lack of sufficient information about the projects. It is easy for those with fraudulent motivations to take advantage of the lack of a personal relationship. Since platforms operate solely through the Internet and credit rating is, for the most part, an automated process where data provided by the borrower are not always verified, there is a higher chance of information asymmetry or

intentional fraud. Investors are often unable to assess the true level of the risks associated with the investment. For proper functioning of crowdfunding, stricter enforcement of information disclosure rules is indispensable, and this requires a set of special rules.

The online operation of the platforms and the lack of personal contact entail elevated money laundering risks, both on the side of investors and on the side of borrowers, compared to the traditional financial intermediary system.

Another noteworthy risk factor is liquidity risk. Investments made on crowdfunding platforms are typically completely illiquid; in other words, investors have no exit options before maturity. Stocks and bonds platforms are basically primary market portals; secondary trading with securities (such as on a stock-exchange) is, for the most part, extremely limited with a high cost of sale.[1]

Finally, operational risks are also included among the most important risk factors. These may stem either from fraud or from certain characteristics of platforms that are inherently associated with key risks. As most platforms are small ventures with limited resources, presumably they operate with weaker controls and enterprise management systems, compared to the standards of the financial services industry.

These risks are expected to be more pronounced in Hungary than in more developed regions. High risks and a lack of business confidence may forestall any meaningful development of this form of finance. This stumbling block could be lifted by high-quality regulations and a sound operating structure (model).

4 How do the most successful platforms work?

4.1 Kickstarter

Kickstarter has been already mentioned above as the most important crowdfunding site by international standards. The mission of the enterprise is to support the projects and ideas of creative project owners, artists, inventors and innovators. Kickstarter is a so-called donation-based online platform, where backers cannot become investors or shareholders and they do not expect anything in return for their contributions.

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1 See, for example, the section presenting the operation of Lending Club.

Chart 1
The business model of Kickstarter

Start
You point your browser at Kickstarten.com

Search
Find a project you like the sound of.

Triggertrap would be an excellent example.

Pledge
Pledge a vertain amount of money.

Say. $35.

Choose your reward
Each project offers a series of rewards for the kickstarter.

As a becker, you pick the rewards you want.

Did the project meet its funding goal?

YES

NO

MONEY RELEASED
• The project getd all the pledged moneys
• The pledgers get their rewards
• Everyone lives happy ever after

EPIC FAIL
• Project gets none of the money
• Backers don't get rewards
• Backers get their money back

Source: www.triggertrap.com (http://triggertrap.com/launching-on-kickstarter/)

Successful projects rely on excellent ideas and products, as they are the drivers that can lift and bring a project to fruition. For instance, the Pebble smartwatch elicited enormous popularity and raised USD 10 million. The most funded Kickstarter campaign in history was Ouya, an android-based gaming console, which raised more than USD 1 million in 8.5 hours and over USD 8.5 million in total. The platform charges a 5 per cent fee on the funds collected.

Kickstarter commenced its international expansion in 2012 by first entering the market in the United Kingdom. It then gained a foothold in Canada, Australia and New Zealand in 2013.

4.2 Lending Club[2]

Lending Club is an online credit marketplace, bringing together borrowers and investors through the cutting-edge technology and financial innovation offered by the platform. The goal of the US-based firm is to bring about a radical change in lending by making it more inexpensive, transparent and consumer-friendly. Since its opening in 2007, Lending Club has facilitated more than 230,000 loans at a total value of USD 3.2 billion; the company currently has more than 400 employees. Besides operating the web portal, the company provides numerous background services to facilitate lending. For instance, it examines the credit score of applicants and provides services that expedite the performance of payment obligations.

Basically, the platform provides access to two loan products. It offers personal loans for private individuals from USD 1,000 up to USD 35,000. These loans have a fixed interest rate and a maturity of 3 or 5 years. Applicants must have a predetermined credit score in order to be granted a personal loan. Investors (creditors) purchase small loan portions ("notes") in the form of bonds. In essence, this implies the securitisation of small-amount loans. In 2014, a new product was introduced, the small business loan, available in amounts ranging between USD 15,000 and USD 100,000, with a fixed interest rate and maturities between one and five years.

In the credit market, the platform competes primarily with banks. Since it operates with no physical branch infrastructure, relying essentially on online technologies, it can achieve efficient operation and a cost advantage. From the aspect of investors, the service competes with mainstream investment options (e.g. bank deposits, bonds, stocks, mutual funds). For investors, the advantages emphasised by the platform are flexibility, easy diversification, the possibility to earn solid returns in a risk-reward model and investment opportunities unlike any available through traditional means.

All loans are provided by the platform's credit institution partner (WebBank), which receives a commission from the platform in exchange for its services. Lending rates and origination fees are determined in relation to the borrower's credit risk, which is calculated on the basis of the platform's own loan grading model.

Loans are financed in three different ways:

1. Open bond issue: by way of a public prospectus, notes are offered through the website to anyone interested. Notes are issued by the platform's operator, Lending Club itself. Each series of notes is backed by a single loan facilitated through the platform. Interest and principal are repaid fully from the cash flows stemming from the payments associated with the underlying loan.

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2 The decription based on the Lending Club's webpage and the prospectus approved by the SEC.

2. Private security offering: targeting accredited investors, securities are issued from time to time in a private procedure where, similar to public issuance, the sole collateral for the securities is the repayment of the underlying loan.

3. Loan trading to third parties: even in this case, clients are served through the platform itself.

Chart 2
The business model of Lending Club

Source: www.lendingclub.com
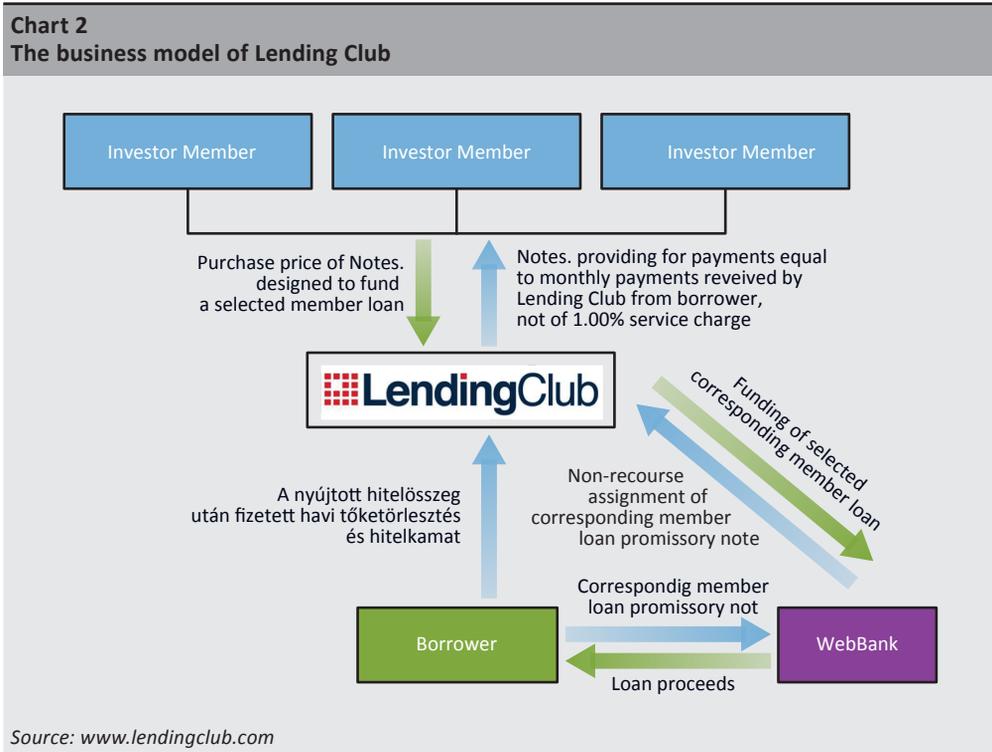
Lending Club has massive information technology support at its disposal, with fully automated systems in the following areas: client acquisition, registration, subscription, payment cycles and electronic account monitoring system.

Given that the company offers complex financial services through its lending and security issuance services, its activity is strictly regulated and supervised and is subject to prior authorisation.

The first step of the investment process is investors' registration. During the registration process, investors are identified and offered to sign an investment contract that includes provisions on the details of the note purchase. Investors must also comply with certain financial security and investor-protection rules (which vary from state to state) prescribing minimum requirements about the investor's annual income and net worth and defining the maximum threshold of individual investments. Investors may not spend more than 10 per cent of their net worth on the purchase of notes.

After registration, investors can search and browse the loan listings to decide which borrower to fund and by how much, indicating their commitment to invest in pieces of loans in USD 25 increments, up to the amount of free funds at their disposal. After confirmation of the investor's commitment, the order may not be cancelled and the funds may not be used for anything else.

In all cases, the actual creditor is WebBank, a credit institution licensed to sign the loan agreement. Upon submitting their request, potential borrowers disclose their annual income and place of employment, and give consent to the platform to obtain data from external credit rating agencies regarding their creditworthiness. Based on the data thus obtained, the platform determines the applicant's credit rating and shares all information (except the name of the borrower) with investors, who can decide on the basis of the information provided whether they wish to invest in the notes issued with the backing of the underlying loan.

The lending rates on individual loans are determined by a committee. They are based on the following criteria: general economic environment, the history of the supply-and-demand relationship between funds and borrowing needs on the platform, the expected default ratio associated with specific credit ratings, and the pricing of comparable products offered by competitors. Lending rates typically vary between 6 per cent and 26 per cent.

Once a loan request has received its credit grade rating and the committee has determined the corresponding interest rate, the listing is posted on the Lending Club website and becomes visible to potential investors. While investors do not see the borrower's name, the requested amount, the credit rating, the term of the loan, and the borrower's income and employment are publicly available on the website, along with confirmation of whether this information has been verified. Investors can also see other investors' subscription offers to date and the loan purpose indicated by the borrower. Investors also have access to information provided by external credit rating agencies (credit bureaus). This information about the loan and the borrower, pertaining to the issue of the note, is published in the form of a prospectus supplement. As such, its disclosure rules are governed by those applicable to the prospectus, and they include the appropriate risk warnings.

Loan requests are posted on the platform for a maximum of 14 days; investors have this period to indicate their commitment to order. If applicants fail to receive full funding during that period, they may request relisting of their request, up to the amount yet to be funded. When the listing is closed, WebBank pays the requested loan amount to the borrower, using Lending Club as the payment designee, and assigns the loan to Lending Club. Upon issue of the notes, the purchase price (face value) of the notes is deducted from the investors' accounts. In case of a successful disbursement, the borrower pays an origination fee, which is deducted from the disbursed amount.

Secondary market trading of the notes is restricted. Investors may only sell the notes on a trading platform set up for this particular purpose and operated by a non-affiliated investment service provider, which charges 1 per cent for the transaction.

Monthly repayment information is sent to investors and the external credit bureaus. In the case of late payment, an arrangement may be made to reschedule the debt, even without the consent of noteholder investors. The portal declares the payment to be delinquent on the website on the 31st day of delinquency, at which point it is referred to either an internal or third-party debt collection agency.

4.3 Crowdcube

Crowdcube, which has grown to become the UK's largest and the world's leading equity-type crowdfunding platform, launched its portal in 2011. Its fundamental goal is to help British businesses raise money. Providing an alternative for banking services besides so-called "business angels" and venture capitalists, the portal gives start-ups an opportunity to finance their projects through funds contributed by investors. In essence, anyone can invest capital in early-stage and growth businesses via the Crowdcube portal in exchange for a commensurate equity stake in the business they helped fund. Enterprises seeking funding on the Crowdcube platform are invited to introduce their planned projects and the business opportunities they entail to thousands of investors. In the case of a successful fundraising campaign, Crowdcube charges a 5 per cent success fee. Approximately GBP 30 million has been invested via the platform to date (GBP 15 million of which was raised in 2014). Crowdcube has 80,000 registered users and has raised funding for 131,000 businesses so far. The technology sector has proved to be the most popular segment of start-up and growth-stage companies.

Crowdcube has obtained a supervisory license for its activities from the British supervisory authority. Thanks to its supervisory license, Crowdcube's clients are protected by the investor protection fund and, in certain cases, they can also turn to the Financial Ombudsman Service.

During their activity on Crowdcube, investors acquire an equity stake – in the form of securities – in the company that they have funded. Obviously, such investments in start-ups entail significant risks; however, they promise fairly large potential returns. No middleman is involved in the process; investors become direct legal shareholders. In addition, once funded, the British platform continues to monitor the progress of the business concerned, provides consulting services during security issuance, and supports the firm in any other professional matters, as required.

The issue of mini-bonds is another way of borrowing capital on Crowdcube. The mini-bond product enables start-up or growth-stage businesses to borrow expansion capital from their stakeholders, customers or even entire investor communities. The company determines the annual fixed interest rate of the bond to be issued (typically between 6 and 8 per cent) and the maturity of the bond (usually up to 5 years). As is the case with other bonds, the issuer then receives the growth finance they need, which they repay gradually during the term of the bond at a predetermined interest rate. Participants can benefit from the transaction in various ways, while the business has an opportunity, among other things, to build a stronger relationship with its customers. At the same time, the portal calls attention to the fact that mini-bonds are unsecured, non-convertible and non-transferable – and, as such, they carry high risks.

In February 2014, the popular British crowdfunding platform set up the Crowdcube Venture Fund, offering investors a higher level of protection by teaming up with an independent, professional fund manager to manage and monitor their start-up portfolios while also taking into account tax-efficiency considerations.

At the beginning of the campaign, businesses seeking to raise capital create their own page (i.e. pitch) on the Crowdcube portal. In order to do this, they need to submit an online application, to which they attach a business plan, a summary of their investment proposition, and a financial forecast for the next three years. Next, Crowdcube examines whether the company meets the criteria set by the investors of the platform and considers the success of the enterprise so far. This review process takes about two to three weeks.

After the application has been accepted, the company creates its pitch, uploading an introductory video and other documents containing financial information. In order to attract investors, it is important to include as much relevant information as possible, along with creative, interesting elements to raise attention. If the company's pitch is approved by Crowdcube, it will be activated, and the collection of the target amount begins.

Once the campaign goal has been reached, the funds are disbursed to the company (this process takes about seven days), and an investor schedule is drawn up, specifying the number of shares to be issued. Finally, the securities are issued.

In order to protect both sides, Crowdcube performs background checks and uses rigorous anti-money laundering controls in respect to both investors and businesses.

5 Regulatory needs

5.1 United States

The United States responded quickly to the regulatory needs of crowdfunding. By 2012, the business-friendly society of the USA pushed through a change in the rigid rules of security issuance, and the impediments of the simplified, Internet-based, small-volume borrowing of early-stage businesses have been removed. The regulator focuses on the portal and the investor, while minimum compliance is prescribed for issuers. For start-ups, it is key that they are not bound by any (rigorous) preliminary licensing obligation, which cannot be avoided during initial public offerings. Start-ups are early-stage enterprises mostly built around a business idea; they would have difficulties complying with any indicators and would not be able to produce the documentation required for an IPO. Therefore, start-ups are only able to launch fundraising campaigns on crowdfunding portals because they are subject to different rules than their peers in traditional financial markets.

Adopted in April 2012, the *Jumpstart Our Business Startups Act* (abbreviated as the JOBS Act) lays down certain crowdfunding exemptions. These exemptions allow companies to launch fundraising campaigns with significantly more relaxed and less stringent rules, provided that during the campaign they meet the set criteria defined in the JOBS Act.

Firstly, the JOBS Act sets restrictions on transaction volumes, both in terms of the aggregate volume of the issuance and in terms of the volume allowed to be sold to a single investor (from the point of view of investor protection).[3]

Another requirement of the transactions is that they should be facilitated by a broker or a so-called funding portal that complies with the criteria presented below. In addition, investors must also comply with a predefined set of criteria.

Main requirements for platforms

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3 The total dollar amount of the securities being sold by an issuer may not exceed USD 1 million over a 12-month period. Over the course of a 12-month period, investors are permitted to invest up to:
   • USD 2,000 or 5 per cent of their annual income (or net worth, defined as assets less liabilities), whichever is greater, if their annual income (or net worth) is less than USD 100,000;
   • 10 per cent of their annual income (or net worth), whichever is greater, if either their annual income (or net worth) is equal to or more than USD 100,000.

In order to be compliant, intermediaries must be registered, either as a broker or as a funding portal, with the SEC (Securities and Exchange Commission, the US security supervising authority) and any applicable self-regulatory organisations (SRO). Intermediaries disclose all information on the investment deemed appropriate by the SEC and at the same time ensure that:

• each investor reviews investor-education information;

• all relevant information provided by the issuer is made available to the SEC and to potential investors no later than 21 days prior to the first day on which securities are sold;

• the investor confirms its understanding that it is risking loss of the entire investment and that the investor's financial position could bear such a loss;

• each investor answers questions demonstrating an understanding of the level of risk generally applicable to investments in start-ups and small issuers and an understanding of the risk of illiquidity;

• appropriate measures are taken to reduce the risk of fraud with respect to the transactions;

• all offering proceeds are only provided to the issuer when the aggregate capital raised from investors is equal to or greater than the target offering amount, and all investors are allowed to cancel their commitments to invest if the funds raised does not reach the original target amount;

• continuous monitoring is in place to ensure that no investor exceeds the investment limits referred to above;

• the privacy of information obtained from investors is protected;

• their directors, officers and partners are prohibited from having any financial interest in an issuer using their intermediary services.

Main requirements for issuers

Issuers must provide or make available to the SEC, investors and the relevant broker or funding portal the following information:

• the name, legal status, physical address/registered seat and website address of the issuer;

• the names of the directors, officers and each person holding more than 20 per cent of the shares of the issuer;

• a description of the business of the issuer and the anticipated business plan of the issuer;

• a detailed description of the stated purpose and intended use of the proceeds of the offering sought by the issuer with respect to the target offering amount;

• the target offering amount and the deadline to reach the target offering amount; the issuer must provide investors with regular updates regarding the progress of the campaign;

• the price of the securities to the public or the method for determining the price, provided that, prior to sale, each investor is provided in writing the final price and all required disclosures, with a reasonable opportunity to rescind the commitment to purchase the securities;

• a description of the ownership and capital structure of the issuer;

• a filing with the SEC not less than annually and reports to investors of the results of operations and financial statements of the issuer.

5.2 European regulatory initiatives

European governments also turned their attention to crowdfunding as an alternative form of finance targeting small businesses, as companies in this segment notoriously struggle with a lack of capital. With the involvement of market participants, the European Commission has drawn up an action plan to stimulate long-term financing opportunities, including crowdfunding, in order to facilitate economic growth (European Commission [2014]).

Some Western European countries have already taken some independent regulatory steps; however, the phenomenon is not treated in a uniform manner everywhere.

The general regulatory framework in effect across the European Union is currently composed of the following rules.

Three EU directives are connected to crowdfunding regulations: the Markets in Financial Instruments Directive (MiFID), the Prospectus Directive (PD), and the Alternative Investment Fund Managers Directive (AIFMD). The directives on credit institutions and the Payment Services Directive (PSD) are applicable to lending-based crowdfunding, depending on whether the platforms collect money from clients or execute payments.

To date, regulations do not include specific provisions on crowdfunding. It is noteworthy that there is not a single definition for crowdfunding in Europe, and it is unclear what kinds of services crowdfunding platforms are expected to provide.

At present, the European Banking Authority and the European Security Market Authority work together to ensure a clearer understanding of how the current regulatory framework is applicable to crowdfunding and to facilitate a higher level of supervisory convergence in the EU. The European Commission is exploring the potential and the risks of crowdfunding, as well as the national legal frameworks applicable to it, in order to identify whether value is added at the European level in terms of policy action in this field.[4]

5.2.1 Italy

In Italy, crowdfunding-related activity is regulated by a decree entitled "The collection of risk capital on the part of innovative start-ups via on-line portals,"[5] which was adopted in June 2013.

Registration requirements have been defined for crowdfunding portal managers and for start-ups seeking funds via the platform. For the registration of businesses, the following information must be provided in addition to general company data: a description of the business activity (business model) and organisational structure of the company, a list of all outsourced activities, information on controlling shareholders (with an indication of their stake, expressed both in monetary value and in percentages), and the name of the persons performing managerial and supervisory functions.

In operating the portals, portal managers must strive to ensure transparency, avoiding any conflicts of interest that may have a detrimental effect on the interests of the investors and the issuers. The portal manager must make available to the investors all of the information provided by the issuer regarding the offer. This information must be disclosed in a comprehensive, detailed and straightforward manner in order to ensure that investors fully understand the nature of the investment and the associated risks, so that they can make informed decisions about the investment. Moreover, the portal manager must draw non-professional investors' attention to the fact that the investment entails high risks and, as such, their investment should be proportionate to their financial resources. The portal manager must refrain from expressing recommendations in respect to the investment offers listed on the platform.

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4 http://ec.europa.eu/internal_market/finances/crowdfunding/index_en.htm

5 Delibera n. 18592 "Regolamento sulla raccolta di capitali di rischio da parte di start-up innovative tramite portali on-line"

The portal manager must provide to investors, in a concise and easily comprehensible form, all of the information related to investments in innovative start-ups, including:

• the risk of losing the entire invested capital;

• the risk that it may be impossible to cash in on the investment immediately;

• the taxation benefits applicable to the investment;

• the contents of the specific company's business plan.

The portal manager must also ensure that non-professional investors may only access the sections of the portal where it is possible to pledge a contribution to a specific investment offer if they have:

• read the information related to the investment;

• answered positively to a questionnaire that is intended to demonstrate full understanding of the essential features and main risks related to investment in innovative start-ups via portals;

• clearly declared that their financial position would be able to sustain the entire loss of the investment.

Banks and/or investment firms processing orders must inform the portal manager on a continuous basis of the progress of the investment offer. For each individual order, the portal manager must ensure that the funding necessary for the processing of the offer is deposited in the account held on behalf of the issuer at the bank or the investment firm to which the orders are transmitted.

Non-professional investors who have expressed their commitment to purchase a financial instrument via a portal must be ensured of the right to revoke their order if at any time between pledging their commitment and the closure of the offer, a new fact arises or a relevant material mistake occurs vis-à-vis the information provided on the portal that could influence their decision regarding the investment. The revocation right can be exercised within seven days from the date on which the investor obtained knowledge of the new information. If the investor exercises its right of revocation, the invested amount must be fully refunded to the investor.

5.2.2 United Kingdom, France and Germany

The operation of peer-to-peer (P2P) lending platforms is a regulated activity, falling within the scope of the Financial Services and Markets Act 2000 (Section 36H; effective from 1 April 2014). The activity is subject to supervision; however, it is not covered by the local deposit guarantee scheme.

The regulation defines customer information, complaint management and capital requirements, and determines the maximum loan amount to be GBP 25,000.

Loan agreements via the platforms are concluded between the creditor and the borrower; terms are standardised. RateSetter manages the risk of late payment and default by using its "Provision Fund".[6]

In France, the most widely known platform is Prêt d'Union, which is authorised by the French supervisory authority[7] to carry out broker and credit institution activities. The platform enables private individuals and institutions to provide loans by way of covered bonds.

The development of independent regulation pertaining to these platforms is in progress, with a view to ensuring consumer protection and transparency. The regulation is expected to cover disclosure requirements and to establish the relevant special legal status (*intermédiaire en financement participatif*). In addition, the draft legislation sets an overall investment ceiling (EUR 1 million) and limits the amount a lender can invest in any particular loan (EUR 1,000).

In Germany, crowdfunding platforms are not regulated by independent legislation; they are subject to bank regulations. The market leaders, AUXMONEY and Bergfürst, pursue their activities in possession of a banking license.

6 Hungarian opportunities

For a more thorough exploration of domestic opportunities, it is necessary to examine both the borrowing requirement and the prevailing legislative background.

Examining developments in investment/equity ratios (excluding the amortisation effect) of micro- and small enterprises over nearly the past two decades, one finds that, apart from a couple of outliers, the annual investment activity of this segment follows a declining trend. This reconfirms the assumption of a need for innovative forms of borrowing.

As regards investor risks, the default ratio of micro- and small enterprises stabilised at an annual level of 3 per cent after the effects of the crisis wore off. This ratio implies that, in the case of a typical 5-year project, there is a 16 per cent[8] probability that the business
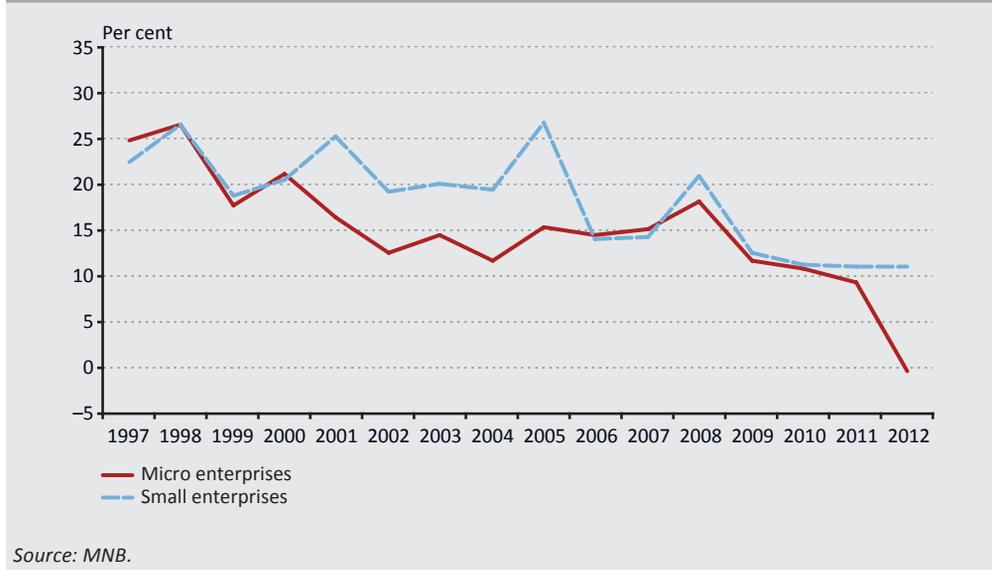
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6   The Provision Fund functions as a guarantee fund, pooling funds from borrowers' payments. The purpose of the Fund is to cover losses stemming from potential borrower defaults.

7   Autorité des Marchés Financiers (AMF)

8   Based on values derived from Chart 4.

will go bankrupt during the lifecycle of the project. As the main targets of crowdfunding are new enterprises, the default rates of which are significantly higher than those of their older peers, the risks involved can be considered rather high.

Chart 3
Investment/equity ratios of micro and small enterprises
(excluding amortisation effects)

Per cent

[Chart showing investment/equity ratios from 1997 to 2012, with Y-axis from -5 to 35 per cent, and two lines: Micro enterprises (solid red) and Small enterprises (dashed light blue)]

— Micro enterprises
- - Small enterprises

Source: MNB.

Since 2010, primarily owing to the venture capital funds backed by EU resources (JEREMIE programmes), venture capital funding available to SMEs increased substantially, expanding the range of funding available outside of the banking system. By the end of 2013, the share of JEREMIE funds in the HUF 215 billion subscribed capital of venture capital funds reached a total of HUF 132 billion. Crowdfunding could fit seamlessly in this system, especially in the JEREMIE programme. Already functioning venture capital funds could provide a good exit option for investors of small businesses supported by crowdfunding investments.

On the lending side, besides bank loans, the Funding for Growth Scheme eased supply constraints, and significant state programmes are in place in the area of microfinance (New Széchenyi Combined Micro Loan, New Széchenyi Loan, Széchenyi Card Overdraft, etc.). These programs have gained popularity, owing to their two main features: the preferential interest rates ensured by the state subsidy and, for the financial institutions providing the loans, the state guarantee programme, which is a significant risk-reducing instrument. These programmes generally require borrower companies to have a one- or two-year operating history. Based on the above, crowdfunding could have important potentials in the areas of equity finance and lending to companies without an operating history. In

case of small start-ups, lending and investment risks are nearly equally high.[9] Accordingly, attention is focused on the potentials of crowdfunding in equity-based financing.

Although the Internet breaks down geographical barriers, international experience shows that businesses prefer to use crowdfunding platforms operating in the local regulatory environment. For the time being, there are no direct investment platforms ("regulated marketplace") in the CEE region that facilitate this form of borrowing. In Poland, joint work initiated by the Warsaw Stock Exchange (WSE) and aimed at the establishment of such a platform has been commenced by the institution, comprising 5,000 start-ups (Aula Polska) and the WSE, with a view towards improving the financing of enterprises and facilitating innovation.

Besides exploring current regulatory options, the question arises whether there is a need for developing *sui generis* rules, as was the case in the United Kingdom.

Chart 4
Default rates of micro- and small enterprises

Source: Opten.

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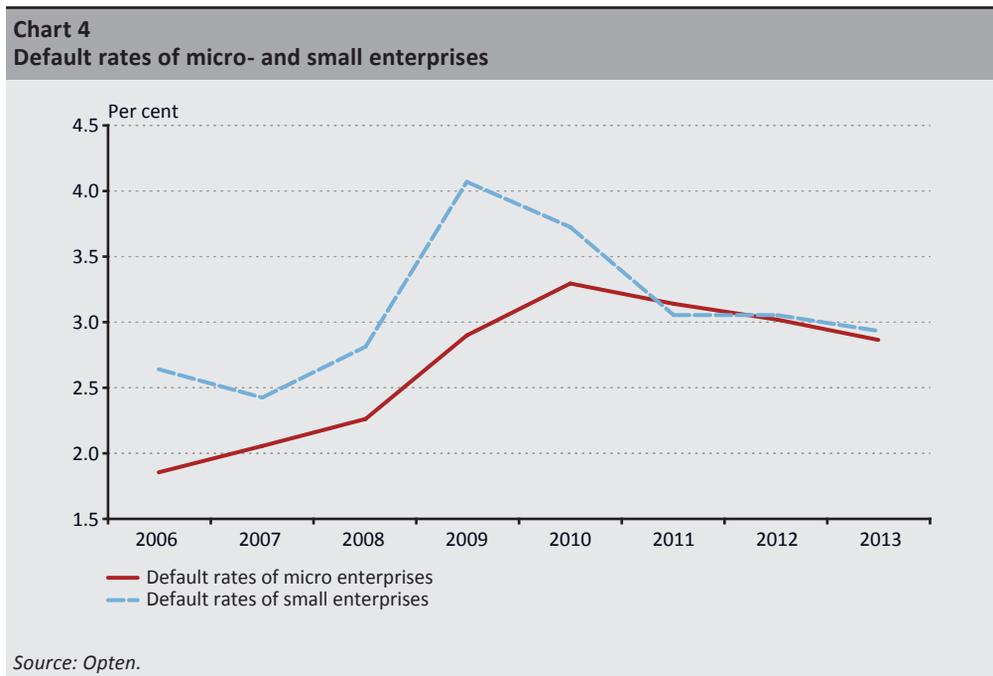
9   The rare exception is the case when substantial assets are provided as contributions and the start-up commences operations in a well-capitalised position.

In Hungary, security trading is regulated by Act CXX of 2001 on the Capital Market (Tpt.). The provisions of the Tpt. are based on the principle that any marketing of securities in ways other than private offering are subject to regulations on public offerings.[10] According to one of the exemptions specified in the Act, the offering is considered private if the subscribed capital borrowed by the company does not exceed EUR 100,000 within a year. In such cases, regarding the capital collected within this limit through a campaign publicly available to anyone (which, however, must be a regulated process in full compliance with investor protection criteria), the issuer must only adhere to the rules of private offerings; in other words, the issuer does not have to submit a prospectus for the approval of the fundraising campaign. In theory, this may provide an opportunity for a portal involved in equity-based crowdfunding.

In view of the aforementioned provisions of the Tpt. and the relevant provisions of the Civil Code on limited companies – according to which only public companies are entitled to solicit capital by way of public invitation[11] – crowdfunding by way of security issuance appears to be feasible within the abovementioned framework of private offering. In respect to the above, however, it should be noted that, due to the company registration procedure and the origination of the shares (i.e. their production by means of dematerialised ways or printing), this form of raising funds may well become extremely costly relative to the volume issued (legal fees, fees charged by KELER Zrt, etc.). In addition, in the case of this form of crowdfunding, potential shareholders may subsequently incur further costs beyond the initial payment of membership capital.

As the example of US peer-to-peer lending demonstrates, besides the issuance of shares, the model can be also envisaged in the context of bond issuance.

As regards donation-based capital contributions, the relevant taxation obligations should be considered (e.g. VAT, corporate and dividend taxation), although they are primarily applicable to donations offered by business associations (for non-public purposes).

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10 Pursuant to Section 14 (1), the private offering of debt securities is subject to the following criteria: "It shall be construed as a private offering (hereinafter referred to as "private offering") when:
a) securities are offered only to qualified investors;
b) securities are offered to less than one hundred and fifty persons in each Member State, and if these persons are not considered as qualified investors;
c) securities are offered to investors, each purchasing at least one hundred thousand euros, or its equivalent in any other currency, from the securities offered;
d) the face value of the securities offered is at least one hundred thousand euros, or its equivalent in any other currency; or
e) the total consideration for all securities in the Union included in the offer shall not exceed one hundred thousand euros, or its equivalent in any other currency, within twelve months from the date of announcement of the offer;
f) a limited company is created by the transformation of a cooperative society and its shares are offered only to the members and shareholders of the predecessor.

11 Pursuant to Section 3:249 of the Civil Code.

Several platforms operating abroad pursue activities that may be considered as loan mediation between the funders and the fundees; under the national law of the company's location, these may qualify as financial services. In Hungary, the pursuit of credit and loan operations and the provision of financial intermediation services on a commercial scale is subject to authorisation (pursuant to the provisions of Act CCXXXVII of 2013 on Credit Institutions and Financial Enterprises).

Upon developing a domestic model, consistency must be ensured regarding regulations pertaining to money laundering and terrorist financing (Act CXXXVI of 2007), which prescribe customer identification, the reporting of suspicion of money-laundering transactions, etc. This is particularly important in this case, given that platforms are Internet-based with no personal contact involved.

The registered capital portal defines the details of its operational processes. In line with international examples, the legislator's main focus is the protection of investors. The venue of capital raising and its supervision must be determined; transparency must be ensured and investor protection control must be put in place. The goal should be to ensure that the transformation of the regulation does not result in dilution and less investor protection; it should only remove the biggest obstacles from the path of the new institution.

Investor protection should basically cover the following key areas:

1) On the investor side:

– setting the upper limit of the investment and determining the size of the investment in proportion to the investor's income/financial standing;

– guaranteeing the protection of personal data.

2) On the operative side of the platform:

– providing adequate information about risk factors, in particular the fact that investors may lose the entire invested amount (except in the case of donation-based financing);

– providing an adequately detailed description of the platform's operation;

– describing all fees and charges payable to the platform manager;

– providing an overview of the rights/obligations associated with the nature of the platform (e.g. regarding lending, the borrower's option for prepayment or repayment of the loan before its scheduled maturity);

– developing a complaints management procedure;

– defining disclosure requirements.

Besides investor protection rules, potentially efficient tools to consider are, for example, the registration or authorisation of platforms, a capital requirement or mandatory capital buffer, or the requirement of financial collateral (similar to the new institution of trust asset management).

As the domestic institutional system is being established, a strategic decision must be made as to whether it should be subject to the existing legislative framework or if separate regulation should be adopted. The main advantage of the latter is that this solution could truly ensure investor protection and the supervision of the institutional system (perhaps even by means of a prior authorisation procedure).

In addition to these considerations, the relevant activity of the European Commission should also be monitored, as potential future EU regulations may have a fundamental impact on the design of the domestic institutional system. The European Commission is exploring the status and risks of crowdfunding and the individual member state regulations in order that, should the need arise, an EU-level legislation can be enacted to ensure optimal operation of the internal market.[12]

Chart 5
The main pillars of the crowdfunding model
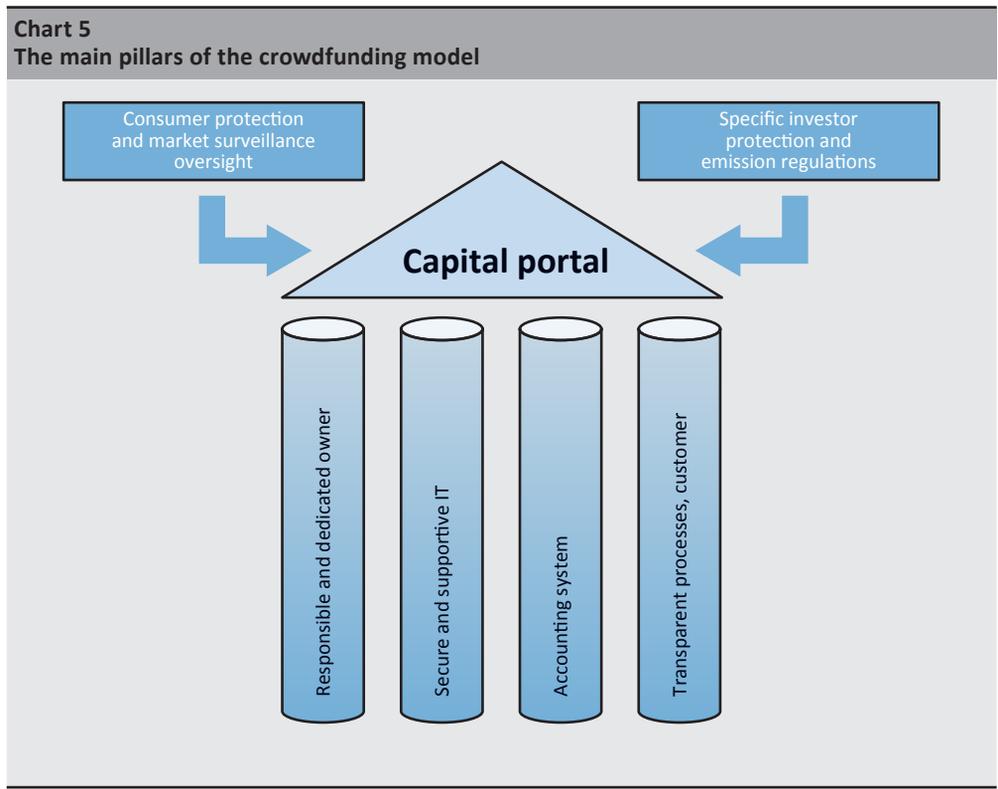
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12 http://ec.europa.eu/internal_market/finances/crowdfunding/index_en.htm

Irrespective of the regulatory environment, the success of a portal depends on numerous factors: in order to attract a critical mass, the portal must become a "brand" – a stable, neutral, independent institution that is fully compliant with criteria of investor protection. The presence of prestigious owners behind the portal at its inception may also facilitate success. The existence of a secure and supportive IT background is of key importance. And, last but not least, crowdfunding portals must be supported by a safe settlement system.

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Back to basics – good indicators for good fiscal institutions!

Ludovit Ódor – Gábor P. Kiss

A proper fiscal framework should ensure fiscal sustainability while avoiding procyclicality of fiscal policy. As a prerequisite, fiscal rules should be based on numerical indicators that are conducive to both of these basic objectives. In this paper, we discuss problems that the existing European fiscal architecture fails to address, even as it becomes increasingly more complex and rule-based. We argue that a lack of robust, simple indicators makes the enforcement of rules and/or the prevention of procyclicality of fiscal policy very challenging. In our view, a decentralised framework would be better suited to fight against the deficit-bias in Europe. Accordingly, we propose that the first line of defence against irresponsible fiscal policy be provided by national, country-specific rules, with active monitoring of local fiscal councils. In this model, the community level would be responsible for checking compliance with minimum standards defined for local fiscal frameworks and for EU-wide coordination of policies instead of yearly fine-tuning of national budgets.

Introduction

In contrast to monetary policy, fiscal policy remains an area where there continue to be substantial gaps between theory and practice. Although significant progress has been made since the crisis (especially in the European Union), the fiscal framework itself has become overly complicated, non-transparent and almost unenforceable over the years. This article proposes a framework that is not only better aligned with theory, but also benefits more from synergies between fiscal rules and independent fiscal institutions. In addition, it offers a more efficient division of labour between the community level and the national level with regards to fiscal responsibility. Minor adjustments to the existing system will not suffice; we must go back to the basics. The new framework will achieve its objectives only if it takes into account country-specific conditions and is based on much better fiscal

indicators. This article therefore focuses on issues of methodology and theory that must be resolved in order to design an efficiently functioning fiscal architecture.

According to some theoretical approaches, there exists an optimal trajectory for public debt that is specific to each country. Another important theoretical lesson is that immediate adjustment after a shock to debt is not optimal: efforts should be made to achieve tax smoothing instead (Barro, 1979). A prerequisite for this, however, is a pre-shock debt level that is not excessively high and market expectations that are well anchored even after the shock. Otherwise, a sudden increase in risk premia may easily lead to a loss of confidence in the government debt markets.

In theory, the deficit can be divided into two components, a permanent one and a temporary one. The permanent deficit component has a role in determining national savings when the economy is in equilibrium, whereas the temporary component has the function of stabilisation at around equilibrium. The optimal value applies to the permanent component, which is not only country-specific but also time-varying. For instance, emerging economies may justifiably operate at higher levels of deficit and debt, which will be reduced later, once they have completed their convergence process. The matter of stabilisation at around equilibrium is further complicated by the fact that discretionary decisions can also be adopted beyond the operation of automatic stabilisers. However, whereas fiscal stimulus is frequently used to offset the impacts of an economic downturn, contractionary fiscal policy to curb excessive demand in a booming economy is rare.

This asymmetry is only one of the explanations for the deficit bias observed in many countries; it may have a number of explanations, differing from country to country (Calmfors and Wren-Lewis, 2011). Some explanations highlight bad incentives, while others emphasise the absence of hard budgetary constraints. Bad incentives may include the common-pool nature of public goods, frequently leading to overuse. Furthermore, heterogeneity in the electoral base means that there are groups of voters that are mostly taxpayers and others that are mostly beneficiaries (receiving public services and transfers). In many cases, it is hard to determine who will ultimately bear the burden for a tax cut or a transfer raise, which might lead to myopia when designing discretionary actions. Transparency could, to a certain extent, prevent all this or at least reduce the information asymmetry among different participants; after all, it is often too easy to hide the reality behind optimistic budget plans and methodological gimmicks. The real barrier would be an electoral majority that does not tolerate a high deficit. In such a case, transparency would be helpful.

For fiscal policy to operate properly, it needs to rely on a fiscal framework that keeps debt on an optimal trajectory and at the same time avoids fiscal policy that is procyclical (i.e. intensifies economic volatility). A fiscal framework is comprised of numerical fiscal rules, fiscal councils, and the planning, procedural and accounting rules of the budget. A numerical fiscal rule will function properly and be enforceable only if it covers the full

scope of discretionary fiscal policy. We argue that this is feasible through the selection of appropriate accounting rules. Furthermore, a numerical rule should exclude the impacts of all exogenous factors. As we will see, there is potential for significant methodological progress in this respect as well, although the uncertainty surrounding the potential GDP level and growth rate will nevertheless persist.

A fiscal framework can also be seen as a commitment device similar to the one created online (stickk.com) by some professors at Yale University. They assert that a proper commitment device can increase the likelihood of achieving personal goals (e.g. losing weight, giving up smoking) by as much as 30 per cent. Such commitment is comprised of four components: the target, the stakes, the referee and the support. The first three components are also present in a fiscal framework. In an ideal case, the electoral majority will also provide support. Other solutions than a fiscal framework exist to exercise control over fiscal policy; all four components may be significantly different in such instances.

– In principle, the electoral system may ensure fiscal discipline. The parliamentary majority may participate, but support from the electoral base for fiscal prudence is doubtful. There are voters who are taxpayers and savers, financing the public debt, and also groups that receive more in public services than they pay in taxes. In some countries, however, voters are highly sensitive to irresponsible fiscal policies (examples include Switzerland, New Zealand and Germany).

– Investors financing the public debt may also exert market discipline; the process differs, depending on whether the investors are domestic or international. The latter are often too late in responding and may then do so with dramatic impact (*sudden stop*), jeopardising the state's ability to maintain its solvency.

– When solvency is threatened, the lending arrangements of the International Monetary Fund (IMF) may temporarily replace the investors. When maintenance of the lending arrangements is at stake, the IMF acts as referee. Voters, however, do not necessary support fiscal measures stipulated as a precondition for the arrangements; on the contrary, they often blame the IMF for the unpopular measures (*blame-shifting*).

– In the European Union, fiscal discipline is required at the community level. At stake in this case is a legal procedure (*excessive deficit procedure*) and potential fines, with the European Commission (EC) and the European Council acting as referees. Electoral support is not automatic in this case either, and the EU may be placed in a role similar to that of the IMF (*blame-shifting*).

– Frameworks at the national level are a new factor. The stakes may take a variety of forms, from automatic correction mechanisms to the right of the Fiscal Council (FC) to veto the annual budget act. In addition to its control role as referee, the FC is responsible for ensuring transparency and gaining electoral support for sound policies.

The rest of the paper mainly addresses two issues. First, we analysed the question of an appropriate indicator for setting the fiscal target, including all fiscal policy actions but excluding impacts from exogenous factors. This question may be approached from different perspectives. One approach identifies a list of problems and seeks solutions to them. An alternative way is to concentrate on different solutions and approaches employed to find appropriate indicators. We focus on the latter approach, since it can clearly illustrate that the non-satisfactory track record reflects institutional problems rather than methodological ones. This will also lead us to the second issue, regarding what role the independent FCs can play in setting, monitoring and evaluating compliance with the target, as well as what division of labour is feasible between the community level and the national level. (In the following, the acronym FC is used to indicate independent fiscal institutions as defined by the EU.[1])

1 Introduction to fiscal indicators

A large number of fiscal indicators are used in international practice (some of these are presented in the following sections). They are created for different purposes and their definitions reflect the differences in the questions they are intended to answer. As mentioned in the introduction, it is important to differentiate between permanent and temporary components of the deficit. Similarly, the impacts of discretionary fiscal policy and exogenous factors should be separated. This is demonstrated in the following table.

Table 1
Deficit decomposition

	Permanent	Temporary
Endogenous (discretionary)	part of structural deficit	creative accounting
Exogenous	part of structural deficit	cyclical adjustment, surprise inflation impacts, revenue windfall/ shortfall

Table 1 appears simple, yet it raises a number of questions.

First, what time horizon is consistent with the definition of "permanent"? For instance, cyclical adjustment considers the economic cycle to be temporary, and thus it does not eliminate the "volatility" experienced on a longer time horizon. As a result, convergence periods, absorption cycles, financial cycles and demographic volatility are found in the

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1 Independent fiscal institutions are defined as the institutions (other than the central bank, government and parliament) that prepare fiscal forecasts and analyses and/or provide advice. Within this role, they monitor compliance with the fiscal rules, but do not participate in the creation of norms. (http://ec.europa.eu/economy_finance/db_indicators/fiscal_governance/independent_institutions/index_en.htm).

permanent component. The approach depends on the length of the horizon for forecasting and determining the equilibrium path of the economy. Over the selected horizon, however, the average of actual balances and (structural) balances, excluding temporary impacts, are equal.

The second question is, how are temporary measures defined? It is possible to find here a deliberate confusion of one-off and individual items, the alternative to which would be addressing this issue at the most aggregated level (level of the budget balance). Practically, only self-reversing measures may be considered temporary (i.e. the average of the actual balances and the (structural) balances, excluding temporary impacts, will be equal). The time horizon of self-reversal may be very long (a typical example is the outsourcing of government investments under PPP arrangements, the impact of which is reversed through repayments over decades). This type of measure is often referred to as creative accounting.

Stock indicators (for instance, public debt) represent one type of basic indicator. Another basic type is the flow indicator, such as the budget balance. The third main type includes changes in the budget balance, often called the fiscal impulse. Most of the stock and flow indicators are defined on the basis of statistical or accounting principles and are, in principle, mutually consistent and comparable over time and across countries. Analytical indicators (such as change-in-balance indicators, for instance) are less standardised and contain more *ad hoc* elements. Experience indicates that this flexibility may contribute to their ability to give a more accurate representation of the fiscal situation than purely statistical indicators. In the following, an overview is provided of the typical methodological problems related to fiscal indicators on the basis of the experience of the IMF and the EU, and then specific fiscal indicators are proposed which may be suitable as targets as well as operational instruments.

2 Fiscal indicators in IMF practice

The IMF provides regular analyses of a wide range of countries, collecting fiscal statistics and calculating indicators using its own methodology and optionally also relying on the methodological innovations of the OECD and the European Central Bank (ECB). The IMF monitors fiscal indicators more closely, taking country-specific factors into account when it sets and controls targets for countries participating in lending arrangements. The wide range of the countries involved and the detailed information concerning the individual countries makes it useful to review the main fiscal indicators used by the IMF.

2.1 Solvency indicators – the stock approach to flow indicators

Public debt is a key indicator for the IMF, just as it is for the bond markets. Its earlier statistical methodology (GFS86) focused on net public debt (less deposits) and its changes, excluding revaluation, the GFS deficit. This simple, but consistent system considered a transaction as financing only if it concerned solely the public debt and deposits (borrowing, issuance of government security and repayment), with all other items placed in the category of financing requirement (deficit). Thus, for instance, government lending was classified as expenditure and privatisation as revenue. Each item was recorded in a cash approach, making the changes in net public debt (excluding revaluation) fully consistent with the changes in the GFS deficit.[2] This is an obvious approach, because fiscal problems occur precisely when the market stops financing the debt. Another strong connection between debt and deficit lies in the automatic impact that the changes in debt have on interest expenditure. In 2001, the IMF switched to national accounts statistics (GFS2001), which will be discussed in greater detail in the next section.

Practice has revealed a number of distortions in statistical indicators that were impossible to resolve, due to issues with data availability or methodological problems. These were eventually resolved by the standardised methodology of international comparisons (e.g. eliminating cyclical impacts) and partly by *ad hoc* analytical indicators set for the countries participating in IMF lending arrangements, depending on the type of distortion identified in a particular case. Removing short-term distortions was what really mattered for lending arrangements, and longer-term problems were not addressed.

Firstly, deficit and debt statistics were available only for part of the public sector, determined in a narrow legal coverage, as public companies were excluded. Experience shows, however, that the Public Sector Borrowing Requirement (PSBR) is the indicator that covers the overall financing requirement. Unavailable data allowed for temporary cosmetics of the indicators (creative accounting), as quasi-fiscal activities have remained hidden from GFS86 and GFS2001 deficit and debt figures; subsequently (much later, when the government is to assume the debt of the public company), these will appear as capital transfers (Stella, 1993). The OECD defines creative accounting specifically in relation to stocks: according to its definition, creative accounting is an operation that improves the statistical deficit without affecting the net worth of the government (Koen and Van den Noord, 2005). The Slovak FC, for instance, follows this definition in its analyses.

Secondly, statistics will also be distorted due to the fact that debt burdens denominated in domestic currency versus foreign currencies are reported differently, in ways that are not comparable. The debt-interest burden denominated in domestic currency incorporates the real rate of interest plus inflation compensation, but changes in exchange rate do not

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2   There was no need for what is referred to as stock-flow adjustment, which originates from the difference in the definitions of stock and flow indicators existing elsewhere.

affect the debt. By contrast, debt denominated in a foreign currency does not incorporate inflation compensation, but the debt is subject to revaluation. To achieve comparability, the alternative indicator of operational deficit was defined to filter out the inflation compensation incorporated in interest on debt denominated in domestic currency (Tanzi et al., 1993).[3] However, experience in Latin America highlights that inflation, revaluation and changes in the terms of trade may also have an impact on real budget solvency (Blejer and Cheasty, 1993).

A further problem is that debt statistics also present an incomplete picture, because they disregard the stock of non-debt financial assets and liablities. Yet the "optimal" debt level cannot be determined without knowing the whole balance sheet. Valuation difficulties are well known in this respect, since these items are, with the exception of quoted shares, not marketable. The value of a public company will be properly measured only when it is sold, generating privatisation revenue; this is not irrespective of how the government regulates the prices of the services provided by these companies. It is also difficult to measure the value of loans and guarantees granted by the government; the GFS86 employed the practical solution of considering both to be zero (Wattleworth, 1993). Consequently, lending was an item that increased debt and deficit, whereas guarantees were recognised only when called. The stock of government arrears is easier to measure, but was nevertheless omitted from the debt statistics, making it possible to rely on arrears to manipulate both the debt and the cash-based deficit figures (Diamond and Schiller, 1993).

A longer-term problem lies in the fact that neither debt statistics nor cash-based or accrual-based deficits manage the issue of real assets and their depreciation. Valuing the stock of public real assets is very difficult, since they are not marketable: these specific assets have no secondary market or market value.[4] In the absence of such information, their stock can be calculated through estimates of their service life and by using various methodologies to calculate depreciation (e.g. linear or geometric depreciation assumptions) (Boskin et al., 1987). It is unclear which method provides the most accurate approximation of actual economic depreciation and true service life. The problem is not negligible, as the optimal debt stock cannot be independent of the optimal or desirable level of the public capital stock. Standard deficit indicators are distorted, since investment spending (GFS86, cash-based) or the accumulation of fixed assets (GFS2001, accrual-based) are recorded in the financing requirement, whereas depreciation of the fixed assets is recorded in the full accrual basis. Admittedly, this does not necessarily have to be replenished through investment spending, as the existing capital stock may be above the desired level, but

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3   World Bank experts (Rocha and Saldanha, 1992) took a further step when they calculated the operational deficit from the public sector and central bank consolidated balance sheet. This is an important adjustment, since it takes into consideration the claims denominated in foreign currencies (foreign exchange reserves).

4   There may, of course, exist country-specific differences; a common example, however, is a road network that is not marketable, due to which which the government will be the only potential buyer in the event of bankruptcy of a road built in a PPP contract.

differences between these two amounts are never considered as an issue. As a result, the budget may cut the deficit and the debt by delaying investment spending and reducing the capital stock, even if maintaining or even increasing its level is necessary (Stella, 1993).

Besides these problems, it may be necessary to project tax revenues and expenditures on a longer-term horizon, especially if the population structure is changing due to demographic trends. The impact of aging, for instance, may be recognised in an estimate of the net present value of taxes and expenditures (Buiter, 1993). In spite of its theoretical advantages, this has a number of methodological issues that hinder its practical application. For example, the horizon for projecting revenues and expenditures may be subject to debate. Another question concerns realistic ways of considering parameters that limit expenditure growth (e.g. pension indexation, caps on entitlements). These may contribute to deficit and debt improvements, while the real value of certain expenditures may gradually diverge from economic performance and the distribution of this divergence at the level of individuals may be considerable.

2.2 Solvency indicators – eliminating the impacts of the cycle and one-off measures

The previous section looked at how the underlying deficit component can be derived from the actual observed deficit by taking changes in stocks into account. This section deals with a methodology that eliminates the impact of the economic cycle on the budget balance. To calculate what is called the structural deficit, the cyclically-adjusted balance is adjusted further for the impacts of one-off and temporary measures. This indicator captures the medium-term orientation of fiscal policy, which is also relevant for government solvency. It should be noted that there is no consistent adjustment of stocks under structural indicators, which is why the stock approach is discussed separately.

The new IMF method of cyclical adjustment employs a variety of options specific to each country (Bornhorst et al., 2011). Estimating the output gap serves as the starting point. Usually, one of two kinds of methods are chosen, the aggregated or the disaggregated approach. The former multiplies aggregated revenue by the output gap and an estimated elasticity, and does the same with aggregated expenditure. The cyclical revenue and expenditure components calculated in this way are then added together. This measurement, called sensitivity, serves as a good approximation only if the ratio of the main items within aggregated revenues and expenditures is stable and the elasticity of budgetary items to output gap does not change over time.

By contrast, the disaggregated (OECD) approach starts off from the main cyclically adjusted revenues and expenditures. The elasticity of each revenue category can be decomposed into two factors: the output elasticity of tax revenue, which is the product

of the elasticity of tax revenues, with respect to the relevant tax base, and the elasticity of the tax base relative to the output gap. (The same decomposition is done with unemployment expenditures on the expenditure side.) The elasticities are determined based on estimates or assumptions, or derived from tax codes. The manual provides the opportunity to incorporate, if necessary, the impact of the output gap composition (for the ECB's disaggregated methodology, see Bouthevillain et al., 2001), since the changes in the "gaps" of the various tax bases may significantly deviate from the changes in the output gap.

Cyclical adjustment may be supplemented with factors beyond the economic cycle for specific countries, but this process is less formalised and requires a greater degree of expert judgement (Bornhorst et al., 2011). Importantly, however, the adjustments should be well motivated and documented. The aggregated and the disaggregated approach may be applied to the impacts of asset and commodity prices, as well as terms of trade. In the latter approach, the disaggregated method of cyclical adjustment may be supplemented with the asset price gap. In the case of the consumption and absorption cycle (*absorption gap*), economic models are recommended in addition to statistical time series filtering (e.g. HP filter), with sensitivity analyses also added.

A further inherent problem originates from endpoint uncertainty, which means that the estimates of potential GDP, an unobservable variable, may be revised in view of new GDP figures (Orphanides and Van Norden, 2002). The latest IMF paper proposes a solution of reducing potential GDP estimation error by taking into account the observed historic correlation between short-term GDP data and long-term potential output (Tereanu et al., 2014).

All of these adjustments may lead to a more accurate representation of temporary impacts of exogenous factors, but constant uncertainty stemming from the estimation of the potential level of the primary tax bases and the price trends remains, and this may lead to frequent revisions. A further problem is that filtering for interest-rate volatility has been omitted from the range of exogenous factors.[5]

The IMF offers criteria rather than a definition when it comes to filtering temporary and one-off fiscal measures (Bornhorst et al., 2011). They note that these tend to be large, non-recurrent items, often capital expenditures or capital revenues. They frequently involve case-by-case judgements; therefore, adjusted as well as unadjusted figures must be presented in a transparent manner. Following the principle of prudence, borderline items should preferably be excluded from the adjustment. Tax cuts and spending increases

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5   Nevertheless, there have been attempts to quantify the effect of exogenous shocks on fiscal vulnerability, including revenue and expenditure volatility (distribution) as well as rate of inflation. Vulnerability closely correlates with interest rates, the government's asset/liability balance and the average term of outstanding debt. Also included here, in a wider sense, are central bank foreign-exchange reserves and access to international financial markets (Ize, 1993).

may be repeated; what matters here is not the communicated intention. Fiscal operations impacting a single year should, however, be considered as one-off operations.

3 Fiscal indicators in EU practice

In the Economic and Monetary Union (EMU), fiscal policy remains the responsibility of the Member States. Successful operation of such an arrangement presupposes the application of a preventive/disciplinary framework of rules to ensure that member-state fiscal policies are sustainable and avoid intensifying economic volatility (procyclicality). The Stability and Growth Pact (SGP) enacted to this end on 1 January 1999 has a scope that mostly covers the EU Member States outside the euro area as well. In addition to the deficit and debt statistics accumulated by Eurostat, the Commission uses its own methodology concerning structural deficits. There are legal consequences to these indicators, however; experience suggests that creative accounting practices have persisted in spite of all efforts to abolish them.

Achieving comparability across countries was key for this rules framework, but the problems were aggravated by the fact that comparability remained a formal intention in spite of the attempts, since the methodology was far from perfect. Creative accounting was not the sole reason for the inability to ensure fiscal policy responsibility, as issues with eliminating exogenous impacts (e.g. the economic cycle) also played a role. The uncertainty surrounding the estimation of potential GDP level and growth rate also remained a serious problem.

Creative accounting and the unexpected negative effects of exogenous factors exacerbated the operating problems of the fiscal framework. As a result, major amendments were implemented, first in 2005 and then in 2010. The changes were less concerned with the fiscal indicators underlying the framework and focused more on attempting to find solutions by adding new rules. In other words, they tried to save the fiscal architecture by supporting the walls instead of rebuilding the foundations. The following section concentrates on the fiscal indicators serving as the foundation.

3.1 Basic statistics – the Maastricht debt and deficit indicator

The System of National Accounts (SNA93, ESA95, SNA2008, ESA2010) records stocks of assets and liabilities. Consequently, it defines a deficit as equal to the change in the stock of financial assets and liabilities, excluding effects from revaluation. Thus, the proceeds

of privatisation and the government's acquisitions of financial assets are financing items, excluded from the calculation of the deficit.

The statistical deficit indicator was adopted in the EU framework, but it was gross public debt that became the Maastricht debt criterion. These two indicators are inconsistent in terms of methodology. The gross debt indicator is not netted, even against deposits that are simple to include in the financing, in contrast to the approach followed in earlier IMF statistics (GFS86). This method was chosen in spite of the fact that consistency would have been achieved by taking into account the changes in the stock of financial assets and non-debt financial liabilities. Practically, however, these stocks will never trigger a liquidity crisis and are not even closely correlated with the deficit (resulting, at best, in uncertain dividend income); moreover, many of them do not have a market (and thus lack market valuation). Accordingly, their levels and changes (revaluations) are highly uncertain and cannot be measured adequately. Since the deficit and changes in gross debt less revaluation are inconsistent, a so-called stock-flow adjustment or deficit-debt adjustment (DDA) is introduced. It incorporates the effects of a broad range of factors, ranging from the use of government deposits to the difference between the cash-based and accrual-based recording of tax revenues and EU transfers.

Another characteristic of the deficit indicator is that it applies accrual time of recording, but in contrast to full-accrual recording it includes the gross accumulation of fixed assets rather than the depreciation of the fixed assets. This makes sense; after all, depreciation is connected to capital spending in the past (and accumulated debt) rather than investments in the present, which affect issuance of debt via its financing requirement. This, as we have seen, is a key indicator from a market perspective. Moreover, the stock of real assets would need to be taken into account in addition to financial assets and in a manner that is consistent with the recording of depreciation. A similar valuation problem occurs here, as most public real assets do not have a market or market price, nor is it possible to estimate their actual economic depreciation in an accurate way.

The statistical methodology is updated regularly. In early 2000, the government deficit and debt manual had 141 pages, while the seventh edition in 2014 numbered as many as 431 pages. Member States frequently "import" innovations in creative accounting from the private sector to circumvent the rules, and changes in methodology are often slow and controversial due to lengthy bureaucratic procedures. There have been examples of the Member States themselves revealing fiscal gimmickry, since their impact becomes reversed at a certain point and they appear in the deficit and the debt ("skeletons in the closet"). In such instances, it is in the governments' interest to make revisions to the past data in order to improve current data, but such statistical revisions are not always permitted. While this may work against creative accounting, it jeopardises comparability over time and across countries. Certain controversial decisions have also been made: for example, some capital revenues (e.g. from concessions) may not be spread over time (in spite of the recommendations of certain experts in accounting and statistics), but

must be accounted for in a lump sum. Neither has there been significant progress in defining the statistical coverage of the government sector, as public corporations classified outside the government sector are involved in quasi-fiscal activities. It is an innovation in creative accounting that private companies also have quasi-fiscal activities; this is allowed by the excessively permissive statistical classification of public-private partnership (PPP) investments.

1.2 Setting the medium-term objective and eliminating the effects of the cycle and one-off measures

In addition to the 3% Maastricht balance criterion and the 60% debt criterion, the structural balance and the medium-term objective (MTO) were introduced in 1999. Structural deficit could serve as a second line of defence for filtering out distortions caused by creative accounting (Koen and Van den Noord, 2005); in actual fact, however, this is often incomplete in implementation: while the debt assumptions of public companies is removed from the structural deficit, the impact of the corresponding quasi-fiscal activities remains hidden, even though they are self-reversing measures.

The impact of each temporary measure is eliminated one-by-one from the structural deficit on the basis of consensus between the particular Member State and the Commission, although there are practical guidelines (Larch and Turrini, 2009). One criterion is that of size: only measures impacting over 0.1 per cent of GDP may be filtered out. Another concerns the time horizon: measures may apply to one year or a few years at most. A third requires that the focus should be placed on capital items rather than current items. Finally, for reasons of prudence, items that increase the deficit should be omitted from the filtering exercise, or else they will be classified as "temporary" by the Member States. Clearly, these practical considerations are not suitable for filtering out the self-reversing measures and do not fulfil the requirements of theoretically sound principles. Rather, intended to discipline the Member States, these criteria were only partly successful, if at all; the methodology does not treat quasi-fiscal activities properly, even though experience suggests that their impacts can be "outsourced" only temporarily.

Contrary to the filtering of temporary measures, which may be deemed an ambiguous solution, there has been no progress in terms of the cyclical adjustment methodology in spite of the practical problems identified. The Stability and Growth Pact methodology officially adopted on 12 July 2002 remained unchanged as a production function-based output-gap approach (Denis, Mc Morrow and Roeger, 2002). Its components are:

– Cobb and Douglas production function,[6]

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6   Methodological problems and consequences on fiscal policy are discussed in Godin and Kinsella, 2013.

– NAIRU estimates based upon multivariate Kalman filter,

– total factor productivity estimated with a HP filter in the past and with Kalman filter currently.

The methodology prescribes aggregating the elasticities of individual budget items to obtain overall budgetary sensitivity. These individual elasticities are estimated with a methodology developed by the OECD and adopted by the Output Gap Working Group (OGWG).

Since this structural deficit may have legal consequences, the methodological stability of cyclical adjustment is very important. The following presents the problems identified by the Commission and the solutions proposed for these.

As seen above, the first methodological pillar is to estimate the output gap. A tendency observed here is that potential GDP estimates subsequently proved to be overly optimistic (Larch and Salto, 2005). Most Member States experienced a high rate of growth in the late 1990s that was not sustainable, since it was partly linked to the dot-com bubble. The key problem is to separate the trend from the cycle in real time. As a result of the erroneous estimates, several countries followed fiscal policies between 1994 and 2006 that were intended to be counter-cyclical, but often proved to be procyclical subsequently – after downward revisions of growth (Forni and Momigliano, 2004; Cimadomo, 2008). The 2007–2012 crisis, in part correlated with the housing market bubble, also led to a significant downward revision of GDP and potential output. The methodology for estimating the output gap has remained unchanged; therefore, the same scenario could easily happen in the future.

The other pillar of the methodology – or, in Larch and Salto's words, its other Achilles' heel – is the constant overall budgetary sensitivity. As early as 2000, the Commission identified that the elasticity between GDP and the tax bases was fundamentally determined by the nature of the shock in the economy, and it even prepared an estimate for this (European Commission, 2000). This was against a background of tax-rich economic growth in many countries in the late 1990s, with booming private consumption as an underlying factor.

– In 2008, the Commission presented (European Commission, 2008) the ECB's disaggregated method as an alternative (Bouthevillain et al., 2001), which takes into consideration the aforementioned composition effect. In order to capture composition effects, taxes were broken down into four categories and linked to their corresponding macroeconomic tax bases: to wages, consumption and operating surplus. The cyclical component is obtained by multiplication of the fixed elasticities of tax categories with their deviation from the HP filter-estimated trend of tax bases. The Commission has criticised this for its absence of a theoretical basis for a consumption and wage-ratio consistent with the production function approach of output gap. The HP filter, like all moving-average-based methods, suffers from an endpoint-bias problem. The DG ECFIN

has attempted to solve this by means of projection of actual growth figures with a variety of methods, selecting the best-fit time series method. Nevertheless, the fundamental methodology has remained unchanged, although it is currently supplemented, for the sake of information, with the results of a HP filter-based method that, in contrast to the ECB's method, disaggregates only GDP into trend and cycle.

– Another problem is the inability to filter out all exogenous effects. This even exists with the ECB method, which takes composition effects into account. If tax changes are adjusted to changes in discretionary measures as well as to the cyclical component estimated with the ECB method, there remains an unexplained (*windfall/shortfall*) component (Morris et al., 2009). In Germany, Spain, France, Italy and the Netherlands, profit taxes proved volatile; this was attributable partly to the changes in revaluation profits and write-offs.[7] In Ireland and Spain, the housing market bubble resulted in fluctuations in indirect taxes, which were more volatile than the household consumption taken into account by the ECB for cyclical adjustments. Two proposals were put forward to resolve this, but neither was used in practice. One would have eliminated the "dividend" effect of inflation, which may have contributed to the fact that tax revenues differed from the forecasts (Buti and Van den Noord, 2003). This was computed as the difference between the officially projected rate of inflation and the rate of inflation that is consistent with normal capacity utilisation. This, however, would not have eliminated the effects of the housing market bubble nor would it have estimated the short-term impacts of surprise inflation. By contrast, the other proposal suggested adjusting the absorption cycle itself (Lendvai et al., 2011). It used a somewhat arbitrary definition of absorption gap, although in theory it interpreted potential absorption as an indicator that is in line with potential output and the external position consistent with the fundamentals (the balance of payments). The disadvantage of this approach is that it determined the absorption gap as a deviation with respect to norms rather than deviations from trends, as a result of which the correction lacked a zero mean. Moreover, the norms are period- and country-specific (Langenus, 2013).

In spite of cyclical adjustment being considered one of the Achilles' heels of the framework, as seen above, the methodology was not modified. Instead of improvements to the indicators, the rules were changed:

– At the time of the 2005 amendment of the SGP, the escape clause concerning compliance with the rules was relaxed. Until then, a severe economic downturn had been defined as a fall in GDP by at least 2%, or judged as such in view of the abruptness of the downturn or the accumulated loss of output relative to past trends. First, the new rules considered even a marginal fall in GDP as an escape clause condition and, second, they gave the Commission and the Council greater room for judgement in the case of accumulated losses in output during a protracted period of low growth compared to potential growth. A new waiver was proposed by the Commission in spring 2014.

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7 All this generated tax windfalls in 1999–2000 and 2004–2007, as well as tax shortfalls in 2004–2007.

– In 1997, the SGP defined the medium-term objective (MTO) as a position close to balance or surplus. The amendment to the SGP in 2005 made this country-specific. The aim here was to 1) provide a sufficiently wide safety margin for the 3% deficit limit, 2) facilitate a faster achievement of sustainability, and 3) give greater room for manoeuvre, especially in terms of government investments. For this purpose, they took into consideration the differences among Member States in terms of potential growth and indebtedness, as well as the longer-term fiscal impacts of demography. Inclusion of the short-term fiscal costs of structural reforms was permitted only in the event of transition to a fully funded private pension system, and it had to be evaluated at rates decreasing over five years in an excessive-deficit procedure. The *Fiscal Compact*, an intergovernmental treaty instead of Community legislation, tightened these terms. Accordingly, the medium-term objective may permit a deficit reaching maximum 1 per cent of GDP, but only for those Member States with public debt significantly below 60%, and only if long-term fiscal sustainability is not put at risk.

In order to deliver the MTO, the structural balance must be improved by at least 0.5% of GDP per annum. As discussed, its calculation is often deemed ex-post as having been distorted due to the above *methodological* problems; moreover, debt is not set on a decreasing trajectory (the *methodological* problems concerning debt have already been discussed[8]). Therefore, an alternative definition for the path leading to debt reduction and the MTO was also given. This has been stipulated in the so-called Minimum Linear Structural Adjustment (MLSA) requirement since 2012, whereby the annual structural adjustment must not deviate more than 1/4% of GDP in comparison to the linear structural adjustment, which ensures compliance with the least demanding of three different criteria. (See details in European Commission*, 2013.)*

The "Sixpack", in effect since 2012, requires that the analysis of expenditure net of discretionary revenue measures be included in the assessments carried out by the preventive arm. Until the MTO is reached, the growth rate of primary expenditures must not exceed the medium-term reference rate of potential GDP growth.[9] The extent to which the growth rate of government expenditures must remain below the medium-term reference rate of potential GDP growth should be defined so that it can ensure sufficient progress towards the medium-term objective. Expenditure growth in excess of the rate thus defined must be offset by the discretionary increase in revenues, whereas discretionary revenue cuts must be compensated for with cuts in expenditures. Since the tax revenue changes are calculated "bottom up", this will serve as a solution for cyclical

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8   Furthermore, changes in debt rarely represent additional information to the fiscal balance. It tends instead to be noise, since it is more sensitive by an order of magnitude to the effects of exogenous factors (economic growth, deflators, revaluation) than the balance.

9   Eligible for deduction from the primary balance are expenditures on EU programmes that are fully offset by revenues from EU funds; furthermore, unemployment benefit expenditures exclude the non-discretionary changes (which are taken into account in cyclical adjustment). The assessment must consider the potentially very high variability of investments, especially in the case of small Member States.

adjustment shortcomings regarding the composition effect of tax bases and the volatility of taxes (*windfall/shortfall*). Nevertheless, the estimation of potential GDP remains an unsolvable problem in this framework as well.

It should be noted here that we have not attempted to give a comprehensive overview of the EU fiscal framework (see Ódor, 2014a for a critical assessment). It would be worthwhile to run simulations of how all this would work, with special attention to the changes in exogenous factors. In such a case, however, all this would need to be supplemented with the national fiscal rules as well; the Sixpack gave new impetus to their introduction after 2012. As far as a simulation is concerned, it would be a serious challenge to decide which of the potentially conflicting rules should be preferred, along with the question of how the escape clauses and automatic correction mechanisms would work in real life. In all likelihood, this complex system would not provide an optimal result; it would not, for instance, guarantee that a procyclical fiscal policy could be avoided. Instead of introducing more and more new rules, suitable fiscal indicators should once again be defined; this can result in much simpler and more consistent rules. The following section offers an overview of some indicators suitable for introduction and the role that the independent FCs could play at this juncture. After all, not even a decade and a half has been sufficient to find the right solutions for certain fundamental problems at the community level.

4 Adequate fiscal indicators require adequate fiscal institutions

This section presents a framework that is based on theoretical considerations, covers the whole scope of fiscal policy, and takes advantage of the synergies existing between fiscal rules and the independent fiscal institutions. Believed to guarantee a better division of labour between the national and the community levels, the framework has the following main components:

• country-specific "optimal" stock indicators as long-term limits,

• analytical flow indicators, consistent with the above, as medium-term objectives,

• expenditure rules as instruments to achieve those targets,

• independent fiscal institutions as the first-line supervisors of these indicators and rules,

• second-line supervision at the community level.

This framework avoids the community-level dilemma between international comparability and an economic policy tailored to a particular country, which frequently led to the unenforceability of the rules.

4.1 Stock indicators

As seen above, the "optimal" level of the debt stock cannot be determined without taking into account the desirable level of financial and non-financial (e.g. fixed assets) stocks, as well as the projection of tax revenues and expenditures (the demographic impact). This is because it matters whether the accumulated debt has been spent on investment and asset acquisitions, and so does the question of what effects the aging population will have on future assets and liabilities. Overemphasising existing debt instead of projecting net worth when gauging sustainability is a mistake akin to using waist circumference rather than body mass index (BMI) when estimating how overweight a person is.

However, as mentioned above, the projection of net worth raises a large number of measurement and methodological questions. The first initiatives have appeared in this area (Ódor, 2011 and 2014c), but introduction across all the EU Member States is not possible for the time being. Nevertheless, many of these criteria may already be considered when setting the medium-term balance objective (MTO). As in the current solution, the outstanding debt and the long-term projection of tax revenues and expenditures can be taken into account. As an additional country-specific criterion, the outstanding stock and the projection of financial and non-financial assets may be used. Admittedly, this would represent a deviation from the current weight of one third for the different factors; this question also requires further deliberation. The FCs could be relied on extensively in this respect, particularly as their independence and country-specific knowledge may be coupled with an interest in designing meaningful indicators, since they are in charge of checking that the objectives are set and delivered.

The market may of course consider that the desired level of debt would not be financeable. There are significant differences between countries in terms of the extent to which the markets are ready to finance them. Experience shows that sudden financing problems may lead to serious liquidity crises. One method of prevention is fiscal discipline, and another is transparency. Maturing debts and planned issuance should be continuously monitored to avoid surprises, and it is also very important to constantly analyse contingent liabilities (including government bailouts in the financial system).

4.2 The headline indicator for fiscal balance

There are two possible solutions to replace the statistical approach, which is ineffective against creative accounting. One would be adoption of international public sector accounting standards (IPSAS Board). The other would be the use of practical analytical indicators, such as those generated by the Congressional Budget Office (CBO) in the United States.

The advantages of the accounting approach include the fact that it is a harmonised methodology, it is compiled by an independent institution, and the principle of substance over legal form may be an efficient tool against creative accounting, which seeks to take advantage of regulatory loopholes (partly successfully in the case of statistics). This raises the problem, however, that a focus on substance may not be altogether simple in practice, as it can take forms that might appear arbitrary. It has a further advantage in that it would be possible to turn to the international accounting standards to adopt their solutions to the creative accounting methods imported from the corporate sector, to which the standards react relatively quickly. Nevertheless, there are no clear answers in accounting to the valuation difficulties concerning unmarketable government assets (with no market prices) or the resulting problems in calculating depreciation; it is similar to statistics in this respect, which is also unable to provide appropriate solutions.

A potential direction would be for the flow indicators calculated by the independent institutions to eliminate creative accounting by identifying them from the stock side. This approach coincides with the OECD definition of creative accounting, which states that these operations have no effect on the net worth of the government (Koen & Van den Noord, 2005). As seen above, the projection of net worth has appeared among the proposals (Ódor, 2011) and in the practice of the Slovak FC. It has the advantage of being comprehensive: besides eliminating distortions that result from creative accounting, it is also able to identify the effects of changes in parameters affecting long-term expenditures (e.g. retirement age). However, it may also have disadvantages, specifically the aforementioned valuation problem and the absence of the definition of a desired level of financial and non-financial assets. For this reason, for instance, it is unclear how capital spending should relate to the depreciation of the stock of fixed assets.[10] It may be useful to redefine boundaries of sectors, since some of the financial assets consist of assets of corporations providing public services, underlying which there may be public fixed assets or, just as likely, quasi-fiscal debt.

The CBO's methodology represents a different approach in the flow indicators of independent institutions. Here creative accounting is defined as operations without significant economic impact (Congressional Budget Office, 2002). The practical approach

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10 If the stock of fixed assets is at the desired level, then investments must be equal to depreciation. The latter estimate should be reliable, however.

to this is a "standardisation" of the deficit. A Hungarian body of experts (KESZT, 2010) has proposed a similar solution. In essence, the proposal is to generate with simple adjustments a "normalised" cash-based level that excludes any creative accounting.[11] This involves expanding the coverage of public finances to include public companies and investments to include PPP projects (as if the private partners in those projects were involved merely as the financing partner), and spreading over time the capital revenues from sources other than the disposal of fixed assets (e.g. over the whole concession period.) It should be noted here that Magyar Nemzeti Bank has regularly published such an analytical indicator since 1998. This approach requires significantly fewer data and imposes fewer methodological requirements than the previous solution and therefore it would be more practical and more transparent for some of the countries.[12] While it may not be optimal in terms of accuracy of the indicator, the approach has an advantage in its balance of robustness/stability and simplicity. (In practice this prudential approach would mean that the method would opt for the more stringent solution in case of doubt, for instance, it would define the coverage of the government in the broadest possible sense.)

4.3 The structural deficit as intermediate objective and the expenditure rule as instrument

The target defined at the level of the structural deficit will, by definition, relate to specific years, but there is also a need to set them in a medium-term framework. These frameworks allow achievement of the medium-term objective (MTO). The instrument for achieving the medium-term targets may include expenditure rules covering multiple years by regulating the annual rate of growth in primary expenditures (excluding interest expenditure) or setting a spending cap for every year (Ódor and P. Kiss, 2011). The following discussion addresses the definition of structural deficit, the elimination of temporary and cyclical impacts, and, in conclusion, the expenditure rule.

We have seen above how a suitable basic indicator is able to eliminate the effects of creative accounting. Adjustments to other factors may be needed as well, however. Factors exogenous to fiscal policy include natural disasters and the budgetary effects of court rulings. A backward-looking moving average may be proposed here; it will filter out only genuinely significant impacts and will not deviate the structural deficit from the actual deficits across the period as a whole (Hoffmann and P. Kiss, 2010). However, a deliberate

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11 Cash-based accounting will provide sufficient information on the budgetary situation if: 1) the spending on public functions is included in the budget (there is no quasi-fiscal section); 2) the capital expenditures and revenues are related solely to fixed assets (there are no early lump-sum receipts of concession income); 3) expenditure and tax-reimbursement scheduling is adjusted to the customary deadlines (no delays); and 4) the real cost of state loans and guarantees is booked (as provisions raised) when they are granted.

12 This method, however, does not filter out capital spending that falls short of the depreciation of fixed assets; that would be possible only at the structural deficit level.

confusion of individual and one-off measures should be avoided at all costs. Below a certain level of aggregation, every item may be deemed arbitrarily as "individual", whereas in the more aggregated approach they may be mutually offsetting (Hoffmann and P. Kiss, 2010). Nevertheless, investment spending may represent an exception to this; as seen above, it may need to be compared with depreciation. If the objective is, for instance, to prevent the stock of fixed assets from decreasing, then a shortfall of investment spending compared to the level necessitated by depreciation may be interpreted as temporary.

Cyclical adjustment has an inherent problem in that potential GDP is an unobservable variable, and its estimate may be revised at any time, in light of new GDP figures, due to endpoint uncertainty. The IMF methodology represents one kind of solution: it takes into consideration the historical correlation between short-term GDP revisions and long-term revisions in potential output to reduce the estimation error on potential GDP (Tereanu et al., 2014). Another possible solution is to find a method that minimises the joint uncertainty coming from the choice of model and from parameter updates with new data. Cheremukhin's (2013) method in the United States is an example. Nevertheless, since the possibility of significant revisions cannot be fully excluded, this could be managed with an escape clause to the fiscal rule.

P. Kiss and Vadas (2006) proposed solutions for other problems of cyclical adjustment.

– Similar to the Commission's methodology, the starting point is the Cobb–Douglas production function. Since the aggregate output gap equals the weighted sum of income gaps from labour and capital, it can be disaggregated into tax bases related to capital and labour. A standard consumption function may then be used to connect wages and potential consumption values on a theoretical basis. The authors have proposed a multivariate HP filter to link the above equations, with an aggregation limit added. Besides the theoretical foundations, this is more advantageous than the ECB's HP-filtering because it does not rely on extending the time series to close the gaps. Instead it uses the information included in the output gap as regards the cyclical situation.

– However, the composition effect of different tax bases will have an automatic distortion effect as different deflators are used to generate the corresponding real variables. This composition effect is easy to adjust for with the price gap between the consumer price index (CPI) and the GDP deflator, which is applied to adjust labour and consumption-related revenues.

– The private and the government part of labour and consumption tax bases and revenues must be disaggregated. As in the ECB method, it is assumed that the indirect taxes and contributions paid by the government and the direct taxes and contributions paid by

public employees have zero elasticity (just as these government expenditures consistently have); in other words, they are not dependent on the cycle. This considerably reduces the budgetary impact of the cycle.

– A number of biases in elasticity between taxes and tax bases are highlighted. Note, for example, the effect of the nominal parameters of the tax regime (minimum values, tax brackets, caps) and regulations causing asymmetry (e.g. carry-forward losses). All this necessitates updating the calculation/estimation of the elasticities each year. It may also partly reduce the volatility of taxes still remaining after cyclical adjustment.

If applied in a credible framework, the expenditure rule (Ódor and P. Kiss, 2011) may also eliminate the distortions originating from tax volatility, as it adjusts the expenditure growth rate, not with the change of cyclically adjusted revenue but the estimated effects of discretionary tax measures. The FCs may play an especially important role here, as they have appropriate information at their disposal to perform this task. As mentioned before, estimating potential GDP will also remain an unresolvable problem in this framework, even though it is the benchmark for expenditure growth. Its minor revisions may be solved with a spending reserve[13] and major revisions with an escape clause. Further investigations will be necessary to decide whether the rule should apply to the total primary expenditure or should handle intra-governmental transfers to municipalities and investments separately (Ódor and P.Kiss, 2011). As has been seen, investments represent a special category, since they are closely related to a specific stock indicator and can be directly compared to the rate of depreciation. Savings in investments may be feasible on the short term, but this will not be acceptable for the purposes of either the structural deficit as a medium-term target indicator or the expenditure rule as instrument.

The treatment of inflation may nevertheless pose a problem in the case of the expenditure rule. In principle, inflation volatility may affect the primary balance as well. An example is the so-called inflation dividend, which is the budget revenue impact of the "inflation gap", defined as the difference between the actual and the ECB target for the Eurozone countries (Buti and Van den Noord, 2003). An expected rise in inflation would, in fact, have an impact on the primary balance only if the government were to decide that it would not compensate for the loss in real value of expenditures from its extra revenues (P. Kiss, 2007). This, however, is not permitted under the expenditure rule, since it automatically increases the expenditure budget with the expected rate of inflation. The case of surprise inflation is different. The question here is whether the expenditure reserves are sufficient to offset the effect of the higher inflation and whether its compensation is obligatory. Another question is whether expenditures should be reduced in the event of, and consistently with, lower inflation, and thus the reserves increased.

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13 Its size may be determined in a country-specific way, similarly to the estimated safety margin for the MTO.

4.4 The role of fiscal councils

Today it is recognised almost universally that independent central banks, simple rules and a high degree of transparency play an essential role in monetary policy. Alan Blinder (2004) has called this a "quiet revolution" in the practice of economic policy. In spite of the fact that the crisis has engendered new problems in monetary policy as well, Ódor (2014b) considers it important that independent institutions and simple rules should have a stronger role also within fiscal policy. However, as fiscal policy has greater distribution effects than monetary policy, the scope of the role assigned to the independent FCs should be carefully considered. For example, it is not recommended to authorise an FC to legislate.

The following presents areas where independent fiscal institutions might help to reduce the deficit bias to a significant degree. One of the most important lessons from the recent years has been the recognition that the FCs are able to mitigate several of the trade-offs created when fiscal rules are defined. Three such trade-offs should be mentioned here. The first is the tension between flexibility and enforceability. If the rules are too flexible, they will never be enforced. If they are too binding, however, they may trigger a number of situations in which compliance with them would require procyclical fiscal policy. Independent institutions acting as referees may provide a solution to this problem. The second trade-off lies between simplicity and electoral support. While simple rules are easy to circumvent, voters are unlikely to understand the complex ones. As discussed in this article, a fiscal council may have a role here as well: if adequate fiscal indicators are defined, no loopholes will be found, even if the rules are simple rather than complicated. Portes and Wren-Lewis (2014) emphasise a third trade-off, one between optimality and efficiency. As in the above, an independent institution will be able to mitigate this problem as well.

The FC's theoretical role is normally subdivided into three specific areas (Ódor, 2014b):

1. the interpretation and communication of fiscal policy,

2. the evaluation and monitoring of the fiscal rules,

3. an analytical (expert) role.

The model proposed in this article covers each of those three areas. The FC fills the first function by estimating public sector net worth and evaluating the escape clauses. It performs the second role as it carries out ex-ante and ex-post assessments of compliance with the proposed fiscal rules. And it fulfils the third function when it calculates the structural balance, estimates the effects of discretionary measures, or, as the case may be, defines the optimal debt path.

This issue become more complicated when we consider reforming the community level instead of the national level. Ódor (2014a) criticises the fiscal framework operated at the community level. One considerable problem is that the loss of credibility due to disregard

of the "no bail-out" clause cannot be restored by creating an overly complex system with an increasing number of rules. Although independent fiscal institutions have been given a more important role, there remain a large number of country-specific issues where the focus is (more or less successfully) on comparability among countries rather than the provision of the best possible estimates. As far as the potential for improvement is concerned, Ódor presents a decentralised solution for the longer term, where the first line of defence against deficit bias would be constituted by country-specific (preferably constitutional) rules under the supervision of national FCs. However, this path of progress would require restoring, at least in part, the "no bail-out" clause (for instance, by involving private capital in the bail-outs).

Under such potential division of labour, the community level would serve two important functions. One would be the supervision of the national framework. Rather than analysing budgets every year, this would involve the defining of minimum standards applicable to national fiscal frameworks. An EU-level process would be triggered only in the case of gross policy errors at the national level. Obviously, the community level would have an additional role if and when fiscal rules were to be extended to the EU budget in the course of further integration.

Last but not least, such a change would raise the question of who should exercise oversight over the supervisory institution. As mentioned before, one option is to involve the community level. Of course, there are other solutions as well: for instance, national parliaments or international networks (an organisation of FCs), or perhaps one of the EU institutions. The best solution would most likely entail an independent fiscal institution at the community level, one that is not subject to the sort of political pressure that the Commission is. This institution would monitor the national FCs and would itself report to a committee appointed by the European Parliament.

5 Conclusions

In order to design more effective fiscal frameworks, we went back to the basic question of measuring fiscal performance. No fiscal rule can operate well without measuring the true fiscal position. We have examined two types of indicators. The appropriately corrected headline indicators are expected to eliminate the effects of creative accounting, while more precise structural balances are necessary to filter out all exogenous factors. In both cases, independent fiscal institutions might play an important role. However, the estimation of potential output will still remain inherently uncertain, so the focus should be on employing methods which require fewer revisions or creating budgetary reserves to deal with the uncertainty.

As seen above, the methodological manual of the IMF also proposes alternative solutions for estimating structural deficits, which, incidentally, have no legal consequences. At the level of basic indicators, they are much less able to deviate from the clearly biased statistical indicators. Non-compliance with the terms of IMF lending arrangements employed in a crisis situation will have consequences; experience indicates, however, that greater country-specific flexibility would be necessary in the definition of headline indicators.

By contrast, the EU also uses fiscal rules to prevent crisis situations. However, their legal consequences make the definition of these indicators very rigid. The headline indicators are not allowed to deviate from the statistical indicators, even though the latter are not suitable for measuring the true fiscal position. As far as the estimation of the underlying position is concerned, budgetary effects of the business cycle are the only exogenous factors eliminated. The methodology used has not been updated in more than a decade and it is unlikely to be updated, given the rigidity of the legislation. Instead, more and more new fiscal rules have been introduced at the cost of increased complexity, potential inconsistencies and asymmetry in the framework.

This paper argues that new and better fiscal indicators are necessary. The involvement of suitable fiscal institutions is a precondition; the independent FCs may fulfil this role at the national level. The indicators incorporating country-specific considerations can then contribute to the optimal operation of the fiscal rules and institutions (FCs) in line with the original objectives. We do not recommend focusing on public debt only while ignoring other stock indicators. In our view, appropriate measuring of different financial and non-financial assets and liabilities, as well as the impacts of aging, is an important precondition for determining country-specific target values. This task will be achievable in the long term; until then, estimates of the above factors may be considered in determining the medium-term objective (MTO). Concerning headline indicators, we have proposed a shift from the existing statistical approach and presented a variety of alternatives. Similarly, there are a number of methods available for eliminating exogenous factors. The FCs may play a key role in these open issues. Their increased powers would also entail greater responsibility, making it necessary to design appropriate control mechanisms.

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Two scenarios of the evolution of modern pension systems

József Banyár

In 1958, Paul Samuelson published a paper entitled "An exact consumption-loan model of interest with or without the social contrivance of money" (Samuelson, 1958), which is widely recognised as having laid the theoretical foundations for pension economics. It is seen as providing a sort of theoretical groundwork for the scheme referred to as the pay-as-you-go pension system. Samuelson asserts that it is impossible to find an optimal solution for old-age consumption on a market basis in an economy without money and opportunities to set aside reserves, and that a Hobbes-Rousseau style of social contract is therefore required (as embodied in the modern system of social insurance institutions), according to which active generations support the older generation that they follow and, likewise, will be supported by the next generations, who are in childhood or have not even yet been born. In his model, Samuelson does not talk about child-rearing; he does not even include childhood in his model. He puts the cost of raising a child at zero, even though he admits that a sufficient number of children is required to maintain modern social insurance. This paper tackles the question of what pension system will result if Samuelson's simplified assumption about children is removed and his model is extended to include childhood. The outcome is surprising: on basically the same foundations, a completely different scenario can be built, which would result in a system that is very similar to the present-day pension system but deviates from it in one or two significant ways. These two scenarios – this new system and Samuelson's, respectively – are here called the "IAI" (inactive-active-inactive) scenario and the "AI" (inactive-active) scenario; the investigation focuses on how the pension systems predicated on these two scenarios resemble each other and where they differ. The most important element in the IAI scenario, which can be considered a modernised version of what Samuelson calls the "traditional pension system" (where children were the means of old-age support) that went out of fashion, is that the pension contribution should not be considered here as a sort of investment, giving entitlement to subsequent pension, as Samuelson does in his AI scenario. Instead it is treated as repayment, organised by the state and due to parents for raising children; similarly to the "traditional pension system", this secures their sustenance in old age (i.e. their pension). This is also a social contract; however, only parents who have raised children will be eligible for a pension under this contract. Those who do not do so will save on the costs of childcare, and the state must

organise for them another type of pension system, a funded one in which the childcare costs saved are put aside and from which their pension is drawn. The conclusion of this paper includes a review of approaches published to date in the literature, which treat the problem of pension and child-rearing in ways differently than here.

1 Introduction

Paul Samuelson's 1958 paper (Samuelson, 1958) creates a sort of theoretical groundwork for the so-called pay-as-you-go (PAYG) system, which is widespread in the developed world and the long-term sustainability of which is being questioned almost everywhere.

This paper investigates what pension system emerges if some of Samuelson's original simplifications are resolved and the events are interpreted differently at certain points. The result is surprising: a wholly different scenario can be constructed on essentially the same foundations.

The following section briefly examines the main points in Samuelson's original paper and then draws attention to one of his abstractions, which is subsequently resolved.

It can be seen that Samuelson's model is not robust when it comes to results: the resolution of the minor abstraction results in a radically different picture of pensions. The two scenarios – this one and Samuelson's – represent entirely different pictures; even though built on similar grounds, they lead to completely different conclusions at key points.

2 Samuelson's original article and its abstractions

In his paper, Samuelson seeks to answer the question of whether, in an economy shared by three generations of people and in which the consumer goods produced will not keep over the long term, a free-market exchange mechanism is at play to ensure that the older, currently active persons share some of their output with younger active persons in order to make sure that the latter will share theirs with them later on, so they do not die of

hunger in old age. For the sake of simplification, he assumes that in this "economy" only one type of goods is produced and consumed: perishable chocolate. He recognises three generations: young, employed persons constitute the first generation; older, employed persons comprise the second generation; and inactive persons, who no longer work, make up the third generation. He does not deal with children specifically; they exist by default and do not represent substantial consumption. Accordingly, Samuelson disregards them as a factor (and includes their consumption within that of the parents); only active and retired persons have significant consumption.

In order to analyse the issue, Samuelson posits a simple model with several simplifications (some of which have already been mentioned) and formulates his main question in the following way: what interest rate will lead to equilibrium and social optimum (i.e. a maximum value in the utility function analysed)? He finds that a 0% rate of interest would lead to a socially optimal level in a stationary population, which he demonstrates by means of a mathematical example: if everyone produces 1 unit per period (that is to say, a total of 2 units over their entire life), then they will consume 2/3 in each period (i.e. in their old age, they will receive 1/3 each from two persons, who are in their active periods). This, however, is irreconcilable with the free-market mechanism, as it is unimaginable that older, active persons (in their 2nd period) would hand over some of the goods they have produced to bribe active persons in their 1st period to ensure that the latter will share with them some of the goods that they produce in their 2nd period, once the former are pensioners in their 3rd period. On a free-market basis, this either does not add up or only does so at a horrendous rate of interest. This means that those in their 2nd period would need to give a huge amount to those in their 1st period if they wished to receive a little back in their 3rd period from those who were then in their 2nd period. In other words, the free-market equilibrium would not result in the social optimum, and therefore the free market should not be relied on. Instead, a social contract that extends even to the as-yet-unborn should create the social optimum, as reflected by the above example and a 0% interest rate. According to this social contract, one should surrender some of the goods produced in the active period and hand it over to the older generation at a 0% rate of interest, then receive it back in old age (but not from the same generation); this is to continue through an infinite sequence of generations. This is organised by social insurance (SI), and thus the standard of living is improved for all.

Samuelson considers production to be stationary throughout (i.e. 1 person produces 1 unit of chocolate in 1 period), but he also looks at a scenario of population increase, in which the population grows at a rate of m, multiplying by (1+m) in each period. He finds that rather than at a rate of interest of i=0%, a periodic interest rate of i=m ensures the social optimum under such conditions (i.e. the pension received in old age is equal to the contributions paid to SI previously, adjusted by this interest rate). He calls this a "biological" interest rate.

Samuelson posits that if everyone insisted on *quid pro quo*, everyone would be worse off than the social optimum (the biological interest rate, in the absence of SI) until the end of time. This makes it expedient for mankind to conclude a Hobbes-Rousseau type of social contract, in which the young are given a guarantee of support in their old age if they support the older generation today; this applies to the as-yet-unborn as well. This makes the social optimum achievable in a single lifetime.

At the end of his paper, Samuelson points out that while such a social contract is essential in a moneyless economy to achieve a social optimum, it may be replaced by financial savings, making the situation different in a monetised economy.

In his analysis, Samuelson also makes the following assumptions, which are discussed below. This social contract has existed since time immemorial in economies, both in static populations (which, needless to say, represents a special case of a growing population, in which m=0) and growing populations; and m has also been unchanged for an infinite period of time. He does mention that there have been times in the past when this was different, as children supported their aged parents; this, however, has gone out of fashion since then. Nevertheless, he considers the old system and the new one to be similar in that advanced social insurance may also cause a bias towards a growing population, similarly to what is observed among farmers and groups with close family ties, where children are desired as a means for support in old age.

He assumes that m is basically higher than 0, but mentions that it may be negative as well, even citing some examples (namely, Ireland and Sweden).

Another simplification is that he assumes that people in the economy are entirely uniform: there are no genders or couples (he does not even mention this aspect, and he talks only about individuals). Furthermore, the paper does not even touch on the problem of raising children. Nobody dies prematurely, everybody lives for exactly three periods (or, rather, four, if the period of childhood, which is left out of his analysis, is included), these periods fit together exactly, and the life of the population is synchronised with these periods.

His model uses the following notation:

t   a one-period duration, which may take positive or negative integers as values

C_1, C_2, C_3 the consumption in the three periods

i_t the interest rate

$R_t = \dfrac{1}{1+i_t}$ the discount rate

B_t the number of cohorts

S_t savings

The budget equation for one person is:

$$C_1+C_2 \cdot R_t+C_3 \cdot R_t \cdot R_{t+1}=1+1 \cdot R_t+0 \cdot R_t \cdot R_{t+1}. \qquad (1)$$

All this says is that the discounted consumption of an entire life must be equal to its discounted production.

The demand functions is thus:

$$C_i=C_i(R_t,R_{t+1}) \quad (i=1,2,3). \qquad (2)$$

Samuelson seeks the equilibrium values of ... R_t, R_{t+1}, ... that will clear the competitive markets in which the current and the future goods will be exchanged. He also defines the utility function (U) for this.

In addition, he defines "net" demand, which is the algebraic difference between a person's consumption and output. Net demand in this sense is the negative equivalent of what people normally call "savings" (S). This is how he defines it, in accordance with capital theory:

$$S_1=S_1(R_t,R_{t+1})=1-C_1(R_t,R_{t+1}), \qquad (3)$$

$$S_2=S_2(R_t,R_{t+1})=1-C_2(R_t,R_{t+1}),$$

$$S_3=S_3(R_t,R_{t+1})=0-C_3(R_t,R_{t+1}).$$

In old age, S_3 is negative, corresponding to the positive savings made in young age, so that the budget is:

$$S_1+S_2 \cdot R_t+S_3 \cdot R_t \cdot R_{t+1}=0. \qquad (4)$$

In a stationary population, for all values of t; in an increasing or decreasing population, $B_t=B \cdot (1+m)^t$.

First, it is necessary to stress that the above description disregards childhood consumption. The following will attempt to resolve this shortcoming to see what happens initially in a static population model like Samuelson's and then in a growing population model. To recap, Samuelson essentially disregards children and childhood. Children are born *per se*, not as the result of an economic decision; they cost nothing (their consumption is part of the adult's consumption, but does not reduce it) and they consume nothing. The first stage of life that Samuelson analyses is the active period starting at age 20. While children are not included in the economic exchange, they are part of the social contract, which essentially starts applying to them at the age of twenty. So what happens if this is not the case, but children also consume?

The rest of the paper does not look into what Samuelson devoted so much effort to investigating – namely, what conditions allow a market-based exchange among selfish individuals over a long period of time – because it is not difficult to understand the conclusion in his paper that this is essentially impossible and a social contract is required. Instead, it focuses on using the equation system to investigate possible templates for this social contract.

3 The case of the Stationary population

3.1 The modified model and a simple numerical example

On the basis of the above, an additional period "0" is introduced to precede the three periods used by Samuelson. The resulting four periods represent roughly the following age brackets: 0 to 20 years, 21 to 40, 41 to 60, 61 to 80.[1] There are two active and two inactive periods. Maintaining Samuelson's other assumptions (such as, for instance, that everyone produces 1 unit in each of their active periods), this modifies budget equation (1) as follows: (1')

$$C_0+C_1 \cdot R_t+C_2 \cdot R_t \cdot R_{(t+1)}+C_3 \cdot R_t \cdot R_{(t+1)} \cdot R_{(t+2)}=0+1 \cdot R_t+1 \cdot R_t \cdot R_{(t+1)}+0 \cdot R_t \cdot R_{(t+1)} \cdot R_{(t+2)}. \qquad (1')$$

The savings (3) will appear the same in the first approach, with only a further equation being added; this is S_0, which will evidently take a negative value, C_1:

$$S_0=0-C_1, \qquad (3')$$

$$S_1=1-C_2,$$

$$S_2=1-C_3,$$

$$S_3=0-C_4.$$

---

1   Incidentally, Samuelson's two active periods lasted from age 20 to 65, while the third period (of retirement) was 15 years long. This is an inconsistency, because he holds one of the two active periods, totalling 45 years of total length, to be equivalent to the inactive period; the active period is actually one and a half times longer). However, this issue is not addressed specifically here. Instead, a more consistent period division is instead proposed, as seen above. This is not especially relevant in any case, but merely a tool to help with visualisation.

And this is appended to the budget identity (4) as well, as follows: (4')

$$S_0+S_1 \cdot R_t+S_2 \cdot R_t \cdot R_{t+1}+S_3 \cdot R_t \cdot R_{t+1} \cdot R_{t+2}=0. \tag{4'}$$

In the stationary population, everyone has exactly one child (which is the same as each couple having two children).[2] It is assumed here, similarly to Samuelson, that everyone has the same consumption. Also unchanged is the assumption that active persons are involved in production in two periods, producing 1 in each of those. It already follows from these assumptions that everyone consumes the 2 units of chocolate produced in their active periods over the course of their entire life. In other words, it is true that:

$$C_0+C_1+C_2+C_3=2 \tag{5'}$$

or that the net saving over the course of life is 0, in line with.

$$S_0+S_1+S_2+S_3=0 \tag{6'}$$

This modified equation system has R=1 (i.e. i=0) as a solution, just as in Samuelson's. In this case, (1') essentially transforms into (5') and (4') into (6').

Providing a mathematical example with a possible concrete solution will allow for interpretation of the results.

It is obvious to assume that consumption will be smooth over the course of the entire lifetime:

$$C_0=C_1=C_2=C_3=0,5.$$

The best way to envision this is to assume that an active person in period 1 has a child, shares with them the 1 unit of chocolate produced in the first period, and raises the child before the end of the period. In the second period, the active person shares the 1 unit of chocolate they produce with their now inactive, retired parent. According to the savings equations (3'):

$$S_0=0-C_1=-0,5,$$

$$S_1=1-C_2=0,5,$$

$$S_2=1-C_3=0,5,$$

$$S_3=0-C_4=-0,5.$$

---

2   For the sake of simplicity, it is assumed that there is one boy and one girl. The father raises the boy and shares his output with him and the mother does the same with the girl (i.e. each child belongs to one parent and each parent to one child). It is necessary to make very generic assumptions that are nevertheless more detailed than Samuelson's, since we have also included childhood in our scope of analysis.

3.2 Interpreting the solution – a different scenario, a different kind of social contract

The above distribution is not suitable for interpreting this solution in the way that Samuelson interpreted his (i.e. without taking period 0 into account). The social contract here is not across an infinite number of generations, where each gives something to the previous generation and receives it back from the next one indefinitely; instead, exchanges take place here in a closed threefold set of generations of child-parent-grandparent: the parent gives to the child just as they had received from their parent in the past (and so on). This creates debt (negative savings) for the child vis-à-vis the parent, which the child returns in their 2nd active period. An active person in period 1 invests 0.5 savings in raising their child, in effect lending it to the child, whereas an active person in period 2 uses their savings for repaying the debt they incurred in period 0. Even though the generations overlap, each transaction will come to an end within three generations: the child is a recipient in their childhood and repays upon having raised their own child.

This is a sort of social contract, of course, but entirely different from Samuelson's: the pension is the repayment made by children to the parents for the costs of raising them. This is nothing else than the system that Samuelson deemed as having gone out of fashion. Is it indeed so? Does inclusion of the state in the process, to collect contributions and distribute pensions, change the old method substantively? The equations suggest that no, it will not, that it is merely a technical difference that the equations do not reveal. Accordingly, the scenario of creating SI differs from what Samuelson says. According to him, it had gone out of fashion for children to support their parents (as had been the case in the agrarian societies of the past, where it was easy because multiple generations cohabited and children reciprocated the care they had received from their parents) and, therefore, it was necessary to enter into a new social contract. In this social contract, all transfers would be strictly "forward" (i.e. give to the preceding generation and receive from the next generation), which is facilitated by organising SI.

In this scenario, subsequent to the collapse of agrarian societies, different generations no longer cohabit and supporting parents is now more difficult. Many have, in fact, dispensed with this obligation as it has become easy to do, compared to when generations cohabited in a community and observation of the norms, such as the support a child gave to their aged parents, was monitored. The state had to step in and organise the transfer from children to parents (i.e. repayment by the children of the costs of raising them, which now took the form of pensions). In essence, however, nothing had changed. This scenario could therefore be called the old scenario and Samuelson's the new scenario; however, I have preferred to name them after the generations participating in them. Accordingly, Samuelson's scenario is an Active-Inactive (in short, AI) scenario, since the children (who are also inactive) do not participate in it. The traditional pension system is an Inactive-Active-Inactive (in short, IAI) scenario. The assertion here, essentially, is that there has been

no change, and there is no need for a new scenario as the old one worked. The modern pension system scenario could be an IAI scenario as well.

The economy proposed here, therefore, deviates from Samuelson's in that the participants do not even attempt to "do business" with the other (younger) active persons, but do so with the children – right from the start. This is no longer possible directly, as it was in the past, but involves the state organising it.[3]

The above mathematical example is overly specific, but the interpretation is obviously relevant for all other solutions where

$$C_0 = C_3,$$

because the same logic is at work. Accordingly, if the older generation consumes exactly as much as they gave their children in the past, it becomes entirely clear that this is a matter of returning something.

Naturally, $C_0 = C_3$ and $C_1 = C_2$ may take a wide range of relative values, but the most relevant assumption is probably that $C_0 < C_1$, (i.e. children and old people consume less chocolate than active persons). It is easy to find an ideology to support this in simple economic terms: a child is physically smaller than an adult and thus consumes less; active persons must work and eat more; and old people do not work and, as a result, do not need to consume as much.

The interpretation does not change even if $C_0 > C_3$. In this case, raising children simply returns a negative rate of interest; after all, this is required for security in old age. It is still the costs of their care that the children will repay – just with a negative rate of interest. The situation becomes slightly more problematic when $C_0 > C_3$.

3.3 A slightly more complicated mathematical example and its two possible interpretations

The following practical objection may be raised: a child consumes less than an adult, but adults seek to smooth their consumption over their whole adult life. In this case:

$$C_0 < C_1 = C_2 = C_3.$$

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3 The above model does not differ from Samuelson's in the sense that they both greatly simplify the actual situation; in Samuelson, this was later resolved by practice grounded in his theory, whereas there remains here the responsibility of describing the system in greater detail. The simplification lies mainly in that both of us disregard the fact that lifetimes are not as standardised as in this model, which necessitates an actual system to have a variety of methods for risk equalisation.

To simplify matters, specific numbers can be used:

$C_0=0,2$,

$C_1=C_2=C_3=0,6$.

According to the above, the distribution is: in period 1, the active person consumes 0.6 of their 1 unit of chocolate output, gives 0.2 to their child and 0.2 to their grandparent. In period 2, the active person consumes 0.6 of their 1 unit of chocolate output and gives 0.4 to their parent, supplementing the 0.2 given by their child to add up to 0.6; accordingly, the parent/grandparent in period 3 is able to consume 0.6.

3.3.1 Two kinds of explanations

The 0.6 consumption by the inactive person in period 3 may be explained in two ways:

Explanation 1: the childcare investment of 0.2 made by the young parent in period 1 has returned a 0.6 profit in period 3 (a yield of 200% over two periods).

Explanation 2: there were two sources for the 0.6 consumption in period 3.

a. The pensioner received the 0.2 unchanged (for the sake of simplicity, assume that they received it from their child, the active person in period 2, who also gave them 0.4), and

b. received 0.2 from two subsequent generations, whose transfer to the generation before them can be interpreted as their way of smoothing their consumption over their entire adult lifetimes. They do not, of course, do this by way of market exchange (which Samuelson proved to be impossible); instead, they use the same SI mechanism invented (according to the IAI scenario) to make sure that children repay their parents the costs of raising them.

Two explanations, two different scenarios, two different social contracts! The first explanation is our mutually embedded, three-generation series of social contracts above, whereas the second one is a combination of this and Samuelson's social contract of infinite generations.

3.3.2 Selecting from the explanations

Which explanation is true? One may notice right away that the new, three-generation series of mutually embedded social contracts is present by all means, whereas Samuelson's is optional. It will be clearly absent if consumption in old age is not greater (let alone smaller!) than consumption in childhood (i.e. there is no consumption smoothing in adulthood). It seems, in fact, that real pension systems tend not to provide pension amounts that would lead to this assumption.

Nevertheless, if they do provide it, the question arises whether we are facing scenario a) a plain explanation, or b) a combined one.

In a real pension system (which is, of course, much more complex than the model here), the best way to decide this question may be the practical one of comparing the benefits from the specific pension system with the costs of childcare, with due reference to changes in productivity as well.[4] If either provides more than the other, then it can include an income-smoothing component as well. We must remember, however, that in this empirical analysis the costs of parenting comprise not only the transfer of physical goods ("chocolate"), as in our model, but also a considerable investment of time, which may not be a direct cash expenditure but cause the loss of opportunities to earn income (typically among mothers). If the benefit were lower than this, then an increase would be necessary.

3.3.3 SI is not the best means for income smoothing

Aside from how to resolve the above question in practice, there is another matter that needs an answer: is it expedient to use the pension system for income smoothing in old age or would a different method be advisable? There are several reasons why the answer is no:

1. No, because the pension system is intended for a different purpose. The pension system protects primarily from extreme poverty in old age, but is not tasked with ensuring the accustomed level of welfare. Samuelson does not consider this a motive for the pension system, which he finds simply as protection against death from starvation.

2. In Samuelson's model, goods cannot be stored. Therefore, the pension system cannot be resolved through the stockpiling of physical goods, necessitating a social contract between generations. He mentions at the end of his paper, however, that this – purely this formulation – applies only to moneyless economies, and as money is introduced, an entire different pension system becomes possible, one that is based on savings. In today's world, there are practically no moneyless economies; therefore, monetary savings are the best means for the smoothing of consumption – if it is needed in the first place.

3. In the modern environment where the old family units have dissolved, a law may be needed to require that the costs of child-rearing be repaid. Consumption smoothing, however, is a private matter, and there are no sound reasons for making it mandatory by elevating it to the level of a national system.

4. Finally, the terms of the modern pension systems themselves prevent consumption smoothing in the active periods. The way that they function today is not very conducive to smoothing. This can be examined in greater detail below.

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4 This is not discussed in this paper. It should be noted, however, that Aaron (1966) happened to use exactly the same factor, rightfully, to adjust Samuelson's model.

3.3.4 The SI and consumption smoothing

The above mathematical examples have adhered to the following principle: an active person in period 1 consumes most of the goods they produce and also gives goods to their child. If anything remains over and above this amount, they give it to the inactive person in period 3, who will receive more than this from the active person in period 2, as the latter no longer has any child-rearing expenditures. By contrast, the SI logic assumes that all active persons pay the same contributions (in percentage terms, but this coincides with the absolute value in our model). The expenditures can be seen as follows.

The active person in period 1 spends C_0 on child-rearing and pays $\frac{C_3}{2}$ in contributions, so they will have $c_1 = 1 - c_0 - \frac{C_3}{2}$ left.

An active person in period 2 will have more left, however: $c_2 = 1 - c_0 - \frac{C_3}{2}$, since they no longer need to pay for child-rearing, only the SI contributions. Accordingly, even if the SI were to work towards consumption smoothing, it would need to do so first in the period of contribution payment, by applying a lower rate to those raising children than those no longer raising any. In other words: it would make sense to insert a chronological demarcation between child-rearing (=investment in the next generation to create my own pension) and the repayment of the costs of raising us. This would also achieve a kind of (approximate) "generational fit", as the pensioners would receive the costs of child-rearing back from the very generation that they raised.

4 The case of the non-stationary population

4.1 Samuelson's mathematical example

Analysing even the case of a stationary population puts the pension system in a new perspective. But while it suggests a new explanation and different kind of scenario, Samuelson's assertion that we should work with an interest rate of around 0% does not need to be modified. Admittedly, it should be projected on child-rearing costs rather than the SI contribution.

In the IAI scenario introduced here, to what extent does the interest rate m apply in the event of a growing population?

Samuelson's main assertion concerning a non-stationary population increasing (or decreasing) by a factor of 1+m (per period) is that the pension may also increase: namely,

the contributions are adjusted by the m rate of interest per period to receive the pension figure. Accordingly, our contributions have a ("biological") interest rate of i=m.

To consider Samuelson's specific example (and carry the calculation somewhat further) in order to understand how it works in his understanding, he does not include a period 0 and assumes, for the sake of illustration, that $c_1 = c_2 = \frac{2}{3}$ (i.e. the intention is to smooth out the consumption of the 1 unit produced in the active period). In a stationary case, the SI contributions of 1/3 each by two active persons will result in 2/3 consumption in old age. Assuming now (also for the sake of simplicity) that m=100% (i.e. the population doubles in each period, everyone has two children, and every couple has four) and that this has been the case for a long time, there are twice as many persons in period 2 than in period 3, and four times as many in period 1. Accordingly, every pensioner in period 3 will have 6 active contributors. If each of these pay 1/3 of a contribution share, then the pensioner will receive a total of 2 units, which represents 100% interest per period on their contribution payments, since if m=1, then 1+m=2, and

$$\frac{1}{3} \times 2^2 + \frac{1}{3} \times 2^1 = 2$$

4.2 Samuelson's example according to the IAI scenario

To match the IAI scenario, Samuelson's example undergoes the following modifications:

• The children are also involved in consumption (e.g. 1/3). This is also included in the 2 units of chocolate that the person will have to produce, who will thus be able to consume a total of 5/3 in adulthood.

• The pension is based on children returning the costs of their care (i.e. the parents enter into contracts with their children).

• Otherwise this scenario also assumes two children to be raised by each person (four per couple), as in the example above, and a continuation of this process over multiple generations. In other words, everyone has "half" a parent to support (i.e. every parent is supported by two out of their four children).

In this instance, the above example is modified as follows:

• In period 0, a person receives 1/3 of a unit from one of their parents.

• In period 1, the same person consumes 1/3 of a unit and gives 2/3 to their two children.

• In period 2, the person consumes 2/3 and gives 1/3 to their parent, who thus receives a total of 2/3 from their two children.

• In period 3, the person consumes 2/3, received from their two children.

In this way, one consumes a total of 2 units and earns a total of 2 units.

There are several differences between this example and Samuelson's example:

• In this model, the person consumes only 1/3 of a unit in period 1, spending the rest on child-rearing. Samuelson does not recognise child-rearing costs, and thus consumption is 2/3.

• In period 1, pension contributions are not paid. Instead, the 1/3 for this is spent on child-rearing.

• Period 2 is the same here as in Samuelson.

• Period 3 is the same as in Samuelson's stationary model.

The main difference is that there is no "biological" interest on the contribution in the IAI scenario, nor is there any on child-rearing: one gets back what one has spent on the child. Compared to the stationary situation in the IAI scenario, the pension is twice as high, since there are two children; this has a price, however, as consumption in young age is lower by the amount spent on child-rearing.

In other words, there is a multiplier of 2 for the pension compared to the stationary scenario, but this does not imply periodic compound interest, merely the fact that the pension will be twice as high if there are two children. But Samuelson's "yield" has evaporated and disappeared. Indeed, it is nowhere to be found! So where did Samuelson get it from? The situation is very simple: the main difference between the two examples is that Samuelson rechanneled some of the child-rearing costs of the populous first generation to the pensioners! In other words, he set the benefits too high for the older generation, directing it away from child-rearing!

Is this expedient? Our answer will depend on which scenario concluded from Samuelson's model (slightly modified, made to some extent more realistic) is deemed to be correct: the AI (Samuelson's) scenario or the IAI scenario, outlined above.

5 The two scenarios

To summarise therefore: Samuelson's model can be interpreted in at least two ways not just one, as a sort of social contract. The two interpretations describe the antecedents as different scenarios, of which I provide a brief summary here:

5.1 The AI scenario

According to Samuelson's scenario, called the AI scenario, people in the agrarian societies of the past used to achieve security for their old age through cohabitation of the generations, as active persons supported their old parents, who lived with them, which is why it was important to raise children ("traditional pension system"). This has now gone out of fashion (presumably because generations no longer live together), and therefore a new kind of social contract was entered into and social insurance was organised to ensure compliance ("modern pension system"). According to this, active adults give up some of their earnings for the benefit of elderly inactive persons, in return for which they can expect to be supported by the future generation on the basis of the social contract that applies to children and the as-yet-unborn as well, and so on. In this way, payment of contributions creates the grounds for eligibility for a pension.

The whole social contract is predicated on having a sufficiently large next generation (i.e. a system of pensions payable pursuant to a social contract demands a sufficient number of children, just as the earlier solution of children supporting their own parents did); in contrast to that, however, the system does not incorporate children and child-rearing explicitly in any way.

5.2 The IAI scenario

There is, however, a different way to tell the story of how the modern pension system of SI evolved. According to this, the traditional and the modern pension systems are essentially identical, and there is no new (AI) scenario, as the old one (IAI) remains in effect: it is the children and grandchildren who support the parents and grandparents today as well. Albeit there have been a number of technical changes, since the old arrangement of solving all this within a shared household is no longer feasible, as shared households have dissolved. Moreover, support in the traditional pension system was not predicated fundamentally on money transfers, whereas today, when the generations live apart, money is the only way of support. The new conditions are also different from the old ones in the sense that it is now easy for children to get out of their obligations, making it necessary for the state to set up social insurance to organise the (now strictly monetary) transfer from children and grandchildren to parents and grandparents. Accordingly, the social contract is not about active persons supporting the elderly, in return for which the active persons of the next generation will support those active today in their old age. What is happening is, in fact, the same as in the past: young people pay old people back the costs of raising them (perhaps with interest, perhaps only in part) and their children will do the same for them.

Pensions, therefore, remain nothing other than the recovery of investment in children; pension contributions are not a kind of "advance saving" for a future pension, but the repayment of child-rearing costs.

This means that, in accordance with the IAI scenario, the traditional and the modern pension systems differ from one another not in essence, in the nature of the social contract, but technically; after all, both are predicated on the same premise: that investment in children is the basis for future pensions.

Although the IAI scenario does not posit a substantive difference, but only technical differences between the modern and the traditional pension systems, these technical differences are huge. Admittedly, they concern implementation rather than essence. In the traditional pension system, investments in children and their returns were strictly on an individual basis.[5] When the pension system is organised by the state in the modern system, the state spreads risk to a certain extent: it makes the sustenance of the old person independent of whether specifically their child is willing to support them, making the contributions (or the repayment of child-rearing costs) mandatory. The state also makes it irrespective of how well the child is doing on the labour market and how much money they have, if any, to repay the costs of raising them. An insurance component is also included in the system, as the risk of a long lifetime is spread over time, which exempts children from the risk of their parents living too long and exempts parents from the risk of their children dying before them.

The costs of child-rearing (which are the basis for the pension) are estimated by proxy (namely, the income of the parent), which is taken into account when calculating the pension.

5.3 The differences and the similarities between the two scenarios

The two scenarios explain the different characteristics of modern pension systems differently, and various diverging policy conclusions may be drawn from them:

- In the AI scenario, the pension is a reward for contributions previously paid to finance the sustenance of the elderly (i.e. the contribution is an investment), whereas in the IAI scenario it is the "proceeds" from child-rearing (i.e. the investment was the child-rearing). The pension is the proceeds of two different investments in the two different scenarios.

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5   The adjective "individual" should not be interpreted in the modern sense; this took place within the joint family.

- Contributions have different statuses in the two scenarios: they are an investment generating a yield in one and a repayment of debt in the other. The latter, naturally, does not give grounds for any proceeds; on the contrary, interest may be paid on it. According to the AI scenario, the payment of contributions is, in effect, "forced saving" (and as such, it is essentially similar to the forced saving in mandatory, but funded pension systems), whereas in the IAI scenario it is the "forced" repayment of child-rearing costs.

- The status of child-rearing is also dissimilar in the two scenarios: it is a private hobby in the former, one that has nothing to do with pensions (although it ultimately underlies the pension system, albeit not explicitly), whereas in the latter it is a central component of the pension system.

- In the AI scenario, the "internal rate of return" of the pay-as-you-go pension system is calculated by comparing the contributions paid and the pensions received, whereas in the IAI scenario it is calculated by contrasting the child-rearing costs with the pensions.

- The fact that contribution payments are investments in the AI scenario also implies that there is government debt underlying them implicitly ("implicit government debt"), as the pension is "due" in return for the contributions paid. In the IAI scenario, there is no implicit government debt within the pension system, since the payment of contributions represents a repayment of debt by the individual; at the same time, this is also the basis for the pension.

Otherwise, the two scenarios describe very similar pension systems. In both, the state uses the SI to force active persons to give up some of their income and transfer it to the elderly. Neither scenario assumes the existence of reserves in the pension system (or only short-term ones), but while this may be considered a shortcoming in one, it is self-evident in the other. The main difference lies in the basis for determining the pension: in the AI scenario, the basis is the contributions paid; in the IAI scenario, the basis is the children raised, who will contribute.

5.4 Which scenario fits today's pension systems better?

Modern pay-as-you-go pension systems were created solely on the basis of the AI scenario, which serves as their official philosophy. It is possible to argue, however, that the modern pension systems created right at the start as pay-as-you-go systems are described better with the IAI scenario. The quintessence of this, after all, is the problem of a lack of care for the elderly (in other words, the refusal by young people to honour their earlier obligation of supporting their aged parents, which could be interpreted as a repayment of the costs of raising them). It was, therefore, necessary for the state to exert pressure. It did not do

this on an individual-by-individual basis,[6] however, but created a system incorporating certain rational (and one less rational) risk-sharing elements and a degree of redistribution, thereby increasing the security of society.

It is important to mention, however, that pay-as-you-go systems were created in one of two ways (see studies by György Németh on the subject, such as Németh, 2009): either by creating them as such right from the start, as in the USA, or due to the pension system "plummeting" into this situation from an earlier funded system when underlying capital disappeared, but entitlements were still recognised (and the system subsequently proceeded to operate as pay-as-you-go). It may be argued in the latter case that classifying this as forced saving continues to be justified, but we must note that such funded pension systems extended only to a small part of the population when their capital was lost and, once they were extended to other groups, the same logic as in the USA started to predominate.

The IAI scenario sheds light on who benefited from the introduction of the pay-as-you-go pension system. In both scenarios, the use of various risk equalisations was beneficial for most stakeholders. Where the two scenarios differ is that, in the AI scenario, those who received their pension after a short period of contribution payments following the introduction of the system benefited in particular, since they accessed the pension "undeservedly". According to the AI scenario, there is implicit government debt rather than actual capital underlying the system because the contributions of the first pensioners are still missing.

By contrast, the IAI scenario interprets this differently: children dispensed with their obligation of repaying the costs of their care (i.e. by supporting their aged parents), and the state later forced them to do so by setting up the modern SI and levying contributions. In this scenario, the elderly who received their pensions then did so "deservedly", and the ones to benefit the most were those who previously had neither paid contributions nor supported their parents, as well as those who received a pension without actually raising children.

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6 An example of the latter solution may be found in China, where the constitution declares that children have an obligation to support their parents. This is a clear sign of the survival of the traditional pension system. Its philosophy is the same as that of the IAI scenario, but the specifics of the solution do not correspond to those of a modern pension system.

6 Conclusions and lessons

6.1 The internal contradictions of modern pension systems

In light of the above, it is an inherent contradiction of modern pension systems that they are predicated on children and their potential as contributors, yet they do not reward child-rearing; on the contrary, they disincentivise it.[7] This is because the modern pension systems were created with the inclusion of an additional risk equalisation to the aforementioned ones: namely, they made the pension irrespective of whether a couple managed to have children or not. It seems that they assumed that everyone wanted children, but only some succeeded, and they also assumed that the same applied to the success or failure to start a family at all. If we assume that having a family is an objective for everyone and only unlucky people will not have children in their family, then a kind of solidaristic element of redistribution exists within the system. If, however, these assumptions are not true, then it is an undesirable element of redistribution in the system, which causes a free-rider problem and requires correction.

The situation is even worse: in fact, this arrangement rewards free riders, as persons who do not have children are able to pursue formal earning activities longer, which then results in higher pensions. Accordingly, it is economically rational not to have children once a modern SI has been established (in contrast to the traditional pension system), which in turn jeopardies subsequent pensions, as there will be no contributions and thus no pensions if there are no children.

It has been observed that pay-as-you-go pension systems reduce fertility. The IAI scenario tells this story differently. According to that scenario, it is not the pay-as-you-go system itself that reduces fertility, but a single component of it: namely, that the system is organised in a manner that "socialises" children. In other words, the benefits from raising children are divided equally among those who contribute and those who do not contribute to creating them, thus making free rides rational (which, in this particular case, means saving on the costs of child-rearing).

The new explanation also maintains that the pay-as-you-go pension system is needed, but should be the institutional form of repaying the costs of child-rearing, since the old, direct arrangement is no longer feasible as the division of labour has changed.

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7 This overall judgement is not changed, but only slightly modified by the fact that a large number of pension systems, including in Hungary, incorporate components that reward child-rearing (to a degree). In the Hungarian system, such a feature is the inclusion of the time period spent on childcare in the total period of service.

6.2 Potential transition between the two scenarios

Due to the aforementioned structural error, an internal contradiction has widely pushed the modern pension systems into a crisis, as almost nowhere do they have a sufficient number of children to finance them. Their revision is, therefore, on the agenda. A logical path for revision would entail the discarding of the AI scenario and drawing conclusions from the IAI scenario. One might even say that developments in pension systems have made it impossible to use the AI scenario for explaining the implicit social contract, forcing the use of the IAI scenario and the changes it implies. The most important of these changes is that contribution payments as such will not create eligibility for a pension, only successful child-rearing will. A child is raised successfully if they become a contributor.

Naturally, parents do not bear 100% of the costs of child-rearing today. For instance, most of the costs of schooling and healthcare for children are socialised (i.e. paid for by the community of taxpayers). Also, persons who raise children receive a variety of transfers (e.g. family allowance, tax relief), which also come from the taxpayers. Accordingly, childless persons do contribute to raising the next generation, to some extent, through the taxes they pay; therefore, they should also receive some of its benefits. However, that is not equal to the amount due to those with children (persons with children are understood here as those who are raising contributor children or are financing their child-rearing, regardless whether they are their biological children or not). The way to formulate a reformed pension system is, therefore, to declare that those who successfully raise one contributor per person (i.e. two per couple) will receive approximately as much pension as the average pensioner does today. The childless will receive much less and those with several children will receive more.

Also, it must be made clear to all that there are two options regarding pensions:

1. Either one spends some percentage of earnings and free time on child-rearing, in which case the full pension in the pay-as-you-go pension system is received, or

2. One saves on the costs of child-rearing and receives a much lower pension, but one's own savings and the annuities purchased with them may be added (and the source of one's own savings will come from the child-rearing costs that were not spent).

Naturally, it is possible for individuals to make this choice only up to a certain age. Accordingly, the transition to the pension system of the IAI scenario must be phased: it should be introduced comprehensively only to those who are still able to adapt to this situation. Others, who have lived their lives according to the old philosophy (of Samuelson), should receive their pensions on that basis.

6.3 About NDC

One popular way of reforming the pension system today may involve a transition to a system of Notional Defined Contribution (NDC). It is, therefore, necessary to comment on NDC in light of the IAI scenario, especially as this author has proposed reforming the Hungarian pension system on an NDC basis (Banyár-Mészáros, 2003).

Clearly, NDC belongs fundamentally to the AI scenario and represents its most logical version, one that is rationalised to the utmost! Its starting point is that the pension system can be saved primarily by stimulating contribution payments, and that this presupposes accurate and correct accounts. Its other recognition is that the monthly pension level is not a good measure of pensions, since a person retiring young will receive much more in total than someone retiring at a later age, even if their pensions are level. The total expected pension figure should, therefore, be used as guidance; equal pension means equal expected total pension. For this reason, pensions must be calculated in accordance with the rules of annuity calculations.

The IAI scenario does not differ from this at two important points: it also considers contributor discipline to be necessary and it prefers comparing pensions at the expected total pension level rather than at the monthly pension level. The IAI scenario also deems correct accounts to be important, although it interprets this somewhat differently: contributions as repayment of child-rearing costs must be paid correctly, and contributions to child-rearing must be correctly accounted for as well. In terms of the latter, there are two types: the payment of taxes and the actual raising of children.

It is difficult to account for taxes paid, of course, but there are proxies available. The individual pension contribution may be a good proxy – provided that its level is set properly. Thus, the individual account included in the technical solution for NDC may serve as a basic component of a pension system based on the IAI scenario, but only the amount on the account must be increased with the estimated costs of child-rearing. Individual accounts will also be needed for the purpose of comparison of the expected total pension level, as well as to be able to reward those retiring later with a proper rate of increase in their pensions.

The IAI scenario and behavioural economics

The IAI scenario highlights the AI scenario's mistaken interpretation of affairs. This can be explained on the basis of behavioural economics, namely as a form of WYSIATI ("what you see is all there is") (for a definition of WYSIATI, see Kahneman, 2013). In essence, the AI scenario did not take into account the role of child-rearing. This may be due to the fact that child-rearing usually does not involve a financial transfer, but a sacrifice of time;

moreover, the process does not go through the system of state redistribution. By contrast, pensions are channelled through that system in their entirety, and therefore it seems all there is (WYSIATI). All that one needs to do is compare these transfers with one another.[8]

7 The afterlife of Samuelson's paper, attempts to supersede the AI scenario

as one of the main points of reference since 1958, Samuelson's paper has been used to explain the structure of the pay-as-you-go pension systems and considered as key in the laying of the economic foundations for the pension system (see Robin Blackburn's thick tome of 550 pages on the history of pensions, in which he describes Samuelson's paper in this way and refers to it many times; Blackburn, 2002). The pay-as-you-go pension systems had, of course, been created previously, but experts until then had nursed a fear that this was in fact a Ponzi scheme that would collapse one day. Samuelson's paper dispelled this fear, claiming that the system was predicated on solid theoretical foundations (Blackburn, 2002).

Samuelson's paper influenced pension modelling in another way as well. After his model, it became generally accepted to consider the active age as the start of the human lifetime, completely disregarding the period of growing up and the costs associated with it (in Hungarian pension theory, Simonovits provides one example of this approach; see Simonovits, 2002).

Another paper that is frequently quoted besides Samuelson's is a brief, three-page study by Henry Aaron. Therefore, reference is often made to the Samuelson-Aaron model or theory. Aaron extended Samuelson's model in the sense that, besides population growth (which Samuelson analysed), he also took into account increases in real wages, formulating the assertion that the pay-as-you-go system increases welfare compared to the funded systems if population growth plus real wage growth exceeds the rates of interest. This indicator was later referred to as the internal rate of return of the pay-as-you-go pension system.

It should be noted here that Samuelson's paper was not initially intended so much as a theoretical foundation for pension systems, but was instead a by-product of a debate, in which Samuelson wanted to prove that the market did not solve everything well and that a social contract and a set of social institutions was necessary from time to time.[9]

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8   Róbert Gál drew my attention to this.

9   I owe thanks to György Németh for pointing this out to me.

This article can be seen as proof that Samuelson would have achieved his original objective with his paper, even if he had presented this scenario for establishing social insurance; in truth, he would not even have had to change his model much, only his argumentation.

Incidentally, the conclusion of this article that the pay-as-you-go pension systems could have been explained differently right from the start – and thus their structure could have been changed at an important point – is not to be found in the literature. By contrast, there is nothing new in proposing the explicit inclusion of child-rearing in the type of model Samuelson puts forward in his paper (namely, the overlapping generations (OLG) model); this would mean making it endogenous, in contrast with Samuelson, and linking child-rearing with pensions (with or without a model). A few approaches may be cited, without attempting completeness.[10]

Alessandro Cigno was one of the first to suggest that the pay-as-you-go pension system itself contributed to decreasing productivity in the countries that employed such a system (Cigno, 1991). András Gábos, Róbert Iván Gál and Gábor Kézdi tested the assumption, using Hungarian data (Gábos-Gál-Kézdi, 2009), and found that productivity is very strongly influenced by monetary family allowances, whereas the pension system has a strong impact that is nevertheless weaker than that of family allowances. In a kind of conclusion from this, Cigno subsequently analysed the possibility for relating child-rearing to pensions (Cigno-Werding, 2007), where the pension would depend on the number of children raised and their ability to pay contributions.

Hans-Werner Sinn does not question the AI scenario, but his proposal is nevertheless very similar to the one concluded here with the IAI scenario (Sinn, 2001). He believes that if a pension system had to be created from scratch today, it would be a funded system, but the transition would impose excessive burdens on the current active population. It would also entail an inequitable aspect of especially punishing those who are raising children, even though they are not the reason for the crisis of the pay-as-you-go pension systems. Therefore, he recommends a selective, transitional funded pension arrangement in which pensions of the childless are capitalised from their contributions, at least in the first phase.

Mária Augusztinovics was one of the first in the world to connect child-rearing to the pension system (Augusztinovics, 1993). She quotes Samuelson, but even as she accepts his scenario she considers capitalisation of the pension system as a desirable path. She also asserts, however, that this must be coupled with a "capitalisation" of child-rearing and that the two capitalisations should be combined so that pension capital is invested primarily in raising and educating the new generation. This would continue until adulthood, at which time this new generation would need to invest into itself (i.e. finance its own higher education); this would take the form of student loans, which would serve as funds

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10 I owe thanks here to Róbert Gál, who pointed out several of the publications cited.

for the pension system to a degree. It is this idea that Edina Berlinger takes further in her paper (Berlinger, 2005).

Augusztinovics's message could be reformulated in general terms based on this paper by declaring that in actual fact there is only one sort of good pension system – namely, the funded system – and the pay-as-you-go system predicated on Samuelson's AI scenario is not good. Based on the IAI scenario, however, pay-as-you-go represents a special kind of capitalisation: investment in human capital, with the pension as returns on this investment. This idea, albeit in different formulations, also exists in the literature. Mason and Lee (2004) wrote in similar terms about the demographic dividend (a phenomenon that occurs when the number of births has just started to decline, the expected lifetime of the elderly is not yet increasing, and the average lifetime of the large present-day active generation is lengthening; this increases the proportion of active persons within the population, as a result of which the latter have less of an obligation than before to provide sustenance). The authors maintain that a second demographic dividend may be possible if the demographic dividend itself is used for capitalising the system; a special form of this is investing capital in educating the new generation. This helps avoid the population growth resulting from the demographic dividend from leading to an eventual aging crisis, which would certainly occur if pay-as-you-go (of the type proposed by Samuelson) were introduced.

Van Groezen, Leers and Meijdam created a pension model that incorporates child benefits as well (Groezen-Leers-Meijdam, 2003). They propose that the state, besides levying a pension contribution on active persons so that pensions can be paid to the elderly, should pay a subsidy proportionate to fertility from the taxes also levied on the active persons; these two items function as Siamese twins within the transfer system. The same line of thought is adopted in the current Hungarian literature by András Simonovits (2014), who considers the model of these three authors as a starting point for his own. He concludes that such transfers – and a similar pension, one that is dependent on productivity – will reduce social welfare, even as it increases productivity and social heterogeneity. This contribution is partly Simonovits's comment on the potential introduction in Hungary of pensions that are dependent on the number of children. Experts in this country have regularly re-tabled the debate on the subject (see Kovács, 2012 and Banyár-Mészáros, 2014).

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The application of ensemble methods in forecasting bankruptcy

Miklós Virág – Tamás Nyitrai[1]

In practice, one chosen method is generally used to solve classification tasks. Although the most modern procedures yield excellent accuracy rates, international research findings show that a concurrent (ensemble) application of methods with weaker classification performance achieves comparable rates of high accuracy. This article's main objective is to compare the predictive power of the two ensemble methods (Adaboost and Bagging) most commonly used in bankruptcy prediction, using a sample consisting of 976 Hungarian corporations. The article's other objective is to compare the accuracy rates of bankruptcy models built on the deviations in specific financial ratios from industry averages to those of models built on financial ratios and variables factoring in their dynamics.

1 Introduction

Increasing uncertainty surrounds the global economy in the wake of the economic crisis and growing market competition, rendering business decisions more difficult and making forecasts regarding the future survival of corporations more important than ever before (Cao, 2012). Bankruptcy can result in substantial losses for all stakeholders of corporate activity – in particular, shareholders and management, and ultimately, the entire national economy. Therefore, bankruptcy forecasting has been one of the key focus areas of the financial and accounting literature (Kim and Kang, 2012).

In methodological terms, bankruptcy prediction is a simple task of classification with the purpose of distinguishing between solvent and insolvent corporations as accurately as

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possible. According to Du Jardin (2010), there are over 500 methodological procedures for this purpose; nevertheless, no consensus has emerged on which method to use when building bankruptcy forecasting models (Oreski et al., 2012).

The statistical and data mining methods that are suitable for classification purposes, along with developments in supporting IT, have significantly shaped the evolution of bankruptcy prediction. The past period has seen rapid progress in both areas, affecting bankruptcy forecasting as well. While the presentation of methodological comparative analyses remains the main method in this discipline today (Sánchez-Lasheras et al., 2012), a new direction of research in this field is the investigation of possible applications of method combinations (Cao, 2012).

Ensemble methods constitute a special type of method combination. They consist of drawing multiple random samples with replacement from the sample available for modelling, to which a previously selected classification procedure is applied. The model's final accuracy rate is then determined as the average of the predictions yielded by the various models, which characteristically exceeds the accuracy rate achieved by using the given method alone. One of the main objectives of this article is to compare the two most popular ensemble methods in the international literature – the Adaboost and Bagging[2] procedures – and determine whether the prediction rate they yield exceeds the accuracy achieved by using only the classification method chosen for this study.

Quotient-type financial and accounting ratios are traditionally used in models for bankruptcy prediction as the explanatory variable. However, these ratios are often used in modelling with no basis of comparison, despite the fact that even university manuals emphasise that financial ratios are not an absolute criterion and can only be objectively assessed in light of a basis of comparison (Virág et al., 2013). Platt and Platt (1990) recommend using relative industry ratios, comparing corporate indicator values to the 100-fold multiple of the industry average. This approach presents the advantage of allowing a comparison of financial ratios of corporations engaged in different industries and provides a solution to the temporal instability of bankruptcy models.[3]

Aside from these benefits, however, the use of relative industry ratios also presents some challenges. It is important to take into account the fact that several financial ratios are measured on an interval scale, which poses a problem in the case of relative industry ratios. For instance, comparing negative corporate profitability to a negative industry average could be misleading.[4] In such cases, a positive relative industry indicator does not

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2 To our knowledge, there are no accurate Hungarian equivalents for Adaboost and Bagging, so we will use the English terms when referring to these methods.

3 The temporal instability of bankruptcy models refers to the fact that the accuracy rate of models built on data for a given moment in time or period declines substantially for data located at a later time.

4 According to the database available for this study, several industries have been plagued by a negative industry average in the context of economic recession.

necessarily provide a realistic picture, compared to the industry average. To address this issue, this study examines the approach consisting of corporate ratios, using the difference compared to their own industry average instead of their quotient as the explanatory variable. In addition to providing a methodological comparison, the study also scrutinises the accuracy rate achieved by deviations calculated compared to the industry average – used as explanatory variables – in a sample containing the data of 976 Hungarian corporations.

The international literature has also increasingly focused on the issue of the majority of modellers using only financial ratios from the last year preceding the crisis among the models' explanatory variables. The problem of this approach is that it ignores the nature of corporate financial management and only uses corporations' static financial situation during modelling (Chen et al., 2013). According to the article's assumption, comparing a corporation's specific financial ratio values to the equivalent values for the preceding period could impart relevant information. The article also examines raw financial ratios and their deviations from industry averages, as well as the accuracy rates that can be achieved if the correlation of specific financial ratios with the equivalent ratios of earlier periods is included as a separate variable in bankruptcy models.

The study attempts to apply these three groups of variables (raw, deviation from the industry average, dynamic) individually or in a combined manner in bankruptcy forecasting models. The study aims to determine whether these groups of variables are individually or collectively better suited to maximise the accuracy rate of bankruptcy models, which is the primary objective in developing bankruptcy models (Du Jardin, 2010).

It is important to emphasise that the analysis presented in this article is experimental. It is not based on a representative sample and it does not intend to present a bankruptcy model optimised for a specific forecast. That said, the available sample and the results achieved with it could be suitable for answering the research questions posed here, while the conclusions drawn from the findings could be the subject of further studies in the field of bankruptcy prediction and other independent areas of research.

The study features the following structure: the next part presents international publications that examine the bankruptcy prediction performance of ensemble methods in the context of comparative analyses. The third part includes a brief presentation of the Adaboost and Bagging procedures. Part four showcases the sample and the research methods applied in the empirical study. Part five covers the findings of the study. The sixth and final part summarises the conclusions drawn from the analyses and suggests possible areas for further research.

2 Theoretical bases of ensemble methods

The operation of ensemble methods presented here follows Marqués et al. (2012a). These procedures are called an ensemble method, because a given classification method is applied multiple times to a dataset. When applying ensemble methods, a sample with replacement is taken from the observations or the available input variables, and the classification method is only applied to the selected partial sample.

When applying ensemble methods, it is necessary to determine in advance the number of times that the dataset will be sampled. In the case of a partial sample consisting of p elements, the procedure will be applied p times. The results of these have the same weight in the elaboration of the final prediction of the ensemble methods; in other words, individual observations are classified into the group where they featured most frequently during the application p.

In order for the accuracy rate achieved using ensemble methods to exceed the outcomes obtained by the application of individual methods, the findings of the different model applications should differ to the greatest possible extent. This diversity can be achieved if a different partial sample is used for every application p from among the available observations. This is the principal used by the Adaboost and Bagging procedure. The latter takes p samples with replacement from the available dataset, applies the classification method chosen by the user to each of them, and takes the simple arithmetic average of their outcome to establish the final classification. The Adaboost procedure only differs in that sampling changes as a function of the results of model applications, as observations that are incorrectly classified upon application i have a greater chance of being included in sample i+1, while those classified correctly based on partial sample i have less chance of being included in sample i+1. The final classification in this case will also be into the class where the observations wound up most frequently during the application of the model p times.

The performance of classification methods is sensitive to the relevance of the independent variables used to build the model. Different input variables using the same classification method yield different accuracy rates. The diversity essential for the effectiveness of ensemble methods can also be achieved if a sample with replacement is used from the available variables instead of the available observations. In the literature, this method is referred to as "random subspace".

The first approach is applied in this study: the case where the use of samples with replacement taken from the observations ensures diversity within the group. The article compares the aforementioned Adaboost and Bagging method using the data of Hungarian

corporations, which, as far as the authors are aware, is the first of its kind in an academic publication of Hungarian economic literature.

3 An overview of the literature

The use of ensemble methods is currently topical in the international literature on bankruptcy prediction. The following section presents some of the findings of comparative analyses published over the past years, without attempting to be comprehensive.

Alfaro et al. (2008) compared the predictive power of the Adaboost method as applied to neural networks and decision trees. According to the findings of those authors, the models built using the ensemble procedure yielded far better results than neural networks and even linear discrimination analysis.

In contrast, using data from Russian manufacturing firms, Fedorova et al. (2013) did not find any significant difference between the use of neural networks alone or in conjunction with the Adaboost procedure.

Ensemble methods apply a single classification method multiple times. The performance of classification methods, however, is substantially influenced by the quality of the explanatory variables used, which highlights the importance of variable selection in bankruptcy prediction. Wang et al. (2014) posit that the accuracy of bankruptcy models may deteriorate considerably with the presence of unnecessary explanatory variables among the input variables. Accordingly, the authors attempted to integrate a variable selection procedure into the Adaboost method. The accuracy rate of bankruptcy models built using complex methods significantly exceeded those of traditional ensemble methods, as well as the most commonly used individual techniques.

The majority of studies on bankruptcy prediction present a comparative analysis of the various methods available (Sánchez-Lasheras et al., 2012). The data mining methods suitable for classification purposes and the development of supporting IT tools form the basis of this, and the main motives for such comparisons stem from the absence of a consensus on the optimal method for bankruptcy prediction (Oreski et al., 2012). The outcomes of these comparisons of various methods suggest that different methods yield the highest accuracy rates in different cases. This begs the question of whether a similar pattern can be observed for ensemble methods. Marqués et al. (2012a) attempted to find the answer, comparing the performance of seven classification methods with the six most frequently used ensemble methods based on the databases of six bankruptcy models. Their findings suggest that the C4.5 classification procedure yielded the most reliable results of the various ensemble methods. Accordingly, this article also uses that technique.

Marqués et al. (2012b) try to enter the question of whether the concurrent application of two ensemble method approaches (sampling based on observations and on variables) would improve the forecasting ability of the models. They conducted their analyses using six different bankruptcy model databases. The results suggest that the concurrent use of ensemble methods achieved better results than those obtained by individual procedures or a single ensemble method.

A special set of ensemble methods consists of applying several different classification procedures to a full set of data instead of applying a single method multiple times to a subset of observations and/or variables within the training dataset, with the results being combined to yield the final classification of observations into different groups. The work of Cao (2012) in this domain deserves a mention, as it attempts to combine the results of various methods using the data of corporations quoted on the Chinese stock market. Although Cao's findings significantly exceeded the accuracy rates achieved using individual methods, it should nevertheless be noted that, contrary to traditional ensemble methods, the author did not perform analyses; therefore, there is no empirical research evidence corroborating whether ensemble methods applying a single classification method several times or procedures incorporating the outcomes of multiple classification methods can be regarded as superior in bankruptcy prediction.

4 The examined dataset and the research methods used

4.1 Sample

In an attempt to answer the questions posed by the study, a sample comprising 976 elements compiled from a data collection of the authors and consisting of solvent and insolvent corporations (in a ratio of 51/49 per cent) was used. Accordingly, the sample is not representative by any means, which is not uncommon in bankruptcy prediction. The overrepresentation of insolvent companies is due to the fact that data mining procedures based on machine learning are prone to specialising on the attributes of the dominant group in cases of unequal distribution (Horta and Camanho, 2013), which may result in the overly low accuracy rate of insolvent corporations in bankruptcy prediction. For the purposes of sampling, corporations were considered to be insolvent if they were under bankruptcy or winding-up proceedings at the time of data collection, according to the Trade Register.

Criteria adhered to during sampling:

1. Only in the sample were observations featuring data available for at least the three past years in the website of the Ministry of Justice and Public Administration's Company Information and Electronic Company Registration Service.[5] This sampling criterion was necessary to eliminate very new businesses, which are more similar to older, insolvent corporations than functioning ones due to their initial difficulties (Du Jardin, 2010). In addition, the study also uses dynamic financial ratios that compare corporations' latest observed financial ratio values to data pertaining to the previous period, which requires the availability of financial ratio values at least for the past three years.

2. Observations for companies that failed to generate sales revenue for two consecutive years were not included in the sample. This is because such corporations do not conduct material business activity, and their inclusion in the sample could distort the outcomes of the models.

3. Observations featuring financial ratios that did not exhibit any deviation throughout the at least three-year horizon were not included in the sample. With those, the standardised values needed for the calculation of dynamic financial ratios used in the study could not be calculated, as the deviation of the observed data was used as the basis of basis of comparison for the calculation.

According to Du Jardin (2010), the common approach in bankruptcy prediction is to use the financial ratios that have proven relevant in other studies as the explanatory variable. This study also follows this approach. When selecting input variables, the ratios of the first Hungarian bankruptcy model (for more detail, see Virág and Hajdu, 1996) and our own data were used. Table 1 lists the names and calculation methods of the 17 ratios. Virág et al. (2013) discuss the contents of the ratios in detail. The different ratios were calculated on the basis of balance sheet items and the relevant profit and loss account rows at their closing date value.

Return on equity, an indicator frequently used in bankruptcy models, often poses the problem of dual negative division (Kristóf, 2008), for which the literature does not present a clearly preferred method; therefore, this indicator was not taken into account in the calculations.

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5 http://e-beszamolo.kim.gov.hu/kereses-Default.aspx

Table 1
Name and calculation method of the ratios used in the empirical study

Indicator	Calculation method
Liquidity rate	Current assets/Current liabilities
Quick ratio	(Current assets-Inventories)/Current liabilities
Liquid assets ratio	Liquid assets/Current assets
Cash flow/Liabilities	(Net profit+Depreciation write-off)/Liabilities
Cash flow/Current liabilities	(Net profit+Depreciation write-off)/Current liabilities
Capital stock	(Fixed assets+Inventories)/Equity
Asset velocity	Net sales/Balance sheet total
Inventory velocity	Net sales/Inventories
Receivable velocity	Receivables/Net sales
Indebtedness	Liabilities/Balance sheet total
Equity ratio	Equity/Balance sheet total
Creditworthiness	Liabilities/Equity
Return on sales	Net profit/Net sales
ROA	Net profit/Balance sheet total
Receivables/Current liabilities	Receivables/Current liabilities
Net working capital ratio	(Current assets-Current liabilities)/Balance sheet total
Company size	Natural-based logarithm of the stock of assets

Quotient-type ratios also present another typical problem that arises when the denominator is zero. This issue is often handled by regarding such data as missing values, which is then replaced by a median observation value or an extreme percentile. It should be pointed out, however, that the former approach does not necessarily provide consistent values to bankruptcy forecasting models, while in the latter case, the substitution of the value in question could be sample-specific. This study opted for the approach of choosing 1 in cases where the denominator would be zero.

The sample based on the above criteria yielded a database containing the financial ratios of 976 Hungarian corporations and their deviations from the industry average[6] for the 2001–2012 period. The last business year observed for the observations included in the sample cover the 2009–2012 interval. Due to the random nature of the sample, it is highly heterogeneous, including micro-enterprises with small volumes of assets alongside medium-sized and large enterprises. The sample is also heterogeneous in terms of activities, and it includes the key areas of the economy (agriculture, industry, commerce, IT, etc.). Despite this strong heterogeneity, the models presented in the article feature an accuracy rate of about 80 per cent, meaning that they should be able to function as a

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6   The sectoral classification of the corporations included in the sample was based on the data included in the publicly accessible online Trade Register, effective on the sampling date.

basis for a practical application of the conclusions drawn from the findings of the study and, hopefully, spur additional research.

4.2 Research methods

The primary objective of the study is to compare the forecasting performance of the Adaboost and Bagging procedures using the C4.5 classification method, a data mining procedure yielding a decision tree. We chose (p) 100 as the number of members for the ensemble methods and at least five observations were required for the C4.5 procedure to form a new branch. The last branches of the decision trees generated were classified into the group where the ratio of the specific group (solvent/insolvent) was higher.[7] Nyitrai (2014) briefly presents the methodological background of the classification technique; see Quinlan (1993) for in-depth coverage of the topic.

The predictive power of the examined methods was estimated by using a 100-fold randomised distribution of the sample. The procedure consists of distributing the available dataset into a training and testing sample in a proportion of 75/25 per cent using 100 randomly chosen distribution points. Forecasting capacity was measured as the average of the accuracy rate of the 100 testing samples. The accuracy rate of models refers to the ratio of correctly classified observations as compared to the total number of observations.

The other objective of the article is to examine the use of the deviation of financial ratios from the industry average, alongside or instead of raw financial ratios in the models, as well as dynamic financial ratios quantifying the correlation of the financial ratio of the most recently observed year with the corporation's earlier equivalent financial ratio values. This was quantified by means of the following formula:

$$\frac{X_{i,t-1} - X_{i,min_{(t-2;t-n)}}}{X_{i,max_{(t-2;t-n)}} - X_{i,min_{(t-2;t-n)}}}$$

In the formula, i refers to a specific corporation, t to the year we would like to make prediction and n the length of the time series available for the observation (number of years observed).

As the ratio time series of the corporations observed contained outliers in many cases, the financial ratio time series were standardised for all observations by using the time series

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7 This approach should only be used when the two groups are present in equal proportions in the sample. Otherwise, the performance of the model should be assessed using a GINI indicator or the ROC curve, avoiding the definition of subjective cut-off values.

average and deviation,[8] then values falling outside the two deviations were replaced with the closest values still within the range[9] in order for the above formula to most accurately express the correlation of the most recently observed ratio of the corporation under review with the equivalent value of the preceding period.

The reader may why ask outliers were defined by using the two deviation ranges for the ratio time series. As a statistical rule of thumb, deviation ranges of 5, 3 and 2 are used for eliminating outliers. The "strictest" value (deviation of 2) was chosen because the time series available for calculating the average and deviation for the observations consist of 2–11 elements. Experimental calculations showed that in the case of such short time series, bankruptcy models based on dynamic ratios exhibited superior predictive performance if "stricter" rules were applied.

5 Findings of empirical studies

The research presented in the study defined two objectives:

1. To examine whether there is any significant difference between the accuracy rates of the Adaboost and Bagging procedures when applying the C4.5 classification method. Here arises the question of whether it is at all worthwhile to use ensemble methods instead of just using the C4.5 procedure alone. To examine this topic, calculations were also performed with the selected classification method alone.

2. To compare raw financial ratios, the dynamic ratios generated from them, and the use of the deviations of raw ratios from industry averages as input variables in the aforementioned models.

The research methods presented in the previous section were used in an attempt to answer these research questions. Table 2 presents the outcomes of the calculations.

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8   When calculating the average and deviation for standardisation, data was used between time points t-2 and t-n of the ratio time series of the observations.

9   To allow the most accurate estimation of the financial position of the corporation under review in the most recently observed year in function of the preceding period, the data pertaining to the most recently observed year (t-1) was not replaced nor was it used for substitution.

Table 2
Accuracy rates of experimental model applications on average for the testing samples

Methodology	Input variable group							Average
	raw	industry	dynamic	raw dynamic	raw industry	raw dynamic industry	dynamic industry	
Adaboost	78.80%	76.06%	78.67%	81.33%	79.33%	81.51%	80.34%	79.43%
Bagging	79.88%	77.97%	79.91%	83.01%	79.76%	82.17%	81.29%	80.57%
Independent	74.34%	70.64%	72.37%	75.12%	73.29%	74.91%	73.31%	73.43%
Average	77.67%	74.89%	76.98%	79.82%	77.46%	79.53%	78.31%	

Based on the findings, the following conclusions can be drawn:

– The accuracy rate of the Bagging procedure surpassed that of the Adaboost in all cases; however, this difference was typically around 1 percentage point.

– When applying the C4.5 method alone and in the case of the Bagging procedure, the best performance was achieved when dynamic ratios were included alongside raw ratios; however, in the case of the Adaboost method, the best predictive performance was achieved by the model where all three variable groups were included in the group of independent variables. Among the models created, the best predictive performance was achieved using the Bagging method when dynamic ratios were included alongside raw ratios among explanatory variables.

The question of the extent to which these results stem from sampling and idiosyncrasies remains open; in other words, this means the significance of accuracy rate differences among the various methods. In view of the fact that, based on the calculations performed here, a normal distribution of accuracy rates cannot be presumed for any of the three procedures under review, the significant difference between classification accuracy was examined using the Mann-Whitney test, the non-parameter equivalent of the independent sample t-test (Du Jardin, 2010). The test yielded a significant difference in all three comparisons for all relevant significance levels, which means that the discrepancies found in Table 2 are significant. Thus, the Bagging procedure's accuracy rate in the case of the C4.5 method significantly exceeds that of the Adaboost procedure, albeit slightly; and the performance of both ensemble methods significantly exceeds the results achieved by the application of the C4.5 classification method alone. The difference was far greater in the latter case, around 6–7 percentage points.

The other objective of the study was to compare the accuracy rates of the models built using various groups of variables. The findings in Table 2 suggest that the Bagging procedure and the application of the C4.5 method alone yield a better predictive performance if the dynamic ratios generated from raw financial ratios are included alongside the latter. The Adaboost procedure forms an exception, exhibiting the best predictive performance

when all three variable groups were included among the models' independent variables. The testing of the significance of the difference between the various accuracy rates obtained using different sets of variables also calls for the verification of their normality. The pertaining test rejects the assumption of a normal distribution of accuracy rates at all relevant significance levels, so a nonparameter test must be used to examine the significant differences among the outcomes yielded by the application of different variable groups. Table 3 presents the p-values of the Mann-Whitney test applied in pairs among the different independent variable groups.

Table 3

P-values of the Mann-Whitney test applied to the average accuracy rates of the variable groups under review

	raw	industry	dynamic	raw dynamic	raw industry	raw industry dynamic	industry dynamic
raw	-	0.000	0.134	0.000	0.827	0.000	0.003
industry		-	0.000	0.000	0.000	0.000	0.000
dynamic			-	0.000	0.220	0.000	0.000
raw dynamic				-	0.000	0.389	0.000
raw industry					-	0.000	0.002
raw industry dynamic						-	0.001
industry dynamic							-

In cases where p is close to zero, it can be presumed with a great likelihood that the average accuracy rates included in Table 2 differ for reasons other than sampling idiosyncrasies. This was fulfilled in most cases. Test outcomes can be interpreted in the following manner.

No significant discrepancy were seen in the following cases:

– between raw financial ratios and dynamic rates;

– between raw financial ratios and cases where deviations from the industry average were also included;

– between dynamic ratios in cases where deviations from the industry average were also included alongside raw financial ratios;

– in cases incorporating all three groups of variables and where deviations from the industry average were also included alongside raw financial ratios.

The differences in the averages included in Table 2 are significant, except in the above cases. This confirms statistically that the best predictive performance was achieved when

dynamic ratios were included alongside raw financial ratios among the input variables. The case where deviations from the industry average were included among independent variables does not differ significantly from this. This suggests that the latter has no added value in terms of the models' predictive power. A surprising outcome is that the accuracy rate achievable using deviations from the industry average is significantly the weakest in all possible combinations.

6 Summary

The main reason for this study was the trend in the international literature recommending the use of ensemble methods in bankruptcy prediction instead of an application of the classification method alone. Research findings confirm that the accuracy rate of models can thus be improved significantly.

Given the fact that no similar study has yet been published in the Hungarian economic literature, the performance of the two most commonly used ensemble methods (Adaboost and Bagging) were compared with the application of the C4.5 classification method. This choice was based on the fact that the comparative analysis of Marqués et al. (2012a) revealed this procedure as yielding the greatest gains in performance when using one classification method alone.

Based on the findings, a significant improvement can be achieved when using the C4.5 procedure in combination with ensemble methods, compared to the use of the method alone, for both the Adaboost and Bagging procedures.

Three variable groups were compared in this study: raw financial ratios, the dynamic ratios generated from them (which quantify the correlation of the most recently observed ratio for a specific corporation, compared to the equivalent value for the preceding period), and the deviation of raw financial ratios compared to the industry average. The relative industry ratio formula recommended by Platt and Platt (1990) were replaced with custom industry ratios, as the interpretation of the former is problematic in the case of financial ratios measured on an interval scale. The research findings reveal that the predictive power of models based on the deviation of corporate ratios from the industry average significantly falls short of the accuracy rate achievable using raw and dynamic financial ratios in all possible combinations examined in the study.

The best predictive performance was achieved when dynamic ratios were included alongside raw financial ratios among the models' input variables. This result is suggestive of a synergy between these two groups of variables. The findings of the nonparameter

test performed among the average accuracy rates of the examined variable groups suggest that the average predictive power resulting from the joint application of these two variable groups significantly exceeds the result achieved by any combination of the three groups of variables. The sole exception was the concurrent application of all three variable groups; however, the accuracy thus achieved does not differ significantly from the accuracy achieved by using the raw ratios and the dynamic ratios generated from them, which suggests that industry deviations have no added value in terms of model performance.

It is important to emphasise that these conclusions were drawn solely from an application of the C4.5 method. It may be worthwhile to examine the robustness of these findings using other classification methods as well.

While in this study the models based on the rate of deviation from the industry average did not result in a material improvement, compared to models based on raw financial ratios, this result does not mean that the use of the industry mean is unwarranted in bankruptcy prediction. In a Hungarian context, for instance, Kristóf (2005) experienced an improvement in predictive performance based on his research conducted on the first Hungarian bankruptcy model database. Kristóf attributed the improvement in part to the application of industry ratios. Therefore, a possible direction for future research could consist of examining ways of managing interpretation issues of relative industry ratios in cases of financial ratios measured on an interval scale, so that the financial ratios compared to the industry average might improve the models' predictive power. Based on the findings of the article, examining the classification performance that can be achieved by using the dynamic financial ratios calculated from industry ratios could be a relevant area of research.

Another question warranting further scrutiny is why the models' predictive powers show no improvement with the application of financial ratios compared to industry averages. One possible explanation could be that the scopes of activity of the corporations included in a sample were defined based on the principal activity "Standard Classification of All Economic Activities (TEÁOR)" listed in the Trade Register. In fact, the corporations observed may rely on other ancillary activities, on which the publicly available databases did not yield any information. It can be assumed that these ancillary activities have sufficient significance that the industry averages based on the principal activities' TEÁOR codes are less suitable for use as bases of comparison in case of financial ratios.

Finally, it is necessary to highlight another limitation of the analysis, the resolution of which could also be a subject of future research. As a statistical rule of thumb, this study used a range of two deviations to identify outliers. This "definition" was the authors' own arbitrary choice and may not necessarily be the optimal one. The analyses of this study can be conducted again, using other definitions of outliers, and the results compared.

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How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism

Tamás Bánkuty

George A Akerlof & Robert J Shiller
Animal Spirits

Princeton University Press, 2010, ISBN: 978-0-691-14592-1; XXVIII + 230 pp.

Taking a look at the 2008 crisis, the authors – Nobel laureates Shiller and Akerlof – compare the global economy to a roller coaster, with its highs and lows, with the adventure park's management giving free rein to the ups and failing to impose any speed limits, resulting in some people being oblivious to the fact that they were even on a roller coaster, only realising it as they began to plunge.

Current economic models are only capable of giving insight into the functioning of the economy if individuals have economic motives and give rational answers to them. However, traditional models fail to provide an answer in other cases (e.g. in case of non-economic motives and rational answers, economic motives and irrational answers or non-economic motives and irrational answers).

In order to understand the workings of the economy, say the authors, we must understand the deep underlying emotional factors (Animal Spirits) that are the driving forces of human thoughts and actions, as economic events are often driven by psychological forces. The authors' assumption that changing thought patters may stand behind economic events fully contradicts traditional economic theory. Akerlof and Shiller identify five Animal Spirits that shape the economy. The first is confidence and its multiplier effects. Economists explain every economic crisis that has affected the United States by a loss of confidence,
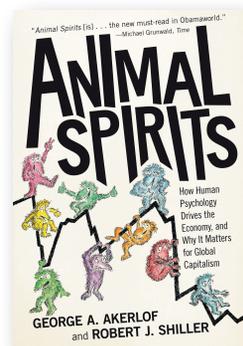
but they failed to understand precisely what confidence meant and think that confidence is rational, while in fact its main feature is precisely that it is irrational, as truly confident people often disregard certain information and act according to their true beliefs. The second factor is fairness, as individuals strive to be honest, to meet their own and other people's expectations and therefore avoid unfair conduct in the realm of business as well. Corruption and bad faith, i.e. the dark side of economic life are the third factor to be taken into account. The drawback of capitalism is that it does not necessarily produce what people really need, but what they think they need and are willing to pay for. If people are willing to pay for authentic drugs, capitalism will produce these drugs, but if there is demand for useless placebos, it will also meet this demand. This is why consumer protection is of the utmost importance. An illustrative example is that in the 1930s, the most popular card game was based on cooperation, while bluff-driven poker has become the most popular game nowadays. One of the key preliminary assumptions of modern economics is that people see through inflation, but in fact this is oftentimes not the case. For example, employees see wage reductions as unfair even in the event of deflation. Taking this phenomenon into account would yield an entirely different macroeconomy and lead to entirely different economic policy conclusions, so this is the fourth factor to be taken into account. Human thought is comprised of stories with their internal logic in dynamics, which ultimately shape our behaviour. Due to their decisive role, these stories – the fifth psychological factor – should also be taken into account in economics.

Before the crisis, everyone widely subscribed to the classic economic theory suggesting that "everything is alright", as free competition based capitalism is perfect and stable, and people make rational decisions on the market according to Adam Smith's free market theory. We see what happens when people are irrational, wrong or misled.
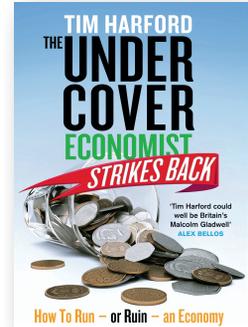
The Undercover Economist

András Kómár

Tim Harford
The Undercover Economist Strikes Back

(How to Run – or Ruin – an Economy)

London: Little, Brown, 2013

ISBN HB 978-1-4087-0424-0, 320 p.

Written by popular British economist, journalist and television personality Tim Harford, this book provides an overview of the key areas of macroeconomics and economic governance in the form of a dialogue with the aim of spreading professional knowledge. The author guides his layman dialogue partner through 15 chapters, each dedicated to a different topic to give a grasp of macroeconomic processes, providing anecdotes to illustrate the theories and economic governance models, preparing his partner for the challenges he might face at the helm of a (national) economy and the available instruments for addressing them.

The author focuses in particular on the options available to national economies in the face of recession, unemployment, inflation and other anomalies affecting them, and analyses whether economies reacted adequately to the economic crisis that emerged in the wake of the 2007 financial crisis and whether economic theories proved helpful for leaders of national economies.

Besides theories, the book presents many colourful stories about famous economists, making it a pleasure to read (such as New Zealand's Bill Phillips, father of the Phillips curve, who worked in a gold mine, was a crocodile hunter, served as a pilot in the British air force during World War II, received several medals for his acts of valour, and was held captive for three years in a Japanese concentration camp as a prisoner of war, was freed weighing 45 kilograms and dubbed the Indiana Jones of economics on account of his adventurous life).

In his discussion of economic stimulus, Harford explains how the IMF's excessively low, and as it later transpired, flawed estimates of the multiplier effect of fiscal stimulus and the 90 per cent government debt-to-GDP reference value touted by Harvard professors

— based on a botched calculation and also debunked later down the line — side-tracked nations struggling to manage the situation during the crisis that started in 2007 (as many of these countries based their decisions on them on account of their influence), prompting nations to adopt austerity measures when economic stimulus would have been called for instead, even at the cost of a temporary rise in public debt.

Unemployment and the fight against it are a recurrent theme throughout the book. Employment occupies a special role during times of economic downturn, as higher unemployment during recessions is the source of some of the greatest, and also the hardest to correct, social damage, and therefore economic policymakers must make employment a priority.

In the context of the fight against inflation, the book presents central bank independence and the emergence of inflation targets, focusing in particular on self-restriction and the functioning of commitment theories, alongside central bank credibility.

In the field of economic governance, the author explains that while statistical indicators (such as GDP) are useful when forming policy decisions, an astute (economic) policymaker is aware of their incapacity to reflect the complexity of social reality and so they rather focus on identifying social issues and on addressing practical problems (for instance to fight unemployment or the standard of public services), rather than adapting to indicators.

The book says many of the current mainstream macroeconomic approaches call for a review and should incorporate new fields (such as behavioural economics or the complexity theory), and an overly theoretical approach should be replaced by greater focus on addressing real, experienced problems. Harford is convinced that the resolution of current socio-economic issues calls for a renewal of economics (and specifically, macroeconomics).
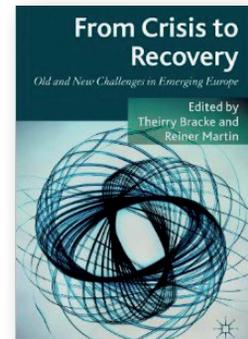
Old and New Challenges in Emerging Europe

Nikolett Vágó

Ed by Thierry Bracke & Reiner Martin

From Crisis to Recovery: Old and New Challenges in Emerging Europe

Basingstoke: Palgrave Macmillan, 2012

ISBN: 9780230355286 HB; 240 pp.

The book was written based on the eponymous conference hosted by the European Central Bank (ECB) on 5-6 July 2011 in Frankfurt. The first two chapters cover the presentations held by Lorenzo Bini Smaghi and Jürgen Stark, both members of the ECB's Executive Board at the time. The subsequent chapters comprise the papers serving as the basis of the presentations held during the five sections of the conference, supplemented by a summary of the comments made at the event. The focus of the analyses were Europe's emerging countries, which suffered such a drastic decline during the 2008-2009 economic crisis that their performance still lags compared to other emerging regions of the world even after the crisis.

Examining the growth models of emerging European countries, the authors address the very relevant question of whether the European growth model of the years leading up to the crisis was unsustainable and whether it may have contributed to the worsening of the crisis, and also provide an overview of the main characteristics needed for a new, sound growth model fostering convergence with the developed world. Besides economic growth, the authors also address with great emphasis the integration of the financial system and many other financial stability issues. The rest of this article provides an overview of the main topics and findings of the papers comprising the book, partly in chronological and partly in logical order.

Coricelli[1] gives a positive assessment of the European integration model in the years leading up to the crisis, explaining that it fostered wage convergence between developed and less developed European countries. Bank loans played a predominant role in capital flows, and foreign ownership in the domestic banking sector. The institutional reforms linked to European integration fostered parallel foreign trade and financial integration, viewed by Coricelli as one of the cornerstones of sustainability.

The rapid growth during the upswing, however, was based on an unsustainable growth model. Dynamically growing domestic demand was the main driver of growth, fuelled by the inflow of foreign capital, abundant bank lending and rising asset prices. Smaghi highlights the fact that this did not go hand-in-hand with higher domestic supply resulting from productivity and capacity growth, even engendering internal and external real economic and financial imbalances. While expectations for future increases in incomes led to optimism, lower risk premia and excessive credit demand, low interest rates engendered excessive risk-taking and inordinate investment in non-tradable sectors (e.g. construction). The current account exhibited an increasingly large deficit in the majority of emerging countries, inflation accelerated and the labour market became tighter.

In the countries under review, the crisis was followed by deep recession, hitting countries with the largest current account deficits the hardest. Most of them were affected by the sudden stop effect, net capital inflow fell, as did export in the wake of the collapse of global trade. Drying up lending and the bursting of the property bubble dampened domestic demand. The crisis resulted in a substantial decline in government revenues and for higher budget deficits than in the past and compared to Asian and Latin American emerging countries. Coricelli explains that large net foreign debt was mainly accumulated in places where the speed of financial integration outstripped that of trade integration. The vulnerability of these countries to fluctuations in foreign investor sentiment stems not only from the size of the exposure, but also from sustainability issues linked to debt.

The chapter by Korniyenko[2], Ohnsorge[3], Ricka[4] and Zettelmeyer[5] gives an overview of the position of emerging European countries in finding their way out of the crisis. Although as a result of crisis management measures countries within the region started to return to a path of growth in 2010, albeit to different degrees, they still face substantial challenges over the medium term. The region needs a new growth model, stable and sustainable in the long run, that builds on balanced foundations. Smaghi deems that it was primarily domestic political decisions that gave rise to the excess vulnerability of emerging countries.

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Economic convergence and European integration continue to be the main engine of economic growth. In the short run, productivity and export growth would be necessary, while in the long run – as a result of structural reforms – tradable sectors should be strengthened.

Mooslechner[6] and Reininger[7] conclude that relying partially on external funding is a natural part of countries' convergence. However, during the crisis, capital outflows most severely affected countries whose banking sectors featured large stocks of net foreign assets. Domestic deposit business lines should therefore be shored up. Developing the corporate bond market could support greater diversity to the funding of the real sector. The market for domestic bank bonds also needs to be reinforced in the majority of emerging countries. The inflation targeting system still provides an adequate framework for monetary policy, but macroprudential and supervisory regulation should be strengthened in parallel. The banking sector's resilience to shocks should also be bolstered and the development of domestic capital markets specifically supported. Coricelli calls for mitigation of the dual moral risk: while too-big-to-fail banks, counting on state guarantees, should be discouraged from excessively risky behaviour in the countries of their subsidiaries, locals in these countries should not count on foreign banks acting as lenders of last resort.

The book provides a comprehensive overview of the economic developments of the countries under review in the years leading up to the crisis, their different crisis management steps and the possible reasons behind the protracted recession. It also attempts to offer recommendations regarding the future, mainly relying on international comparisons and avoiding formal deductions. The analyses are supplemented by numerous charts and tables, making it pleasant for readers who are less versed in model based theories, but interested in economics and economic policy.

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To the margins of a Nobel Prize winner's ideas Beyond the cycles – long-term challenges of the global economy

Barnabás Virág

Lehman Brothers filed for bankruptcy protection on 15 September 2008, ushering in one of the most severe global crises of the past hundred years by aggravating problems that, until then, had been mostly limited to the US subprime mortgage market. Most forecasts had not even hinted at a meltdown of this magnitude. After the initial shock wore off, economists dedicated their attention to analysing the symptoms of the crisis and devising strategies to prevent severe negative repercussions. Although there were some disputes about the prioritisation of the root causes, there seemed to be general consensus about on the fact that what had transpired was a phenomenon that makes an appearance in market economies from time to time: a cyclical boom followed by an enormous bust ("business cycles"). In line with these assessments, during the recovery period beginning from mid-2009 the centre of attention shifted gradually to the shape and dynamics of the expected growth path. Marked by different letters of the alphabet (V, W, U, L), a multitude of scenarios were conceived in close succession.

Clearer knowledge is now available about the consequences. It did not take long for the rapid growth starting in 2009 to lose momentum. Despite protracted periods of extreme monetary easing, the output of numerous advanced economies has still not reached pre-crisis levels. Even where it did, in the foreseeable future it has no chance of approaching the growth rate of the pre-crisis years. The euro area, the most important export market of Hungary, is likely to soon enter the third period of recession. The normalisation of labour market developments is progressing even more sluggishly than growth. Unemployment rates are hovering well above pre-crisis levels, hitting younger generations especially hard. In spite of low interest rates, financial intermediation has sustained long-term damage, while corporations are tending to give up on new projects amid uncertain prospects of demand. It appears increasingly evident that this crisis is not like any other. In addition to

the deterioration in short-term demand conditions, the longer-term ability of economies to grow has suffered lasting damage.

In recent months, leading contemporary economists have been engaged in active and forward-looking debates at numerous forums about the protracted malaise of the global economy. Presented below is an overview of the most important opinions discussed in these debates as the factors most likely to have an influence on longer-term development trends.[1]

Several fascinating ideas have been proposed to explain the reasons for the sluggish recovery in recent years, perhaps the most recognised of which are those dedicated to synchronised balance sheet adjustment and a number of closely connected theories emphasising the role of financial cycles besides normal business cycles. In addition to normal business cycles, there are so-called financial cycles, which capture the cyclical movement of debt accumulation and debt repayment, materialising both at the individual level and at the level of the total economy. Descending branches of the financial cycle (i.e. when participants are in the process of repaying their accumulated debt) may lead to a weak growth environment that lasts longer than it would in case of a normal business cycle. In this case, the problem of debt overhang has materialised in several economic regions, simultaneously affecting multiple participants (budgets and households). There has thus been a limited opportunity for export expansion, which has served as a way out in other recovery periods when domestic demand dried up. The question is whether this cyclical movement of the economy and financial intermediation can fully explain the outbreak of the crisis and the ensuing slow recovery?

According to many, it cannot. In recent decades, a number of negative trends have evolved in the global economy that had already been predominant before the crisis, even though they received less attention during the years of steady growth. Since these trends have been present nearly continuously since 2009, they may imply the greatest challenge and obstacle to the growth of the global economy in the coming years. At present, one may note the four most frequently analysed factors: high debt levels, increasing income inequality, ageing societies and global warming. Partly individually and partly due to impacts mutually reinforcing each other, these effects may increasingly influence the future of the global economy.

One of the most significant triggers of the 2009 crisis was the excessive growth of debt. Despite the drastic adjustment of the behaviour of indebted participants, global debt-to-GDP has increased further since the crisis. The public debt-to-GDP ratio of advanced economies has reached the peak observed directly following World War II, while the

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1 Sources for this paper include analyses from the collection of studies entitled Secular Stagnation: Facts, Causes and Cures (a VoxEU.org eBOOK edited by Coen Teulings and Richard Baldwin, CEPR Press) and interviews with five winners of the Nobel Prize in Economic Sciences published in the Finance & Development magazine of the IMF under the title "Looming Ahead" (September 2014, Vol. 51).

indebtedness of the private sector has risen to unprecedented highs. Taking advantage of a very loose monetary policy environment in recent years, developing economies became indebted rapidly. Currently, the economies of the world see their debt snowballing to unprecedented levels. The combination of subdued growth and low inflation generally impedes improvement in debt-to-income ratios. Besides restraining consumption and the investment decisions of directly affected participants, high debt levels deteriorate macroeconomic predictability in general, which is a key factor from the perspective of longer-term decisions. This latter effect may be a particularly sensitive point, given the prevailing low interest rate environment. Indeed, a rise in interest rate levels would lead to an immediate loss of wealth for savers holding debt instruments and – through an increase in refinancing costs – may push already high debt levels even higher. Centuries of experience suggest that, in the lack of an increase in nominal income, there is little chance of solving the problem without restructuring – or partly waiving – the loans of distressed borrowers.

Analysing the relationship between income inequality and economic growth has become a part of mainstream economic thinking in recent years. The findings of the relevant research indicate that excessive growth in income inequality diminishes the long-term growth potential of the economy. The share of employees in GDP generated has been diminishing progressively for decades. The negative trend looks especially gloomy when the share of wages is examined without the top 1 per cent of income earners. Rising income inequality gives rise to gradually widening gaps in the accumulation of wealth. This trend continued inexorably even after the crisis. According to a recent report, 1 per cent of the global population presently owns nearly half of all global wealth.[2] In addition to obvious social and political risks, there may be severe, longer-term economic repercussions. Social groups in the bottom half of income distribution with a higher propensity to consume fall more and more behind, leading to a loss of demand over the short term. In the long run, this may inflict long-lasting damages on potential growth if the education and healthcare expenditures required for the development and reproduction of human capital are not available. The reduction of income inequality falls mainly in the competence of fiscal, education and employment policy.

The deterioration of demographic trends already poses serious challenges to several developed countries and may materialise as an acute problem in a number of developing economies (e.g. China). As the number of persons employable in the labour market continues to sink, ageing may put increasing pressure on large welfare systems (e.g. education, healthcare) and overstretched budgets. Although deteriorating demographic trends may be cushioned by a strengthening of migration in the short term, in practice this only means a reallocation of the problem between countries. Aside from an improvement in productivity, a long-term solution could only be achieved through the adjustment of the

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2 For further details, see the Credit Suisse Research Institute's Global Wealth Report 2014 (October 2014).

retirement age (to reflect the increase in life expectancy) and incentives for parenthood, with contributions being paid over the entire active career.

Finally, the economic consequences of climate change resulting from the extreme weather conditions seen in recent years have become more and more perceivable, even for ordinary people. Without adequate, global-scale intervention, the deterioration of the natural environment and the gradual depletion of resources may become an increasingly significant obstacle to social and economic development. Economic solutions aimed at resolving this problem – through the tax regime, for instance – have been known for a long time. With sufficient political will and globally concerted efforts, a lasting adjustment of the social value system could represent a great step forward.

Even this short list may serve to show that while the current growth deficiencies of the global economy are in part related to the special cyclical characteristics of the 2008–2009 crisis, they are likely to be influenced by longer-term trends as well. Without intervention, more than a half-century of spectacular, global economic development may remain a mere curiosity in economic history. The world's economists and economic policy-makers can rise to these challenges only by determination, long-range planning and concerted efforts.

Stock market time series forecasting with data mining methods[1]

Milán Csaba Badics

A large number of data mining methods have been introduced over the past 20–25 years to forecast stock market time series, as ever-newer and increasingly sophisticated models have appeared in the literature and in market practice. This paper demonstrates the utility of the different data mining models for active portfolio management, specifically discussing the applicability of noise filtering and hybrid methods. The primary objective has been to present a price forecast-based trading strategy that is profitable even after transaction charges. The forecasting potential of the different data mining methods was tested using the times series of OTP's closing stock prices.

JEL-codes: C45, G14, G17

Keywords: Stock time sereies forecasting, Trading strategy, Neural networks, ICA, EMD, Data mining methods

Introduction

Investors have focused their attention on the changes in stock market time series for decades, and they have experimented with a variety of methods for forecasting them. This degree of interest has prompted more and more research in academic circles into the possibilities of these forecasts. Conventional statistical and econometric economic models were used at first, but these proved only moderately effective due to the special characteristics of the time series (such as, for instance, their nonlinearity, nonstationarity and high noise-to-signal ratio). It was at this time that interest shifted to nonparametric data mining and machine learning methods, which have fewer statistical constraints and are frequently used in engineering; this toolkit then opened a new perspective, offering

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more efficient financial time series forecasting. Over the past 30 years, an increasing range of data mining methods have been introduced to analyse the changes in stock market data. Initially one of the most popular methods, different types of neural networks, was used to great advantage over the statistical methods. Since even the slightest improvement in forecasting accuracy may return huge extra profits, the search for and proper parametrisation of the optimal network continued to gain popularity in investor and academic circles alike. Nevertheless, the above-average potential of investment decisions predicated on this diminished over time, given the great success and the wide range of application. This can happen to any strategy built on forecasting, once many start to use it at the same time. This did not, however, prompt investment decision-makers to reject these methods. On the contrary, they invested more and more efforts in adopting these methodologies, which had been used successfully in miscellaneous fields of engineering, to time series forecasting. Among other things, they started to use modified versions of the rest of the data mining methodologies (SVR, Random Forest), as well as noise filtering (ICA, PCA) and decomposition-based (EMD, wavelet) techniques. Besides, the use of multi-step hybrid methods and the combining of different forecasts also became widespread. Countless methods and models have been developed to date, with the stock market time series forecast-based strategy being one of the most popular. Their use, however, represents a serious challenge, as efficient forecasting presupposes familiarity with the advantages and disadvantages of the different models.

For this reason, this paper focuses on the best-known data mining methods suitable for active portfolio management, as well as their advantages and disadvantages, discussing which should be used when and how, and also touching upon the most important current research trends. The objective is to present the entire process, from the selection of stock prices to forecasting (OTP and MOL daily closing prices in this paper), through the definition of the necessary input variables and available data mining methods right up to the execution of the trade, essentially giving the reader a roadmap for forecast-based active portfolio management.

1 Stock market time series characteristics, forecast methods and difficulties

Financial time series are difficult to forecast, as they tend to be noisy, nonstationary, nonlinear and chaotic, and often incorporate structural breaks as well (*Hall,* 1994; *Li,* et al., 2003; *Yaser* and *Atiya,* 1996; *Huang* et al., 2010; *Lu* et al., 2009; *Oh* and *Kim,* 2002; *Wang,* 2003). It is for these reasons that forecasting financial and stock market time series is one of the greatest challenges for market participants.

The forecasting methods used in studies fall into two categories: statistical/econometric and data mining/machine learning methods. Traditional statistical approaches include linear regression, calculation of moving average, exponential smoothing, and ARIMA, GARCH and VAR methods. These methods return good forecasting results if the financial time series are linear or nearly linear, although this is not typical in real life. Besides, the conventional statistical methods demand large volumes of historic data, which must also have a normal distribution as a precondition for a good forecasting result (*Cheng* and *Wei,* 2014).

Data mining methods forego these requirements, as they are better able to model the nonlinear structure of time series. Besides neural networks, these include Support Vector Machines (SVM) and the different types of decision trees. These data-driven and nonparametric methods can reveal and manage the unknown interconnections between empirical data, and they are therefore more efficient in forecasting the changes in complex and nonlinear stock market data (*Chen* et al., 2003; Chun and Kim, 2004; *Thawornwong* and *Enke,* 2004; *Enke* and *Thawornwong,* 2005; *Hansen* and *Nelson* 2002). The increasing number of data mining articles and applications appearing in recent years demonstrates that these applications are competitive and have significant advantages over the traditional methods (*Lu* et al., 2009; *Duan* and *Stanley,* 2011; *Huang* et al. 2010; *Ni* and *Yin* 2009).
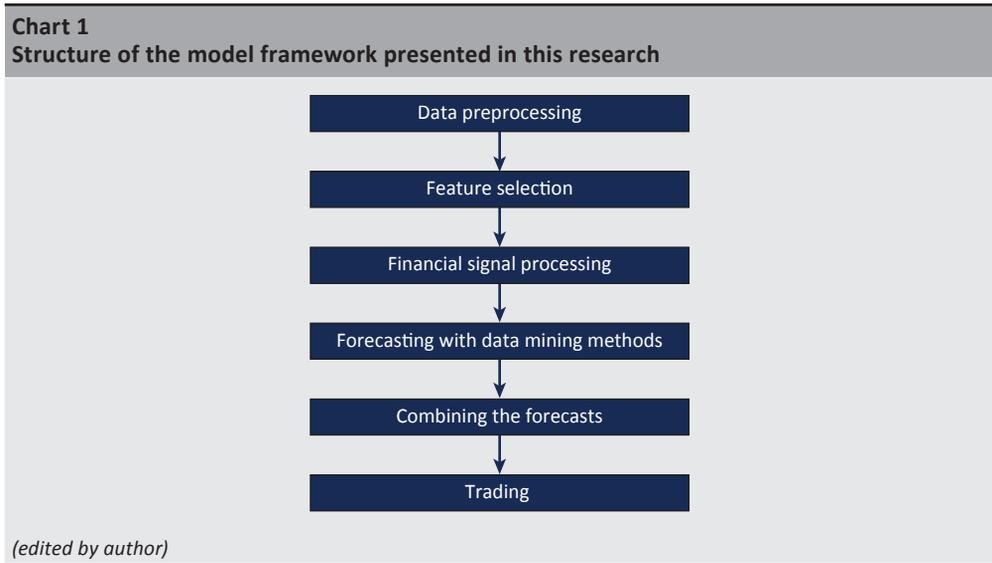
Every data mining method has disadvantages, however, which is why the crossing (hybridising) of different data mining techniques is increasingly popular in academic circles. The basic idea is that hybrid methods will eliminate the disadvantages of the individual methods and create synergies to improve forecasting accuracy. Basically, the hybrid methods consist of three different types. The first is based on the "divide-and conquer" principle, which holds, essentially, that it may be worthwhile to divide complex problems into several smaller ones and resolve these sequentially. One of the most widespread applications of this method in stock market forecasting is Empirical Mode Decomposition (EMD) (*Cheng* and *Wei,* 2014). In the second type, an attempt is made to filter out the noise from the input variables of the models, facilitating a more accurate result. This is the most frequently used method, Independent Component Analysis (ICA), and it is based on the principle that creating independent components (ICs) from the input variables allows isolation of the component containing the noise; if this component is then removed, forecasting accuracy will improve (*Lu* et al., 2009). The third method involves combining the forecasts of the different data mining models, from simple aggregation through Bayesian averaging to Lasso regression. The methods of combining are predicated on the principle that forecasting variation may be reduced by taking all the methods into account at the same time (*Sermpinis* et al., 2012).

The following challenges and difficulties are faced when creating a stock market forecast-based active portfolio management strategy:

1. the selection of the appropriate explanatory variables (*feature selection*)
2. noise filtering, signal processing (*financial signal processing*)

3. forecasting with a data mining method, with the parameters optimised (*forecasting with data mining methods*)
4. combining different forecasts (*combining data mining techniques*)

Chart 1 shows the entire process, including the preparation and transformation of data and trading.

Chart 1
Structure of the model framework presented in this research

Data preprocessing

Feature selection

Financial signal processing

Forecasting with data mining methods

Combining the forecasts

Trading

(edited by author)

2 Process of building a data mining model

2.1 Noise filtering and hybrid methods

Accurate forecasting presupposes identification of the latent variables underlying stock price movements and using them in the modelling process. Independent Component Analysis, a method widely used in engineering, is suitable for solving this type of problem. This process is able to reveal hidden components that drive the changes in data series, isolating them in such a way that they depend on one another as little as possible and their linear combination can be used for reconstructing the original data series (*Kapelner* and *Madarász,* 2012).

Independent Component Analysis allows locating and removing the noise component from the data used in the modelling process, thus improving the accuracy of the forecast (*Lu,* 2010). This is a method frequently used in engineering for *signal processing* (*Beckmann* and *Smith,* 2004), *noise filtering in facial recognition systems* (*Déniz* et al., 2003) and, of course, *stock market time series forecasting. Oja* et al. (2000) used Independent Component Analysis to reduce the noise/signal ratio in the model input data and then forecast exchange rates with an autoregressive model.

The EMD decomposition process uses a slightly different approach than noise filtering, as it tries to filter out the noise from the original time series rather than the input variables. The aforementioned "divide and conquer" principle is the essence of empirical mode decomposition, which was developed by *Huang* et al. (1998) and is based on the Hilbert-Huang transformation. This decomposes the original time series into a finite number of IMFs, which are easier to manage. Because they are highly correlated, it is simpler to forecast them one by one and then, after aggregation, arrive at the forecast for the original time series (*Cheng* and *Wei,* 2014). This method is often used for *decomposing earthquake signals* (*Vincent* et al., 1999), *forecasting wind speed* (*Guo* et al., 2012), and even *determining tourism demand* (*Chen* et al., 2012). In addition to ICA, therefore, this method is combined with a data mining model in the current study.

2.2 Possible data mining methods

The different neural networks are the most widespread and popular of the data mining methods used to forecast financial time series (*Cao* and *Parry,* 2009; Chang et al., 2009; *Chavarnakul* and *Enke,* 2008; *Enke* and *Thawornwong,* 2005). These data-driven, nonparametric methods do not require strong model assumptions or advanced statistical assumptions about the input data, and they are able to model any kind of nonlinear function (*Vellido* et al., 1999; *Zhang* et al., 1998). In their article reviewing nearly 100 studies, Atsalakis and Valavanis (2009) point out that, of all the different kinds of neural networks, feed-forward neural networks (FFNN) and recurrent neural networks (RNN) are the ones most frequently used by researchers to forecast financial time series. The most popular feed-forward neural network is the back-propagation neural network (BPN), whereas the Elman and Jordan networks are the most popular of the recurrent networks.

Further solutions to forecast time series include Support Vector Machines, decision trees and genetic algorithms. The large number of available methods may make it highly time-consuming to identify the most efficient option for a particular time series and, as we have seen, each also has its advantages and disadvantages; therefore, more than one method is often used in the modelling process and the results are then combined. A feed-forward neural network with one hidden layer can model any kind of complex problem (*Chauvin* and *Rumelhart,* 1995), which is why it is used here.

2.3 Combining data mining methods

One of the most interesting questions in the literature on forecasting concerns the ways in which different forecast techniques may be combined. Given the advantage of compensating for the deficiencies of individual methods, several researchers have pointed out the merits of combining different techniques, especially for short-term forecasts (*Zhang* and *Wu* 2009, *Armstrong* 1989). Although Timmermann (2006) notes that simple averaging might compete with the more sophisticated techniques, there are indeed situations when one method is much more accurate than others, making averaging insufficiently efficient. *Granger* and *Ramathan* (1984) recommended the regression technique as having promising results, whereas *Swanson* and *Zeng* (2001) advocated Bayesian averaging. Almost all of the authors have asserted that it is necessary to combine different forecasting methods, but there has been no agreement on when and which should be employed; therefore, several combinations have been used in this analysis.

3 Methods used in this paper

3.1 Independent Component Analysis

If data mining models are taught without taking into account their potential noise content, this may weaken the ability to generalise to the test set or lead to overfitting. Therefore, noise filtering of the input data is an essential task during the modelling process. Independent Component Analysis is used for this purpose here, but first the theory underlying it is explained.

Let $\mathbf{X} = [\mathbf{x_1, x_2, ..., x_m}]^T$ be a multidimensional data matrix that is mxn in size, where m≤n and the $\mathbf{x_i}$ dimension of the observed mixed signals is 1xn i=1, 2, ..., m. Using the ICA model, this $\mathbf{X}$ matrix can be written out as the following equation:

$$X = AS = \sum_{i=1}^{m} a_i s_i \ ,$$

where $\mathbf{a_i}$ is column i of the mxm-sized unknown $\mathbf{A}$ mixing matrix and $\mathbf{s_i}$ is row i of the mxn-sized "source" $\mathbf{S}$ matrix. The $\mathbf{s_i}$ vectors are the latent data that cannot directly be observed from the mixed $\mathbf{x_i}$ data, but the latter can be written out as the linear combination of these latent data (Dai et al., 2012). The purpose of Independent Component Analysis is to find the mxm-sized W matrix (demixing matrix), for which it is true that

$Y = WX,$

where $\mathbf{y}_i$ is row i of the **Y** matrix, i=1, 2, …, m and these vectors are statistically independent (independent components). If the **W** matrix is the inverse of the **A** mixing matrix (**W=A^{-1}**), then the independent components (**y**$_i$) can be used to estimate the original latent signals **s**$_i$ (Lu, 2010).

In the course of Independent Component Analysis, an optimisation problem is solved by selecting an objective function of the statistical independence of the independent components and using optimisation processes to find the **W** matrix (*Lu* et al., 2009). Several processes of this type have been designed and developed (*Bell* and *Sejnowski,* 1995; David and *Sanchez,* 2002; *Hyvärinen* et al., 2001). These tend to employ unsupervised teaching algorithms to maximise the statistical independence of the ICs. One of the most frequent ICA solutions is the FastICA algorithm (*Hyvärinen* et al., 2001), which I have also used to define the **W** matrix.

3.2 Empirical Mode Decomposition (EMD)

Empirical mode decomposition is a nonlinear signal transformation process developed by Huang et al. (1998) for the decomposing of nonlinear and nonstationary time series. The method decomposes the original time series into oscillating IMF (Intrinsic Mode Function) components of differing timescales (*Yu* et al., 2008). Each IMF must satisfy two conditions: first, the difference between the total number of local minimums and maximums and the number of zero positions of the function may not be more than one; second, the local average must be zero (*Cheng* and *Wei,* 2014). This algorithm is the following:

1. Define all local minimums and maximums of **x(t)**.
2. Define the lower envelope **x$_u$(t)** and the upper envelope **x$_l$(t)** of **x(t)**.
3. Using the upper and the lower envelope, set the time series average **m$_1$(t)=[x$_u$(t)+x$_l$(t)]/2**.
4. Calculate the difference between the original time series **x(t)** and the average **m$_1$(t)** time series calculated in the previous step **h$_1$(t)=x(t)-m$_1$(t)**, which will return the first IMF (**h$_1$(t)**), if it satisfies the aforementioned two conditions.
5. Once the first IMF has been determined, continue with the same iteration algorithm until arrival at the final time series, the residual component **r(t),** which is a monotonic function signalling that the algorithm should be ended (*Huang* et al., 1998).

The original time series **x**(t) can be restored as the sum of the IMF components and the residual:

$$x\left(t\right)=\sum_{i=1}^{n}h_i\left(t\right)+r\left(t\right).$$

The resulting IMFs are nearly orthogonal to each other and their average is near zero (*Yu* et al., 2008). The residual is the trend component of the original time series, whereas the IMFs follow a decreasing order of ever-lower frequencies (*Cheng* and *Wei,* 2014).

3.3 Brief description of the ICA-BPN and EMD-BPN hybrid models

The first hybrid model used here comprises three steps: first, it uses the ICA method to determine the independent components (ICs) of the input variables; then it uses the TnA (Testing-and-Acceptance) method of Cheung and Xu (2001) to identify and filter out the noise component; and finally, it forecasts the time series with the help of the BPN neural network. Chart 2 demonstrates this process:

The other hybrid model used in this paper also comprises three steps: first, the EMD method is used to decompose the original time series into IMF components and the residual; then a BPN model is used to forecast the values for the next period for each IMF; and finally, the forecast value of the original time series is created as a sum of these. Chart 3 shows this hybrid method:
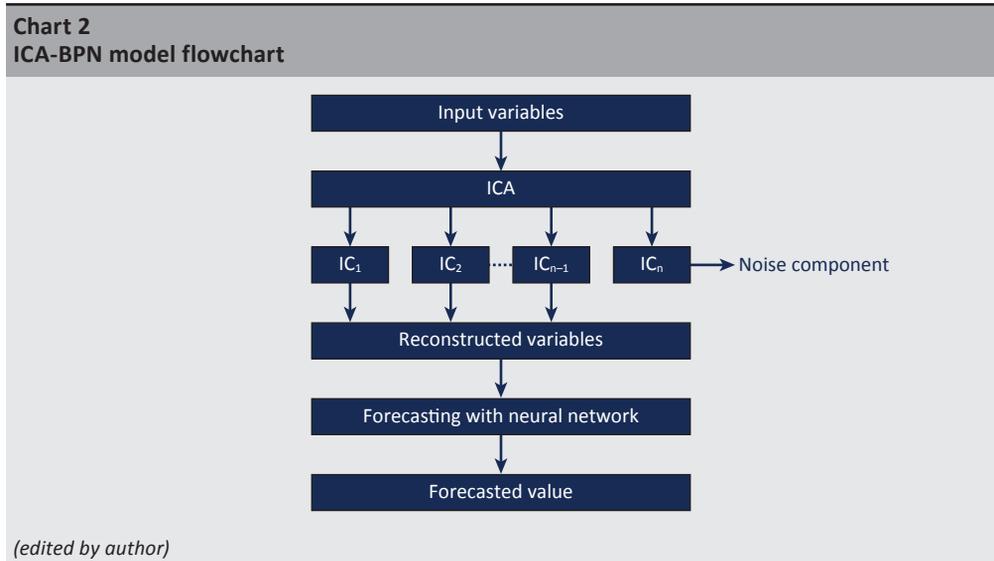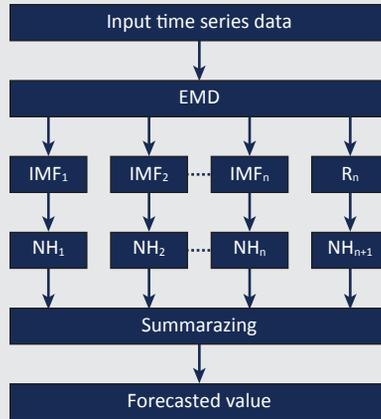
Chart 2
ICA-BPN model flowchart

(edited by author)

Chart 3
EMD-BPN model flowchart

(edited by author)

4 Empirical analysis

4.1 Data and performance criteria

This research applies trading strategies based on the forecasting of the closing prices of OTP shares traded on the Budapest Stock Exchange. The period between 3 October 2011 and 11 April 2014 were selected for analysis. The time series was divided into learning, testing and validating data sets with respective ratios of 64%, 16% and 20% (the forecasting models were tested on the last six months of this time series of two and a half years). Chart 4 shows the price changes, with different sets marked in red, blue and green.
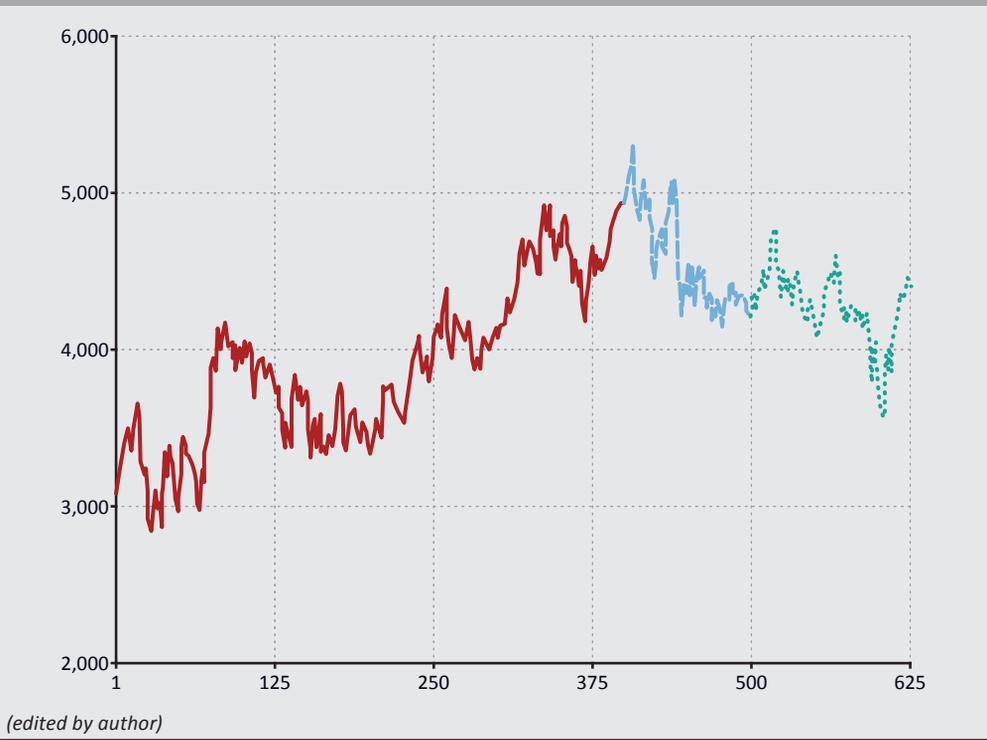
Chart 4
OTP stock prices over the period analysed

(edited by author)

Table 1
The forecasting results of the different methods

	Max.	Min.	Average	Deviation
Weighted MA	5,302	2,835	4,061.4	516
Momentum	789	-814	15.3	242.3
Stochastic K%	100	0	53.5	31.3
Stochastic D%	98.8	2.6	53.4	27.2
RSI	88.5	15.2	51.6	15.4
MACD	235.5	-231.4	3.4	76.3
LW R%	0	-100	-47	30.6
A/D Oszcillator	100	0	51.2	28.7

(edited by author)

The eight technical indicators selected for modelling have been widely and successfully used by Kara et al. (2011), among others. Table 1 contains the statistical features of the indicators in the period analysed.

4.2 The forecasting results of the different methods

In the empirical part of the research, three data mining models were used. The first step taken in the modelling was normalisation of the input data, which was a prerequisite for fast convergence of the algorithms. The data was transformed into a [0,1] interval for each variable by means of the following method:

$$x'_i = \frac{x_i - x_{min}}{x_{max} - x_{min}},$$

where x_{min} and x_{max} are the minimums and maximums of the individual variables in a given time series.

The first step in the modelling employed one of the most popular neural networks, the backpropagation neural network (BPN). The appropriate parameters (number of neurons in hidden layer, learning rate) were selected by means of the grid search process. The network's input layer comprised eight neurons (in accordance with the number of explanatory variables), whereas networks of 11, 12, 13 and 14 neurons were tested in the interim layer. The network had one output: the daily yield of the share. Relying on the study by *Lu* (2010), the models were tested at low learning rates (0.01, 0.02, 0.03, 0.04, 0.05) in the learning process. The convergence criterion used was a rule that the learning process would be halted if the RMSE indicator fell below 0.0001 or if the 1000th iteration was reached. The network topology with the lowest RMSE in the test set was chosen as optimal. Table 2 shows the performance measured in the test set at different neural network parameters; subsequently, when modelling in the validation set, this was relied on to use the network with 8-12-1 topology and 0.05 learning rate.

Chart 5 shows the original and the forecast prices, absolute error and sign accuracy in the validation period.

Since the financial time series is characterised by a high noise/signal ratio, Independent Component Analysis was used to filter out the noise from the input variables prior to using the BPN network in the second model. This first required generating the independent components (ICs) and, second, identifying the noise component with the help of the TnA algorithm.

In a TnA algorithm, the individual ICs were discarded one by one; then the input matrix was restored and analysed in terms of the extent to which it differed from the original. Deviation was measured with the RHD indicator. As eight input variables were used, it was necessary to perform this operation seven times to find the noise component. These RHD values are shown in Table 3.

Table 2
Test set errors of BPN networks with different parameters

Number of neurons in hidden layer	Learning rate	Validation RMSE
11	0.01	0.124111
	0.02	0.120873
	0.03	0.119689
	0.04	0.119021
	0.05	0.118578
12	0.01	0.120424
	0.02	0.117532
	0.03	0.116893
	0.04	0.116581
	0.05	0.116369
13	0.01	0.124840
	0.02	0.123034
	0.03	0.121980
	0.04	0.121219
	0.05	0.120619
14	0.01	0.124489
	0.02	0.120798
	0.03	0.119771
	0.04	0.119247
	0.05	0.118872

(edited by author)

Chart 5
BPN model forecast accuracy in the validation period
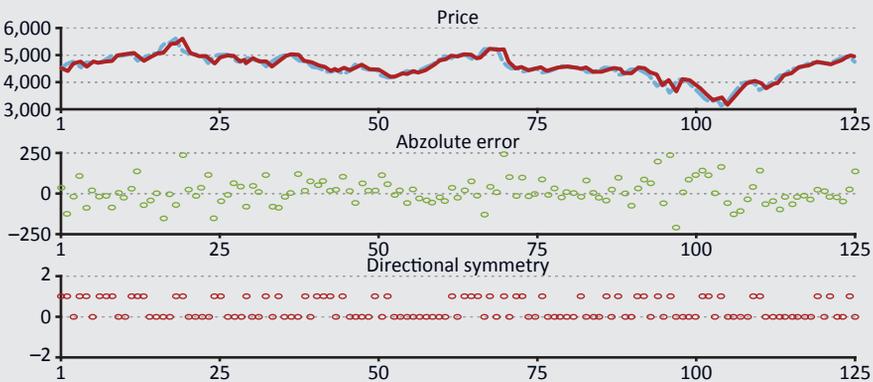
(edited by author)

Table 3
RHD values of reconstructed input matrixes

| Main components	RHD
IC1, IC2, IC3, IC4, IC5, IC6, IC7	4.3674
IC1, IC2, IC3, IC4, IC5, IC6, IC8	3.6260
IC1, IC2, IC3, IC4, IC5, IC7, IC8	4.4830
IC1, IC2, IC3, IC4, IC6, IC7, IC8	2.4118
IC1, IC2, IC3, IC5, IC6, IC7, IC8	3.7873
IC1, IC2, IC4, IC5, IC6, IC7, IC8	3.9655
IC1, IC3, IC4, IC5, IC6, IC7, IC8	7.1473
IC2, IC3, IC4, IC5, IC6, IC7, IC8	7.7748
(edited by author)	

The table demonstrates that the noise is in the fifth component. The second step in the model involved using the reconstructed variables to build a BPN network. The selection of the optimal parameter was closely similar to that described above; the optimal network turned out to be the one with 8-12-1 topology in the ICA-BPN model as well.

In the third method, EMD was used to decompose the original time series into IMFs, given the complex dynamics of the stock market time series. Each of these were forecast separately, then aggregated to arrive at the forecast value for the original time series. As done in a number of other studies (*Yu* et al., 2008; *Cheng* and *Wei,* 2014), stock prices were forecast with this method. Chart 6 shows the empirical mode decomposition of the OTP stock price.

I indicate the original time series in the top row, then the IMF's of ever decreasing frequencies (IMF1, IMF2, …, IMF6) below, and finally the residual of the trend in the last row. As the second step in the method, each IMF was forecast with neural networks of different parameters; the results were then aggregated to arrive at the OTP closing price for the following day. Because it was ultimately necessary to forecast eight time series in this instance and determine the number of optimal inputs for them (the number of lags needed in the NAR model), the process was much more complex and time-consuming than in the earlier two models. In order to keep the problem solvable, the process followed Mingming and Jinliang (2012) and the number of lags were set as 10 for each IMF. In this way, it was only necessary to find the optimal number of neurons and learning rate. Table 4 shows these for the different IMFs.

Chart 6
Profits achievable in the validation set using the various data mining and combinatory models
(OTP)
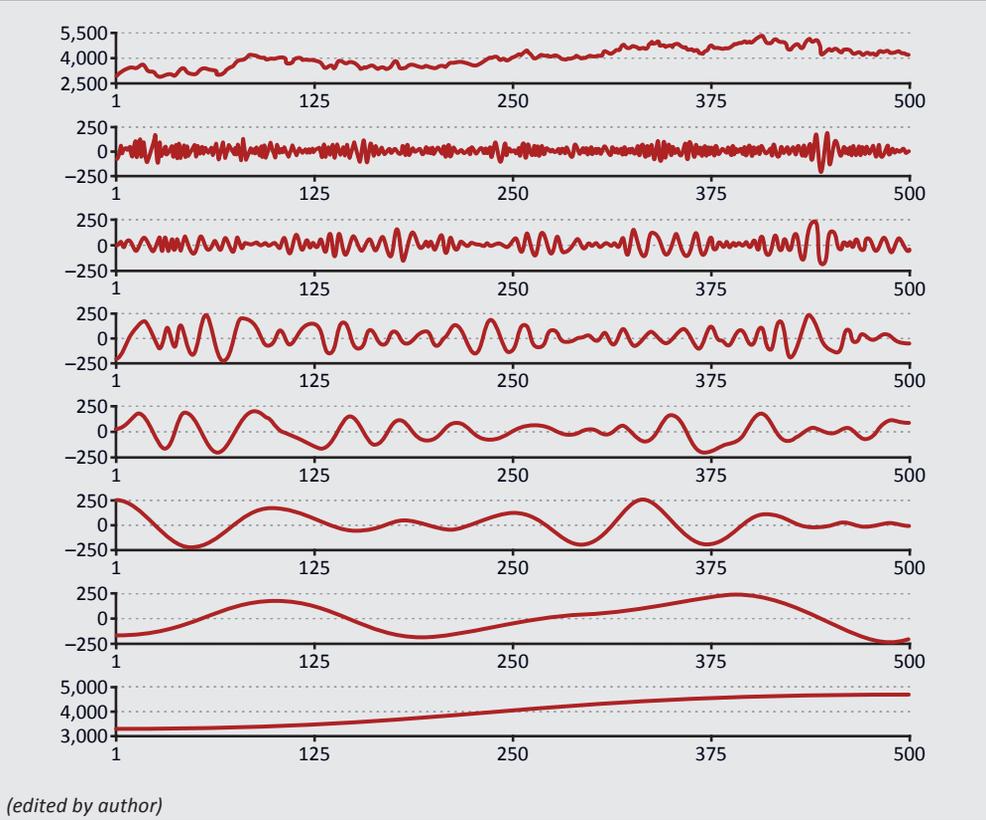
(edited by author)

Table 4
Optimal parameters of different IMF's

IMF	Number of neurons	Learning rate
1	12	0.05
2	12	0.05
3	12	0.05
4	12	0.025
5	12	0.025
6	12	0.025
7	13	0.025
8	13	0.025

(edited by author)

Once the optimal parameters of the three models were identified, they were used to create a forecast for the validation period (Table 5).

Table 5
Performances of different methods in the validation set
(OTP)

Modell	RMSE	MAPE (%)	DA (%)
BPN	0.018864	113.38	61.6
ICA–BPN	0.018738	107.79	60.8
EMD–BPN	0.026672	292.47	56.8

(edited by author)

The tables make it clear that the sign-forecasting rate of the more sophisticated hybrid methods is no better than that of the simple BPN model; nevertheless, it will be interesting to investigate in the following whether they surpass the first model in terms of profits achieved.

First, it was checked whether combining the three methods could improve the achievable forecast results. As mentioned above, combining helps eliminate disadvantages of the individual methods and thus facilitates better forecasting and higher profits. Table 6 summarises the forecasting results of three kinds of combinations of the three methods (simple average, Bayesian average, GRR).
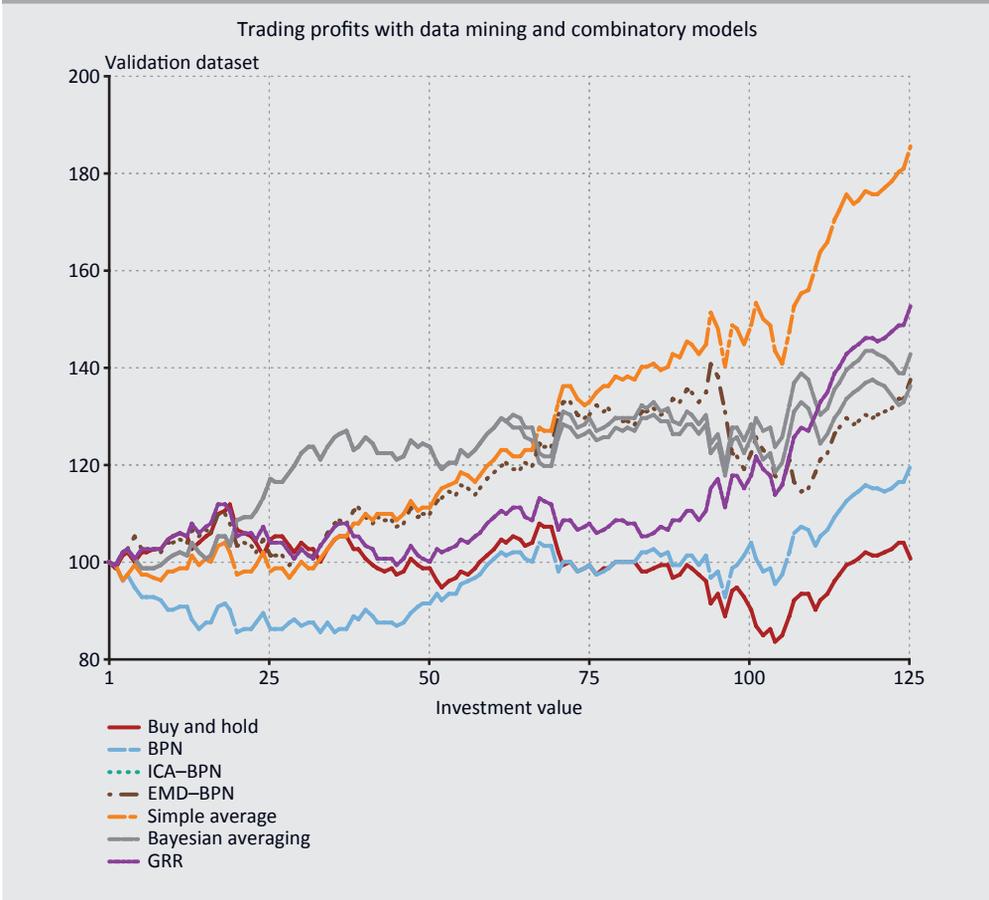
Table 6
Results from combining the three methods
(OTP)

Modell	RMSE	MAPE (%)	DA (%)
Átlag	0.018854	144.82	64.8
Bayes-i átlag	0.018733	107.87	60.8
GRR	0.019087	151.21	61.6

(edited by author)

Table 7
Profit generated by the 6 models in the validation set
(OTP)

	Buy and hold	BPN	ICA–BPN	ICA–EMD	Average	Bayes-average.	GRR
Annual yield	2.50%	36.46%	71.53%	64.01%	124.27%	62.71%	85.16%
Annual volatility	30.63%	30.22%	29.68%	29.92%	28.73%	29.81%	29.52%

(edited by author)

Chart 7
Az egyes adatbányászati és kombinációs modellek alkalmazásával elérhető profit a validációs halmazon
(OTP)

Trading profits with data mining and combinatory models

(edited by author)

Table 7 and Chart 7 show the profits from the three data mining models and three combination models on the validation set (incorporating a 0.1% transaction charge).

The table demonstrates that although the sign-forecasting ratio is worse in the pair of more complex data mining models than in the simple neural network, they greatly surpass the latter in terms of profits. Furthermore, all three models perform better than a "buy-and-hold" strategy. In addition, it is striking that out of all three combining methods, simple averaging delivers the best performance in terms of profits. This may appear surprising at first, since it is the least sophisticated method of averaging. If one considers, however, that the other two weight the models on the basis of errors in the learning and test sets, where the models performing better in terms of profits (ICA-BPN and ICA-EMD) had performed worse than the simple neural network and these are thus included with lower weights in the average, it becomes clear why these combinations result in lower profits. These two methods (ICA-BPN and EMD-BPN) forecast with nearly the same accuracy in the validation period as in the test and learning periods, whereas the simple neural network forecasts worse; thus, when the sophisticated models have higher weights in the combination (simple averaging), more profits are achieved. It would be worthwhile to analyse in subsequent research what would happen if the weights of the other two combination methods were to be selected on the basis of profits instead of RMSE.

5 Challenges in using the method, further opportunities for research, conclusion

As seen from the results of the previous chapter, active management that relies on data mining techniques will have more success than with a "buy and hold" strategy. Nevertheless, it is not straightforward to use models; there are certain difficulties and constraints. These include selecting the optimal methods and parameters, as well as recalibrating the models periodically (perhaps even daily), which is extremely time-consuming and requires extreme care.

For this reason, it is fitting to suggest a few opportunities for further progress and research directions. It would, of course, be interesting to investigate whether the same methods can return the most accurate forecasts for different securities, and, if not, which feature of the stock is responsible. Furthermore, it is also recommended to remember and rely on the data mining methods only briefly touched upon in this paper, from genetic algorithms through decision trees to textual data mining. The latter, which has been the most dynamically advancing area in the past two or three years, involves automated analysis

of market news, establishing expected impacts on the different securities (*Hagenau* et al., 2013).

As far as trading is concerned, it may be important to analyse the profits achievable with leverage, which is permitted on an extremely high number of markets. Sermpinis et al. (2012) presented a methodology for this, forecasting not only prices but also the volatility of securities and determining the rate of leverage according to how high this was (high leverage in the event of low volatility and vice versa). However, this is almost a unique example, as most researchers ignore this matter. It might, therefore, be worthwhile to investigate the possibilities for forecasting volatility, as well as the validity of the leverage rules formulated on this basis.

The reasons listed demonstrate that while data mining allows achieving significant extra yields compared to traditional investment strategies, its execution is highly complex and problematic, requiring considerable resources and expertise.

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