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Indicators Used for the Assessment of the Reserve Adequacy of Emerging and Developing Countries – International Trends in the Mirror of Theories*

Csaba Csávás – Gabriella Csom-Bíró

The paper examines to what extent usage of the foreign currency reserve adequacy indicators applied by the International Monetary Fund (IMF) and investment banks can be mapped with those recommended in the academic literature. The theoretically relevant indicators differ substantially depending on the given country's (1) development, (2) freedom of capital movement, and (3) exchange rate regime. In order to examine the question, the authors compiled a broad database, covering more than 100 countries, based on the IMF's regular country reports. According to the results of the study, the IMF tends to use the short-term external debt and monetary aggregate indicators more often with the increase in income, while the role of the import rule gradually decreases as a function of income. There is a positive relation between the import rule and use of capital controls, while it is the other way round in the case of short-term external debt and the monetary aggregate indicators. For countries with a fixed exchange rate regime, the monetary aggregate and import indicators are used more often than for those with a floating exchange rate regime, while the use of short-term external debt is less frequent. The reserve indicators used for various combinations of country characteristics show group-specific features rather than being a simple aggregation of the indicators used for the individual country characteristics. The authors examined separately the group of countries of similar development level and exchange rate regime as Hungary, which do not apply capital controls, as well as the non-euro area region of the EU, where in its country reports the IMF assesses the reserve adequacy based on the self-elaborated composite metric – which attaches a high weight to short-term debt – on the one hand, and based on short-term external debt, on the other hand. However, the import rule and the monetary aggregate rules are less relevant or not relevant indicators. This differs substantially from the ratios reflected by the full sample, where – due to the large weight of the less developed countries –

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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the IMF uses the import rule the most often. On the other hand, in investment banks' analyses, short-term external debt is the indicator monitored with the greatest emphasis, both in the case of Hungary and the group of the emerging countries.

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Keywords: foreign exchange reserves, reserve indicator, capital control, exchange rate regime, country report

1. Introduction

An adequate level of foreign exchange reserves is not only important for central banks: the topic also commands interest in the academic literature, as well as among investment banks and international institutions. Recently, the 2007–2008 global financial crisis highlighted the importance of foreign exchange reserves (*IMF 2011*).

There is no single rule or even group of rules that can determine the optimal reserve level for each country in a straightforward and standard manner. Central banks keep foreign exchange reserves with a view to satisfying a number of objectives, such as preserving investor confidence, maintaining the exchange rate regime, satisfying the government's transaction-based foreign currency needs, meeting the banking system's foreign currency demand or financing the current account (*Antal – Gereben 2011*). As a result of keeping a reserve level that meets investors' expectations, the valuations that are able to orient and shape the opinion of those relevant to the market bear the utmost importance. Based on this, one of the most important valuations is the valuation of reserve adequacy by market investors, as they are the ones who are capable of materially influencing emerging market asset prices. Accordingly, our paper deals with the reserve indicators deemed most important by investment banks in respect of emerging countries; in addition, the international institutions, the analyses of which are public – such as the International Monetary Fund (IMF) for example – are also important, as the valuations published by such institutions may significantly influence investors' assessment of a country.

The main question that we examined was whether the individual reserve indicators are used in those countries where the academic literature regards them as more relevant. The literature recommends a number of indicators, based on which the expected level of foreign exchange reserves can be judged. Some of these are traditionally applied, simple indicators, such as the Guidotti–Greenspan rule resting on short-term external debt, the import rule and the monetary aggregate rules. The academic literature formulates a number of recommendations regarding the greater or lesser relevance of certain traditional indicators in the different types of countries. Our paper can be regarded as one filling a gap, as we have found

no example of previous examination of the question to what extent the practical experts follow the recommendations of the academic literature when using the reserve indicators. Our survey is also a pioneering one in the sense that we compiled a broad database, covering more than 100 emerging and developing countries, to examine the reserve indicators used in the IMF country reports prepared under Article IV (we did not examine the developed countries, as in their case the reserve adequacy is less relevant due to the strong institutional system). There are surveys which examine the IMF reports (*Roy – Ramos 2012*), but they do not examine the indicators used for reserve adequacy; they merely summarise the economic policy recommendations, and do so only by citing examples, rather than in a systematic way. Some of the literature examines how emerging or developed countries performed with the various reserves indicators during different crises, and – based on that – which indicator may be deemed the most important (e.g. *Bussiere et al. 2015*). By comparison, our survey is novel in the sense that – in addition to the emerging/developed dimension – we also examined other country characteristics upon using the individual indicators.

We focused more on the IMF's analyses than on banks' analyses, mostly due to methodological reasons: the organisation examines its member states' economic policy regularly, in separate analyses, also taking into consideration idiosyncratic factors characterising the countries. At present no database of a similar nature, covering a group of countries of a similar magnitude is available: thus, apart from the IMF's country reports, no research of this nature and level of detail can be performed using the data of other international organisations. In their valuation methodology, the leading credit rating agencies also apply indicators measuring foreign exchange reserve adequacy, which may also influence investors' assessment. However, the country reports of the credit rating agencies often contain no reference to reserve adequacy, or they do not select the indicators on a country-specific basis, and thus it is also not possible to compile a database of similar nature and size on the basis of these analyses.

In our analysis we present, primarily in a descriptive way, how frequently the individual reserve indicators are used and their connection with various country-specific features. In the analysis performed on the database compiled from the IMF reports, we compare the proportion of the individual indicators within the sub-samples to each other and examine the deviation of those by simple statistical tests. However, we do not deal with the question of whether or not the analysed reserve indicators are indeed optimal. For the purpose of the examined questions, the relevant issue is whether or not a given indicator is used. The analysis also does not deal with the degree of reserve adequacy in the individual countries.

On the other hand, we examine which indicators are regarded by investment banks and the IMF as the most important in the case of Hungary and the emerging

countries which resemble Hungary the most. We demonstrate that there are significant differences both in the sequence of the individual indicators and the frequency of their use within the reserve indicators applied by the IMF and investment banks. For example, use of the short-term external debt is more frequent in case of investment banks, followed by the import rule, whereas both the short-term external debt and the import rule are used less frequently in the IMF analyses than the IMF composite metric. The question as to the preference of which institutions may be deemed the most important for the purpose of a country's reserve adequacy may serve as the subject of future surveys.

The paper briefly presents the theoretical background and history of the three examined traditional reserve indicators (Chapter Two), followed by the presentation of the hypotheses to be tested, the features of the database compiled from the IMF reports and the methodology of the analysis performed on the basis thereof (Chapter Three). Chapter Four summarises the result of our surveys performed on IMF data, while Chapter Five deals with the reserve indicators used in investment banks' analyses.

2. Theoretical background of the reserve indicators

The purpose of reviewing the academic literature is to build up our hypothesis as to which indicator is relevant in which type of country. We briefly present the definition and historical background of the three traditional reserve indicators (the monetary aggregate rule, the import rule, the short-term external debt rule) in the chronology of their development. Additional reserve indicators are presented by *Antal and Gereben* (*2011*), as well as by *Csávás and Csom-Bíró* (*2016*).

2.1. Monetary aggregates

According to the *monetary aggregates rules*, the reserves must cover a given proportion of an indicator of monetary volume, the so-called *monetary aggregate*. The indicator captures the foreign exchange reserve requirement arising from the potential flight of capital by resident actors in a crisis situation, when the domestic actors' confidence in the national currency decreases and they start to liquidate their savings held in bank deposits or cash, by converting them into foreign instruments. This approach is based on the assumption that in a crisis situation it is not only external funding that may stop, but that domestic investors may also transfer assets abroad. This *"internal drain"* may be higher in magnitude than that originating from the current account deficit or from short-term external debt (*Obstfeld et al. 2010*). The monetary aggregates are the oldest ones among the indicators examined in this study; emphasising the importance of the foreign currency need arising from the demand of the resident sector dates back to the beginning of the 19th century (*Thornton 1802*). Up until the 1970s, in the period

before opening the capital accounts, the emphasis was on covering monetary aggregates by foreign exchange reserves (*Rodrik 2006*).

The most often used monetary aggregate is the *M2 monetary aggregate* (cash and bank deposits with maturity less than 2 years, also known as *"broad money"*). For this, the IMF prescribes a *20 per cent ratio*, while others, for example *Wijnholds and Kapteyn* (*2001*) proposed a *band of 5–10 and 10–20 per cent*, depending on the volatility of the foreign exchange reserve relative to the monetary aggregate and on the type of the given country's exchange rate regime. There are examples for the use of other monetary aggregate categories as well: the *M3 aggregate* also includes, in addition to the banking system's liabilities included in M2, for example, money market fund shares. The key requirement towards central banks operating a currency board is that the *foreign exchange reserve should cover the monetary base, i.e. the M0* (sum of cash holdings, central bank reserves and overnight deposits), and thus this can also be regarded as a monetary aggregate-based reserve indicator (*Hanke – Schuler 2002*).

The literature recommends the use of the monetary aggregates for countries with weak banking system and a high risk of capital withdrawal by domestic actors. The conversion of domestic deposits into foreign currency may be connected with the actors' exchange rate expectations, if they anticipate a major depreciation of the national currency. The indicator is recommended rather for the fixed exchange rate regime, where the credibility of the exchange rate regime is yet to be established (*IMF 2000*). According to Wijnholds and Kapteyn, in the fixed exchange rate regime there is a higher probability that in an uncertain situation domestic actors will convert domestic liquid assets into foreign currency. The development level of the banking system is also an important factor. The low credibility of the banking sector and fears of bank collapse is relevant in a less developed banking sector, which may also justify the withdrawal of deposits and conversion into foreign currency assumed to be safer in a crisis situation. Of the central banks' reserve objectives, the monetary aggregates can be mostly linked to the maintenance of the exchange rate regime.

2.2. Import rule

The import coverage ratio signals the foreign currency demand in a balance of payments crisis, when export sales opportunities narrow, no other foreign currency revenue is available and the foreign currency necessary for imports can only be provided from reserves. According to the more common version of the import rule, the reserves must provide coverage for *3 months of imports*. The origin of the rule dates back to the 1950s; it was first proposed by the IMF as a new rule, arguing that within the balance of payments the external processes represented the determinant factor (*IMF 1958*). When the indicator was first calculated, the reserves of the countries under review varied between 3 and 6 months' imports,

while initially the IMF prescribed 3–5 months of imports; however, by now *the 3-month level is practically used exclusively*, which corresponds to the minimum of the former bands. However, as it is noted by Wijnholds and Kapteyn, the preferred 3-month level of the import rule has neither theoretical, nor empirical basis; it can be regarded as a rule based on certain tradition.

Upon quantifying imports, the IMF usually uses a forward-looking methodology, i.e. it examines the imports expected in the next period, while investment banks tend to calculate retrospective imports. The indicator considers both goods imports and services imports. The spread of the rule may have been attributable to the fact that it is easy to measure, as balance of payments statistics are available for a number of countries. The literature already declared many years ago that *the import rule is obsolete* (*Wijnholds – Kapteyn 2001*). The empirical surveys regarded it as a good indicator for the explanation of the economic downturn measured during the crises primarily in low-income, developing countries (*IMF 2011*). On the other hand, the studies examining the emerging countries did not find the import rule to be significant based on the crisis indicators, with regard to the crises of 1994–95 or 1997–98 (*IMF 2000*). When looking at the valuation methodologies of the major credit rating agencies, the import coverage ratio is included only in the valuation model of *Fitch Ratings* (*2012*), where the year-end reserve is determined as a proportion of import payments, without detailing the minimum coverage ratio.

The literature recommends the import rule for those countries that have no access or limited access to the capital markets or apply capital controls (*IMF 2016*). One of the reasons for limited access to the international capital markets may be that their capital account is not liberalised, as they apply *capital controls*. However, it is possible even without controls that due to their low level of development or high risks, foreign investors are not willing to finance these countries. This indicator may also be relevant for *commodity exporter countries* in a crisis scenario when commodity prices fall, that is the export revenue may decrease to a larger degree than elsewhere. In addition, where the *import content of exports* is low, this indicator may be more relevant, as the decline in exports is not necessarily accompanied by an automatic fall in imports. The use of the import rule may be directly connected to the financing of the current account, as a reserve objective.

2.3. The Guidotti–Greenspan indicator

According to the *Guidotti–Greenspan rule,* the foreign exchange reserves must cover the short-term external debt, i.e. those debts maturing within one year. While earlier the balance of payments items were regarded as the main source of external vulnerability, after the 1997 crises in South-East Asia the focus moved to the volatility of capital transactions (*Odenius – Rajan 2013*). The idea of using short-term external debt as a reserve indicator emerged not long after the outbreak of these crises, as early as in December 1997, at a BIS meeting of central bank

governors (*Wijnholds – Kapteyn 2001*). Based on the experiences gained in the crises, it was *Pablo E. Guidotti* (*1999*)*,* former deputy governor of the central bank of Argentina, who first formulated, at the Bonn seminar of the G-33 group of developing countries held in March 1999, that the foreign exchange reserve must be sufficient to ensure that the country is able to live without new foreign borrowing for up to one year. Almost simultaneously with this, *Alan Greenspan* (*1999*), former governor of the Federal Reserve (Fed) fine-tuned the rule in April 1999 at one of the World Bank conferences. According to that, the foreign exchange reserves must exceed the country's foreign currency debt maturing within one year.[1] It belongs to the history of the indicator that similar criteria had been recommended for reserve adequacy much earlier: *Keynes* (*1930*) noted in respect of the reserves of India that the foreign exchange reserve must cover the withdrawal of foreign funds as well.

The academic literature quickly started to use this indicator; a study was published as early as September 1999, which examined the role of the foreign exchange reserve ratio to short-term debts in earlier crises (*Rodrik – Velasco 1999*). In March 2000, the IMF already recommended the use of short-term external debt for the evaluation of reserve adequacy, and soon after this it started to use it (*IMF 2000*). There is no available information why exactly the *1-year threshold value was determined*; presumably this is attributable to statistical reasons (countries typically do not publish more detailed maturity breakdown of short-term foreign debt components).

The Guidotti–Greenspan rule has several modified versions as well. According to one of the alternatives, in addition to short-term external debt, the reserve should also cover the expected current account deficit of the coming year (*gross external financing requirement*). The reason for this is that the current account deficit may entail an additional foreign exchange reserve requirement. This modification is typically handled asymmetrically, i.e. when the current account has a surplus, it is not deducted from the amount of the short-term external debt (*IMF 2011*). The IMF also uses it in the country evaluations under Article IV, in the case of certain countries struggling with current account deficit. A further modified version of the short-term external debt is the *external debt servic*e which also takes into consideration interest payments, in addition to the principal components of the expiring external debt, although this reserve indicator is used less often. Furthermore, for some countries the IMF notes in its country analyses that it includes *part of the external inter-company loans that expire within one year* in

[1] Greenspan also proposed to expand the rule with additional elements, such as that the maturity of the external debt should be at least 3 years, or that the country should hold as much foreign exchange reserve as ensures with a high probability (e.g. with a probability of at least 95 per cent) that the country does need to rely on external funds for at least 1 year. In the end, these additions did not become part of the Guidotti–Greenspan rule. Greenspan initially recommended only the short-term foreign currency debt, but the commonly used rule contains not only the foreign currency-denominated debt, but also that denominated in the national currency.

the short-term external debt, despite the fact that in statistical terms intra-group loans belong to the working capital category rather than to the debt category. The adjusted indicator assumes that in the case of a crisis, the outflow of inter-company loans may also generate risks. The valuation method of the credit rating agencies also includes the short-term external debt rule, particularly the adjusted versions of that. For example, Moody's, upon assessing certain countries' external vulnerability and reserve level, also adds non-residents' long-term deposits held with domestic banks to the short-term external debt and compares the reserves to this adjusted debt indicator (*Moody's 2013*). Standard & Poor's sets out from the gross external financing requirement defined on its own, i.e. it increases the disposable part of the reserve with the current account balance when determining the external liquidity ratio (*S&P Global Ratings 2014*), while Fitch also adds liquid liabilities, such as e.g. non-residents' long-term government securities holdings, to short-term external debt (*Fitch Ratings 2012*).

The Guidotti rule represents a relevant indicator in a crisis situation when external financing stops and the expiring external debt can only be repaid from foreign exchange reserves. A stop or turnaround in capital inflows (also known as a *sudden stop*) may generate substantial losses for a country's economy (*Reinhart – Calvo 2000*). If – for lack of foreign currency liquidity – the state or the private sector is unable to repay its external debt, it could necessitate a major adjustment in the real economy. All components of the short-term external debt carry rollover risk to a certain degree; accordingly, the indicator takes into consideration both domestic and foreign currency-denominated debt elements (*IMF 2000*). Several studies demonstrated that when the foreign exchange reserve falls short of the short-term external debt, there is a higher probability that an economic crisis or currency crisis may develop (*Furman – Stiglitz 1998; Calafell – Del Bosque 2002*). In relation to the period of the collapse of Lehman Brothers, more recent research has found that the Guidotti–Greenspan indicator provided a better explanation for the decline in GDP than traditional indicators (*Bussiere et al. 2015*).

The literature recommends the Guidotti–Greenspan rule to countries with access to international capital markets, and substantial, but uncertain cross-border financing. As a reserve indicator, short-term external debt is recommended to countries with access to foreign capital markets (*IMF 2016*). This assumes that the country's capital account is also liberalised, i.e. not only the current items of the balance of payments, but also the financing items are free, i.e. there are no capital controls. Since the liberalisation of capital flows, the volatility of capital transactions may be substantially higher than that of the current items, used e.g. by the import rule. The fact of liberalisation alone is not sufficient; the build-up of risks also requires external finance, and within that the degree of short-term debt must be high; higher short-term external debt carries higher rollover risk. The degree of uncertainty in external finance is more difficult to measure, and thus it is more the magnitude

of that may be important for the purpose of assessing the use of the indicator. The relevance of the indicator may be influenced, for example, by the ownership structure of the banking system: when the share of non-resident owners is higher, the banking system's foreign debt, and within that the short-term debt, may also be higher. Since the short-term external debt also includes the short-term external debt of the state and the banking system, in respect of central banks whose reserve objective is to satisfy the transaction foreign currency demand of the state or the banks, the prescription of the reserve requirement according to this indicator may be justified.

3. IMF data collection methodology, hypotheses

3.1. Compilation of the IMF database; theoretical considerations

For the purpose of analysing the indicators for the assessment of foreign exchange reserves in our study, we collected the country-specific data based on the country reports and analyses of the *International Monetary Fund* (IMF). We explain this by the fact that this organisation *regularly reviews the economic policies of its member states, in the course of which it considers both* standard and *country-specific idiosyncratic factors*. Within the framework of regular comprehensive economic policy consultations (usually annual) in accordance with Article IV of its Articles of Agreement, the IMF conducts consultations with its member states, as a result of which it formulates recommendations for them. During the supervision, the focus varies based on the individual circumstances of the countries; however, it is a general practice that the Monetary Fund *also analyses and assesses the optimal level of foreign exchange reserves within the framework of the exchange rate, monetary and fiscal policy*.

In selecting the countries to be involved in the analysis, we set out from the 189 member states of the organisation, of which we eliminated those countries *where certain factors do not permit the comparative analysis of international reserves*. One such criterion is the development level of the countries, because in the case of *developed countries*, the IMF's and investment banks' requirements cannot be compared with those related to emerging countries, since the holding of reserves in the case of developed countries is not a priority consideration mainly due to their strong institutional and regulatory systems, liquid money markets and flexible exchange rate regimes. Although after the crisis the reserve requirement of the developed countries also rose, it is a general view that they do not need substantial foreign exchange reserves and they mostly keep foreign exchange reserves for the event of market turbulences. (This is particularly true for the countries that issue the reserve currency, which can easily exchange the local currency into foreign currency in the foreign exchange market or conclude swap agreements with each other to ensure a sufficient foreign exchange reserve level and foreign

currency liquidity) (*IMF 2011*). The *participation* of the given currency *in a currency union* and the *explicit or implicit presence of dollarisation or euroisation* were two other factors for exclusion from our survey. The first is due to the fact that the member states of currency areas, due to losing the right to conduct an independent monetary policy, also entrust the central bank of the currency union to manage international reserves. Dollarisation or euroisation is also a form of surrendering monetary sovereignty, in the course of which a state abandons its national currency in part or in full and replaces it with a foreign, but stable currency as legal tender. In the last two cases, it is also not possible to examine the indicators that serve the determination of the optimal level of the foreign exchange reserves by countries. After eliminating these countries, roughly 120 member states served as a basis for our analysis.

In our research, we created our own database based on the data of the IMF's country reports and indicators relevant for the reserve adequacy indicators. A large part of the countries are subject to further review, in addition to country analysis under IMF's Article IV, due to their participation in IMF programmes, where the IMF also examines changes in the reserve level and reserve adequacy. Accordingly, we performed data collection for the purpose of analysing the reserve adequacy indicators using two types of IMF reports: the data sources included the country reports under Article IV and other country-specific analyses prepared by the organisation on countries participating in IMF programmes.[2] The latter are always published in consolidated form with country reports under Article IV, or as a separate report, but an independent, comprehensive economic policy analysis. In collecting the data, we made no difference between these two data sources. Almost half of the reviewed countries participate in some sort of IMF programme at present as well, and thus in the case of some of the programme countries the source of the data solely included the documents related to the programmes, i.e. we did not always use the country report under Article IV.

In view of the development of the countries and their different economic, financial and political situation, during the collection of the reserve adequacy ratios, we only examined the information and findings related to reserve adequacy, and ignored other factors in the reports. Based on their incidence, we collected the indicators into four main categories: short-term external debt, import rule, monetary aggregate and IMF composite metric. With the exception of the import rule, the other three categories also include other similar indicators or data adjusted for other items. We present these below.

[2] The category of non-preferential IMF loans includes the Stand-By Arrangement (SBA), the Flexible Credit Line (FCL), the Precautionary and Liquidity Line (PLL), the Extended Fund Facility (EFF) and the Rapid Financing Instrument (RFI). The Extended Credit Facility (ECF), the Standby Credit Facility (SCF) and the Rapid Credit Facility (RCF) belong to the preferential IMF loans and are available to countries in the low-income category.

In the IMF reports, *short-term external debt* usually means short-term external debt adjusted for 20 per cent of the estimated short-term part of inter-company loans; the unadjusted Guidotti–Greenspan indicator is used less frequently. Generally, however, it is not clear from the reports which of the above two indicators the short-term external debt corresponds to. On the other hand, in the case of certain countries short-term external debt is calculated not only alone, but also adjusted for other items (e.g. current account deficit or surplus, or the banks' foreign currency and non-resident deposits); we also allocated these other categories to the short-term external debt group.

In addition to the application of the traditional M2 rule, the *monetary aggregate* category also includes the monetary base and the M3 aggregate. Although it does not belong to monetary aggregates category in the narrow sense, in a few cases the indicator is also adjusted for other items (e.g. deposits, foreign currency deposits and the deposits of non-residents, or the monetary base adjusted for bank loans), which we also considered in this category.

In the case of the *IMF composite metric*, we consolidated several complex indicators in this category. The ARA indicators (*Assessing Reserve Adequacy or risk-weighted metrics*), developed for emerging countries define the required level of foreign exchange reserves on the basis of the weighted average of four indicators: (1) short-term external debt, (2) portfolio liabilities and other long-term external debt, (3) monetary aggregate, (4) exports (*IMF 2011*). The IMF uses certain versions of the ARA indicators depending on country-specific factors, and thus, similarly to the traditional indicators, the differences between the countries are important here as well. In a fixed exchange rate regime, other external debt and the monetary aggregate have higher weight, while in countries applying capital controls, monetary aggregates have higher weight (*IMF 2015*), i.e. in the case of these factors outflow was higher during previous crises.

Based on the review performed in 2013, in a country similar to Hungary, with a floating exchange rate regime and without capital controls, the weights are as follows: short-term external debt: 30 per cent; portfolio liabilities and other long-term external debt: 15 per cent; monetary aggregates and exports: 5–5 per cent (*IMF 2013*). For the purpose of defining the weights, the methodology considered the extreme values of the outflow observed in past crises. The weighted indicator designates a band; the authors regard the value between 100 and 150 per cent of the estimated value as an optimal level, and for the purpose of defining this band they also considered the results of the cost-benefit models.

Primarily due to their higher vulnerability to external shocks and their limited or zero access to international capital markets, the reserve adequacy of developing countries is examined not only through the traditional indicators, but also on the

basis of *cost-benefit analyses*, the purpose of which is to balance the marginal benefits and the costs of holding reserves (low-income and middle-income country reserve adequacy template or Assessing Reserve Adequacy in Credit-Constrained-Economies, ARA-CC) (*IMF 2016; Dabla-Norris et al. 2011*). The IMF also applies a separate composite metric in the case of small islands (risk-weighted measure for small island developing states), which also considers their specific features, e.g. more limited financial infrastructure, occurrence of commercial shocks or natural disasters (*Mwase 2012*).

In our database, we collected the information related to the indicators based on identical criteria for all countries, relying on the last two IMF reports. Within short-term external debt, the IMF composite metric, the import rule and the monetary aggregates indicators, we separated text, figure and table categories, where we indicated with the number 1 whether the given ratio appeared in the text evaluation (text), in the figure (figure) or in the tables summarising economic indicators (table).

For the further use of the data we took the intersection of the two datasets created on the basis of the two reports, where we no longer examined the table category. The statistical data related to foreign exchange reserves usually appear in the tables containing the selected economic indicators or the balance of payments data, forming standard elements of the report. For example, the import rule, regarded as a traditional indicator, appears in the tables for more than 90 per cent of the countries; however, the assessment of the reserve adequacy is included in other parts of the reports, independently of the tables, and not necessarily on the basis of the import rule. Conversely, at the same time: if the IMF assesses the adequacy based on one or several indicators, the indicators do not necessarily appear in the tables. Accordingly, we regarded the indicators in the table rather as data of informative nature, and at the intersection of the given indicator we only examined whether it appears either in the textual evaluation or in the figure, but in both reports. The explanation for our methodology is that the intersection returns a more robust result compared to the union of the reports, and we can also exclude the random use of the indicators.

The IMF started to use the IMF composite metric from 2011, and thus we took into consideration the characteristics (text, figure, table) examined under the indicators only on the basis of the reports issued after 2011. The data collection was closed with the reports published until 31 December 2016. Since we examined the intersection of the reports, we excluded from the sample those countries that had only one report after 2011 (e.g. Argentina, Egypt, Libya), or where the IMF did not examine any reserve indicator (e.g. Qatar), as well as those that failed to reach the level of development that would have permitted the examination of changes in foreign exchange reserves (e.g. Somalia). For some of the countries, we assume that we found no IMF report, because – although the consultation under Article IV exists

– the authorities did not approve the publication of the reports (e.g. Bahrain, Oman) (*Roy – Ramos 2012*). Due to the foregoing, our earlier sample of 120 elements was reduced to 105 countries.[3] In order to perform a comprehensive analysis of the reserve indicators used by the IMF, we allocated another three features to each country: (1) the income category they belong to, (2) characterised by free or restricted capital flow, and (3) whether they use a floating or fixed exchange rate regime.

3.2. Hypotheses

We expect that the more developed a country is, the more frequently the Guidotti–Greenspan rule and the monetary aggregates are used, while the use of the import rule is less frequent. In the academic literature presented before, one of the factors that determines the use of the reserves indicators is access to foreign capital markets. This is not the equivalent of capital controls, as it more indicates the willingness of non-resident actors. It is difficult to measure this directly, and thus we use the development of the countries as a proxy. The more developed an economy is, the more it can be expected that it has access to external finance (*ceteris paribus*). The literature describes a positive relation between access to external markets and the Guidotti–Greenspan indicator; based on this, we expect a positive relation between income and the use of this indicator, while it is the other way round in the case of the import rule. Although the literature does not mention this factor directly, access to external markets is relevant in the case of the monetary aggregates rules as well, as the capital export of the resident actors assumes that the country has access to the capital markets not only on the liability, but also on the assets side. Based on this, similarly to the Guidotti–Greenspan indicator, we also expect a positive relation between the use of the income and the monetary aggregate indicator.

In the case of capital controls, our hypothesis is that the stronger the degree of the controls is, the less frequently the Guidotti–Greenspan indicator and the monetary aggregates are used, while the import rule is used more frequently. One of the conclusions that can be deduced from the academic literature is that in countries applying capital controls, the import rule is relevant, while the Guidotti–Greenspan indicator is not. In the case of monetary aggregates it can also be expected that where the degree of capital controls is higher, domestic actors are less capable of rescuing their savings abroad. Thus, here we expect a direct relation between the reserve adequacy indicator and the degree of capital controls, contrary to the development by income level, which is only used as a proxy.

As regards the monetary aggregates rule, we expect that it is used more frequently in countries with a fixed exchange rate regime. As mentioned earlier, the use of

[3] The list of the countries and the IMF country reports used is included in the Annex.

monetary aggregates is recommended more for fixed exchange rate regimes. This is also corroborated by the statements made with regard to currency boards, which is also a special fixed exchange rate regime. However, in the case of the other indicators we do not formulate ex-ante hypotheses, as it is not clear from the academic literature whether the exchange rate regime should influence the relevance of the Guidotti–Greenspan indicator or the import rule. It is a relatively common statement that a fixed exchange rate regime justifies a higher reserve level, but this provides no guidance as to which indicator is more relevant. On the other hand, we examine the practice applied in the IMF reports based on this dimension as well (*Table 1*).

We did not build up a hypothesis for the *IMF composite metric*. This is partly attributable to the fact that the IMF developed this indicator for its own use, and thus we deemed it obvious that it would occur very frequently in the IMF country reports. In addition, the ARA indicator can be calculated and applied to all countries, irrespective of capital controls and type of exchange rate regime. Hence, in contrast to the other indicators, the examination of these dimensions is not applicable. Another important reason is that the justification of the composite metric in the literature differs substantially from that of the traditional indicators, and thus we had no opportunity to test the academic literature, just like in the case of the other reserve indicators.

Table 1
Hypotheses related to the connection of the individual country features to the use of reserve indicators

	Guidotti–Greenspan indicator	Import rule	Monetary aggregate
Development/access to capital markets	+	–	+
Capital control	–	+	–
Fixed exchange rate regime			+

Source: Own collection.

3.3. Income categories

For the categorisation of countries by income, we used the World Bank's World Development Indicators database, where the organisation allocates the countries of the world to four income groups, based on the previous year's per capita gross national income, adjusted for inflation and exchange rate effects (*calculated using the Atlas method*). According to the 2015 figures of the annually updated report, below USD 1,025 countries belong to the low-income category, between USD 1,026 and USD 4,035 to the lower middle-income category, between USD 4,036 and USD 12,475 to the upper middle-income category and above USD 12,475 to

the high-income category. Compared to the list of previous years, the category of several countries may change (positively or negatively); however, we did not examine the data on a time series basis and nor did we take into consideration the changes compared to previous years. 16 of the 105 countries included in our sample belong to the low-income group, 36 to the lower middle-income group, 36 to the upper middle-income group and 17 to the high-income group. The relatively even distribution of the countries permits a more detailed examination of the reserve adequacy indicators, as we can perform further observations within the individual groups without the number of countries in the sub-sample falling too low. We selected the database of the World Bank for the grouping of the countries by development level, as the IMF and investment banks often allocate countries to the emerging countries category, relevant for Hungary, differently, while the categorisation based on income groups is straightforward and covers all countries of the world.

3.4. Capital controls

For the measuring of financial openness, or more precisely, for the examination of the free flow of capital or the existence of capital controls, we selected the Chinn–Ito-index ("KAOPEN[4]"), which monitors the changes in the openness of capital markets in 182 countries in the period of 1970–2014. The capital liberalisation index measures the *de jure* openness, i.e. in the case of the selected countries it focuses on the regulatory aspects and restrictions affecting the current and capital account transactions (*Chinn – Ito 2008*). The index is compiled, based on the IMF's publication entitled Annual Report on Exchange Arrangements and Exchange Restrictions (hereinafter: AREAER), by averaging the binary variables that present the restrictions applicable to the cross-border financial transactions in the period under review. In addition to its relative transparency, another advantage of the index is that we have access to a regularly updated database for a very wide range of countries.

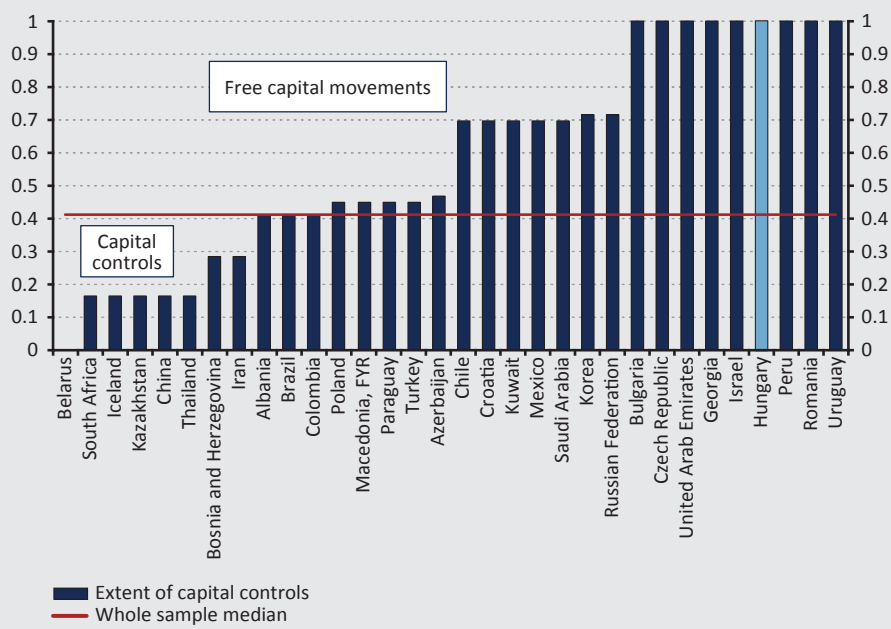
In the KAOPEN data series, the higher value denotes greater degree of openness, i.e., countries, mostly developed ones with fully open capital accounts, receive the highest value. In assessing the reserve adequacy ratios, we considered the 2014 values, where the maximum of the data series is 2.39, representing full openness of the capital market, while the minimum of the variable is –1.89. We use the version of the index that appears as a normalised value between 0 and 1, where 1 represents unrestricted capital flow, while 0 represents complete restriction (KA_OPEN). In measuring capital controls, we did not examine to what degree the values of the index are indeed reliable, i.e. the size of the actual capital flows, the

[4] KAOPEN is the abbreviation for capital "openness" (*Chinn – Ito 2008*).

de facto openness and other indicators used for measuring capital controls (e.g. Quinn index).

The IMF experts calculate the ARA metric not only by differentiating between fixed and floating exchange rate regimes, but also by taking into consideration capital controls. For the determination of capital controls, they set out from the median of three different, but standard indicators (Chinn–Ito index, Quinn index and the IMF share index), where if it takes a value of 0.25 or below, they consider the given country as one having capital controls in place (*IMF 2016*). Analogously to this, we took the median of the Chinn–Ito indices calculated for 2014 in the group of countries under review (0.4128) to measure the openness of the capital market. Where the value exceeded the median value (>0.4128) we deemed capital flows to be free, while in the case of values equivalent to or lower than the median (≤0.4128) we deemed capital flows to be restricted and converted them into dummy variables (0 or 1). Of the 105 countries involved in the analysis, only Serbia was not included in the country list of the Chinn–Ito index. For the analysis of the raw data, we plotted the countries similar to Hungary, belonging to the high-income or upper middle-income category (*Figure 1*).

Figure 1
Capital flow in certain countries belonging to the higher-income* categories



**Note: high-income and upper middle-income countries together.*
Source: Chinn-Ito Financial Openness Index 2014 Update.

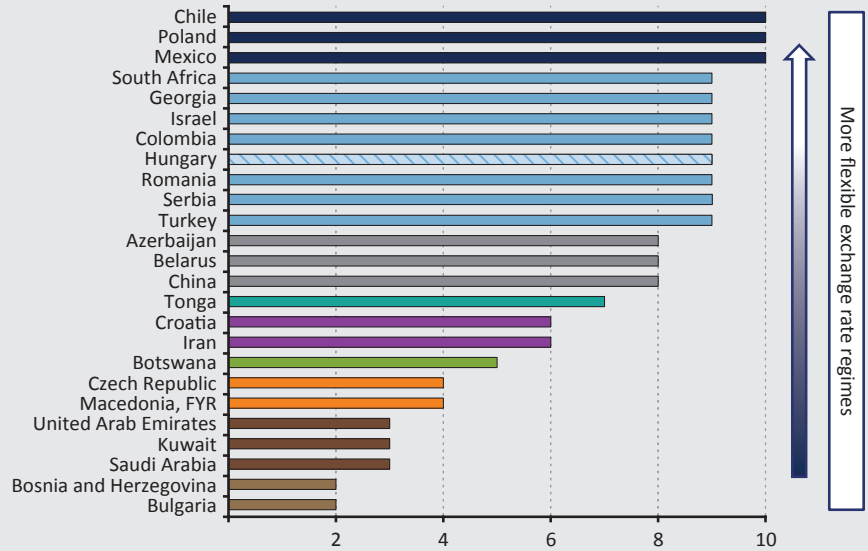
During the 2014 update of the index, the authors called the attention to the fact that since 2005 certain (mostly industrialised) countries reported the introduction of controls of capital movements against terrorist states within the framework of AREAER; however, due to the nature of such controls and in the absence of real restrictions, the authors treated these countries as ones not applying international sanctions (*Chinn – Ito 2016*). Hungary is also included among the 14 listed countries, thus it may happen that the AREAER database shows restrictions in certain categories of Hungary, while based on the Chinn–Ito index it received the highest value (2.39 or 1 in the case of KA_OPEN).

3.5. Exchange rate regime

The IMF publishes a report on exchange rate regimes and exchange controls annually (AREAER). Based on the classification system, last modified in 2008, there are three main categories: *hard/soft pegs, floating arrangements* and those interim countries that cannot be allocated to any of the categories, or the exchange rate regime applied by them often change (other managed exchange rate regime – *residual*). Since the revision performed in 2008, the IMF's classification system sets out from the *de facto* exchange rate regimes, beyond which it also indicates the *de jure* categories indicated by the countries and the explanation of those by the authorities. The three large categories comprise altogether ten exchange rate regimes. Upon the use of exchange rate peg, the volatility of foreign exchange reserves is higher as a result of the regular, and often intensive, foreign exchange market interventions performed to protect the exchange rate, while with the increase in the flexibility of the exchange rate regimes – when the objective is usually only to mitigate the swings in the exchange rate – the fluctuation of reserves decreases (*Farkas 2010*), thus it bears utmost importance even when reserve adequacy is analysed.

We allocated the 2015 data of the IMF's AREAER database to the countries included in our sample. The exchange rate categorisation of the countries may change annually, but we did not examine the changes which occurred in the individual years – particularly the differences between 2014 and 2015 – on a time series basis. Based on the IMF categories, we allocated the countries to the fixed or floating group, depending on which of the two main categories of the AREAER database they belong to (*Figure 2*). We examined the residual countries, belonging to the category of other managed exchange rate regime, one by one and decided on the basis of the information in the IMF country reports and the *de jure* category specified by the authorities of the given country for 2015, whether they are closer to the floating or fixed exchange rate category. Based on the methodology described above, of the 105 countries included in the sample, 47 apply floating exchange rate regimes and 58 apply fixed exchange rate regimes.

Figure 2
Exchange rate regimes in certain countries belonging to the higher-income categories



Legend: 2=Currency board arrangement, 3=Conventional peg, 4=Stabilised arrangement, 5=Crawling peg 6=Crawl-like arrangement, 7=Managed floating with no predetermined path for the exchange rate, 8=Other managed arrangement, 9=Floating arrangement, 10=Free floating.
Source: IMF AREAER database.

4. Results of the analysis of the IMF data

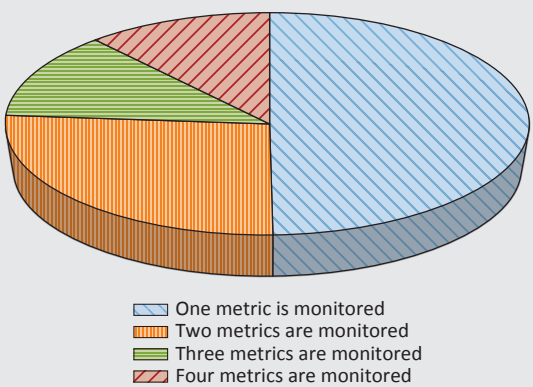
The primary objective of our analysis was to test whether the IMF monitors the individual indices in those countries where they are relevant in theory. In the following, we present the results obtained during the testing of our established hypotheses.

4.1. Incidence of the reserve indicators

As regards the incidence of the four main reserve indicators used by the IMF and analysed by us, for about 75 per cent of the sample they examine one or two indicators to assess the reserve adequacy (*Figure 3*). Examining the incidence of the indicators, we found that for almost half of our sample (52 countries), the IMF deems only *one indicator* relevant, and within that the ratio of the import rule is 70 per cent and the IMF composite metric is 23 percent (the short-term external debt and the monetary aggregate appear only in one case each). For 70 per cent, the import rule appears for the low-income or lower middle-income countries, while the IMF composite metric appears only for the upper middle-income and high-income countries as a single indicator. For more than one quarter of our full

country group (28 countries), the IMF evaluates the reserve adequacy based on *two indicators*. The most frequent combination (ratio of almost 70 per cent) is the IMF composite metric and the import rule, where in 70 per cent of the cases we found countries belonging to the lower-income category and in 30 per cent higher-income countries. The ratio for the lower-income countries is attributable to the fact that in their case, in addition to the popularity of the import rule, the IMF tends to use a composite metric developed specifically for them.[5] In the case of the higher-income countries, this is more attributable to the gradual omission of the import rule. The combination of the short-term external debt and the IMF composite metric is monitored by the IMF in 25 per cent of the cases when it examines two indicators, and this applies to the higher-income countries, almost without exception (examination of the import rule and the monetary aggregates is negligible). For more than 12 per cent of the sample (13 countries), the country reports include *three indicators*, with two larger groups being typical in that, i.e. the short-term external debt – IMF composite metric – import rule and the IMF composite metric – import rule – monetary aggregates. However, based on the analysis of the income categories, we were unable to draw any straightforward conclusions. For 11 per cent of the countries (12 countries), the IMF examined *four indicators*, with three-quarters of the countries belonging to the higher-income category.

Figure 3
Incidence of the reserve indicators based on the intersection of the examined IMF reports



Source: collected from the IMF country reports.

[5] For example: low-income and middle-income country reserve adequacy template or ARA-CC metric, or risk-weighted measure for small island developing states.

4.2. Reserve indicators depending on income categories

According to our first hypothesis, the more developed a country is, the more frequently the Guidotti–Greenspan rule and the monetary aggregates are used, while the import rule is used less frequently.

The results of our analysis performed on the basis of the IMF's country assessments show that there is a positive relation between the use of short-term external debt and monetary aggregates, and the increase in income (*Figure 4*). In the low-income group, the IMF hardly examines the reserve adequacy based on the *short-term external debt* indicator (the value around 6 per cent represents 1 country) and the use of the indicator also does not reach 25 per cent in the lower middle-income category. However, within the two higher-income categories, the short-term external debt is monitored in more than 35 per cent of the cases, which occurs both in the high-income and upper middle-income categories together with several indicators (except one country). That is, the application of the short-term external debt is more common and exceeds the average in the emerging countries. We obtained a similar result in the case of *monetary aggregates*: the incidence of the indicator is lower in the lower-income countries, and higher in the higher-income countries, and it is monitored usually on a complementary basis, together with at least one more indicator. The IMF country reports mention it mostly in the case of the countries belonging to the upper middle-income category (31 per cent), but the indicator is also used for almost 25 per cent of the high-income countries. On the other hand, the role of the *import rule* gradually decreases in parallel with the increase in incomes. For the purpose of evaluating the reserves, the IMF considers the import coverage ratio for all low-income countries under review, as a single indicator in the case of three-quarters of the countries. The ratio of the indicator is also very high, close to 100 per cent, for the lower middle-income countries. Within the group, it is a single indicator for more than 40 per cent of the countries, but in most of the cases it appears together with other indicators, mostly with the IMF composite metric. The use of the indicator substantially decreases in parallel with the increase in the development level: in the high-income category the incidence rate is merely 47 per cent. This may be attributable to the fact that for certain countries the reserve adequacy is presented in the reports through several indices. Our analysis in respect of the *IMF composite metric* concluded that the use of the metric increases in parallel with the development of the countries. While it is considered relatively rarely for the low-income countries, it may be regarded as a relevant indicator for more than half of the countries in the lower middle category, which may be the effect of the composite metric developed for the small islands and lower-income countries. The results are also confirmed by the statistical tests;

the use of all three traditional indices significantly differs when the countries are allocated to two groups based on income.[6]

When examining the indicators within the income groups, in the lower-income categories the import rule is followed by the IMF composite metric and monetary aggregates or short-term external debt, while in the case of the higher-income countries, the IMF metric takes the lead, followed by import rule, the short-term external debt and the monetary aggregates. In our view, the use of the three indicators examined on the basis of our hypothesis may be also influenced by the availability of data. While the import data are available, irrespective of the countries' development, for the evaluation of the reserve based on import coverage, the data necessary for the calculation of the short-term external debt or the composite indices are not necessarily available for the less developed countries.

Figure 4
Reserve indicators used in the IMF country reports by income categories

Note: The ratios show the percentage rate of the countries within the given group where the reports mentioned the given indicator.
Source: Own collection from the IMF country reports and World Bank World Development Indicators.

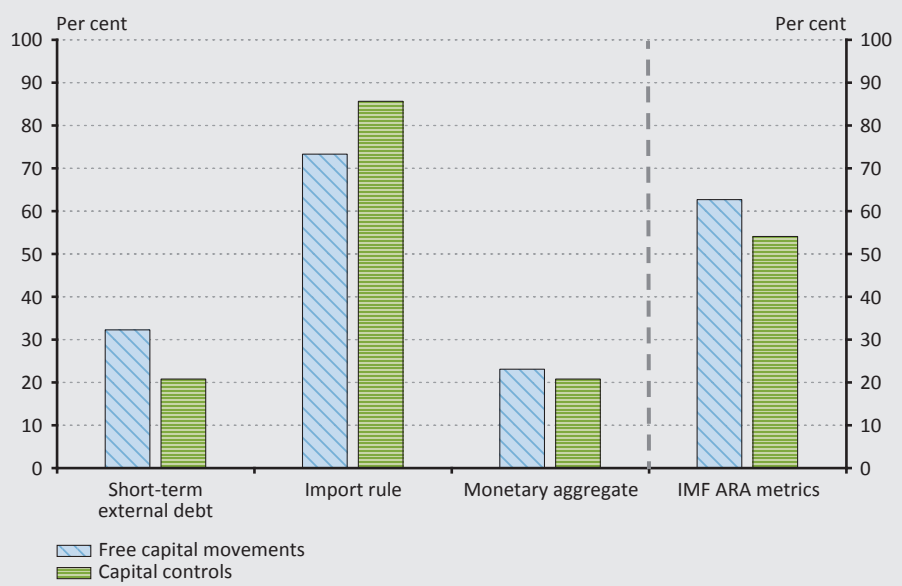
[6] For the short-term external debt, the import rule and the monetary aggregates, the difference is significant at a significance level of 5, 1 and 10 per cent between the high and upper middle-income, the lower middle-income and low-income countries, respectively. For the results see *Table 2 in the Annex*.

4.3. Reserve indicators depending on the capital controls

According to our second hypothesis, the stronger the intensity of the capital controls is, the less frequently the Guidotti–Greenspan and the monetary aggregate indicators are used, while the import rule bears greater significance.

Our research results confirmed a positive relation between the import rule and capital controls; however, the short-term external debt and monetary aggregate indicators are less relevant in the countries applying capital controls (*Figure 5*). In 46 per cent of the 104 countries under review, there is some capital control in place, which we defined by comparing it to the Chinn–Ito-index median. We found that in the IMF reports, upon assessing the reserve adequacy, the short-term external debt and the monetary aggregates are used more often for countries characterised by free capital flows, while the import rule is typical in the case of more intense capital control, which supports the statements of our hypothesis (only for the monetary aggregates did we find no statistically significant difference). For the IMF composite metric, the differentiation between the free and restricted capital flow cannot be interpreted, as the ARA metric is also examined in the countries that apply capital controls, using a formula differing from the traditional one (changing the weight of the monetary aggregates).

Figure 5
Reserve indicators used in the IMF country reports in the case of free or restricted capital flows



Note: The ratios show the percentage rate of countries within the given group where the reports mentioned the given indicator.
Source: IMF country reports, own collection, Chinn-Ito Financial Openness Index 2014 Update.

On the other hand, the Chinn–Ito index also provides an opportunity to separately examine the countries that, based on this index, have the most liberalised capital flows, i.e. where the value of the index is 1. However, the narrowing to this more limited range does not significantly change the results: among them 70 per cent of the reports prepared under Article IV use the import rule, while the short-term external debt is used in only 30 per cent of the cases. This result is surprising in light of the fact that according to the academic literature we should see exactly the opposite relation between these two indicators. The excessive use of the import rule is presumably related to the fact that among countries with a Chinn–Ito index of 1, there are also some low-income and lower middle-income countries (e.g. Haiti and Guatemala).

4.4. Reserve indicators depending on the applied exchange rate regime

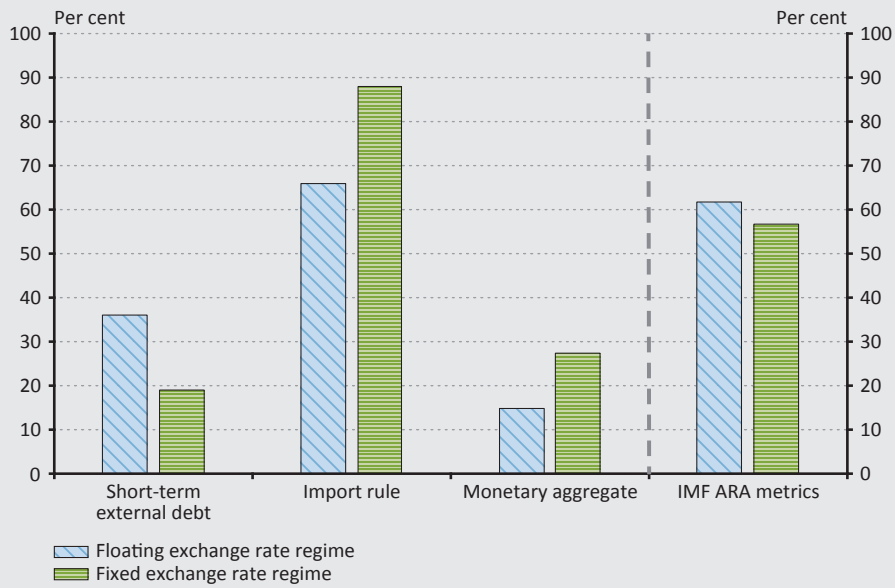
According to our third hypothesis, the more fixed exchange rate regime a central bank applies, the more frequently the monetary aggregates are used.

Countries applying fixed exchange rate regime use the monetary aggregates and import rule more often than those with floating exchange rate regime, while the use of short-term external debt is less frequent. Of the four indicators examined, we defined a prior hypothesis only for the monetary aggregates. In line with our expectations, in countries with a fixed exchange rate regime, the ratio of the application of monetary aggregates is higher in the IMF reports (*Figure 6*). The difference is material, i.e. almost twofold: some of the monetary aggregate indicators are mentioned in almost 30 per cent of the countries with a fixed exchange rate regime, while this ratio is merely 15 per cent for floating exchange rate regimes (the difference is significant in statistical terms as well). Our sample contains 3 countries, the central banks of which operate a currency board within the fixed exchange rate regime (Bosnia and Herzegovina, Bulgaria, Djibouti). In these cases, the monetary aggregate, specifically the monetary base, appears without exception, in line with the fact that for the currency boards the coverage of the central bank money with foreign exchange reserves is a minimum requirement. If we ignore these countries, it is still true that the use of monetary aggregates is more frequent in the case of the fixed exchange rate regimes than in the case of the floating exchange rate regimes. The use of the short-term external debt is substantially more frequent in the case of floating exchange rate regimes than at the fixed ones; there is no material difference in the case of the IMF composite metric, while the application of the import rule is more frequent in the case of fixed exchange rate regimes.[7] This raises the question of why it is worth differentiating depending on the exchange rate regime in the case of the import rule and the short-term external debt. One possible theoretical explanation for the import rule is that with floating

[7] In the breakdown by exchange rate regime, we obtained similar results as at the capital flows; based on this it may arise that we merely see the same results due to the connection of these two dimensions (two-thirds of the countries with fixed exchange rate regime belonged to our capital control category). However, if we break down the countries into capital controls/free capital flows categories, and examine the exchange rate regime within those, we end up with differences of the same direction in both groups as in the figure above. Thus, the differences observed for the exchange rate regime are not explained by the different degree of capital controls.

exchange rate regimes, in the case of a crisis the weakening of the exchange rate may temporarily reduce nominal imports, and thus the use of the import rule may be less relevant.

Figure 6
Reserve indicators used in the IMF country reports in the case of fixed and floating exchange rate regimes



Note: The ratios show the percentage rate of the countries within the given group where the reports mentioned the given indicator.
Source: Collected from the IMF country reports, 2015 data from the IMF AREAER database.

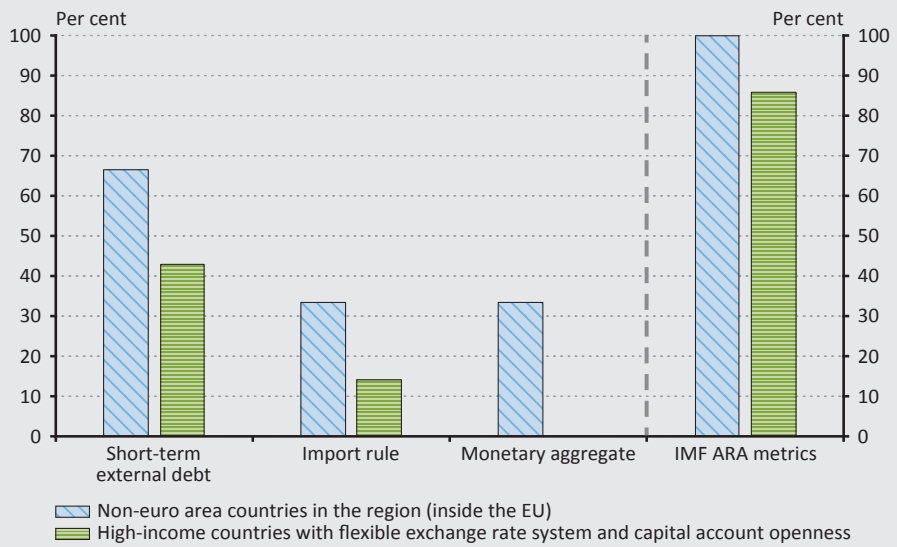
4.5. Reserve indicators along additional dimensions and in respect of Hungary

According to the results of our further analyses, the differences observed along the exchange rate regime and capital control dimensions are influenced primarily by these dimensions rather than by income. The three dimensions examined are related to each other; it is true for the higher-income countries that they tend to use a floating exchange rate regime and there are no capital controls. Almost half (25 countries) of the countries belonging to the high-income or upper middle-income categories (53 countries) similarly to Hungary, apply *de facto* floating, while the majority of them (28 countries) apply *de facto* fixed exchange rate regime. On the other hand, the ratio of free capital flows is almost 70 per cent within the higher-income countries. Accordingly, we allocated the countries to higher-income and lower-income categories, and then we considered within these two groups the incidence of the reserve indicators depending on the exchange rate regime and the capital controls. Apart from some exceptions, we found differences of similar

direction as in *Figures 5* and *6*, in both the capital flows (free, restricted) and the exchange rate regime (floating, fixed) categories, which means that for the majority of the indicators the differences observed at the capital controls and the exchange rate regime are caused not by the different development level of the countries.

In respect of the country group having similar characteristics as Hungary, and the regional non-euro area countries within the European Union, the IMF evaluated the reserve adequacy in the country reports under Article IV based on two indicators, i.e. the short-term external debt and the IMF composite metric. We examined the countries similar to Hungary in two types of groups: first we analysed the typical incidence of the reserve indicators along the dimensions used in our research, i.e. for the group of countries belonging to the high-income category, applying floating exchange rate regime, with free capital flows (group one) and then for those typical for regional non-euro area countries within the European Union (group two), relying on our IMF database. Group one represents about 7 per cent[8] of our tested sample, while group two represents roughly 6 per cent[9] of it. In the case of the countries belonging to group one, the IMF examines reserve adequacy based on one and two indicators (at a ratio of 57 and 43 per cent). The IMF composite metric and the short-term external debt are the most frequently used indicators (86 and 43 per cent),

Figure 7
Reserve indicators used in the IMF country reports in the countries with similar characteristics as Hungary and in the regional countries of the non-euro area



Source: Collected from IMF country reports.

[8] The group includes Chile, South-Korea, Israel, Poland, Hungary, Seychelles Islands and Uruguay.
[9] The group includes Bulgaria, the Czech Republic, Croatia, Poland, Hungary and Romania.

while the import rule is used less often (14 per cent) and the monetary aggregate is not relevant at all (0 per cent) (*Figure 7*). Reserve adequacy is analysed in the case of Hungary and Uruguay based on the short-term external debt and the IMF composite metric, in the case of the Seychelles Island based on the IMF composite metric and the import rule, while in the case of Chile, South Korea and Poland only on the basis of the IMF composite metric, and for Israel based on the short-term external debt.

In the case of the other group, we examined the reserve adequacy ratio of the EU non-euro area countries, most relevant for and at a similar development level as Hungary. As regards our three main dimensions (1) – with the exception of Romania and Bulgaria – the majority of the countries belong to the high-income category, (2) none of the countries restricts capital flows, (3) Poland, Hungary and Romania apply floating exchange rate regime. The results are very similar to those of group one; the IMF composite metric and short-term external debt can be regarded as the two most important indicators (100 and 67 per cent), while the import rule and the monetary aggregate occur at a lower, but identical rate (33 per cent each). The higher ratio observed for the import rule and the monetary aggregate, belong to the two upper middle-income countries, i.e. Bulgaria and Romania, since in the case of these countries the IMF examines all four indicators. (In the case of Bulgaria the use of the monetary aggregate is justified by the fixed exchange rate regime, or more precisely the currency board, while Romania is characterised by the floating exchange rate regime, thus our third hypothesis is not confirmed by Romania alone.) In the case of the Czech Republic and Poland, the IMF analyses reserve adequacy only on the basis of its own metric, while for Croatia and Hungary it uses the short-term external debt and the IMF composite metric. Only two countries, i.e. Poland and Hungary, are at the intersection of the two groups.

The analysis of the reserve adequacy is not a constant element of the European Commission's country reports; when it is used, the Commission gives preference to the traditional reserve indicators. In addition to our database resting on the IMF country reports, we also analysed the reserve adequacy of the non-euro area regional countries based on the country reports prepared by the European Commission between 2014 and 2016. In 2014, no reference to the reserve adequacy appeared in the reports at any of the six countries; the Commission analysed the then current level of the reserves in 2015 only for Croatia, and in 2016 for Bulgaria, Croatia and Hungary. In the case of Croatia, the short-term external debt and the import rule appeared in both annual reports; however, in 2016 the Commission added the monetary aggregates and the gross external debt as well to the evaluation criteria. The short-term external debt appeared in the case of Hungary, while the monetary aggregates appeared in the case of Bulgaria, operating a currency board, as relevant indicators, which also corresponds to the results of our research performed on the IMF data.

5. Reserve indicators used in investment bank analyses

Apart from the international institutions, investment banks also regularly analyse the reserve adequacy of individual countries. In this chapter, we present the reserve indicators used in the investment bank analyses and their frequency. We expanded the *Csávás – Csom-Bíró 2016* analysis related to the MNB, with additional banks and we also involved the emerging countries in the survey.

5.1. Data compilation

For the investment bank analysis, the first filter was represented by the selection of the range of banks. As a source, we primarily used the recommendations and analyses prepared regularly by large investment banks and sent directly to their clients. The database available to us contained the analyses of roughly 30 banks; however, the analyses of some banks contained no reference to reserve adequacy. *Our sample includes altogether 21 large banks operating on a global basis or in several countries*.[10] In addition to the non-public bank analyses, to a lesser degree we also relied on the banks' websites as a source, and thus we could also examine publicly available analyses.[11] Based on the number of banks, the sample may appear small, particularly when compared to the database compiled on the basis of the IMF reports. However, the banks under review may be deemed significant based on their market weight; their combined share in the global foreign exchange market turnover is 75 per cent, based on the regular survey performed by Euromoney (*Euromoney 2015*). Since the analyses are prepared for the clients of the banks, who can take into consideration the analyses when they trade in the market, the ratio of the banks in terms of their potential market effect may be deemed significant. As regards the ratio of the banks under review in the domestic forint/foreign currency market, they have similarly high share in the spot foreign exchange turnover.

The period under review is 2014-2016, which is in line with the date of the IMF reports examined earlier, thus we could survey a relatively long period. When collecting the analyses of the individual banks, we followed the principle that wherever it was possible, at least two analyses should be included in the database. In the case of a few banks we found only one relevant analysis, and thus with a view to increasing the sample size, for some banks 3–4 analyses were involved in the examination. As a result of this, *our survey includes 48 different analyses*, i.e. a little more than two analyses per bank on average.

[10] Bank of America, Bank Zachodni Santander Group, Barclays, Citibank, Commerzbank, Credit Suisse, Concorde, Danske, Deutsche, Erste, Franklin Templeton, Goldman Sachs, HSBC, JPMorgan, KBC, Morgan Stanley, Nomura, OTP, Societe Generale, UBS, Unicredit.

[11] Publicly available analyses: Bank Zachodni WBK 2016, Deutsche Bank Research 2016, Goldman Sachs 2013, JP Morgan 2016, Templeton 2015, UBS 2015.

Upon categorising the reserve indicators, we followed similar principles as in the case of the database compiled from the IMF reports. In addition to the Guidotti–Greenspan indicator, we also allocated the modified versions thereof (e.g. gross external financing requirement) to the short-term external debt indicator. In addition, of the traditional indicators, the import rule and monetary aggregates, as well as the IMF composite metric, also appear in the bank analyses. The monetary aggregate denotes the M2 monetary aggregate in all analyses. In the case of the IMF composite metric, the banks often import the data from the IMF reports, but there are also examples of own calculations. In addition to these four indicators, one bank uses a cost-benefit based optimising model, being its in-house developed model, thus we ignored this indicator for the purpose of the analysis (*Goldman Sachs 2013*).

Our sample includes 30 emerging countries altogether. As regards the countries under analysis, the nature of the analyses limited the range of countries. Less than half of the analyses relates only to one country, among them mostly to Hungary. The rest of the analyses examine many countries together. The developed countries were excluded from the sample in this examination as well; the analyses typically allocate the countries to the emerging category.

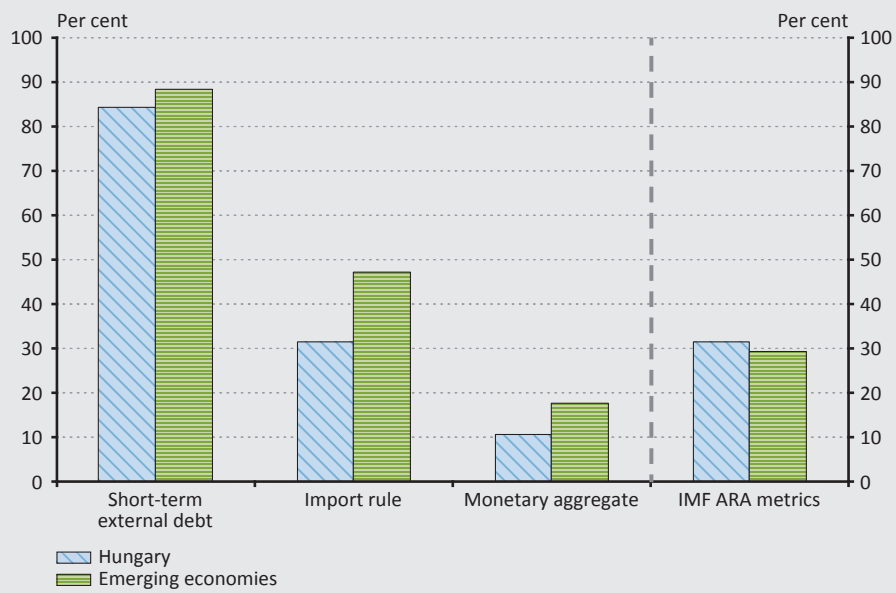
While in the case of the analyses dealing with the given country separately, the banks may select the indicators to be used based on country-specific factors, in the case of the combined analyses covering several countries, this is usually not the case. This does not permit an analysis of which country-specific factors the banks apply to differentiate between the countries in respect of the indicators used. On the other hand, we divided the samples into two parts: analyses related to Hungary and generally to emerging countries. In the case of Hungary, we examined the analyses of 19 banks, and in the case of emerging countries those of 17 banks, and thus the range of the banks is mostly identical. As regards the number of the analyses, we examined 33 and 26 of them, respectively. Analyses which also assessed the MNB's reserve adequacy were included in both groups, however, the two sub-samples only overlap to a small degree.

During the analyses we evaluated it as a hit, if the given indicator appears in the analysis of a bank, be it *in text, on a figure or in a table*. However, if a given bank uses the same indicator in two separate analyses related either to Hungary, or to a group of emerging countries, we treated it only as one hit for the given indicator. Thus, the overrepresentation of the banks included in the databases with several analyses can be avoided. If the same bank indicated two different indicators in its two different analyses, we evaluated it as a hit. In accordance with this, we compare the hit rates not to the number of analyses, but to the number of banks that provided the analyses.

5.2. Results

In the case of the emerging countries and Hungary, the vast majority of the large investment banks monitor short-term external debt, and almost all banks use it for the assessment of reserve adequacy. The banks assess the reserve adequacy of emerging countries based on several indicators, of which the short-term external debt is the most popular one. The same applies to the analyses examining Hungary: more than 80 per cent of the banks monitor this indicator (*Figure 8*). Thus, the short-term external debt rule is not only the most popular among the banks, but it can be stated that almost all banks under review use it for the assessment of reserve adequacy. In the case of the emerging countries, the next one in the line is the import rule, with almost half the banks using this indicator. However, in the case of Hungary, the second most popular indicator, lagging well behind the short-term external debt, is the IMF composite metric applicable to emerging countries. The incidence rate is around 30 per cent, i.e. almost one-third of the banks use this indicator. In the case of the emerging countries we find a similar ratio, although here this indicator is ranked only third in terms of incidence. The result related to the IMF composite metric may be interesting in the sense that of the examined indicators this is the newest one, nevertheless the large banks have already started to use it. The monetary aggregates indicator, taking the fourth place, is the last one in both groups, it is mentioned only by 2–3 investment banks.

Figure 8
Incidence of the individual reserve indicators used by the banks



Note: Ratio of the banks mentioning the given indicator within all banks, several banks mentioned more than one indicator. 48 analysis of 21 banks, published in 2014–2016, based on 30 emerging countries in total.
Source: Bank analyses.

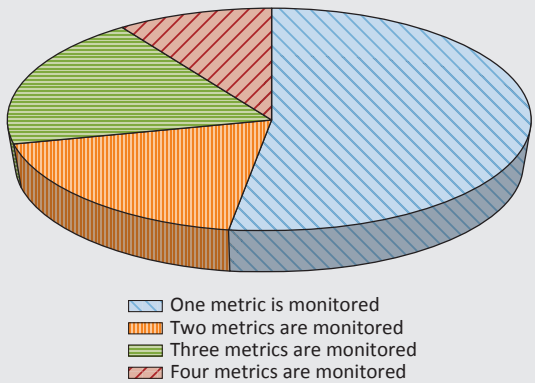
In the case of Hungary, the import rule is used less frequently than for the other emerging countries. The banks examine the individual indicators in a similar ratio for Hungary and for the entirety of the emerging countries. Significant difference can be seen in the case of the import rule, which is mentioned almost one and a half times more frequently for the emerging countries than for Hungary. Despite the relatively small sample size, this can be regarded as a substantial difference. The difference is attributable to three more hits, which is not negligible relative to the total number of the banks (due to the partially overlapping sample, we did not examine the difference between the use of the individual indicators by statistical tests, as they typically assume that the two sub-samples are independent of each other).

The significantly different ratio of the import rule, observed in the case of Hungary and the rest of the emerging countries, may be attributable to country-specific factors. Although we do not examine it by tests similar to the previous chapter, the difference related to the import rule is presumably attributable to country-specific factors examined earlier. In order to confirm this, we examined to what extent the average characteristics of the emerging countries under review differ from those of Hungary. As regards income, we found that about 20 per cent of the emerging countries under review – which were included in the previous analysis based on the IMF reports – belong to the high-income, half of them to the upper middle- and the rest of them to the lower middle-income category. Since Hungary is in the high-income category, one reason for the difference may be that the income of the emerging countries is lower on average, which showed a higher incidence rate for the import rule in the IMF's practice as well. The difference may be also attributable to the fact that about 70 per cent of the emerging countries belong to the free capital flows category, while 30 cent of them apply capital controls, which also justifies the higher relevance of the import rule. As regards the exchange rate regime, the emerging market group is less heterogeneous; almost 85 per cent of them apply a floating exchange rate regime (the high ratio of the countries with floating exchange rate regime is presumably attributable to the fact that currencies with fixed exchange rate are less relevant in the focus of the investment banks for the purpose of the exchange rate analyses). The inclusion of the countries with fixed exchange rate regime in the investment banks' sample may also explain the higher incidence of the application of the import rule.

Based on the combined use of the indicators, in addition to the short-term external debt, the banks tend to use the other indicators only as a complementary indicator. Similarly to the IMF reports, we also examined the incidence rate when the banks examine an indicator alone or together with other indicators. The picture is similar in the sense that about half of the banks mentioned only one indicator (*Figure 9*). The most important difference is that in the case of the banks that mentioned

only one indicator, practically all banks mentioned the short-term external debt. In the case of the banks that examine two indicators, it can be also stated that there was only one example, when these two indicators did not include the short-term external debt (combination of the import rule and the IMF composite metric). At each of the banks that examine three indicators together, the combination included the short-term external debt, the IMF composite metric and the import rule. The results suggest that in addition to the short-term external debt rule, banks tend to use the rest of the indicators only as complementary.

Figure 9
Incidence of reserve indicators based on bank analyses



Note: Ratio of the banks mentioning the given indicator within all banks, several banks mentioned more than one indicator. 48 analysis of 21 banks, published in 2014–2016, based on 30 emerging countries in total.
Source: Bank analyses.

The sequence of the individual indices differs significantly from the results obtained from the IMF reports, which suggests that the IMF is only partially able to orient banks' expectations. In the banks' analyses, the most popular indicator is the short-term external debt, followed by the import rule, while the IMF metric is ranked third. By contrast, in the IMF reports, in the case of the countries similar to Hungary, the most frequently used indicator was the IMF metric, followed by the short-term external debt and the import rule. The different results could be attributable to the different range of countries under review. However, if we filter the IMF reports to the countries examined in the banks' analyses, the sequence identified in the IMF reports does not change.[12] Accordingly, the difference in the two types of analyses is not attributable to the composition effect by countries. The prevalence of the IMF

[12] The incidence rate of the IMF index is almost 90 per cent, while the short-term external debt was monitored by the IMF in half of the countries, the import rule appears at 30 per cent and the monetary aggregate at one-sixth of the countries.

composite metric in the IMF reports may be attributable to the fact that IMF gives preference to its own indicator, which may be regarded relatively self-explanatory. Nevertheless, the different sequence suggests that although the banks also started to use the IMF composite metric, the IMF is only partially able to orient the banks' expectations as regards the type of indicators used for the assessment of reserve adequacy.

6. Summary

The literature recommends several criteria for which countries the reserve indicators measuring the foreign exchange reserve adequacy are relevant and for which ones they are less relevant. The main question examined in our paper is whether the individual reserve indicators are used in those countries where the academic literature regards them more relevant. For the analysis of the issue, we compiled a broad database, covering more than 100 countries, based on the IMF country analyses under Article IV and the reports related to the IMF programmes. We examined four indicators, namely short-term external debt, the IMF's composite metric, the import rule and the monetary aggregate.

The result of the analysis performed on the basis of the IMF country reports shows that the most frequently used indicator is the import rule, followed by the IMF composite metric and the short-term external debt. The use of the indicators significantly varies as function of income: the IMF tends to use the short-term external debt and the monetary aggregates more often for the higher-income countries, while the role of the import rule gradually decreases. This is in line with our hypothesis derived from the academic literature, according to which the use of the indicators depends on the access to capital markets, which is explained by the development level. The use of the IMF composite metric increases in parallel with the development level of the countries; however, the use of the composite metric for determining the optimal reserve level is becoming increasingly common in the case of the developing countries as well.

Further results confirmed a positive relation between the import rule and capital controls; however, the short-term external debt and monetary aggregate indicators are less frequent in the countries applying capital controls, which corresponds to the recommendations in the academic literature. Use of the import rule may be deemed excessive in the case of countries characterised by fully free capital flows, which may be attributable to the fact that there are also low-income and lower middle-income countries among them. Furthermore, we found that for countries applying fixed exchange rate regimes the monetary aggregates and import rule are used more often than for those with floating exchange rate regimes, while the use of short-term external debt is less frequent.

In the group of countries with similar development level as Hungary, with similar exchange rate regime and not applying capital controls, and in the non-euro area EU countries, the IMF assesses the reserve adequacy in the country reports based on two indicators, i.e. the short-term external debt and the IMF composite metric, while the import rule and the monetary aggregates are less relevant or not at all relevant indicators. The country reports prepared by the European Commission for the EU member states do not always contain an assessment of the foreign exchange reserves and the reserve adequacy, and thus we could draw conclusions only on the basis of some regional countries. The Commission prefers the traditional indicators, and the use of these corresponds to the IMF's practice.

Apart from the international institutions, the large international banks also assess the reserve adequacy of emerging countries based on several indicators. Based on 48 various analyses prepared by 21 banks acting globally or in several countries, we examined a total of 30 emerging countries for which reserve indicators are used the most often by investment banks. According to our results, the vast majority of the large investment banks monitor the short-term external debt both in the case of the emerging countries and Hungary. In the case of the emerging countries, after the import rule the IMF composite metric is the third most popular indicator, while in the case of Hungary the banks mentioned these two rules at an equal rate. That is, in the case of Hungary the use of the import rule – presumably due to country-specific factors – is less frequent than in the case of the other emerging countries. However, in the case of banks examining more than one index, it can be stated that the other indicators appear only as a complementary index in addition to the short-term external debt. Thus, the sequence of the individual indicators differs from the results obtained from the IMF reports, which suggests that the IMF only partially orients banks' expectations.

Annex

Table 1
IMF member states involved in the analysis and reports underlying the used data*
** The table continues on the next page*

Country	Report 1		Report 2	
	Date	Name	Date	Name
Afghanistan	July 2016	ECF	November 2015	Article IV / SMP
Albania	September 2016	EFF	June 2016	Article IV / EFF
Algeria	May 2016	Article IV	December 2014	Article IV
Angola	November 2015	Article IV	September 2014	Article IV
Aruba	May 2015	Article IV	October 2010	Article IV
Azerbaijan	September 2016	Article IV	June 2014	Article IV
Bahamas	July 2016	Article IV	July 2015	Article IV
Bangladesh	January 2016	Article IV	November 2015	ECF
Barbados	August 2016	Article IV	February 2014	Article IV
Belize	October 2016	Article IV	March 2016	Article IV
Bolivia	December 2016	Article IV	December 2015	Article IV
Bosnia and Herzegovina	September 2016	EFF	October 2015	Article IV
Botswana	April 2016	Article IV	July 2014	Article IV
Brazil	November 2016	Article IV	May 2015	Article IV
Bulgaria	November 2016	Article IV	May 2015	Article IV
Burundi	March 2015	ECF	September 2014	Article IV / ECF
Cabo Verde	November 2016	Article IV	September 2014	Article IV
Chile	December 2016	Article IV	August 2015	Article IV
Colombia	June 2016	FCL	May 2016	Article IV
Comoros	December 2016	Article IV	February 2015	Article IV
Costa Rica	May 2016	Article IV	February 2015	Article IV
Czech Republic	July 2016	Article IV	July 2015	Article IV
South Africa	July 2016	Article IV	December 2014	Article IV
Djibouti	July 2016	Article IV	December 2015	Article IV
United Arab Emirates	July 2016	Article IV	August 2015	Article IV
Ethiopia	October 2016	Article IV	September 2015	Article IV
Belarus	September 2016	Article IV	May 2015	Article IV
Fiji	February 2016	Article IV	November 2015	Article IV
Philippines	September 2016	Article IV	September 2015	Article IV
Gambia	April 2015	RCF / ECF	September 2015	Article IV

Country	Report 1		Report 2	
	Date	Name	Date	Name
Ghana	October 2016	ECF	January 2016	ECF
Georgia	January 2015	SBA	August 2013	Article IV
Guatemala	August 2016	Article IV	September 2014	Article IV
Guinea	November 2016	ECF	July 2016	Article IV
Guyana	July 2016	Article IV	September 2014	Article IV
Haiti	June 2015	Article IV / ECF	January 2015	ECF
Honduras	November 2016	Article IV / SBA / SCF	January 2016	SBA / SCF
Croatia	June 2016	Article IV	May 2014	Article IV
India	March 2016	Article IV	March 2015	Article IV
Indonesia	March 2016	Article IV	March 2015	Article IV
Iraq	December 2016	SBA	July 2016	SBA
Iran	December 2015	Article IV	April 2014	Article IV
Island	June 2016	Article IV	March 2014	Article IV
Israel	September 2015	Article IV	February 2014	Article IV
Jamaica	November 2016	EFF / SBA	June 2016	Article IV / EFF
Yemen	September 2014	Article IV / ECF	July 2013	Article IV
Jordan	September 2016	EFF	June 2014	Article IV / SBA
Cambodia	November 2016	Article IV	November 2015	Article IV
Kazakhstan	September 2015	Article IV	August 2014	Article IV
Kenya	March 2016	Article IV / SBA / SCF	October 2014	Article IV
China	August 2016	Article IV	August 2015	Article IV
Kyrgyz Republic	June 2016	ECF	February 2016	Article IV / ECF
Rep. of Congo	October 2015	Article IV	October 2014	Article IV
Korea	August 2016	Article IV	May 2015	Article IV
Kuwait	December 2015	Article IV	December 2014	Article IV
Lao People's Democratic Republic	February 2015	Article IV	December 2013	Article IV
Poland	July 2016	Article IV	January 2016	FCL
Lebanon	July 2015	Article IV	July 2014	Article IV
Liberia	December 2016	ECF	January 2016	ECF
Macedonia	November 2016	Article IV	September 2015	Article IV
Madagascar	August 2016	ECF	November 2015	RCF
Hungary	April 2016	Article IV	April 2015	Article IV
Malawi	June 2016	ECF	December 2015	Article IV
Malaysia	May 2016	Article IV	March 2015	Article IV

Country	Report 1		Report 2	
	Date	Name	Date	Name
Maldives	May 2016	Article IV	March 2015	Article IV
Morocco	August 2016	PLL	February 2016	Article IV
Mauritania	May 2016	Article IV	February 2015	Article IV
Mauritius	March 2016	Article IV	May 2014	Article IV
Mexico	November 2016	Article IV	May 2016	FCL
Moldova	November 2016	EFF / ECF	January 2016	Article IV
Mongolia	April 2015	Article IV	March 2014	Article IV
Mozambique	January 2016	Article IV / PSI / SCF	August 2015	PSI
Myanmar	September 2015	Article IV	October 2014	Article IV
Nicaragua	February 2016	Article IV	December 2013	Article IV
Nigeria	April 2016	Article IV	March 2015	Article IV
Russian Federation	July 2016	Article IV	August 2015	Article IV
Pakistan	October 2016	EFF	January 2016	Article IV / EFF
Papua New Guinea	November 2015	Article IV	December 2014	Article IV
Paraguay	May 2016	Article IV	February 2015	Article IV
Peru	July 2016	Article IV	May 2015	Article IV
Romania	May 2016	Article IV	March 2015	Article IV
Rwanda	June 2016	PSI / SCF	January 2016	PSI
Solomon Islands	March 2016	Article IV / ECF	April 2015	ECF
São Tomé and Príncipe	December 2016	ECF	June 2016	Article IV / ECF
Seychelles	January 2016	EFF	July 2015	Article IV / EFF
Sierra Leone	December 2016	ECF	July 2016	Article IV / ECF
Sri Lanka	December 2016	EFF	June 2016	Article IV / EFF
Suriname	June 2016	SBA	October 2014	Article IV
Samoa	July 2015	Article IV	June 2013	RCF
Saudi Arabia	October 2016	Article IV	September 2015	Article IV
Serbia	December 2016	SBA	September 2016	SBA
Sudan	October 2016	Article IV	December 2014	Article IV
Tajikistan	February 2016	FSSA	May 2012	ECF
Tanzania	July 2016	Article IV / PSI	February 2016	PSI
Thailand	June 2016	Article IV	May 2015	Article IV
Tonga	June 2016	Article IV	April 2015	Article IV
Turkey	April 2016	Article IV	December 2014	Article IV
Trinidad and Tobago	June 2016	Article IV	September 2014	Article IV

Country	Report 1		Report 2	
	Date	**Name**	**Date**	**Name**
Tunisia	June 2016	EFF	October 2015	Article IV / SBA
Uganda	June 2016	PSI	November 2015	PSI
Ukraine	September 2016	EFF	August 2015	EFF
Uruguay	February 2016	Article IV	March 2015	Article IV
Vanuatu	October 2016	Article IV	June 2015	Article IV / RCF
Vietnam	July 2016	Article IV	October 2014	Article IV
Zambia	June 2015	Article IV	January 2014	Article IV

Abbreviations:
ECF – Extended Credit Facility
RCF – Rapid Credit Facility
EFF – Extended Fund Facility
SBA – Stand-By Arrangements
FSSA – Financial System Stability Assessment
SCF – Standby Credit Facility
PLL – Precautionary and Liquidity Line
SMP – Staff-Monitored Program

Source: Collected from IMF country reports.

Table 2
Test results

	high-income and upper middle-income category		low-income and lower middle-income category		Z-score	P-value
	r	n	r	n		
Short-term external debt	0.36	53	0.17	52	2.20	0.015
Import rule	0.60	53	0.96	52	–4.95	0.000
Monetary aggregate	0.28	53	0.15	52	1.62	0.054
IMF composite metric	0.74	53	0.44	52	3.20	0.001
	free capital flow		restricted capital flow			
	r	n	r	n		
Short-term external debt	0.32	56	0.21	48	1.32	0.095
Import rule	0.73	56	0.85	48	–1.56	0.061
Monetary aggregate	0.23	56	0.21	48	0.29	0.385
IMF composite metric	0.63	56	0.54	48	0.86	0.196
	floating exchange rate regime		fixed exchange rate regime			
	r	n	r	n		
Short-term external debt	0.36	47	0.19	58	1.98	0.025
Import rule	0.66	47	0.88	58	–2.70	0.004
Monetary aggregate	0.15	47	0.28	58	–1.62	0.054
IMF composite metric	0.62	47	0.57	58	0.50	0.309

Note:
n denotes the number of observations in the given category, while r denotes the use rate of the given reserve indicator within that.
Z-score denotes the test statistics used for the testing of the difference between the ratio of the two sub-samples.
P-value denotes the significance level of the z-score test statistics, calculated by the Welch one-way t-test.

Source: Collected from IMF country reports.

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Developments in Government Interest Expenditure for Hungary, 2000–2015*

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In this study, we examine the changes in interest expenditure between 2000 and 2015, and in this context, focus particularly on analysing the impact of decreasing yields on the government securities market observed over the past three years. The annual change in interest expenditure can be categorised into several factors based on a methodology similar to the decomposition of government debt, and the summary discloses the details of the trends characterising the four periods which can be distinguished over the past 15 years. From among these factors, we gave precedence to the analysis of the changes in yields as this factor exerts a stronger influence on the developments in interest expenditure than any other factor. Based on a regional comparison, in addition to a supportive international environment, domestic factors have also strongly affected the favourable developments of the government securities market in recent years. From the Hungarian developments, we should highlight the fact that interest rate cuts together with the Self-financing Programme, which mitigated Hungary's external vulnerability, has had a tangible impact on the developments in Hungarian government securities' yields, and as such, due to the substantial contraction in interest expenditure, exerted a favourable effect on the balance of the general government. Finally, we also present the imputed interest expenditure entailed by the reorganisation of the pension system, and the study argues that these should be managed separately from actual interest expenditure.

Journal of Economic Literature (JEL) codes: E42, H50, H62, H63

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1. Introduction

In this study, we analyse developments in accrual-based government interest expenditures between 2000 and 2015, with the objective of identifying factors which facilitated the substantial decrease of approximately 1 percentage point of

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GDP in general government interest expenditure since 2013. Independent analysis of the levels and changes in government expenditure is relatively infrequent in international literature, as interest expenditure is generally analysed in close correlation with government debt, since interest payment has a causal relationship with the underlying stock of debt. However, the developments seen over the past three years in Hungary justify an analysis expressly focusing on interest expenditure, since due to Hungarian and international factors, the government's interest expenditure is declining at a much faster rate than the drop in the debt ratio observed year after year. One notable and favourable outcome of decreasing interest expenditure is that it facilitates compliance with the Maastricht deficit target, without deficit reduction measures reducing government demand. In turn, a disciplined fiscal policy has an impact on sustainability, as the debt reducing effect of the primary surplus decreases the country risk premium, which may be reflected in the further decline of yields and interest expenditure. To enable us to analyse in detail the reasons underlying the changes in interest expenditure, we present a methodology suitable for separating the various impacts which determine interest expenditure. Our results confirm the assumption that in recent years the decrease in government securities market yields was the key determining factor behind the reduction in interest expenditure. However, when further analysing developments between 2000 and 2015, other interesting questions can be identified, such as why, despite the increase in the level of debt, interest expenditure did not increase in 2000. In the study, the period under review concludes with the close of 2015, and therefore we did not provide details regarding subsequent developments and measures taken by the central bank.

In the second chapter, the study presents the background based on Hungarian and international literature. In the third chapter, we discuss recent developments in government interest expenditure, while chapter four explains in detail the decomposition methodology that helps us to identify the various factors underlying the changes in interest expenditure. In chapter five, we divide the past fifteen years into four periods based on the decomposition. According to our calculations, the prime explanatory factor was the fluctuation of yields, which was mainly attributable to a low international yield environment and the improving risk assessment of Hungary, due to favourable domestic macroeconomic developments; the role of the Hungarian central banks' measures are also important. Chapter six presents developments in nominal and real interest rates, highlighting developments that took place after 2013, while also discussing developments in implied interest rates in a regional comparison and in the light of the changes in the debt profile. In chapter seven, we cover the settlement-related specifics of the so-called imputed interest expenditure stemming from the reform of the pension system, i.e., a current issue concerning the statistical time series of interest expenditure; and we argue that, based on economic logic, these should be managed separately from the interest expenditure within the primary balance. In the last chapter, we draw conclusions.

2. Background

From among the publications discussing similar topics, we would like to highlight the study of *Barabás et al.* (*1998*), which analysed the impact of financing government debt with marketable government securities. In this study, the authors analysed the changes in "expanded consolidated government debt", which accounts for outstanding debt in the government sector and that of the MNB, i.e. two separate institutions, taking part in the financing at that time in a consolidated manner. This may have been justified then, since it was the MNB that took out the foreign currency debt due to the fact that only the MNB had access to foreign markets, and the interest charged on this debt was also paid by the central bank.

Therefore, the government deficit did not comprise the interest payments on external funding taken out at market rates, only the burdens associated with the low interest HUF loans of the government outstanding to the MNB. For that reason, the authors produced the operational balance of the general government from the volume changes of the aggregate balance of the government sector and of the MNB, which contains the primary balance and the real interests. While analysing the consolidated outstanding debt, they summarised their results related to real interest rates, developments in debt, privatisation and the adjustment performed in 1995. They discovered that the implicit real interest rates of government debt consistently exceeded the growth of the economy between 1988 and 1997, causing the debt ratio to increase. The debt increasing effect could be decelerated only by the adjustment performed in 1995, as it resulted in a surplus on the primary balance, but it had a negative impact on economic growth. The substantial (approximately 15-percentage point) contraction in debt that followed was caused by the debt repayment made from the proceeds of privatisation.

It was concluded from the quantitative results that sustainable growth and convergence to developed economies can only be realised in tandem with additional debt reduction. But for the timely reduction of the debt ratio, "the at least 1.5–2 per cent structural surplus of the primary balance measured against GDP is necessary" *(Barabás et al. 1998:1*). Privatisation proceeds did not change the net financial position of the government, and indebtedness remained substantial despite the repayments financed from the proceeds, which, according to the authors, had a restrictive effect on the growth of the Hungarian economy.

However, this study focuses primarily on changes in the accrual-based interest expenditure of the general government, which is only one part of the paper presented as a background. With regard to this, and in view of the following features, it is not justified to use the methodology applied by the above study:

- Today, it is no longer necessary to consolidate the MNB and the government sector recorded in the statistics as two separate subsectors, as the National Bank

no longer becomes indebted in the name of the government, i.e. all government debt can be found in the balance of the government sector.

- During the period analysed in this study, the inflationary environment differed significantly from the era of high inflation after 1990.
- The structure of government debt is significantly more stable (and more transparent) than the debt structure at the time of the political changeover.

Current interpretation of consolidated interest payments of the general government and of the central bank

It should be noted that the consolidated examination of government debt, the balance of the central bank, as well as the paid interest expenditure in connection with the government's foreign currency debt may also be justified at present, but for a wholly different reason, as discussed by *Barabás et al.* (*1998*).

Baksay et al. (2012) analysed how the change in the proportion of foreign currency within government debt affected the compliance of central bank reserves, and the profit and loss of the central bank. The government's foreign currency debt increases the central bank's interest expenditure and offsets the interest savings achieved by the government on its foreign currency debt. When analysing the process in detail: the foreign currency obtained from foreign currency issuing, on the one hand, increases the central bank's foreign exchange reserves, and on the other hand, the government converts it to domestic currency at the central bank, then utilises it (spends it), which, in turn, increases domestic money market liquidity. The central bank must sterilise the increased liquidity in line with inflation targeting, and the central bank pays the base interest rate[1] on the sterilisation asset. In this way, the difference between the yields of advanced economies and Hungarian market yields is the central bank's net interest loss, because the central bank can invest its foreign currency reserves at lower interest rates, while it pays a higher domestic interest-rate for the sterilisation portfolio. In consolidated terms, the foreign currency debt loses its apparent advantage of having a lower interest rate than that of government securities issued in the Hungarian currency.

Ardagna et al. (*2004*) studied the impact exerted by the primary balance and government debt on the level of interest rates influencing the interest expenditure of the budget. When reviewing the data of 16 OECD countries between 1960 and 2002, they found that a 1-percentage point deterioration in the primary balance, as a percentage of GDP, triggers approximately 10 basis points of growth in the case of long-term yields. Based on their results, global factors also have a tangible effect on the long-term end of the yield curve of a given state.

[1] Specifically from September 2016, after the introduction of the cap of the three-month deposit stock, it pays the sterilisation average interest-rate: the weighted average of the base interest rate, the preferential deposit interest-rate equivalent to the base rate and the interest rate of overnight deposit.

Orbán and Szapáry (*2006*) analysed the reasons underlying the high government deficit and its macroeconomic impacts, pointing out the Hungarian phenomenon, also analysed in our current paper, that the interest expenditure of the general government between 2002 and 2006 practically stagnated, despite increasing debt. The authors noted that the consequence of a continuously increasing government debt may be a high interest payment of the government which may only be covered by the excessive taxation of the income generated by Hungarian sectors. Due to increasing debt, a portion of household savings is financing the government instead of private sector investments (crowding-out effect). It was also emphasised that the upward drift in debt goes hand-in-hand with the increase in risk premium, which, in turn, may have an added negative impact on fiscal policy as it increases real interest rates.

Izák (*2009*) examined the link between the primary balance, government debt and, among others, interest expenditure in post-socialist EU member states. The result offered by the paper, principally of interest from the perspective of this analysis, is that between 1999 and 2006 from among the studied countries, only in Poland was the average real interest rate higher than the economic growth. This indicates that in Poland, a surplus of the primary balance was needed to stabilise the debt, while in other countries the GDP-proportionate government debt remained stable, despite a negative primary balance, due to economic growth.

Tóth (*2011*) investigated the developments in government debt from the aspect of sustainability. Although the author analysed the development of debt, he drew significant conclusions from the aspect of this paper as to how real interest rates influence debt. The reduction of debt between 1999 and 2001 was primarily supported by developments in the primary balance and by economic growth, while the real interest rate, expressly noteworthy from the aspect of this study, had only a slight debt increasing effect.

According to *Tóth,* the period between 2002 and 2010 may be divided into two parts: while from 2002–2006 and 2007–2010 debt grew to an equal extent, these two periods are still different in terms of the factors initiating the increase. Between 2002 and 2006, increasing debt stemmed exclusively from developments in the primary balance, which was only partially offset by economic growth. However, between 2007 and 2010, the primary balance of the budget did not have any actual debt increasing effect, and the upward drift in the debt ratio was caused by the real interest rate, the downturn in the economy and the weakening HUF exchange rate. Based on the results of the author, the real interest rate had the same debt increasing effect during both periods. All of these facts are in line with the results of *Baksay et al.* (*2013*).

The *Bundesbank* (*2013*) study analysed the developments in interest expenditure in EU member states, with a distinct focus on Germany, similar to the descriptive

part of this paper. The study states that changes in yields may have a much more significant impact than any other factor on the developments in the government's interest expenditure. In Germany, for example, gross interest expenditure as a percentage of GDP dropped from 3.3 per cent to below 2.5 per cent of GDP as part of a longer process between 2000 and 2013, as the average interest paid for the outstanding government debt diminished sharply. Similarly, debt increased in several EU member states between 2000 and 2015 while government interest expenditure decreased significantly.

3. Interest expenditure in Hungary in the recent period

The interest expenditure of the general government decreased significantly between 2013 and 2015, falling by approximately 1 percentage point as a proportion of GDP. The dynamics of the contraction that occurred during the past years was outstanding during the period under review, i.e. between 2000 and 2015, and only the reduction between 2000 and 2002 was of an equal extent. However, during these two periods, these factors contributed to the positive trend to different degrees[2] (*Figure 1*).

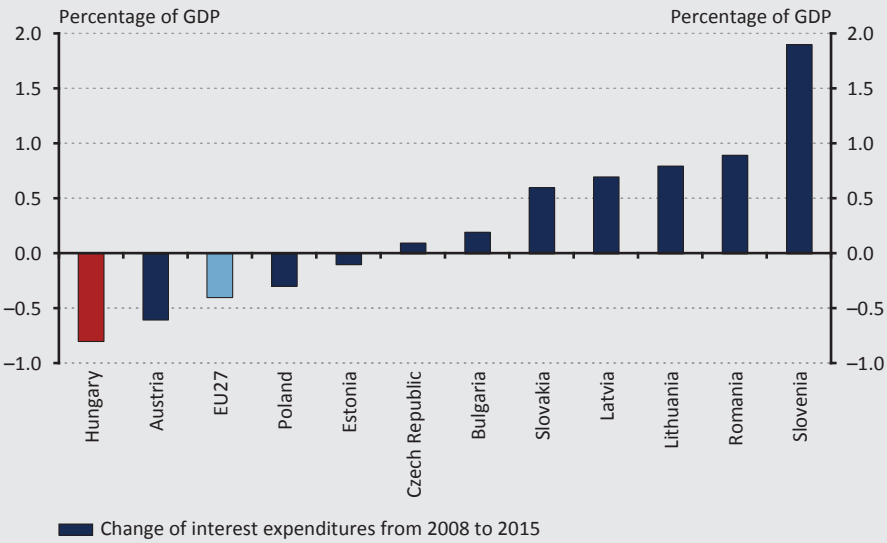
Figure 1
General government's accrual based interest expenditure

Note: The data do not contain the imputed interest expenditure (for more details, see Chapter 7).
Source: Eurostat.

[2] For the detailed summary, see Chapter 5.

The contraction in interest expenditure is outstanding in a regional comparison, that is the reduction can largely be explained by factors specific to Hungary (*Figure 2*). The contraction of interest expenditure of such an extent and the increasingly rapid reduction of the debt ratio in parallel with this is outstanding in the region and for the EU as a whole. The reduction was primarily aided by decreasing yields and the growth of the economy.

Figure 2
Changes in interest expenditure between 2008 and 2015



Note: The data do not contain the imputed interest expenditure (For more details, see Chapter 7).
Source: Eurostat.

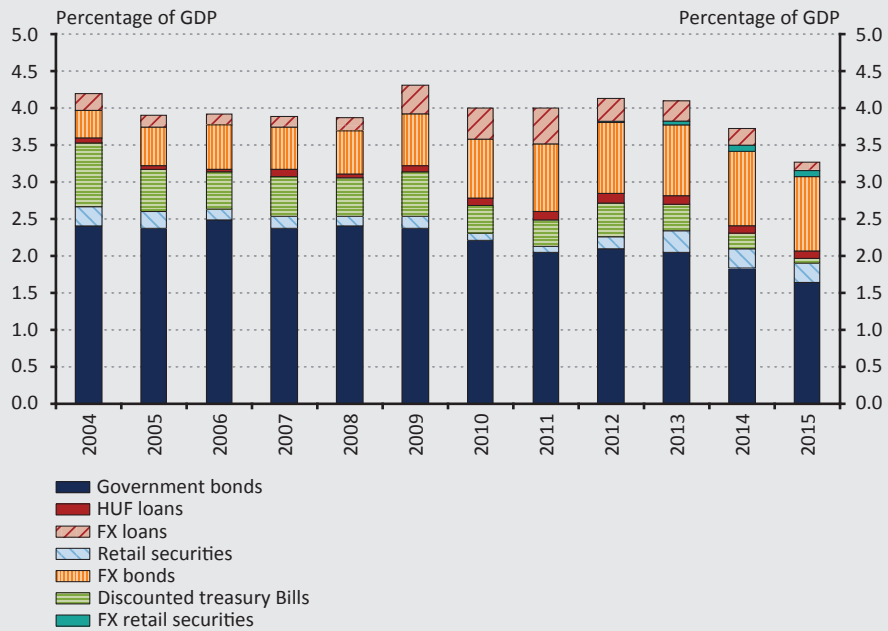
According to the forecast of the European Commission, within the EU the accrual-based interest expenditure of the general government decreased to the greatest extent in Hungary, probably falling by 1.4 per cent of GDP between 2013 and 2017.[3] The interest environment is low worldwide and interest rates declined over the past years in parallel with the monetary easing programmes of the world's key central banks, but within the EU the general government's interest expenditure as a percentage of GDP decreased the most in Hungary. This outstanding reduction is especially notable as during the same period, Hungary completely switched to market financing, and increasingly, to domestic financing (*Kicsák 2016a*).

Due to the aforementioned reorganisation of debt structure, the structure of interest expenditure also changed. The fact that the total interest expenditure of foreign currency and HUF bonds increased in proportion to the overall interest

[3] Also see *Kicsák* (*2016b*).

payment, while the interest expenditure of loans decreased demonstrates the shift to market-based financing. The interest rate of securities issued for households also increased, but the pace of this increase was considerably lower than what would be implied by the increase of nearly HUF 4,000 billion in the stock of government securities held by households. Due to the favourable effect of the decrease in Hungarian yields, the GDP-proportionate interest payments of HUF bonds and HUF government securities held by households have been continuously declining since 2013, despite the upward drift in the weight of HUF-denominated securities. The substantial drop in the interest expenditure of foreign currency loans was caused by a substantial erosion of the portfolio, as the key objective of the Hungarian debt management strategy is to lower the proportion of foreign currency within public debt. After 2010, the full repayment of the EU-IMF-loan and the prepayment of other foreign currency loans continuously supported the achievement of this objective.

Figure 3
Summary of the interest expenditure of the central government by instruments



Source: ÁKK (Government Debt Management Agency).

4. Methodology applied for the decomposition of the change in interest expenditures

As part of this decomposition, we sought to separate the impact of some basic macroeconomic developments within the annual change of GDP proportionate interest expenditures. To this end, we used a methodology similar to the decomposition of developments in public debt.

To measure the impact associated with the changes in yields, the starting point was the straightforward mathematical average of secondary market benchmark yields.[4] The product of the change in average yields in specific years (*r*) and the stock of HUF debt produces the total effect of yield changes. Due to the repricing period of public debt (in a 1-year period, nearly 1/3 of the debt is repriced), one third of the overall impact affects the first year, while the remaining two thirds are distributed among the following years in such a way as to affect the start of the period more strongly, whereas the following years are less affected. The repricing period used in the study applies the maturity structure of previous years as a reference, and thus going forward, the repricing period may change if the maturity structure of the debt changes.

$$eff_{\Delta r} = \sum_{i=0}^{9} \frac{\left(r_{t-i} - r_{t-i-1}\right) \times debt_{t-i}^{HUF}}{GDP_{t-i}^{NOM}} \times \frac{x_{i+1}}{100} \qquad (1)$$

where x is the repricing in each years

and x = [32,11,11,10,9,7,5,5,5,5]

The effect of the real growth of the economy (eff_{g_real}) arises as the difference of two GDP-proportionate interest expenditures: the interest expenditure of the given year (exp^{int}) in proportion to the real GDP (GDP_{real}) of the same year (measured at the price fixed in 2010), and the interest expenditure of the given year in proportion to the real GDP of the previous year. We calculated the effect of nominal growth (eff_{g_nom}) using the same method, with the difference that the denominator includes the nominal GDPs. If we deduct the annual effect of the real GDP from the effect of the nominal GDP, we obtain the effect of the GDP deflator (quantifying the effect of the nominal GDP is nevertheless also indispensable for presenting the effect of the debt ratio).

$$eff_{g\_real} = \frac{exp_t^{int}}{\mathrm{GDP}_t^{real}} - \frac{exp_t^{int}}{\mathrm{GDP}_{t-1}^{real}} \qquad (2)$$

$$eff_{g\_nom} = \frac{exp_t^{\mathrm{int}}}{\mathrm{GDP}_t^{nom}} - \frac{exp_t^{\mathrm{int}}}{\mathrm{GDP}_{t-1}^{nom}} \qquad (3)$$

[4] For the sake of simplicity, we used the mathematical average, as it only slightly deviates from the weighted averages, where the weights are selected in such a way that the average time to maturity of the portfolio matches the actual average time to maturity of the debt.

$$eff_{GDP\_defl} = (3) - (2) \tag{4}$$

The effect of the nominal change in debt ($eff_{\Delta debt\_nom}$) is the product of the spread between the nominal debt of the given year and of the previous year, and the implied interest rate of the given year. The effect of the change in nominal debt and nominal growth together yield the effect of the change in the debt ratio.

$$eff_{\Delta debt\_nom} = \frac{\left(debt_t^{nom} - debt_{t-1}^{nom}\right) \times \frac{exp_t^{int}}{debt_{t-1}^{nom}}}{GDP_t^{nom}} \tag{5}$$

$$eff_{\Delta debt\_rate} = (3) + (5) \tag{6}$$

We can calculate the effect of the fluctuations in exchange rates in two steps. As the first step, we calculate the increase or decrease in debt stemming from revaluation, and then the implications these movements have on the interest rate. The revaluation of foreign currency debt entailed by fluctuations in exchange rates (rev_t) is the product of the spread between the average EUR/HUF exchange rate of the given year and of the previous year and the stock of foreign currency debt. We obtain the effect of revaluation on interest expenditure by multiplying the revaluation and the average implied interest rate.

$$rev_t = \frac{debt_{t-1}^{FX}}{exc_{t-1}} \times exc_t \tag{7a}$$

$$eff_{\Delta exc} = rev_t \times \frac{int_{nom}^{imp}}{GDP_t^{nom}} \tag{7b}$$

where exc_t is the annual average exchange rate

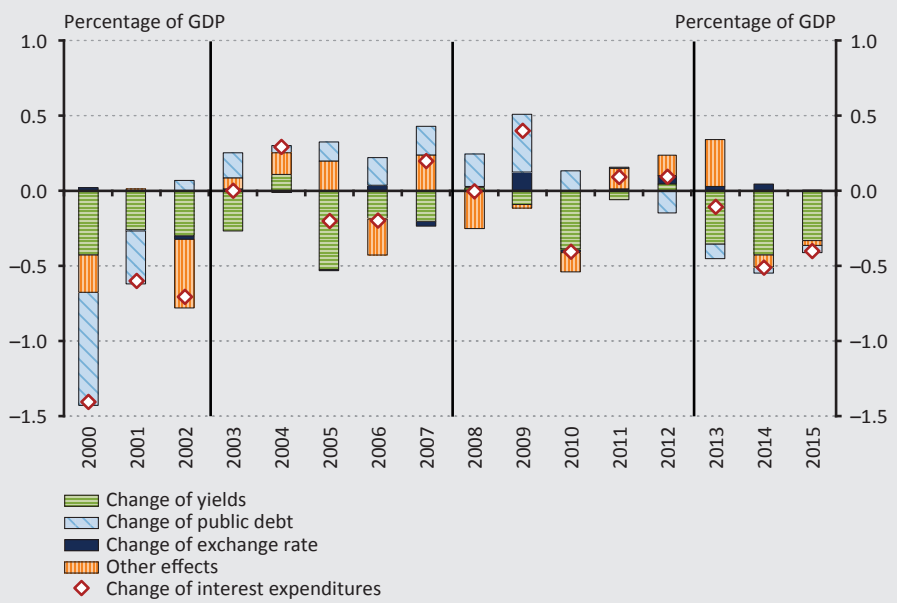
$$\text{and where } int_t^{imp} = \frac{exp\_FX_t^{int}}{debt_{t-1}^{FX}} \tag{8}$$

and int_{avg}^{imp} is equal to the average of the period between 2000 and 2015 of int_t^{imp}.

5. Principal factors determining the fluctuation of interest expenditure

The GDP-proportionate reduction in interest expenditure was largely initiated by decreasing market yields entailed by economic growth, the programmes implemented by the central bank over the past 3 years, the favourable macro-economic conditions in Hungary and the supportive international environment. The nominal increase in debt and exchange rate fluctuations primarily supported a growth trend. In this chapter, we principally attempt to decompose and quantify the core effects within the changes in interest expenditure (*Figure 4,* red rhombus), and based on the available data summary for the years elapsed since 2000 into 4 periods.

Figure 4
Key factors affecting the change in interest expenditure



Note: The data do not contain the imputed interest expenditure.
Source: Based on data provided by the Government Debt Management Agency (ÁKK), Eurostat, HCSO and MNB.

5.1. Factors affecting the changes

From 2000–2001, the change in the debt ratio contributed to the decrease in interest expenditures, while between 2002 and 2010 it produced a continuous increase, and then after 2010, it once again caused interest expenditure to decrease. The decrease in the debt ratio had the most significant effect on interest expenditure in the years 2000 and 2001, substantially contributing to the reduction of expenses. Thereafter, between 2002 and 2010, the GDP-proportionate debt increase augmented interest expenditures by an average of 0.2 percentage points. The unfavourable effect was the most pronounced

in 2009, when expenditures increased by 0.4 per cent of GDP due to the increased level of debt. As opposed to that, after 2010 debt reduction supported the decrease in expenditure each year, which amounted to an average of 0.1 per cent of GDP.

The effect of exchange rate fluctuations that took place after 2000 was negligible on interest expenditure, but in terms of its amount, it tended to increase expenditures. Based on our estimate, using the average annual exchange rate as our reference, the revaluation in 2009 and 2012 may have increased the GDP-proportionate interest expenditure by 0.1 percentage point (rounded), while in other years, the impact may have been less. During the entire period, the overall impact of exchange rate fluctuations contributed to the increase in interest expenditure by nearly 0.3 per cent of GDP.

Capturing the effect of yield fluctuations is more difficult than the other factors, as it took several years for such yield fluctuations to have an effect, instead of in the given year due to repricing of public debt. For this very reason, the yield fluctuation that took place in a given year has a partial effect on the subsequent years. In order to quantify the annual impact, in addition to recognising yield fluctuations, it is imperative to know when public debt was repriced, as the yields belonging to different maturities have a varied effect on developments in government interest expenditure. Based on the quarterly maturity structure data of the past 5 years, nearly 1/3 of debt is repriced within 1 year, more than half of debt is repriced in a period of 3 years, while nearly 100 per cent of the debt is repriced in 10 years (based on *Ádám et al. 2015*).

The yield fluctuation during the period under review had a turbulent effect on interest expenditure, but in general, it supported the reduction of expenditure, especially over the past 3 years. The yields adjusted with the effects of repricing (see Chapter 4, formula (*1*)) contributed to a tangible decrease in interest expenditure between 2000 and 2002. Between 2003 and 2007, yields evolved hectically, but the ample liquidity characterising the entire world predominantly supported the decrease in expenditure. In 2008 and 2012, however, as a result of the crisis, a tangible yield increase was observed, which in turn caused interest expenditure to increase. During that period, the change in yields contributed by an average of 0.1 per cent of GDP annually to the reduction of interest expenditure. We can articulate a trend-like and continuous decrease in yields since 2013, which in itself caused interest expenditure to decline by an annual average of nearly 0.4 per cent proportionate to GDP. Furthermore, we can state that the trend observed in the fluctuation of yields influences the change in interest expenditure more than any other factor.

Other effects may arise partly from the estimation inaccuracies of some effects that cannot be classified under the above mentioned factors. The taking out of the EU-IMF loan in 2008 may have distorted the estimation, while its repayment may have an effect to the contrary in 2013. The most notable debt management operations observable in the other effects are the repurchase and switch auctions

and the government securities market repurchase agreements. These operations may increase the inaccuracy stemming from the estimation of the repricing of yields, thus accelerating or impeding actual repricing.

5.2. Periods that can be differentiated

From 2000–2002, interest expenditure decreased substantially, dropping by an annual average 0.9 per cent of GDP. During these years, the reduction in the debt ratio and the reduced yields also had a tangible impact. In 2002, the increase in the debt ratio caused interest expenditure to grow, but overall expenses decreased (in 2002, we can see by way of the other effects that the increase in the stock of debts had only a minor effect on interest payments).

From 2003 until the outbreak of the crisis in 2008, interest expenditure slightly increased annually on average. In most of this period, the debt ratio increased yearly to much greater extent. During this period, yields evolved in a fairly volatile manner, but they largely decreased. Due to the globally low yield environment, we saw a more significant effect primarily in 2005, causing interest expenditure to decrease. As the result of the high global risk appetite, the fluctuation of yields supported the overall decrease in interest expenditure.

The GDP-proportionate level of expenditure did not substantially increase after 2008 either, since although market yields increased significantly, most of the debt did not come from the market, but from the IMF and the EU. These foreign currency loans had an interest rate considerably more favourable than the market rate. Accordingly, foreign currency loans slowed the increase in interest expenditure, but they had an unfavourable effect from several aspects. Their concentrated maturities made debt management more difficult in the ensuing years, they increased the foreign currency proportion of public debt making the economy more sensitive to exchange rate fluctuations, and ultimately they indirectly increased the central bank's interest expenditure.

As opposed to the previous period, after 2013, the interest payment of the general government decreased in excess of 0.3 per cent of GDP on average, which is typically attributable to the contraction of yields. The decline in yields in and of itself would have resulted in a 0.3–0.4 percentage point decrease in expenditure at an annual level, but this was dampened in 2013 by other factors. During these three years, the decrease in the debt ratio and economic growth had a favourable impact on interest expenditure.

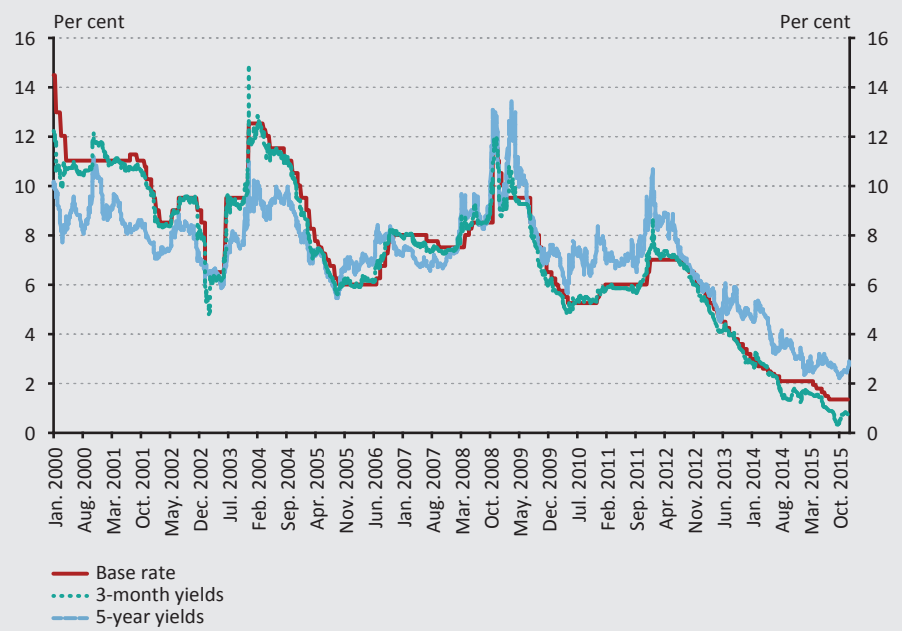
6. Developments in yields

6.1. Yields on the government securities market

Over the past 15 years, several Hungarian and international factors have had a significant effect on the yields on Hungarian government securities market. At the start of 2000, in a high inflationary environment, the level of Hungarian base rates

and yields closely following such base rates evolved at around 10 per cent or above. Thereafter, at the end of 2003 and at the beginning of 2004, the financing costs of the Hungarian public debt may have increased largely due to country-specific reasons. Four years later, the global financial crisis already found Hungary in a vulnerable state and this is also visible in the increase in government securities market yields, while the high yield environment characterised the entire world during this period. The European sovereign debt crisis also caused yields to increase and the high yield level reached its peak in the middle of 2012 (*Figure 5*).

Figure 5
Developments in the base interest rate and of yields of secondary market government securities



Source: ÁKK, MNB.

After 2013, the favourable international environment, the Hungarian macroeconomic indicators and the improving risk perception of Hungary as well as the interest rate cuts by the central bank contributed substantially to the decrease in government securities market yields. The MNB's monetary policy, as part of which the Monetary Council kept the focus on the Hungarian inflation process in line with the primary objective of the central bank, had a favourable effect on the yields of government securities from a fiscal aspect. As a result of low yields and the gradual repricing of debt, the decline in interest expenditure may further continue in the coming years.

From August 2012 until the end of the period under review, i.e. until the close of 2015, the base rate dropped by 565 basis points from the starting value of 7 per cent (*since then, it has decreased by another 45 basis points to 0.9 per cent*)*. As a result of this development, secondary market yields dropped by an average of 490 basis points until the close of 2015* (*and at the end of July 2016, the average yield reduction had already reached 560 basis points*). Short-term yields decreased more substantially, falling by 590 basis points on average, while long-term yields decreased by some 420 basis points. During the easing cycle, the short-term yields moved closely together with the decreasing base interest rate and after the announcement of the Self-Financing Programme, as the result of increasing demand, continue to follow the interest rate cuts and are actually evolving at a lower level than the Hungarian base rate. Long-term yields followed the base interest rate cuts sometimes closely and at other times in a more relaxed way, but overall they had a tendency to decline. This is attributable to the fact that, although the base interest rate is primarily influencing short-term yields, the long, credible interest easing cycle goes together with a decline in the long-end of the yield curve (*Kicsák 2015:4*).

The central bank's programmes contributed greatly to the decrease in yields and the increased demand for government securities. In addition to the international environment, the favourable prospect of the Hungarian economy and the disciplined Hungarian fiscal policy, the measures taken by the MNB also supported the strong decline in the Hungarian government securities market yields.[5]

1. *During the 24 uninterrupted interest rate cuts of the 2-year easing cycle, which started on 29 August 2012,* the Monetary Council decreased the central bank's base rate from 7 per cent to 2.1 per cent (*MNB 2014b*). The start of interest rate cuts was made possible by the improving international environment, and then favourable developments in Hungarian factors and international risk appetite also contributed to the continuation of the cycle for two years. The low inflationary environment in Hungary and stable inflationary expectations, the increasingly disciplined fiscal policy and macroeconomic developments all supported the uninterrupted monetary easing.

2. *The Self-Financing Programme announced on 24 April 2014*[6] had an impact on the government securities market, owing to the adjustment of market players immediately after its announcement and even prior to the actual introduction of the programme. The objective of the Self-Financing Programme (*MNB 2014a*) is to strengthen the financing of public debt from internal, Hungarian sources and to mitigate the external vulnerability of the Hungarian economy.

[5] For listing the programmes, we used: *Kicsák 2015:1–2*.
[6] For the detailed description of the phases of the Self-Financing Programme, please refer to: *Csávás – Kollarik 2016*.

a. As the most crucial component of the first phase of this measure, as of 1 August 2014, the 2-week deposit became the main policy instrument, replacing the previously used 2-week bond and only partner institutions are authorised to keep these instruments with the central bank. The central bank deposit is not an eligible security for the MNB's loan instruments, and therefore demand increased for other, more liquid instruments, primarily government securities.

b. At that point, the central bank also introduced an interest rate swap instrument (as of 16 June 2014) for institutions within its circle of counterparties in order to mitigate their interest rate risk.

c. Another key component of the measure is that foreigners and non-bank Hungarian investors are not permitted to keep their HUF liquidity in the central bank's main policy instrument, and part of the funds excluded from the main policy instrument may also increase demand for government securities.[7]

3. From 25 March 2015, the Monetary Council relaunched the easing cycle during which the base interest rate decreased to 1.35 per cent until the end of 2015, after five consecutive interest rate cuts of 15 basis points each.[8]

4. *On 2 June 2015, the MNB announced the second phase of the Self-Financing Programme*[9] (*MNB 2015 and Csávás – Kollarik 2016*). As a result of this new programme phase, gross external debt decreased further, foreign currency debt declined and the proportion of Hungarian investors increased within the financing of government debt (*Nagy – Palotai 2015*).

a. The most essential component of this change was that from 23 September 2015, the 2-week deposit was replaced by the 3-month deposit as the main policy instrument, which is available for banks without any quantitative restrictions.

b. Parallel to this, from the end of 2015, the central bank defined a limit of HUF 1,000 billion for the stock that can be kept in a 2-week deposit, so in this way the 2-week deposit fulfilled a liquidity management function. (The two-week deposit instrument was phased out in April 2016 as part of the third phase of the Self-Financing Programme.) The maturity of the new main policy instrument is longer than the 30 days that can be taken into account for short-term liquidity coverage, and therefore banks exchanged a part of their central bank deposits for government securities in order to comply with liquidity rules.

[7] For more details, see: *Kolozsi 2014*, and *Hoffmann – Kolozsi 2014*.
[8] The period analysed in this study continues until the close of 2015. Since then, the base interest rate has decreased by an additional 45 basis points to 0.9 per cent.
[9] However, the period examined by the study closes on 31 December 2015, and therefore we present neither the details of the third phase of the Self-Financing Programme nor the impact of the cap of the 3-month deposit.

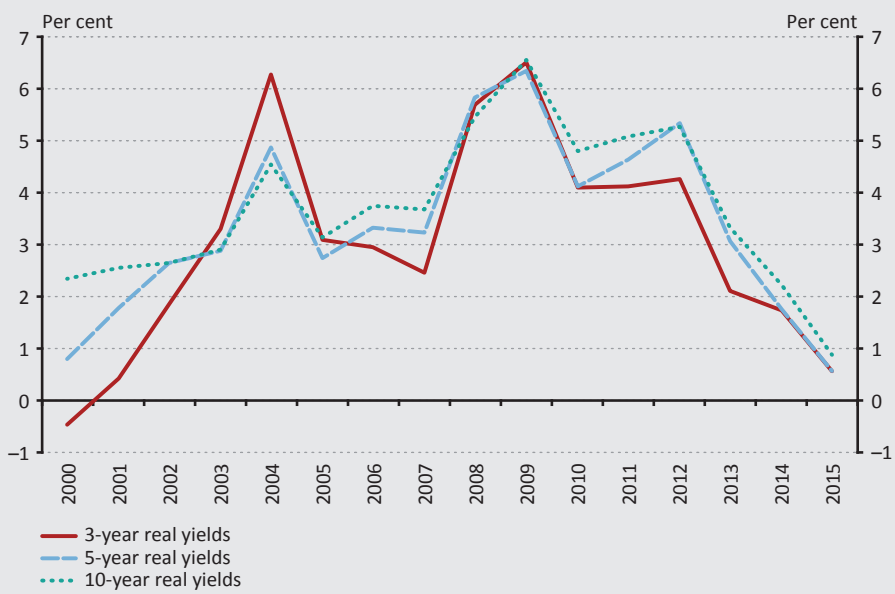
c. Also as part of the second phase, the previously available overnight interest rate corridor became asymmetric instead of the ±100 basis points band. Banks could place deposits with the central bank at an interest rate 125 basis points lower than the base interest rate, while the interest rate of the overnight central bank collateralised loan was 75 basis points higher than the interest rate of the main policy instrument.

d. Both the maturity (one-week instead of two-week and three-month instead of six-month) and the pricing (the spread on the base interest rate was cut from 50 basis points to 25 basis points) of traditional loan instruments changed as well.

e. The interest swap instruments continued to support banks' liquidity management.

In terms of the sustainability of debt, the real yield of government securities is also quite relevant, which, however, showed strong volatility during the years under review. Between 2000 and 2007, the forward-looking real yield[10] of HUF-denominated bonds calculated with the GDP deflator fluctuated below 4 per cent, in tandem with

Figure 6
Developments in forward-looking real yields



Source: Government Debt Management Agency, HCSO, MNB.

[10] We averaged the GDP deflator in all three cases with a forward-looking approach for the entire maturity of government securities, since investors in government securities may decide concerning the expected return based on their expectations regarding the developments in prices when it comes to the formation of market yields. When forecasting the GDP deflator, we used the MNB's Inflation Report for December 2016 as reference.

the global abundance of liquidity and high risk appetite (apart from 2004), signifying that it only slightly reacted to the gradual increase in the government debt ratio. The global financial crisis revealed the structural and financial problems of the Hungarian economy. The short-term and long-term sustainability of government debt was questioned and the country risk premium immediately spiked as a result of which yields on the government securities market significantly increased.[11] The forward-looking real yields remained at a high level until 2012, which was followed by a substantial decrease, and from 2013 as a result of the above detailed reasons (more favourable international environment, country specific factors, lower central bank base rates etc.), and real yields dropped to 1 per cent (*Figure 6*).

6.2. Implied interest rates

The implied rate is the interest rate that shows the actual paid interest in proportion to the outstanding debt. We can calculate the implied interest rate in several ways, depending on for which year we take the interest payment into account, i.e. the interest paid in the given year may be linked to the outstanding debt of the previous year or the current year. For example, in the case of a loan with a longer maturity, interest must be paid for the previous outstanding stock, but the interest paid for very short-term government securities (for example three-month discount treasury bills) relates to the stock of the given year, and interest must also be paid for government securities issued during the year.[12] If the proportion of the various instruments within the stock of outstanding debt is more or less constant, there is no major difference in the result. Considering the above, we express the interest payment in proportion to the weighted average of the previous year's and the current year's debt in such a way that we convert the foreign currency debt to Hungarian currency at the average annual exchange rate.

$$int_t^{imp} = \frac{exp_t^{int}}{\omega \times debt_t^{nom} + \omega \times debt_{t-1}^{nom}} \qquad (9),$$

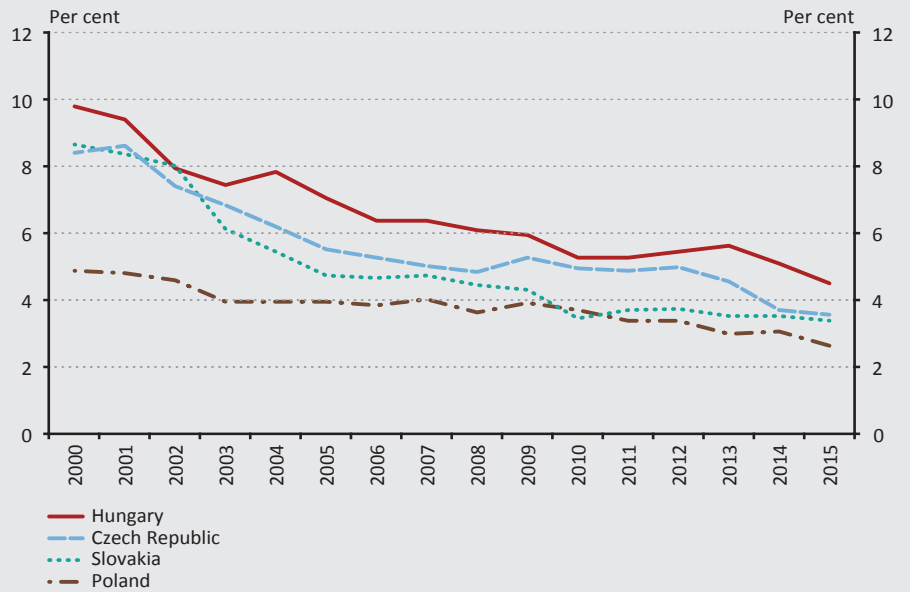
where in this case ω = 0,5

Implicit interest expenditure consistently declined throughout the examined period, both in Hungary and in the region (*Figure 7*). Many different factors contributed to the decline, with one of the most notable being the contraction of inflation and the improving risk perception of the region, also appearing in the decline in interest rate spreads. Nevertheless, the robust easing policy of regional central banks also played a key role.

[11] At the end of 2008 and the beginning of 2009, the mistrust of investors was so high that Hungary temporarily suspended the issuance of government paper (apart from short-term discounted treasury bills).

[12] On an accrual basis, interest expenditure must always be claimed for the remaining part of the year for government securities issued during the year, but the interest expenditure should only be shown in the payments statistics if the interest payment actually took place (that is, the cut-off date of the interest payment falls on a day after the issuing date within the year).

Figure 7
Developments in the implied interest rate of government debt in the region



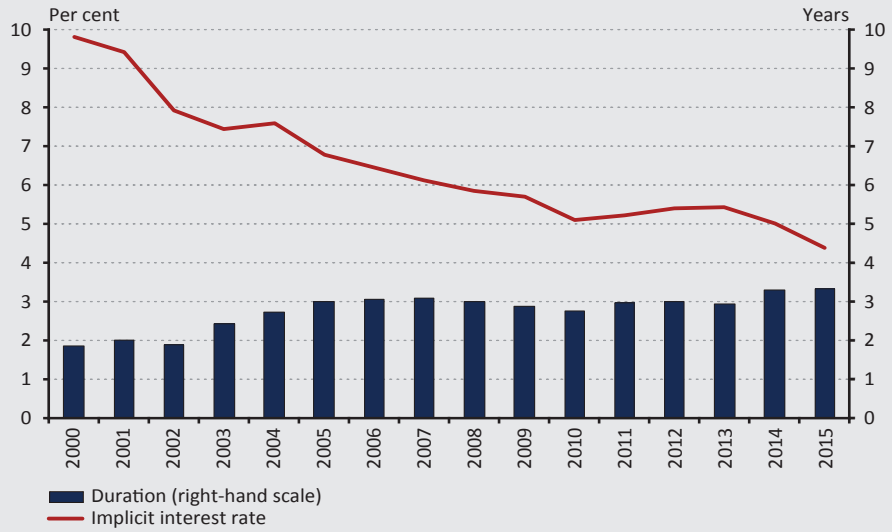
Note: The data do not contain the imputed interest expenditure (For more details, see Chapter 7).
Source: Eurostat.

In a regional comparison, the implied interest rate decreased the most in Hungary following the crisis. The implied interest rate was and still is the highest in Hungary from among the V4 countries, which is generally attributable to the high spreads expected due to the "inherited" large debt. However, following the crisis, Hungary's implied rates tangibly declined by 1.6 percentage point, in excess of the typical 1–1.3 percentage point contraction in other countries of the region.

The decrease in the implied interest rate is especially favourable given the fact that the duration of the Hungarian debt has increased by more than six months since 2010. This denotes that the decline in the implied rate ensued despite the fact that in the interim the proportion of long-term debt increased within government debt, which in itself points to higher interest payment in general. The increased duration promotes a debt profile with lower rollover risk, the cost of which is higher interest overall (*Figure 8*).

The increase in implied interest rates in 2012 and 2013 may have been partially generated by the pre-financing of the IMF-EU loan, which first necessitated the increase in foreign currency issuing, and then later on, an increase of the issuance of HUF. The loans taken out from international organisations had to be repaid in a concentrated manner, and during that period market yields were higher than the interest rates of loans. Later on this changed, and as a result of the continuous

Figure 8
Implied interest-rate (percentage) and duration (year) of Hungarian government debt



Source: OECD, Eurostat
Note: The data do not contain the imputed interest expenditure (For more details, see Chapter 7).

contraction of market yields, the yield of HUF bonds were lower than the interest rates of the foreign currency loan extended by the European Union when the last instalment of the EU loan was repaid. It should be noted that the low interest rate of foreign currency loans was only apparent, since the issuance of foreign currency indirectly increases the amount of deposits placed with the central bank by commercial banks, and as such, the interest expenditure of the central bank. This effect does not occur when HUF-denominated bonds are issued.

7. Imputed interest expenditure

Following the reorganisation of the pension system in 2011, the statistical approach settled a stock of liabilities within the general government sector of the same size as the assets taken over by the state (*MNB 2014c*).[13] *Based on the ESA-2010 methodology, the government sector takes over the households' assets and the liabilities of the same size upon the transfer of assets, leaving the net position of the government sector unchanged.* But according to this methodology the social security sub-system remains a redistribution system, so it cannot have any pension liability. Rather, the stock of liabilities equivalent to the amount taken over must be

[13] We may also apply another approach: According to *Kiss – Kékesi (2011:44) "because in 2011 the majority of the private pension fund members moved back to the public pension system, for the purpose of the analysis we can regard this as if the pension reform (namely, the introduction of private pension funds - the author) did not take place."*

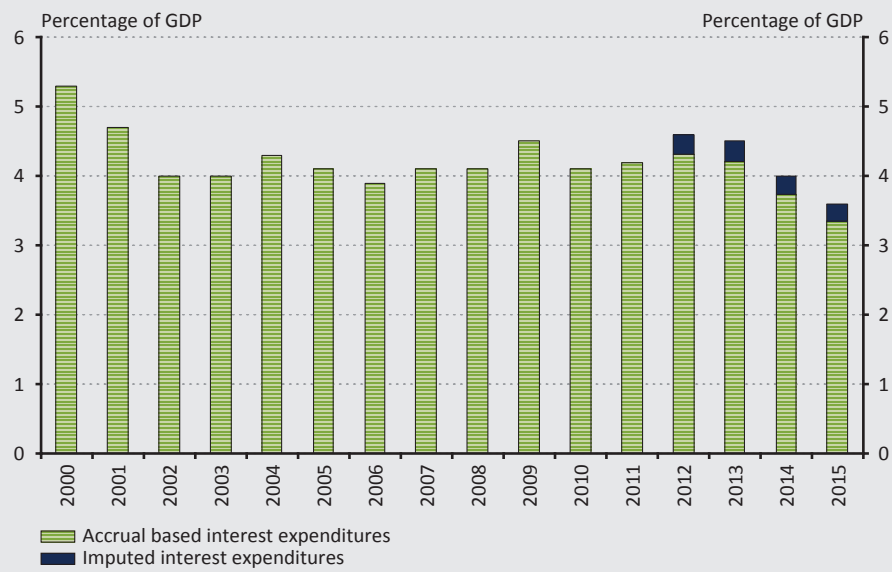
stated as a social security contribution advance. The asset registered as advance may be settled in the future within the government sector as transfer revenues at the same time as pension payments are made for members, which reduces the government's liabilities until they are exhausted.

Characteristics of the former national account methodology

The ESA-95 methodology treated the move of members as an asset transfer, when households transferred their assets from private pension funds into the public pension fund, causing the pension payment liability of the funds to cease, while the balance of the public sector increased by the total amount of the transferred assets. This approach had regard primarily to the specifics of the social security system.

As long as the liabilities arising from the pension reform exist within the public sector, the statistics account for interest expenditure in connection with it, which it calls imputed interest expenditure. This is necessary because according to the argumentation of Eurostat, the assets taken over may represent interest income for the state, or if they utilise it to reduce debt, it results in the reduction of interest expenditure. The statistics account for 3 per cent interest expenditure annually for the current outstanding stock. No actual interest payment takes place, but this is

Figure 9
ESA interest expenditure and imputed interest



Source: Eurostat, MNB.

taken into account among public interest expenditure as charges payable for actual debt.

The settlement as per the new methodology improves the balance slightly in the specific years, while during the entire period the enhancement equals the amount of the transferred assets. The imputed contribution revenues continuously increase, as an increasing proportion of the members moving back to the public system are retiring, and in parallel with this, outstanding liabilities are declining and the related imputed annual interest expenditure is also shrinking. Initially, the balance of imputed revenues and interest expenditure is close to zero in the specific years, while later on it gradually becomes positive, and its sum as seen through the entire perspective (between 2012 and 2046) will precisely match the HUF 2,855 billion that the state actually took over (*Table 1*).

Table 1
Impact of assets taken over and the related stock of liabilities on the balance
(billion HUF)

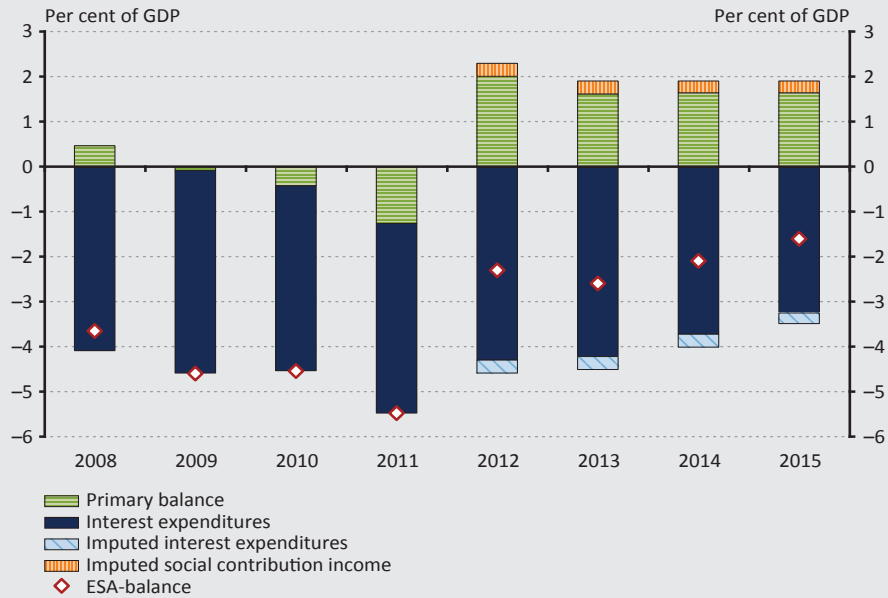
	2011	2012	2013	2014	2015	2016	2017	2020	2030	2040	2046
1. Stock of liabilities taken over	2,791	2,846	2,855	2,851	2,845	2,836	2,823	2,766	2,286	1,150	0
2. Imputed contribution revenues		84	87	89	92	95	97	106	143	192	225
3. Imputed interest expenditure		84	85	86	86	85	85	84	71	39	7
4. Impact on balance (2–3)		0	1	4	6	9	12	23	72	153	218

Source: MNB 2014c.

In our opinion, this imputed expenditure should not be regarded as interest expenditure in economic terms. Although the transferred assets do not entail any liabilities – in line with economic logic – government debt does not increase, while traditionally interest payment is made for the instruments that generate the debt. This purports that the accounted "interest" is considered interest expenditure based on the new statistical approach, however, the imputed stock of liabilities is considered "other liabilities", and therefore it may be more logical to regard this "interest expenditure" as an expense within the primary balance. Moreover, no real cash movement or payment is linked to the imputed interest expenditure (*Figure 10*).

To that end, it becomes clear to present interest expenditure without imputed interests and match it with the imputed contribution revenues within the primary balance. The adjustment appears more well-founded economically, and therefore the MNB uses this methodology in its analytical publications (Inflation Report, Public Finance Report), thereby deviating from the official statistics. This change reduces

Figure 10
ESA balances with and without imputed interest



Source: Eurostat, MNB.

both primary revenues and the interest expenditure compared with the official data, but it does not influence the extent of the ESA balance. The official statistical publications of the MNB include the official data.

8. Conclusion

The government's interest expenditure has substantially decreased over the past three years. The contraction was primarily caused by the decrease in government securities market yields, which was greatly assisted by the central bank's programmes undertaken in a favourable international environment. The fact that interest expenditure decreased the most in Hungary after the crisis and according to the forecast of the EU and of the MNB this contraction will remain outstanding in Hungary until 2017, supports the assumption that Hungarian factors play a key role.

In our paper, we delineated the fluctuation in accrual-based public interest expenditure into its key components, using a methodology similar to the decomposition of the changes in government debt. As part of this delineation, we sought to separate the impact of basic macroeconomic developments within the annual change of GDP-proportionate interest expenditure, such as the fluctuation of yields, the fluctuation of exchange rates and the fluctuation of the debt ratio.

In our analysis, four clearly distinct periods can be identified following the year 2000, based on how various macroeconomic factors contributed to the changes in interest expenditure. Between 2000 and 2002, interest expenditure shrank by 0.9 per cent of GDP on annual average, which was simultaneously prompted by the contraction of yields and of the debt ratio. Between 2003 and 2007, interest expenditure fluctuated at around 4 per cent of GDP as a result of increasing debt – causing expenditure to rise – and low yield levels characterising the global economy, causing expenditure to shrink.

After the onset of the crisis the level of debt spiked and economic growth slowed, and thus public interest expenditure increased substantially in 2009. However, increasing yields were counterbalanced by the fact that government debt was financed by international organisations at an interest rate lower than the market yields prevailing at that point in time. Afterwards, from 2013, the general government's interest payment dropped in excess of 0.3 percentage points of GDP on average. The MNB's Self-financing Programme and declining yields supported by the easing cycle contributed to this the most, but also the continuous contraction of the debt ratio was of benefit.

In analysing the interest expenditure, it must be considered that following the reorganisation of the pension system in 2011, the statistical approach accounted for a stock of liabilities of the same size as the assets taken over by the state, for which interest expenditure is imputed (*MNB 2014c*). The interest imputed for the stock of liabilities continuously augments public interest expenditure as from 2012, while parallel to this, the statistics also impute contribution revenues. It improves the balance of the general government slightly on an annual level until the complete attrition of the stock of liabilities, and during the entire settlement period (until 2046) it improves the balance at a value corresponding to the assets taken over.

In our study, we argue that the imputed expenditure may not be regarded as interest expenditure in economic terms, as interest payment is a function of outstanding debt, while this stock of liabilities does not increase government debt. For this reason, we present interest expenditure without the imputed interest, and the MNB publishes the data correspondingly in its analytically focused publications. Therefore, interest expenditure and the surplus of the primary balance are both lower than the official statistics while the ESA balance remains unchanged.

1. Schedule

Table 2
Summary of the main data analysed in the study

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
HUF Billion																
Gross ESA interest expenditures (without imputed interest expenditures)	702	721	696	766	913	916	935	1,035	1,100	1,185	1,115	1,172	1,231	1,278	1,213	1,115
Public debt	7,340	7,954	9,574	10,982	12,296	13,585	15,612	16,757	19,372	20,471	21,799	22,721	22,414	23,076	24,514	25,402
HUF	4,726	5,530	7,205	8,297	9,040	9,647	11,053	11,466	11,607	10,990	11,549	10,958	12,676	13,368	14,766	16,442
FX	2,614	2,424	2,370	2,685	3,256	3,938	4,558	5,292	7,765	9,481	10,250	11,763	9,738	9,708	9,748	8,961
GDP at 2010 price	22,167	23,004	24,039	24,960	26,209	27,358	28,412	28,540	28,794	26,904	27,086	27,557	27,115	27,690	28,810	29,717
GDP at market price	13,322	15,383	17,422	19,077	21,024	22,471	24,153	25,560	27,072	26,297	27,086	28,166	28,661	30,127	32,400	33,999
EURHUF exchange rate																
Average EURHUF exchange rate	260.0	256.7	243.0	253.6	251.8	248.1	264.2	251.3	251.7	280.3	275.3	279.4	289.3	297.0	308.6	309.8
Per cent																
GDP growth	4.2	3.8	4.5	3.8	4.9	4.4	3.8	0.4	0.8	–6.6	0.7	1.7	–1.6	2.1	4.1	3.1
Interest expenditures as a per cent of GDP	5.3	4.7	4.0	4.0	4.3	4.1	3.9	4.1	4.1	4.5	4.1	4.2	4.3	4.2	3.7	3.3
Net interest expenditures as a per cent of GDP	4.8	4.0	3.6	3.7	3.9	3.8	3.6	3.8	3.6	4.0	3.8	3.7	3.9	4.0	3.5	3.2
Public debt as a per cent of GDP	55.1	51.7	55.0	57.6	58.5	60.5	64.7	65.6	71.6	78.0	80.6	80.7	78.2	76.6	75.7	74.7

The table continues on the next page.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
								Per cent								
Average 3-Month yield	10.9	10.7	8.9	8.2	11.1	6.8	6.9	7.6	8.8	8.4	5.4	6.0	6.9	4.1	2.1	1.1
Average 12-Month yield	10.8	10.5	8.9	8.2	11.0	6.8	7.1	7.5	8.9	8.4	5.5	6.1	6.9	4.1	2.2	1.1
Average 1-Year yield	10.7	10.3	8.9	8.0	10.7	6.8	7.3	7.4	9.0	8.6	5.6	6.2	7.1	4.1	2.3	1.2
Average 3-Year yield	9.8	9.1	8.4	7.8	10.0	6.9	7.6	7.2	9.4	9.3	6.7	7.0	7.5	4.8	3.6	2.1
Average 5-Year yield	9.1	8.6	7.8	7.3	9.2	6.8	7.4	7.0	9.2	9.3	7.0	7.4	7.7	5.2	3.9	2.7
Average 10-Year yield	8.5	8.0	7.1	6.8	8.2	6.6	7.1	6.7	8.2	9.1	7.3	7.6	7.9	5.9	4.8	3.4
Average 15-Year yield		6.7	6.9	6.7	7.8	6.5	7.0	6.5	7.9	8.9	7.3	7.6	7.9	6.3	5.2	3.7

Source: ÁKK, Ameco, Eurostat, KSH, MNB.

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Risks of Commercial Real Estate Financing Based on the Experiences of Supervisory Reviews*

Márk Szenes – András Tomsics – Dávid Kutasi

Following the global economic crisis, project financing and as part of it, commercial real estate financing came into the limelight for both the international and Hungarian banking system. One of the underlying reasons of this phenomenon is that banks suffered their biggest losses due to the concentration of real estate portfolios, while real estate portfolios always represent outstandingly high credit risk as economic cycles exert a strong impact on the value and the income-generating capacity of commercial real estate projects. Based on the experiences of the supervisory reviews conducted by the MNB at large Hungarian banking groups, this study presents the risks associated with commercial real estate financing, the challenges identified with respect to the measurement of risk, and in this context, the challenges related to the calculation of capital requirements, and among others, the issue of cyclicality and the possible solution direction.

Journal of Economic Literature (JEL) codes: G32, G33

Keywords: real estate financing, economic cycles, risk management

1. Introduction

Numerous Hungarian professional publications have addressed the general characteristics of structured financing as part of corporate financing, specifically project and real estate financing, as well as the features and risks of these types of exposures (*Walter 2014*, *2016*; *Nádasdy – Horváth – Koltai 2011*). Exposures where the primary source of repayment of the credit is the income stemming from the utilisation of the property (sale, rental, facility management), including also condominium and gated community building projects, are referred to as commercial real estate financing. This study also focuses on the commercial real estate financing portfolios financed by banks, but we intend to show the issues and the proposed solutions expressly from the perspective of the supervisory authority, in the light of the experiences gathered during the supervisory review. The reason for selecting this topic is that the Hungarian banking system suffered its biggest losses on its commercial real estate financing project exposures, in tandem with

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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retail foreign currency mortgage loans. More than 50 per cent of the HUF 2,800 billion, mainly project exposures related to real estate financing, financed by the largest Hungarian bank groups and banks subject to complex supervisory reviews[1] (hereinafter: complex banks) became non-performing, and their credit losses in excess of HUF 750 billion represented a loss rate of more than 26 per cent projected to the project portfolio. Complex banks, in the red for several years between 2009 and 2014, built up an outstandingly high concentration in the commercial real estate financing segment, a portfolio more than two times higher than their solvency capital measured against the reference period as at the end of 2008.

The supervisory review process has long devoted special attention to commercial real estate financing portfolios. All of the problems presented in this study – portfolio segregation (segmentation), project valuation and rating, capital requirements calculation and cyclicality – came up during the audits and are real and practical issues affecting risk management. The study reflects the experiences gained from the discussions conducted with the banks during the audits, as well as the experiences gained from inspecting the project loan proposals, cash flow plans, impairment calculations, project real estate valuations, project rating systems, and credit risk parameter estimations. In our study, the source of the reports and figures related to the commercial real estate financing portfolios financed by the Hungarian banks were the data and documents, primarily the transaction level loan analytics requested by the authority for the audit.

Commercial real estate financing caused substantial losses on a systemic level, not only in Hungary but also in other European countries and the United States over the past years, although the economies with a long-standing developed financial system were fully aware of the outstanding risks associated with this segment. The American regulators analysed in a separate study the link between the commercial real estate market gradually becoming affected by a crisis at the end of the 1980s and the early 1990s and the banks' concentrated portfolio of commercial real estate financing (*FDIC*[2] *1997*); the comprehensive study published by the ESRB[3] on that topic identified three cycles on the commercial real estate markets of the United Kingdom over the past decades (*ESRB 2015*).

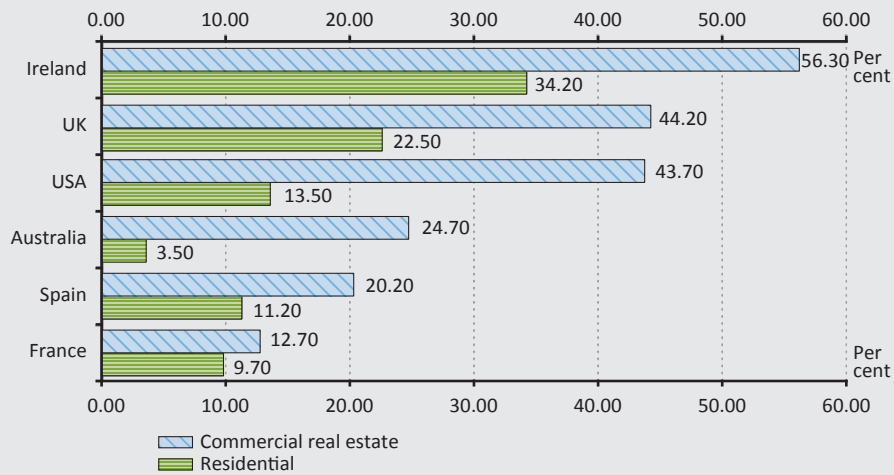
The risk associated with commercial real estate financing is caused by the sensitivity of the project's value and income-generating capacity to economic cycles. This cyclic nature is easily observable by reviewing the macroeconomic variables influencing the main earnings potential of the main types of commercial properties, such as offices, residential developments, shopping malls, hotels and industrial properties. The multiple impacts of an economic bust, such as increasing unemployment, a downturn in the construction industry and real estate markets coupled with

[1] The following banks were subject to the complex supervisory review during the period under review: a Budapest Bank, a CIB, Erste, FHB, K&H, MKB, OTP, Raiffeisen, Sberbank and Unicredit.
[2] Federal Deposit Insurance Corporation.
[3] European Systemic Risk Board.

decreasing consumption and a deteriorating income position of households (e.g. hotels and shopping centres), the deteriorating position of the financial, insurance and other service sectors, decreasing employment within these sectors (e.g. office) exponentially contribute to the deepening of the cycle and to the accumulation of losses. Hence, in the case of commercial properties, the interaction of many different macroeconomic variables moving together and strengthening one another exerts an indirect influence on the commercial real estate market through the relationship between demand and supply.

At the beginning of the global economic crisis, a substantial downward drift in prices was seen both for residential and commercial properties. Commercial real estate prices dropped by 43.7 per cent in the United States, by 44.2 per cent in the United Kingdom and by 56.3 per cent in Ireland, with residential properties also losing between 13–34 per cent from their value in less than one year in these countries.

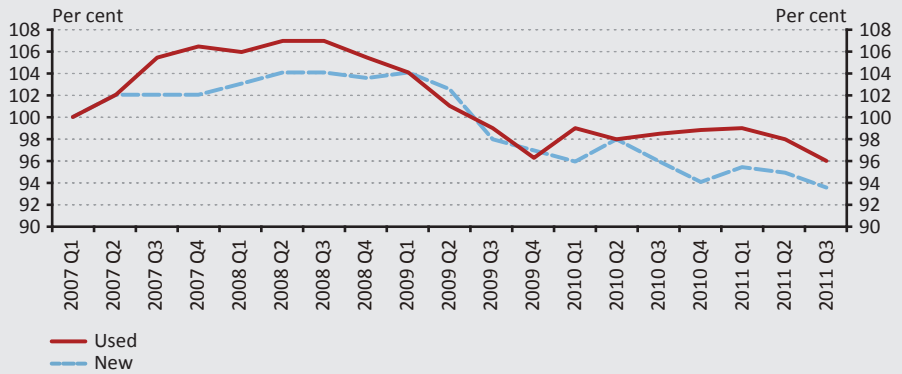
Figure 1
Fall in real estate prices between 2007–2008



Source: ESRB 2015.

When looking at the Hungarian market, trends similar to the international ones could be observed. The price of both new and used residential properties dropped by nearly 10 per cent by the end of 2009 compared to the third quarter of 2008, and in the case of new residential properties this declining trend continued also in subsequent years. The number of condominiums sold on a quarterly level dropped to less than half by the fourth quarter of 2009 compared to its peak in the second quarter of 2008 (around 40,000 properties) and remained at that level in subsequent years (*CSO 2012*).

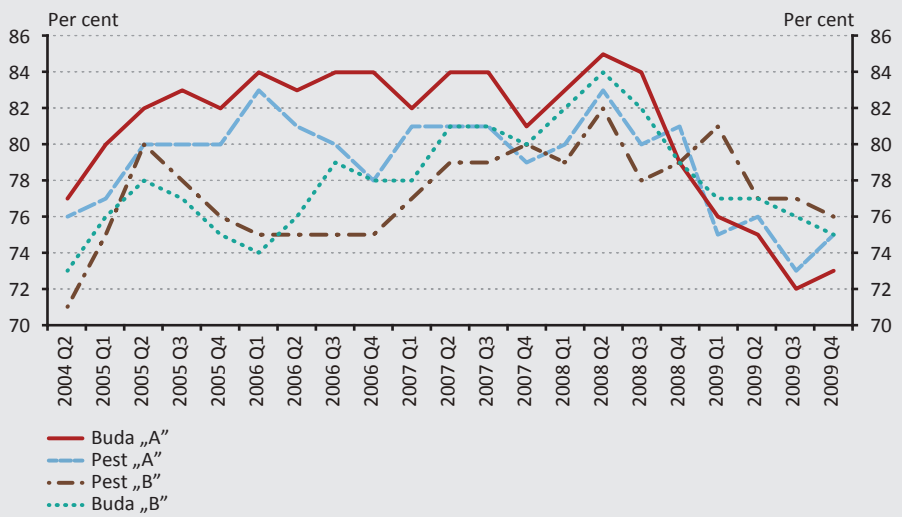
Figure 2
Changes in residential property prices in Hungary
2007 Q1 =100%.



Source: KSH 2012.

Looking at the office market, the change in the occupancy rate of offices is outstanding. The occupancy rate of category A offices in Budapest dropped by more than 10 per cent between the middle of 2008 and the end of 2009, while the rental of category B offices also declined between 6 to 8 per cent. Office rental prices essentially stagnated between 2005 and 2008, but dipped sharply in 2009; compared to the previous period, the price of used offices fell by around

Figure 3
Occupancy rate of offices in Budapest, 2005–2010



Source: GKI 2010.

8 to 10 per cent, while the price of newly built properties dropped by 4 to 5 per cent (*GKI 2010 and 2015*).

The extent of credit losses entailed by the decline in real estate prices confirmed that real estate financing is a capital-intensive banking activity and that risk management controls considerably more sophisticated than previously needed to be implemented. The excessive risk taking prevailing prior to the crisis was mainly observable in the emergence of high concentration, growth expectations ignoring demand, and speculative real estate financing, accompanied by several internal fraud cases, also confirmed by the banks in the course of the supervisory reviews. But at the deepest point of the cycle, however, developments to the very contrary of the above could be observed: the banks that built up a high concentration practically completely stopped their project financing, and even today, this type of financing continues to be strongly selective. Under the current circumstances, the biggest challenge for both the banks and the regulators is to be able to evaluate the real estate financing projects that have survived the economic downturn and the ones that restarted after the economic turnaround independently from the cycle and differentiate them from the aspect of risk. A project assessment independent from the cycle and a rating system reflecting this approach would enable the regulators to substantially mitigate the pro-cyclical nature of the capital requirement prescribed for project exposures.

It is important to stress that the current economic recovery and the positive developments on the real estate market can, on their own, only drastically reduce the realised losses, but not the potential risks, without modifying the risk management processes and the lending practices. Due to the cyclicality of the sector, neither good portfolio quality nor a low capital requirement level – to be generated for covering risk – derive from the low loss level observed in the good years. This is because capital must be generated not for the times of economic booms, but for stress situations of the same gravity as seen in previous years.

However, in the case of the Hungarian banking system, the challenge is not only the prudent risk assessment of the credits that survived the economic downturn and the credits disbursed afterwards, but also the elimination of historic process-related shortcomings and the strengthening of control functions. Going forward, the banks will have to continue paying attention to the proper quantification of the risks associated with the non-performing real estate financing portfolios, and also to the capital coverage of unexpected losses on top of the expected losses already reflected in the level of impairment. In 2015, the size of the non-performing portfolio exceeded gross HUF 1,200 billion, despite the significant portfolio cleaning performed recently, such as partial or full right-offs and asset disposals. This value, exceeding HUF 500 billion in net terms or 50 per cent of exposure, may still have a substantial loss potential should project values continue to fall unexpectedly.

2. Risk characteristics of commercial real estate financing

The precondition to monitoring the risks and to setting up appropriate risk controls is to first and foremost define which exposures can be classified as commercial real estate financing. According to the general definition, every exposure the recovery of which is mainly secured from the income generated from property utilisation is to be regarded as commercial real estate financing. The closest to this definition is the one regarding specialised lending project exposures (SL) as per the CRR[4] implementing the Basel II directive (*BCBS*[5] *2001 and 2006*), which stipulates for the institutions applying a methodology based on internal rating that they have to handle the exposures – essentially meeting the following criteria – separately from the regular companies:

- Apart from the financed assets, the corporation does not have any substantial asset portfolio, and does not perform any other activities apart from the operation of the financed assets;
- the financing bank has substantial control over the financed assets and the cash flow generated by them;
- the company's source of income, and as such, the repayment of the credit mostly comes from the cash flow generated by the financed assets.

A recurring problem regularly encountered during the supervisory reviews is that the banks fail to appropriately apply the above-mentioned segmentation principles as a result of which several banks manage some project type real estate financing deals within their regular corporate portfolio where the risks of the portfolio, and primarily the risks stemming from the concentration remain partially hidden. The risk associated with the specialised lending exposures is mainly defined by the earnings potential of the financed project; this is the reason why it must be emphasised that the close link between the income generated by the asset (the property) and the source of the loan repayment must be considered as a priority for the segmentation.

A segmentation problem may occur in connection with the interpretation of all three SL criteria. It must first be mentioned that if the bank fails to ensure control over the asset (being the collateral) and the cash flow, or if the bank commits to the financing not based on the risk associated with the project, i.e. not based on the project's cash flow but based on collateral, this should not exempt the bank from classifying these transactions as SL exposures.

[4] Capital Requirement Regulation – Regulation (EU) No 575/2013 of the European Parliament and of the Council on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012.
[5] Basel Committee on Banking Supervision.

Secondly, it may be problematic to determine whether the financed company could be regarded as a project company (SPV[6]) established to operate the financed commercial properties. We can generally say that, based on the look-through principle, the risk associated with the exposure of a holding company integrating clearly commercial real estate projects, or the risk associated with the exposure of an asset management company, which was previously held by project companies, and which took over commercial properties – account taken of the risk mitigating impact of some possible diversification factors – is equivalent with the risk of the underlying real estate project portfolio; therefore the evaluation of the exposure's risk should be done in the same way as the evaluation of the underlying portfolio, that is, primarily based on the calculation of the earnings potential of the project properties. A special case characterising this issue involves funds investing in commercial properties, i.e. the exposure to the investment units of such fund. Exposures to collective investment undertakings represent a separate exposure class for both the banks applying the standard method and the ones applying the IRB[7] method, which, however, should be taken into account even in this case as a risk equivalent to commercial real estate financing based on the look-through principle.

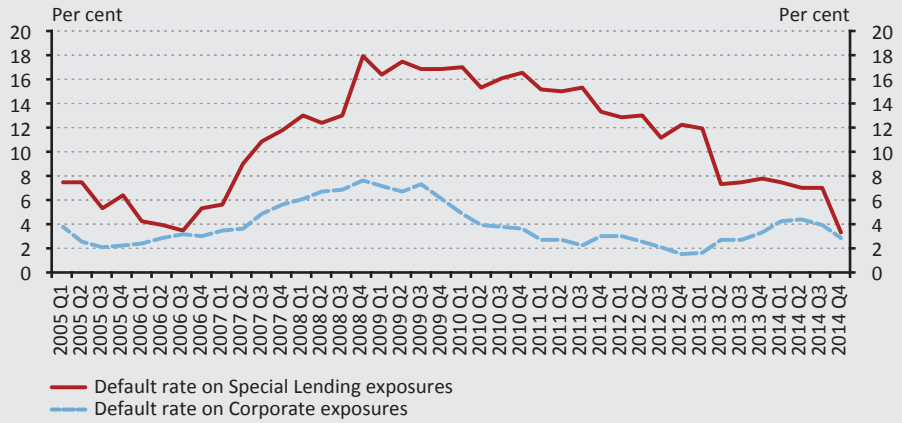
Numerous problems occur in relation to interpreting the third SL classification criteria. Most often, banks do not consider the financing of project companies — otherwise exclusively involved in the real estate business — as real estate financing due to the fact that these companies rent properties and undertake guarantees within the group. In such cases, the risk transfer can only be taken into account if the lease agreement corresponds to the maturity of the loan and the guarantee and the group relations are sufficiently strong.

Building plot financing and real estate projects still in the construction phase, generating income only in the future through either resale or utilisation after the completion of the development, represent the riskiest sub-segment of commercial real estate financing; they have a risk profile fundamentally different from the risk profile of regular corporate exposures, therefore it is especially important to manage them separately from regular companies.

The reason why it is important to segregate commercial real estate projects from the corporate portfolio becomes obvious by presenting the most fundamental risk indicators. Based on the data in *Figure 4* showing the default[8] rates in time series of projects and corporate portfolios of large Hungarian banks, we can see that over the past 10 years projects consistently had a higher default rate than the corporate portfolio. During the crisis years we can see that the default rate of project loans increased to three to four fold compared with the previous period while the default rate of companies increased

[6] Special Purpose Vehicle.
[7] Internal Ratings Based Approach.
[8] Non-performing.

Figure 4
Default rates of project and corporate exposures

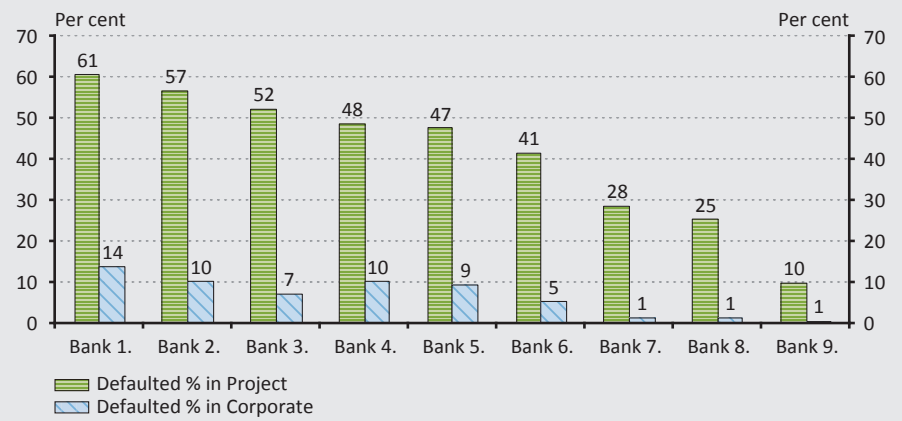


Source: MNB.

only by 1.5 to 2 fold. The improving trend only started considerably later and even to date has still not yet reached the average of the pre-crisis years.

Figure 5 shows the analysis of project portfolios outstanding at the end of 2014. Despite accelerating portfolio cleaning measures, the proportion of non-performing project loans weighted by volume is still 4 to 5 times higher than that of corporate loans at the majority of the banks and in some cases this proportion even exceeds 50 to 60 per cent of the portfolio, which shows that the collection and the management

Figure 5
Proportion of deals in default within project and corporate portfolios



Source: MNB.

of non-performing project loans require significantly more effort compared with corporate loans, which again shows a higher risk level.

The main reasons accounting for the difference between the risks associated with commercial real estate financing and normal corporate financing are as follows:

- real estate financing is an especially cyclical sector;
- the creditworthiness of the project client (its probability of default, i.e. PD[9]) and the value of the project property (its loss given default, i.e. LGD[10]) have a close correlation with one another and with the economic cycle;
- the projects typically have high individual exposure and very low own equity;
- due to their nature, the credit risk associated with projects can be assessed based on a well-defined set of criteria, primarily based on the project's earnings potential (DSCR[11]) and the evaluation based on this factor (LTV[12]) and the characteristics of the project property, its cash flow stability, the strengths and the market position etc. of the sponsor.

In addition to the above credit risk characteristics, we could also mention the interest, operational, regulatory, foreign currency and concentration risks as well (*MNB 2015*). Hungarian professional literature has some excellent overviews of the arising risks and their management (*Nádasdy – Horváth – Koltai 2011*).

On the one hand, interest risk may influence the quality of the overall portfolio and thus its risk through the capitalisation ratio in the course of the yield-based evaluation. On the other hand, interest rates on the loans are variable as opposed to the rents, so they may have a negative impact on repayment capacity.

Operational risk should also be highlighted, primarily internal and external fraud, as well as inappropriate business practices, which caused substantial losses within the domestic project portfolios. Committee documents, police reports, internal audits initiated by the banks in that topic, or in the given case even the complete replacement of the entire project underwriting staff evidence these cases of fraud.

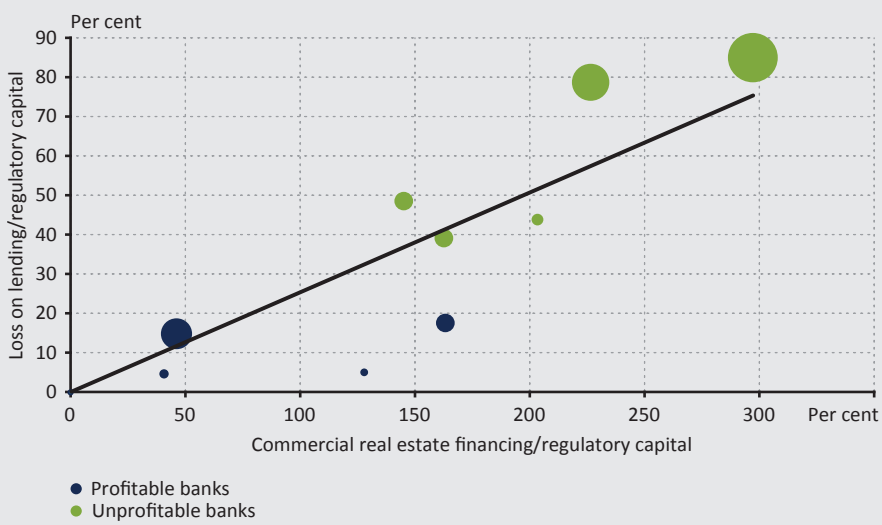
The value of the properties and their economic feasibility may be influenced by the risks stemming from the regulatory environment, and the changes in tax liabilities and environmental protection regulations or even the level of state subsidies. This factor may have a negative and/or positive impact on the projects' value, but their realisation cannot be forecast at all or can be forecast only to a limited extent.

[9] Probability of Default.
[10] Loss Given Default.
[11] Debt-Service Coverage Ratio.
[12] Loan-to-value ratio.

An especially dangerous situation can occur when the loan is disbursed in foreign currency, because in addition to the foreign currency risks, the volatility of foreign currency exchange rates may further deteriorate the volatility of the interest rate. In some cases, foreign currency risk remains concealed, because while the rent of the business is set in euro, in line with the currency of the loan, the business itself generates HUF revenues, and therefore the exchange rate risk is only partially covered.

The concentration of commercial properties built up without any control, and the inadequate control by the banks of the concentration risk explain that the losses arising from credit and other risks mentioned above also caused substantial problems at the level of the Hungarian financial system. *Figure 6* shows that the commercial real estate financing exposure at the end of 2008 compared to solvency capital at the reference date and the credit loss related to this portfolio was especially high at the loss-making banks. While loss-making banks extended credits amounting to more than double their solvency capital, profitable banks' loan portfolio within that segment was slightly more than half their solvency capital. We can see in the figure that even among the profitable banks, there are some that suffered a moderate loss despite the proportionately high concentration, which shows that these institutions had successfully selected better quality projects. However, what we can see in general is that the banks that built up a high concentration suffered major losses, and for the future this highlights the necessity to set up an effective risk limit system and the fundamental rethinking of the project rating evaluation models.

Figure 6
Concentration of real estate financing between 2011 and 2013 in the case of complex banks operating profitably and those that generated losses



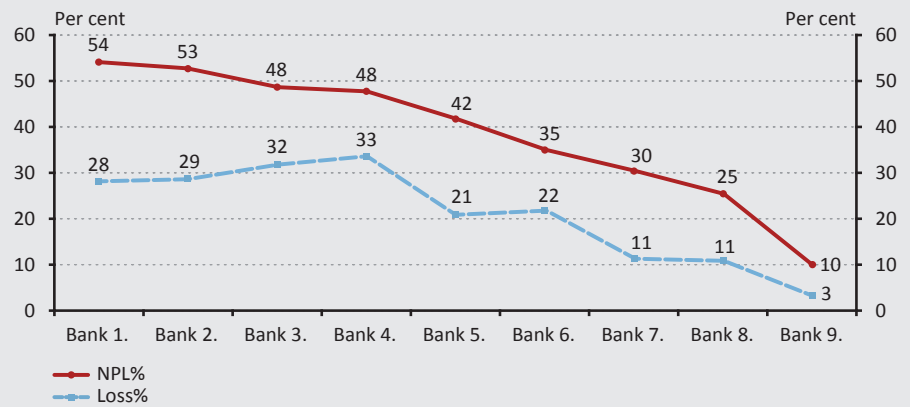
Source: MNB.

3. Measurement of risks associated with commercial real estate financing

Let us now take account of those challenges that banks may face when assessing the risk of commercial real estate financing projects and defining their capital requirement. Concerning these issues, we will also outline some possible solutions.

Based on the data of the MNB ICAAP[13]-SREP[14] audit performed in 2015, project financing complex banks booked losses equivalent to 20 to 30 per cent of the financed exposure with a 40 to 55 per cent NPL[15] rate in general (*Figure 7*); the majority of these losses was generated from the defaults concentrated for the years 2009–2012 (*Figure 4*). During these years, banks recorded credit losses often many times higher than the 8 per cent standard capital requirement, which revealed the inadequacy of the supervisory capital requirement level and the necessity to devise risk-sensitive methods.

Figure 7
Percentage of NPL and losses within the project portfolios



Source: MNB.

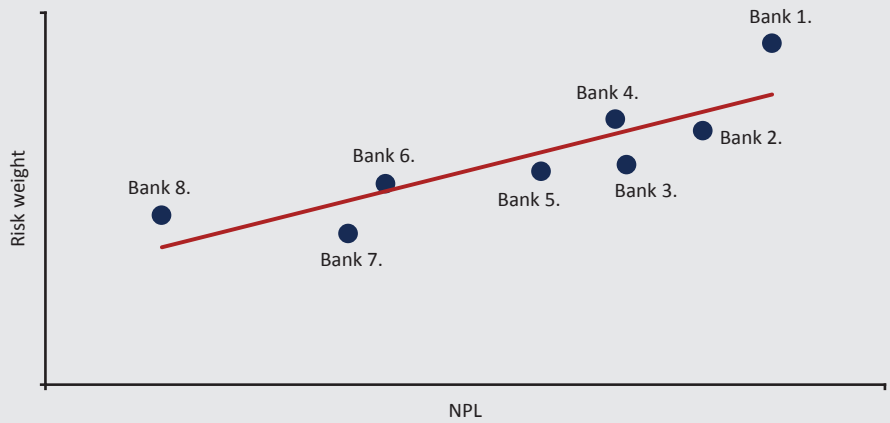
Based on our experiences, the majority of the project financing banks that used to be active in the past do have a sufficient number of default observations available, enabling them to develop a model based on internal rating, using PD/LGD parameters and use it for their internal capital requirement calculation.

Based on the ICAAP-SREP audits conducted by the MNB in 2015, the capital requirement levels of the performing commercial real estate financing portfolios

[13] Internal Capital Adequacy Assessment Process
[14] Supervisory Review and Evaluation Process.
[15] Non-performing loan.

vary enormously as the result of the mainly PD/LGD based IRB calculation, but the correlation with the proportion of the portfolios that became non-performing earlier is fairly strong (*Figure 8*).

Figure 8
Relation between the determined risk weight and the NPL rate



Source: MNB.

It can be established based on the figure that the NPL ratios developed in the past fully support that there may be substantial differences among the risks of the portfolios, depending on the banks' risk appetite. On the other hand, the strong correlation between the current, still performing portfolio and the NLP rate can be explained by the fact that during the crisis and thereafter – based on the rating systems applied by the banks – no substantial quality improvement of the performing portfolio could be observed, that is, the risk ranking that could be characterised by the NPL levels based on the previous portfolio quality also remained on the current portfolios. This picture will only be changed in the future by performing portfolio cleaning and if the different risk profile of new project loans become dominant.

During the parameter estimation applied for internal capital calculation, a wide range of issues stemming from the special risk characteristics of project financing occurred during the supervisory reviews and when determining the capital requirements, so the banks will have to continue placing particular emphasis in the future on managing these issues, focusing in particular on:

- handling the estimation and statistical uncertainties stemming from the number of components with a conservative allowance;
- handling the PD-LGD correlation, that is, the close correlation between the PD related to the creditworthiness of the project and the LGD related to the value of the project property;

- defining the downturn[16] value of the LGD in connection with the sensitivity to the cycles of the project property's value and earnings potential;
- selecting a sample period representative from the aspect of the entire economic cycle, taking the downturn period into account with the proper weight, also considering the fact that in the case of commercial real estate financing, the impact of the crisis may last considerably longer than in the case of ordinary corporate exposures.

The issue of cyclicality, which is especially relevant from the aspect of commercial real estate financing, deserves special attention. The value of project properties may be especially volatile and may frequently change during the lifetime of the project due to various market events. Due to the close correlation between the client's risk and the value of the project property, the low LTV stemming from the current high property prices does not necessarily entail a low loss potential, because the default of the client and the drastic drop in property value go hand in hand, which, on the level of risk parameters, means the correlation between and the harmonised movement of the PD and the LGD. Moreover, risk parameters not only move in correlation with one another, but also with the state of the economy, which may also cause the poly-cyclicality of capital requirement, that is, capital requirement increases during the downturn period while it decreases during the boom period, which may further aggravate the economic crisis with the further weakening or strengthening of lending willingness. Moreover, in addition to the cyclically changing risk parameters, capital requirements may be undervalued in the good years and overvalued in the bad years. The objective of the supervisory authority is that the capital requirement be independent from the cycle if possible, which must be considered during the evaluation and the measurement of the risks associated with the commercial real estate portfolio. Cyclicality is to be managed, on the one hand, during PD estimation within the time series of the default rate by the proper selection of the proportion of boom and downturn periods, and on the other hand, by taking into account the downturn estimation in the LGD, and the correlation of the PD-LGD.

However, the issue of cyclicality can really be observed through the rating system, in the migration between rating categories. Although the risk parameters measured by rating category may be cycle-independent, if the variables of the rating system strongly correlate with the economic variables, in such case the capital requirements will be pro-cyclical due to the migrations that follow the change of the economy. The values of the risk characteristics also used in the rating systems of commercial real estate projects are strongly cyclical, be it either quantitative (LTV, DSCR), or the qualitative parameters (strength of the sponsor, competitive environment). A partial

[16] Can be observed in economic downturn.

solution to the above problem may be the long-term, cycle-independent evaluation of the various risk factors, especially the project property value such as the LTV and the DSCR (*REFG[17] 2014*), and a more thorough analysis of the stress tolerance of the project value and its taking into account with a higher weight during the rating process. The stress tolerance can primarily be analysed by stressing the project's cash flow plan, by way of incorporating exchange rate stress, rent decrease or other deteriorating real estate market trends. By using a rating system implementing these criteria, we can ensure the forward-looking assessment of the risks associated with the newly disbursed exposures, and the validation of the cycle-independent changes that take place within the lending practice and the risk profile.

The above-mentioned criteria of the risk assessment of performing projects must to be taken into account in the case of every institution that uses a methodology based on a rating system and PD/LGD estimation for their internal capital calculation. If the institution is not able to estimate the PD, then a methodology using a simple weighing method based on the slotting rating may also be applied. In its consultation document published in March 2016, the Basel Committee raises the possibility to discontinue the PD/LGD methodology for specialised lending exposures, referring to the general shortage of data available for the banks and would enable only the use of the slotting methodology for the banks applying the IRB (*BCBS 2016*). The slotting methodology means a rating[18] system containing 4 (+1 non-performing) categories based on the classification of project risk characteristics and the supervisory risk weights and expected loss levels defined for it. The slotting methodology is able to properly reflect the risks of the performing portfolio in tandem with appropriate qualitative validation – which the banks applying this methodology for their regulatory capital calculation are obliged to do anyway – in the case of a correct calibration adjusted to the defined risk weights and expected loss levels taking into account the aspects listed in this chapter, although the 4 categories may not be enough to separate projects with different risks.

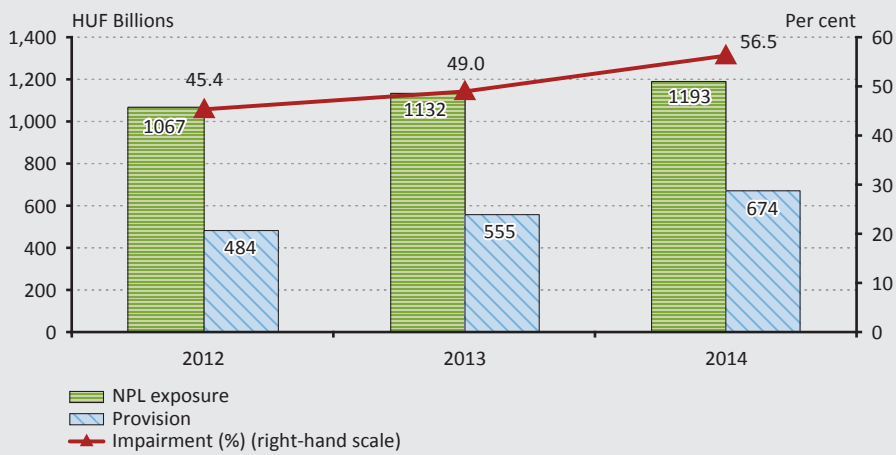
In our introduction we mentioned that the risks of not only the performing, but also the risk of the non-performing commercial real estate financing portfolios deserve special attention. More importantly, the identification of the non-performing status of commercial real estate financing deals caused problems on a high number of occasions, especially in the case of running projects. The reduced interest and principal burdens resulting from restructuring, the balloon-bullet structure[19], and the lack of repayment delay often conceals the fact that the client's earnings potential is insufficient for repaying the loan even if account is taken of the sponsor, which is the condition of default as defined by the legislation.

[17] Real Estate Finance Group.
[18] Rating.
[19] A loan structure whereby the entire principal or a substantial part of it (typically 60 to 80 per cent) is repaid by the debtor at the end of the maturity in a lump sum.

Although the practice followed by the banks shows an improving trend, along with the issue of identifying the default status, the fact that Hungarian banks booked increasing losses year after year not only for the newly defaulting projects, but also for the previously non-performing ones by generating additional impairment also poses an additional problem. While during the period between 2009 and 2012 the correction of an excessively optimistic impairment practice was not prudent enough, and hoping for a fast turnaround of the real estate market was underlying the sometimes spectacularly increasing impairment coverage levels, in later years the increase in coverage levels was rather driven by further deteriorating and stagnating commercial property market prospects and the increasingly conservative evaluation.

Figure 9 shows the increase in the impairment levels of the complex banks on non-performing project portfolios as from 2012. Based on the data of the supervisory reviews performed in 2015, the impairment level of non-performing projects reached 56.5 per cent.

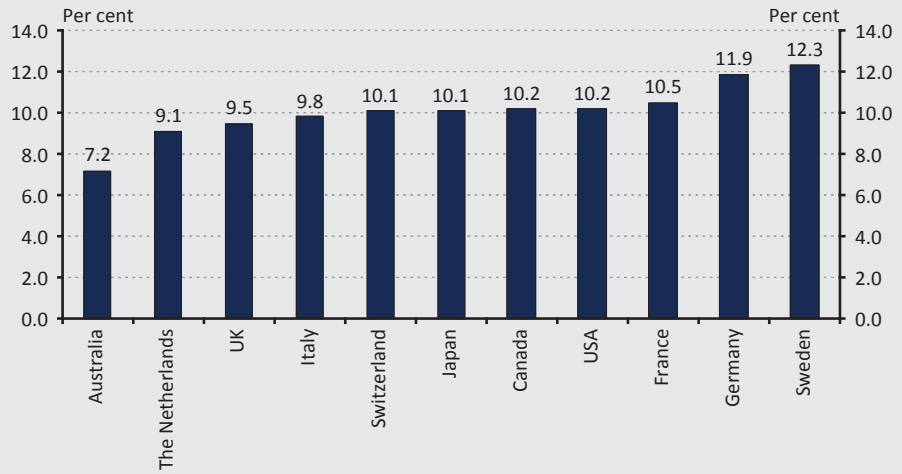
Figure 9
Change in impairment generated for the project portfolios of complex banks operating in Hungary



Source: MNB.

Previous experiences also show that despite prudent impairment practice, additional unexpected losses may be incurred on the non-performing commercial properties during the collection process. The evaluation of project properties represents a serious challenge worldwide, but especially under downturn circumstances, entailing a liquidity shortage on the market. The international outlook suggests that under clean market conditions the difference between the evaluation and the final sales price is in general around 10 per cent (*Figure 10*).

Figure 10
Difference between the evaluation and the actual sales price of real estate financing projects between 2005 and 2014



Source: ESRB 2015.

Based on the increase in impairment levels and the recovery experiences of the sold, yet problematic commercial properties, we can see that under downturn circumstances the uncertainty associated with the valuation of non-performing project properties, i.e., their "unexpected" losses may be considerably higher than the 10 per cent observed under normal market circumstances. The experiences of the recent supervisory audits show that the impairment generation of the Hungarian banking sector improved considerably, both in terms of prudent portfolio management and the development of the estimation methodology of expected losses. Overall, the impairment levels established by Hungarian banks are gradually coming closer to the expected loss levels, that is, the net book value reduced by impairment is fairly close to the project value, and therefore capital only needs to be generated for unexpected losses. Therefore, based on the above experiences, assuming a prudent impairment level, it can be expected that, in the course of internal capital calculation, banks generate a capital requirement level reaching at least 12 per cent of the net exposure on top of the impairment (this corresponds the to a 150 per cent risk weight), which expresses the "unexpected" decrease in the project value valuated in line with the expected circumstances. Selecting the 12 per cent level is thus primarily justified by the increased loss levels observed during the adverse market movements of the past years, and the fact that the unexpected losses potentially occurring under downturn circumstances are justifiably higher than the 10 per cent normal market volatility. The issue of a risk level dependent on the cycle remains an open question, since in the case of an economic boom, any further depreciation may be considerably higher than under

downturn circumstances. A more sophisticated solution for quantifying the risks of also non-performing portfolios could be the stress testing of the cash flow, serving as the basis of the valuation.

4. Conclusion

In this study, we presented the key risks associated with commercial real estate financing that caused the most substantial losses for the Hungarian banking system and addressed those issues that came up during our discussions with the banks in the course of the reviews, then we also outlined the possible solution directions. Together with the issues related to segmentation, we also presented those aspects that justify the segregated management of commercial real estate portfolios from the regular corporate portfolios.

Thereafter, we presented the challenges that arise during the measurement of credit risk in terms of commercial real estate financing (the rating system, credit risk parameters such as the PD and the LGD) and as such, the correlation between the PD and the LGD and the issues of representativeness and cyclicality. As part of risk measurement, we emphasised the importance of stressing the earnings potential and the most possibly cycle-independent evaluation of the project.

Finally, we made a proposition for the capital requirement level of non-performing portfolios based on the observation that during economic downturn periods, project values exhibit enormous deviation and the same is also evidenced by the gradually increasing impairment levels seen over the past years.

One of the key objectives of our study was to present the aspects that, if duly considered, might mitigate the pro-cyclicality of the capital requirement of commercial real estate financing portfolios and ensure proper solvency even in the case of an unexpected crisis situation, a particularly current issue today during this era of real estate market recovery, when risks could be easily underestimated.

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The Impact of Climate Change on the Insurance Sector*

Anett Pandurics – Péter Szalai

One of the key tasks and core competencies of the insurance sector is to assess natural risks on a continuous basis and to manage the potential impacts of those risks. It is therefore not surprising that from the beginning, the insurance sector has been an active participant in modelling the impact of climate change and in identifying possible solutions. Before coming to our analysis of the relationship between the insurance sector and climate change, it is essential to explain key terms and basic possible impacts. For that reason, we start our paper with a brief summary of the causes of climate change and the most important groups of consequences, and a description of the European milestones on the road to the low-carbon economy. The impact of climate change on the insurance sector is explained through a German and an English example, in each case presenting and construing the assertions of a relevant study. In addition to an explanation of the differences in the approaches which are characteristic of each country, we also considered it important to outline the most important institutional viewpoints: in the German case, we mostly found examples for the insurance sector reacting in search of opportunities, while the English study is suitable to illustrate an approach that is more supervisory and risk-oriented in nature. To break new ground, we conclude our paper by addressing the likely impact of climate change on the Hungarian insurance sector.

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Keywords: sustainable insurance, climate hazard, global warming, NCCS-2, low-carbon economy

1. Causes and consequences of climate change

It is widely known that global warming can be pinpointed as the root cause of climate change. The cause of rising temperature can be identified precisely: the vast majority of researchers identifies the cause as the growing emissions of greenhouse gases, which is largely attributable to human activity (*Sachs 2015*). Over the past

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40 years, the issue of climate change has received increasing attention, as it became widely recognised that if everything were to continue as before, economic growth could be pushed to its limits in terms of emissions and resources as early as in the 21st century, which could potentially lead to economic collapse and political tensions.[1]

1.1. Growth in greenhouse gas emissions

Somewhat simplifying the scientific explanations, warming is accounted for by the greenhouse effect. The discovery of the effect in 1896 is attributed to the Swedish chemist *Svante (1896*). The phenomenon of the greenhouse effect can be described as follows: the wavelength of the thermal radiation (light) emitted by the Sun, which has a surface temperature of approximately 5,800 °C, has a maximum falling within the visible range, and the atmosphere of the Earth is virtually transparent at that wavelength. A large part of incident light is absorbed by the surface of the Earth, which will consequently warm to temperatures depending on the given season and latitude, and a number of other parameters. The Earth's own radiation, at temperatures almost always lower than 60 °C, produces a much smaller quantity of energy compared to the Sun, and its wavelength falls in the far infrared range, in which the atmosphere is opaque. Due to the opacity of the atmosphere, the heat cannot be radiated at the speed of light, and can thus be emitted into space as part of much slower heat transmission and convection processes. This process results in the warming of the atmosphere. This phenomenon requires the presence of gases in the atmosphere that are opaque to the thermal radiation of the planet. Such gases are referred to as greenhouse gases (GHGs). Normally, the atmosphere of the Earth also contains GHGs of natural origin, of which the most important are aqueous vapour, carbon dioxide, methane and ozone. Global warming is mostly attributed to the following greenhouse gases (*Figure 1*):

- *Carbon dioxide* is also a natural part of the atmosphere, and as such it is produced by the biological processes of organisms (breathing), and the mechanisms of volcanoes (combustion process) and oceans (release of bound carbon dioxide). As a result of human activity, the largest quantities of it are released to the atmosphere by burning fossil fuels (petroleum, natural gas and mineral coal). The largest emitters are, accordingly, power plants, industry and transportation, but the heating of buildings also carries significant weight. Rapid deforestation is another major contributor to the increase in the atmospheric concentration of carbon dioxide, which is naturally bonded by vegetation.

- *Methane*, another greenhouse gas, also occurs naturally primarily as a product of the decomposition processes of organic matter. In this case, the greatest threat

[1] This idea was first proposed by the authors of the now classic book "Limits to Growth" (*Meadows et al. 2004*), published in 1972.

is represented by emissions from the swamps and peat moors of melting tundra zones. As a result of human activity, the largest quantities of it are released to the atmosphere through the energy sector, agriculture (rice farming, livestock breeding), waste management and wastewater treatment, but significant quantities are also released in the course of petroleum and natural gas production, and from leaking natural gas transmission pipelines.

- *Nitrous oxide* is naturally produced during the decomposition of nitrogenous organisms, while as a result of human activity, the largest quantities of it are released to the atmosphere through the use of fertilisers, but emissions from thermal power stations and transportation are also significant.

- *Synthetic greenhouse gases*[2] are released to the atmosphere only through human activity, mostly as a result of industrial processes. They are released as solvents, coolants, blowing agents, filling material from fire extinguishers, degreasing agents, and as a core component of insulating materials used in buildings.

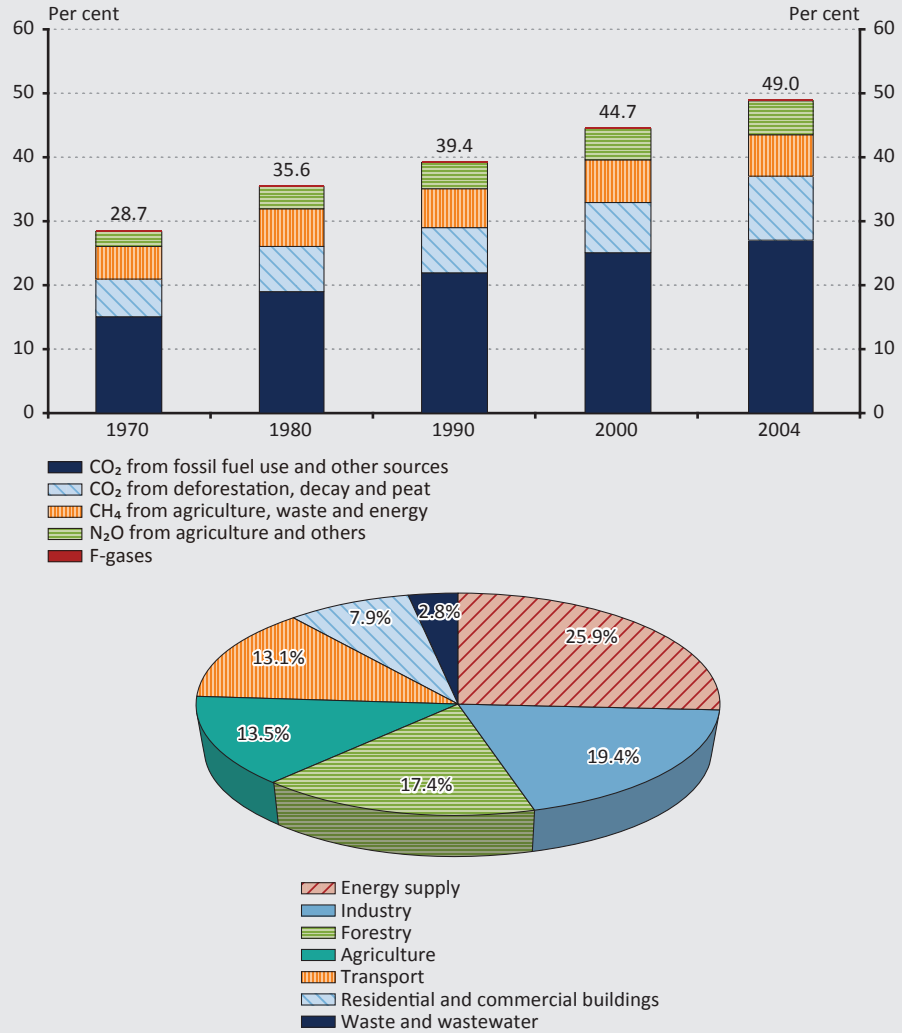
Another contribution to the greenhouse effect is made by natural aqueous vapour, and at that, the extent of its impact is greater than that of the materials listed above; however, its presence in the atmosphere is short (approximately 10 days), while that of the other three natural gases is long (10 to 200 years), and their processes of release and withdrawal from the atmosphere and their atmospheric concentration are largely influenced by human activities. Importantly, there are also natural processes counteracting the greenhouse effect, one of which is photosynthesis. As part of that, plants use the energy from sunlight to produce organic matter from water and the carbon dioxide contained in the air, releasing oxygen in the process.

1.2. Possible consequences

While the phenomenon of climate change has become widely accepted and scientifically demonstrated over the past decade (*Oreskes 2004*),[3] its possible consequences are far from being obvious. It was for that reason that the UN and the WMO (World Meteorological Organization) set up the IPCC (Intergovernmental Panel on Climate Change), which provides a suitable international scientific framework for research and discussions on the subject, and also has the capacity to produce materials to support the decisions of policymakers. In its fourth assessment report, the IPCC projects that by 2100, the global average temperature may rise by 1.1 to 6.4 °C depending on emissions of greenhouse gases (*IPCC 2015:10*). The reference point is the year 1750, and researchers consider a warming of 2°C

[2] The most important synthetic greenhouse gases include sulphur hexafluoride (SF6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).
[3] *Oreskes (2004)* supported this statement through an analysis of 928 scientific papers on climate change, published between 1993 and 2003.

Figure 1
Greenhouse gas emissions and share of different sectors[4]



Source: IPCC (2007:36).

relative to that date as the threshold of irreversibility (*National Geographic 2011*). In the acceleration of global warming, human activity (primarily energy production, industry, agricultural production and transportation) plays a major role (*Figure 1*).

[4] The first figure shows emissions of anthropogenic GHGs from 1970 to 2004, and the second the share of different sectors in total anthropogenic GHG emissions in 2004 in terms of CO_2-equivalent.

In an analysis of the possible and expected consequences of climate change, a distinction is appropriate between primarily environmental effects, the most important indirect effects and feedback generated by these, and the possible social, economic and political changes induced by the first two points.

1.2.1. Direct environmental effects of warming

The direct environmental effects of global warming are the most prominent and are generally perceivable particularly when extreme weather phenomena (storms, flooding and drought) occur. Direct effects are commonly identified as the following phenomena:

- changing seasons;
- increased local temperature peaks;
- shifts in climate zones;
- effects on seas (acidification, sea level rise, warming, shifting streams);
- withdrawal of glaciers;
- reduced polar ice covers (Artic, Antarctic);
- changed precipitation patterns: drought and flooding;
- effects on tropical cyclones;
- forest fires;
- effects on biodiversity.

Apparently, the effects of primary consequences may be extremely significant, while it is also true that it is precisely due to the ramified, leveraged and complex nature of these effects that it is very difficult to claim beyond reasonable doubt that, for instance, the increase in the local temperature peak in a given year was certainly and directly caused by global warming. However, through an assessment of the long-term data series analysed by researchers, the connection becomes obvious and scientifically demonstrable (*Oreskes 2004*).

1.2.2. Indirect physical effects

Direct effects induce additional changes; for instance, they impact the composition of organisms, and contribute to changes in permafrost (permanently frozen ground), and as a result of loosening, to the release of significant amounts of seabed methane to the atmosphere. Such phenomena can be considered as indirect effects, and although their consequences are difficult to foresee, these could also be significant.

1.2.3. Social, economic and political changes

The effects of climate change also concern social and economic arrangements. Possible social, economic and political consequences may include the following:

- global political consequences;
- environmental refugees (‘climate refugees’);

- health effects;
- direct and indirect economic losses (insured losses);
- effect on agriculture;
- effects on specific economic activities (energy industry, viticulture, tourism, etc.).

Due to climate change, new terms, such as 'climate refugee' referred to above, have also been coined in the social sciences. Initially, the term was only applied to residents of smaller islands in the Pacific, who were displaced by the sea level rise (and consequently deteriorating freshwater quality and crop safety), and commonly fled to the higher New Zealand. Subsequently, experts at the World Resources Institute (*Maddocks et al. 2015*) pointed out that the heat waves of unprecedented duration of up to several weeks, which have in recent years hit the Middle East with increasing frequency, and the massive urban inflow of herdsmen and farmers (approximately 1.5 million people) who lost their livelihoods due to the resulting water scarcity, were major contributions to the escalation of conflicts in Syria and the outbreak of civil war. According to the WRI, 14 out of the world's 33 countries most threatened by water scarcity are located in the Middle East and North Africa. As the population is rising rather rapidly in these countries, in the near future demand for water consumption will also increase at both the household and industry levels. At this point, however, it is unclear how those countries will meet this increasing demand, given that rivers have been falling spectacularly or are severely polluted. According to the forecast, over the next 25 years the water situation will deteriorate to such an extent that will threaten with a series of new economic, political and security crises, which may in turn lead to new conflicts and accelerating migration.

1.2.4. The goal is a shift towards a low-carbon economy

International organisations, including the European Union, have been setting key requirements for GHG emissions. In 2011, the Commission adopted its Roadmap for moving to a competitive low-carbon economy in 2050 (*European Commission 2011*). The Roadmap serves to ensure that across the EU, GHG emissions can be reduced by 80 per cent in terms of CO_2 equivalent by 2050 compared to 1990. In order to achieve set milestones, emissions must be reduced 40 per cent by 2030 and by 60 per cent by 2040. Every industry must make its contribution to the reduction so that the transition is viable and affordable. The objectives are ambitious and overarching, and concern virtually everyone. The signature of the Paris Agreement in 2015 (with 150 presidents and premiers in attendance) was a historic milestone in the fight against climate change. As one of the key commitments, signatories (for the first time in history, all 198 signatory countries) undertook to cap warming at 2 °C, while making efforts to limit it to only 1.5 °C.

2. The relationship of climate change and insurance

Through an analysis (*Botzen 2013:37*) of the developments in losses (both insured and uninsured) caused by natural disasters, the significance of weather-related risks for the insurance sector becomes obvious. The figures clearly show an increase in claim amounts. As regards extreme storms, floods and droughts, individual countries show varying degrees of vulnerability according to their location and geographical circumstances, but there is essentially no country that is entirely immune to these effects. Apart from the payment of damages to the insured following the occurrence of disasters, insurance companies may play an equally important role in mitigating risk and promoting adaptation (e.g. by the design of incentives that point in the right direction). It is therefore not surprising that several countries have made serious efforts to identify and analyse the risks and their relationship with the insurance sector.

We consider it important to present the diverging viewpoints through the opinions of insurance operators in various countries. First, a global approach is presented from the perspective of the Bank of England Prudential Regulation Authority (PRA), which is also responsible for the supervision of the UK insurance market, followed by an account of the international initiative Principles for Sustainable Insurance (PSI), and then an analysis of the relationship between the German insurance sector and climate change from the perspective of the GDV (German Insurance Association). Finally, our own insights are also presented in the context of the situation in Hungary.

2.1. Climate change and the global insurance market from the perspective of the UK supervisory authority for insurance

A summary of the impact of climate change on the UK insurance sector was given by the Bank of England in a publication released in 2015 (*PRA 2015*), the background to which was provided by consultations with 30 insurance companies, four roundtable discussions, and a number of interviews with experts. The Bank of England is primarily concerned with the issue in its capacity as Prudential Regulatory Authority (PRA). The PRA is tasked with the prudential supervision of financial institutions and insurance companies, and supervisory responsibility requires it to facilitate the safe and stable operation of the sectors supervised, so as to make a contribution to protecting the interests of the insured.

2.1.1. Risk factors relevant to the insurance sector

The risks associated with climate change and relevant to the insurance sector can be classified into the following broad risk factors:

- *Physical risks:* such risks are generally associated with weather (storms, floods, hailstorms), and their impacts are usually proportional to the incidents occurring,

whether involving damage to property or its subsequent consequences (disruption of supply chains, scarcity of specific resources, etc.).

- *Transition risks:* these are financial risks associated with decarbonisation, i.e. the transition of the economy to lower levels of carbon dioxide emissions. For insurance companies, this is mainly about the risks in the re-pricing (loss of market value) of assets invested in carbon-intensive sectors. To a lesser extent, this also includes, for instance, expected reductions in insurance premiums from customers operating in carbon-intensive sectors.

- *Liability risks:* these risks arise from parties who have suffered damage from the negative impacts of climate change, and then seek to pass some or all of the losses to parties who are believed to be responsible for the occurrence of the incident. Where such claims are successful, insurance companies may be required to cover some of the costs, primarily in the context of professional indemnity or directors' and officers' insurance.

- In our view, a separate factor is comprised of risks associated with life and health; however, their changes are more complex compared to the first three factors, and the quantification of their impacts requires longer observation times.

The study prepared by the UK supervisory authority draws the following key conclusions in respect of the first three risk factors:

Physical risks

- Out of the three risk factors, physical risk has the greatest relevance to insurance companies' balance sheets through its impact on provisions and liabilities. The use of the most important means of risk management (catastrophe risk modelling, portfolio diversification on both the asset and liability side, alternative risk transfers, reinsurance arrangements, and short-term contracts) suggests that insurers are reasonably well equipped to manage physical risks. Provided that premiums are calculated adequately, the management of physical risks is also supported by the specific production cycle of insurance, i.e. the fact that premiums are paid before benefits, which reduces liquidity risk. The stability of operation is also supported by robust regulatory capital requirements, designed to ensure the adequacy of insurers' financial resources also in the event of incidents.

- Over the longer term, the increased levels of risk are likely to have important consequences for market-based mechanisms of risk transfer, and the evolving role of actuarial assumptions about alternative capital and exposure to risk. This includes correlation both across climate hazards and also between risks on the asset and liability sides of insurers' balance sheets.

- Physical risks are likely to become increasingly relevant to insurance business models over time, also impacting the asset side of balance sheets. Particularly investments in real estate and assets managed over the longer term may be affected, to the extent that such investments rely on high carbon emission scenarios, or business models of that nature. Investor sentiment and expectations relating to climate change may also change in the nearer term, and there may also be questions as to the extent of such changes, which may, therefore, also have an impact on assets measured at market value. In negative scenarios, depending on the impact of climate change, unhedgeable risks may also arise according to the study.

- The impact of physical risks appears to be lower where insurers have closer links to the scientific community and are capable of considering multiple perspectives on risk, including the development of scenarios and the use of stress tests and other means.

Transition risks

- The global transition to a lower-carbon economy may have a negative impact on insurance companies via two channels: through their investments in carbon-intensive assets (declining asset prices), and also through reduced insurance premiums from customers employing carbon-intensive technologies. This group of customers have a vital interest in deliberate preparations, and the identification of possible strategies and good practices.

- The PRA views transition risk and more specifically the speed of transition as an important area for further assessment. Transition risk can be mitigated where insurers actively consider potential implications of a global transition to a lower-carbon economy in their business plans and investment strategies.

Liability risks

- The PRA views liability risks to be most relevant to general insurers through the possibility of increased third-party liability claims. To a large extent, this risk factor is speculative in nature: historical events have shown that liability claims can be less predictable and more disruptive to the insurance industry, given the possibility of significant and unforeseen claims rapidly increasing over time, which could even be triggered by a few uncommon court rulings. On the other hand, no decline is expected in customers' need for insurance cover for the management of their exposures, which could increase the overall profit of the business.

- The PRA considers the impact of liability risks to be lower where insurance companies follow a prudential policy and practice in risk taking, adopt written guidelines on the risks associated with climate change and exposures, and continually assess their impact.

2.1.2. Towards a low-carbon economy: supervisory means of supporting transition

Financial regulators and central banks are beginning to take action on the management of systemic environmental risks associated with climate change. The United Nations Environment Programme (*UNEP 2012*) recommended a number of innovative practices to decision-makers ranging from regular climate reporting (*CAR 2014*) to the introduction of the Green Credit Guidelines by China's CRBC (*CRBC 2012*). Regulators of the insurance sector are also exploring the specific implications of climate change-related risks. Accordingly, in 2013 the National Association of Insurance Commissioners (NAIC) in the US adopted revisions to the Financial Condition Examiners Handbook to support examiners in their quantitative assessment of any potential impact of climate change on solvency of insurance companies (*NAIC 2008*). The PRA primarily aims to promote firms' resilience to climate-change risks and support the financial sector in making an orderly transition to a lower carbon economy. This will focus on four activities, as follows:

- *International collaboration:* As with other systemic risks, continual collaboration among financial regulators and other related bodies will also be important in this regard. Changes in the disclosure requirements of even a single jurisdiction could significantly affect transition risks through capital flows in various segments of financial markets. The PRA's international collaboration on climate change to date has focused on participating in the United Nations Environment Programme (UNEP)-led initiative 'Inquiry on the Design of a Sustainable Financial System'.[5] The PRA expects continued international collaboration on these issues to be an important part of its initiative. The PRA considers the facilitation work of the International Finance Corporation (IFC) as part of the 'Sustainable Banking Network' (SBN)[6] as a model to follow, which makes a significant contribution to collective learning amongst banking regulators on sustainability-related issues. An analogous network for insurance regulators and associations interested in sustainable insurance policies, guidelines and practices may also be worthy of further consideration.

- *Research:* The PRA's work on climate change research is at an early stage; the knowledge needed to advance the PRA's above approach is not fully available at this point. The PRA intends to explore research questions most relevant to the impact of climate change on microprudential supervision, including physical and transition risks. The PRA expects these to be considered as part of the Bank of England's wider research agenda.

[5] For more details about studies on the subject, see http://web.unep.org/inquiry.
[6] Established in 2012, the Sustainable Banking Network (SBN) is an informal and exclusive group of banking regulators and associations, which focuses its interest on sustainable banking policies, guidelines and practices.

- *Dialogue and engagement:* An important new feature for PRA is a climate change adaptation report, which can be produced on an ad-hoc basis relying on substantial dialogue with PRA-regulated insurance companies and wider stakeholders. When carried out on a regular basis, this could support an appropriate level of continued dialogue and engagement to participation.

- *Insurance supervision:* The PRA intends to take a judgement-based, forward-looking and proportionate approach to insurance supervision, including the use of business model analysis to examine the viability and sustainability of firms' business plans. Under the Solvency II regime, which came into force on 1 January 2016, firms are required to hold regulatory capital calibrated to a 1 in 200 VaR over a one-year time horizon and undertake a forward-looking review of risks through their Own Risk and Solvency Assessment (ORSA). Additionally, the PRA will give further consideration as to how best to incorporate the identified climate change risk factors into its existing framework, including its supervisory approach. A review of the PRA's business model analysis and stress-testing framework could provide for an ongoing assessment of climate change risk factors. It may be important to build in-house technical expertise to support supervisors in their assessment of climate change risks and in developing a better understanding of the effects on insurers. Additionally, the supervisory authority may also arrange for the incorporation of identified and assessed climate change risk factors into models in the course of thematic reviews of firm ORSAs.

2.1.3. New opportunities for the insurance sector

In addition to risks, the study also mentions new opportunities for the insurance sector. Given the role of insurance in providing protection and risk transfer, the industry could clearly have an important role in *supporting adaptation to climate change*. Responses to the PRA's survey, and wider discussions, highlighted a number of opportunities in this area:

- Improving awareness of climate change risks and providing expert advice to prevent and mitigate risks and losses may be particularly useful in the case of physical risks to property-related assets. While some insurers already provide guidance to customers on resilience to natural catastrophes or floods, the scope of that support should be broadened. One such opportunity is to influence regulations that are in place to improve building codes, to strengthen flood defences, or to reduce climate hazards by other means.

- Developing innovative risk transfer mechanisms as part of broader risk management solutions to help under-insured or uninsured communities and economies to meet the challenges of climate change. This could also include

providing technical assistance to innovative public as well as private initiatives, such as the CCRIF[7] or the ARC.[8]

- There are also opportunities for insurance firms to develop new products. In particular, these relate to the transition to a lower-carbon economy in areas such as renewable energy project insurance, including increasing demand for insurance coverage for design and construction risk as well as performance risk, such as providing cover for income shortfalls from solar farms due to changing weather patterns.

- Existing environmental insurance offerings ('green products') may also provide opportunities for insurers to incentivise behaviour change that reduces carbon emissions. Good examples in this area include 'pay-as-you-go' motor insurance policies, which incentivise a reduction in the usage of cars, while also encouraging greater energy efficiency.

- The insurance industry is traditionally a significant and active institutional investor. Following the examples of other institutional investors may be particularly productive in the field of investments in 'Green Bonds', i.e. debt instruments to fund projects that have positive environmental and/or climate change benefits. In addition to exploiting business opportunities, insurers could play a role shaping and driving the growth of these types of products. Investing in flood defences, or other infrastructure to support adaptation, could be another example of generating suitable risk-adjusted return profiles.

- Through industry associations, making climate change-related investment commitments. For example, at the UN Climate Summit in September 2014, the ICMIF[9] and the IIS[10] jointly committed to doubling the industry investment in climate-smart investments from that year's USD 42 billion to USD 84 billion by the end of 2015.

More widely, compared to other industries insurers arguably have clear views on their role in driving a wider societal response to climate change. A greater knowledge base, the nature of the business, indemnification for damage and the resulting higher sensitivity to risk make the insurance sector more open to the issue of climate change. This is taking a variety of forms, including participation in green initiatives, such as ClimateWise,[11] the global insurance industry's leadership

[7] Caribbean Catastrophe Risk Insurance Facility.
[8] African Risk Capacity.
[9] International Cooperative and Mutual Insurance Federation.
[10] International Insurance Society.
[11] The US initiative aims to provide assistance for local leaders with the development of strategies on adapting to the effects of climate change. More details: http://climatewise.org/.

group driving action on climate change risk, or becoming a signatory to the PSI[12], a specific part of the global initiative UNEP FI.[13]

2.2. Principles for sustainable insurance – a global initiative

PSI (Principles for Sustainable Insurance) is an initiative for the insurance sector launched in 2015 as part of the United Nations Environment Programme Finance Initiative (UNEP FI). According to the initiative, sustainable insurance is an approach that aims to mitigate risk, seek innovative solutions and improve business performance with a view to meeting environmental, social and economic challenges. The initiative highlights four principles, which it considers the focal points of sustainability in insurance. The principles are the following:

1. Embed relevant ESG issues[14] in the decision-making processes of the insurance business.

2. Work together with clients and business partners to raise awareness of environmental, social and governance challenges, and to manage risks and develop solutions.

3. Work together with governments, regulators and other key stakeholders to promote widespread initiatives across society on environmental, social and governance issues.

4. Demonstrate accountability and transparency in the regular public disclosure of progress in implementing the Principles.

To date, the principles have been signed by close to a hundred international insurers and reinsurers (*UNEP 2012*), some of which also have significant shares of the Hungarian market. Not surprisingly, reinsurers are particularly active in this field. Namely, reinsurers play an important role in analysing available historical data, modelling likely effects, and integrating those effects into risk management systems. By doing so, they make a significant contribution to enhancing knowledge about climate change to a scientific standard. In the context of climate change, other than reducing their own ecological footprint, both reinsurers and insurers are actively working on the development of products that help customers mitigate climate hazards and adapt to climate change.

[12] Principles for Sustainable Insurance. For more details, see http://www.unepfi.org/psi/the-principles/.
[13] United Nations Environment Programme Finance Initiative (UNEP FI).
[14] Environmental, social and governance issues understood collectively as they concern sustainability.

2.3. Adaptation by the German insurance market: a practical approach and cooperation

We consider an account of the German example to be relevant in several respects. Apart from geographical proximity and similarity of climate, its approach, which is more practical compared to the UK, and its more local mindset, could be a model for Hungary as well.

2.3.1. Problem identification and social dialogue

From 2009 onwards, the German Insurance Association (GDV) was increasingly concerned with the phenomenon of climate change, and by 2011, it produced the studies which shape thinking to this day. Initially, these focused on the following questions:

- What changes does Germany need to anticipate due to the climate change?
- How can the consequences of climate change be insured in the future?

Based on an outlook to 2100, prepared with contributions from leading climate researchers (*GDV 2011*),[15] the Association modeled specific risk experiences for individual types of natural disasters and prominent risks (floods, storms and hailstorms) that depend or are strongly influenced by meteorological factors. According to the main findings of the study, an increase in hailstorms is to be expected in the summer months. In particular, areas in Western Germany must anticipate a significant increase in damage caused by storms and flooding. Extreme weather events will become increasingly intense, and they will cause a significantly higher amount of damage. The study provided detailed maps to illustrate the likely impacts on specific areas of Germany. At the same time, the results suggest that the insurance sector, although at a higher level of premiums, will retain its ability to cover the risks emerging as a result of climate change.

These models offered a unique tool to the German insurance market, the leaders of which considered that the problems foreseen could only be tackled through joint efforts. To that end, they put forward firm recommendations for other economic and social actors in Germany. Key recommendations for the most important groups addressed are the following:

- various levels of policy:
  - participants in federal policy (earliest possible integration of the industry in decision-making, promotion of climate research, fixing the insurance tax on

[15] The participants invited represented the following institutes: Potsdam-Institut für Klimafolgenforschung (PIK), Freie Universität Berlin (FUB), Universität zu Köln (UK), Institut für Angewandte Wasserwirtschaft und Geoinformatik (IAWG).

specific hazards at a low rate, following the Bavarian model of a joint campaign by the state and insurers for increased security, etc.);

– participants in federal state policy (prohibition on construction in flood-prone areas, facilitation of information flow on weather extremes, coordinated action by federal states, etc.);

– municipal governments (reservation of land for backwater and flood areas);

- representatives of specific professions, in particular planners and architects (storm-resistant roof structures, requirements for doors and windows to provide higher water-tightness performance, use of materials for energy efficiency redevelopment that withstand hailstorms and other natural hazards, etc.);
- economic operators (use of energy efficient technologies, integration of the insurance sector in technological development);
- house owners (planning with the future in mind, wise use of alternative energy sources, acquisition and application of preventive and protective competences, knowledge of tasks depending on local flood hazards, attention to the resistance and water-tightness of doors and windows, etc.).

Apparently, adaptation in the German insurance sector had already begun before 2010. The adaptation process to date can be divided into distinct phases: it started with a more passive learning phase, followed by a more active development phase that resulted in activity for participants in the insurance sector and increased authority for the sector as a whole, and culminated in a role involving the setting of requirements for the environment and demonstrating competencies. A few steps of this process, which also bear relevance to the Hungarian market, deserve to be highlighted.

1. *Every beginning is difficult:* A substantial part of the base studies on climate change that are relevant to the insurance sector were carried out in 2008–2011. Subsequent studies were more concerned with the clarification of details, additions, and the promotion of product development. By 2011, this led to a situation in which insurers started to view climate change more as an opportunity to increase markets and revenues (*Schmitt 2011*). This points to the possibility of making returns on competency development relating to climate change. However, this 'investment' should be handled at the association level rather than at the level of individual insurers, because this will induce the change of attitude that may ultimately result in higher demand for 'green' insurance products. Obviously, in this case costs will also be spread, with the possibility to build a shared knowledge base.

2. *Search for allies:* Some of the base studies are associated with recognised universities and research institutes. As German society has a traditional appreciation of knowledge, the insurance sector's learning and acquisition of competencies in the field of climate change was seen as a genuine process from the beginning.

3. *Self-confidence of the insurance sector:* From a Hungarian perspective, it may appear odd that representatives of the German insurance sector made specific recommendations and demands by publicly addressing certain groups of policymakers, economic operators, professions and society at the same time. This self-confidence was based partly on the knowledge obtained, and partly on the sober consideration, 'If you can't stop it, lead it.'

4. *There may be bumps:* The learning process was strongly inspired by the beginning of the energy transition (Energiewende). In Germany, the first decision to phase out nuclear energy was adopted as early as in 2000, followed by legislation in 2002, and accompanied by the development of renewable energy sources on a large scale. In this accelerating process, the German insurance market initially fell behind, causing insurability problems for power plants, and capacity problems for insurers. Although today the process is supported by the insurance sector both through its insurance capacity and as an investor, participants do not want to make the same mistake again.

2.3.2. Lessons learned from a snapshot

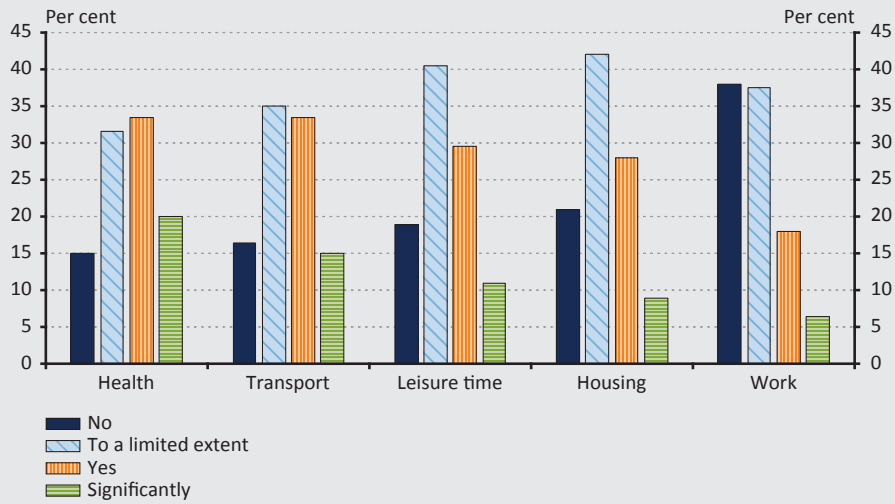
In addition to the foregoing, there have been studies on the likely developments in supply and demand, 'green' products, and the factors supporting such products. A study by the Institut für Technologie of Karlsruhe (*KIT 2011*) reviewed the 'green' products of some global insurance operators, and also carried out an in-depth analysis of agricultural insurance as well as insurance products related to human health, leisure time, housing and transportation in German-speaking Europe (Germany, Austria and Switzerland). The research institute found that for the most part, Germany has products available to support the adaptation to climate change and the avoidance of undesired effects. On the other hand, it also found that people making a living from agriculture, and retail customers had rather limited awareness of the products that could be used effectively in the face of climate change.

Apart from some Austrian/Swiss plant insurance schemes covering multiple risks, including drought, the authors of the study find particular perspective in building insurance products that index the maximum damages payable on cumulated risks.[16] Additionally, the study also discusses a household survey that covered the whole of Germany and examined the acceptance of novel features in certain insurance

[16] Simultaneous occurrence of interrelated incidents associated with the large number of risks.

products, attitudes to climate change, and the willingness and actions to make provisions. The evaluation of the data showed a significant coincidence in the extent to which respondents considered themselves, and the whole country, to be at risk. The largest percentage of respondents pointed to the effect of climate change on health, and that may also be where the state may have the most prominent role to play (*Figure 2*). Another key finding is that the increase observed in the confidence in public and private health institutions leads to a slight decrease in perceived risk.

Figure 2
Effect of climate change on specific areas of life in Germany[17]



Source: KIT (2011:66).

Given that transport is one of the largest GHG emitters in Germany as well, the survey included a question on pay-as-you-drive insurance. The question was as follows: "Car usage is responsible for 12 per cent of Germany's CO_2 emissions. To reduce that rate, all of us should drive less. The insurance sector can promote this by calculating car insurance premiums based on the distance driven. GPS technology enables both your location and speed to be identified. Drivers with relative low mileages who observe speed limits and drive mainly on roads involving a low risk of accidents could have their insurance premiums reduced by up to 50 per cent. Would such a car insurance possibly of interest to you?" 27.8 per cent of respondents gave a positive answer, 54.1 per cent rejected the proposal on grounds of constant monitoring, and 12.2 per cent would prefer to pay fixed premiums. 6 per cent of respondents reported not driving or not having a car. According to the study, the acceptance rate of the service could have been higher if less emphasis had been

[17] Sectors from left to right: Health, Transport, Leisure time/Holidays, Housing, Work. The height of each bar represents the percentage of those agreeing.

placed on the monitoring feature, and the question had focused more on technical details. At the same time, the result also shows that potential users' concerns about data protection must be taken seriously.

Owing to its high sensitivity to weather, agricultural insurance is an area that receives particular attention, and in which Germany is not a prominent leader. In this regard, the study also gave a broader international outlook. The study found that the way forward may lie in product development based on packaged risks rather than specific individual risks.

It will be apparent from the foregoing that the issue of climate change is of strategic importance to the German insurance sector. The German Insurance Association (GDV) has undertaken an active role and taken the initiative in shaping social discourse and mobilising the demand side, while it also supports insurers in helping their customers to adapt to climate change and avoid undesired effects.

3. Hungary

3.1. Hungary and climate change

In Hungary, the beginning of climate change research dates back to the summer of 2003, marking the launch of Project VAHAVA (Change, Impact, Response) lead by Academy member István Láng. Project VAHAVA culminated in the development of the first National Climate Change Strategy (*NCCS 2006*), which the Parliament adopted in 2008. NCCS-1 covered the period 2008–2025 and comprised as one of its main components the start of design work on the Green Investment Scheme (ZBR) to provide funding for investments that improve energy efficiency and use renewable energy sources. The first review of NCCS-1 was carried out in 2012, as part of which the second National Climate Change Strategy was drafted and was subsequently subject to wide public consultation. The material was approved by government on 20 May 2015, and on 2 June 2015 it was submitted to the Parliament (*NCCS-2 2015*), but has been off the Parliament's agenda ever since. The logic of NCCS-2 rests on the following main pillars:

- Examination of the Hungarian components of GHG emissions, the primary cause of climate change, and setting out responses. This chiefly means decarbonisation, i.e. a transition to a low-carbon economy. The details of that transition are specified in the National Decarbonisation Roadmap.
- Modelling climate change scenarios: an outlook on likely conditions in terms of temperature and precipitation, and on changes in waters, soil, forests, biodiversity, and the health of the population. Apart from modelling, the material also takes account of obvious adaptation scenarios as part of the National Adaptation Strategy.

• The details of awareness-raising work are set out in the awareness-raising plan 'Partnership for Climate'.

The NCCS-2 discussion paper (*NCCS 2013:17*) gives the following summary of the climate change tendencies foreseen in Hungary up to 2090: "Climate change foreseen in Hungary: Throughout the country, a 1 to 2.5-degree increase in the annual average temperature is likely, with a somewhat more intense warming to be expected in winter and summer compared to the transitional seasons. Within temperature extremes, the number of frost days could decrease by approximately 35 per cent, while the number of heat waves, particularly in the central and north-eastern regions of the country, could increase by more than 30 days. Shorter-term estimates for precipitation, with an outlook to 2050, involve a great deal of uncertainty without any significant changes over that time horizon. By the end of the century, for the country as a whole, a 15 to 20 per cent increase in precipitation is expected in winter, and a 10 to 30 per cent decrease in summer. The number of consecutive dry days may decrease by 10 to 15 per cent in winter, and increase by 15 to 25 per cent in summer, particularly in areas east of the Danube. The Hungarian trends analysed are in line with global climate change estimates and regional estimates for Central Europe. Overall, the climate change to be expected in Hungary is characterised by an increasing frequency of heat waves and a more extreme water regime (precipitation leading to aridification, droughts, flooding, and flooded soil). The evolution of extremes shows a marked spatial distribution to the detriment of Hungary's central, eastern and north-eastern regions in particular, which is a reminder of the significance of regional vulnerability studies." The foregoing is aptly illustrated in *Table 1*:

Table 1
Expected future evolution of temperature extremes in Hungary[18]

	Average value (days)	Projected change (days)	
	1961–1990	2021–2050	2071–2100
Frost days (Tmin < 0 °C)	93	–35	–54
Summer days (Tmax > 25 °C)	67	38	68
Hot days (Tmax > 30 °C)	14	34	65
Extremely hot days (Tmax > 35 °C)	0.3	12	34
Heat waves (Tavg > 25 °C)	4	30	59

Source: NCCS-2 (2013:14), Table 2.

[18] Hungarian averages of the changes based on PRECIS model simulations, using the A1B scenario. Values for the reference period (1961–1990) derived from the E-OBS database (named source: ELTE Department of Meteorology).

What do the insurance sector and customers need to prepare for? Primarily for a significant increase in average temperatures and unfavourable changes in precipitation, particularly in terms of distribution. Winters will be milder and more wet, while summers warmer and drier. This latter represents a serious risk to agriculture. Additionally, more severe and devastating storms and more supercells are to be expected, and as a side effect of this latter, more hailstorms and hail. An increase is to be expected in the severity and frequency of extreme weather events. These effects also present serious challenges to Hungarian insurers, primarily in connection with property insurance (including in particular home insurance), agricultural insurance, and certain types of liability insurance. Standard corporate responsibility and the professional analysis of long-term risks both require that insurers (and reinsurers) rethink and review their risk assessment models and activities as institutional investors by incorporating aspects of climate protection.

3.2. Climate change and the Hungarian insurance sector

3.2.1. Assessment of the current situation in Hungary: preparedness

Regarding today's Hungary and the preparedness of its insurance sector, the following can be reported:

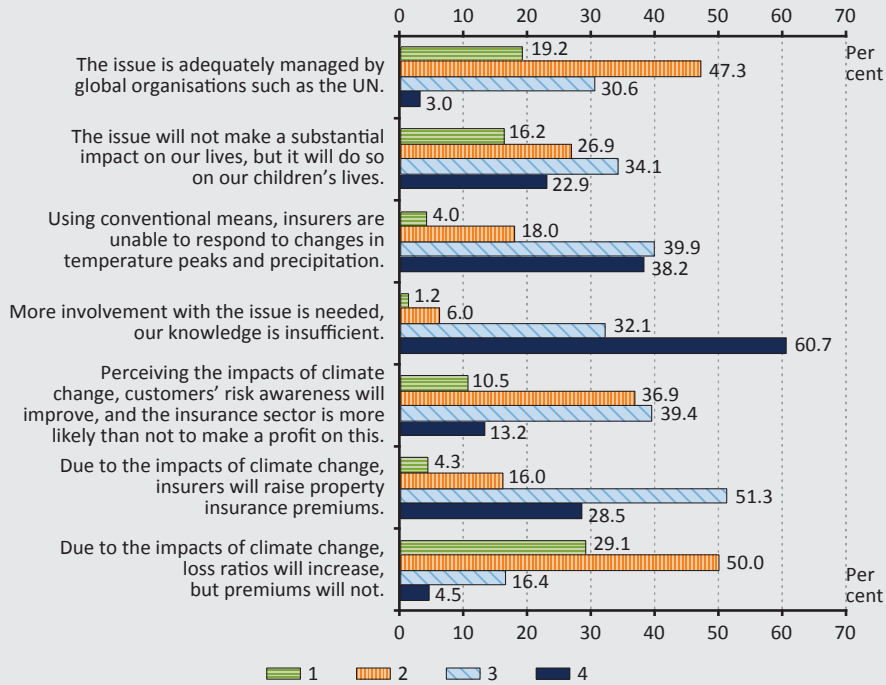
In connection with Project VAHAVA, Dr András Bárczay's paper has provided an excellent summary, in an international context, of the possible consequences and challenges of climate change for financial service providers, and insurers in particular (*Bárczay 2008*). On the provider side, in the 2000s Aegon, manager of the largest portfolio of home insurance, carried out GIS modelling and other in-depth research on the likely consequences of climate change. Selected results of that research have been published (*Vereczki 2010*). On the claims side, this learning process was significantly accelerated by the severe floods in the second half of the 2000s, and the resulting increase in claims payments. Research activities were set back by the discontinuation of the innovation contribution in the 2010s, which has also reduced providers' own resources for research. The organic learning process has become frustrated, and it is therefore not surprising that no major and recent publications are available on the exposure of the Hungarian insurance sector to climate change.

The extent to which our knowledge of the subject is limited is clearly indicated by the results of a recent primary research. In February 2016, approximately 400 respondents completed the survey questionnaire 'Future of the insurance sector in Hungary',[19] 61 per cent of whom completely agreed and another 32 per cent tended

[19] Between 26 and 29 February 2016, 413 respondents completed the questionnaire. Within the insurance sector, survey participants included managers working in various functional areas (31 per cent), insurance brokers (32 per cent), consultants working in the sector (17 per cent) and other professionals and supervisors (20 per cent).

to agree with the statement that lack of knowledge calls for more involvement with the issue of climate change (combined, 93 per cent of respondents felt they had insufficient knowledge about climate change) (*Figure 3*).

Figure 3
Do you agree with the following statements on climate change?



Note: 1 – completely disagree, 4 – completely agree.
Source: Pandurics (2016:23).

Apart from a lack of knowledge, the distribution of answers also indicates that to a significant extent, respondents consider the issue as a local problem outside the present, which will rather concern the life of the next generation (57 per cent tended to agree or agreed completely). At the same time, two-thirds of respondents thought that the problem was inadequately managed by global organisations (66.4 per cent tended to think this).

Responses indicate that in the insurance market, climate change is a phenomenon that actually carries increasing risk, which will exert upward pressure on property insurance premiums, leading more than three-quarters (79.8 per cent) of respondents to think that insurers will raise premiums due to the effects of climate change. Regarding the question on the impact of climate change on the

premium income of the insurance market in the next 5 years, a mere 25.9 per cent of respondents expect a negative impact. While possibly construed as conservative optimism,[20] this result highlights the need for the sector's greater efforts going forward in terms of providing affordable and available cover, and communicating changes in risk exposure.

In terms of the impacts on profitability, the percentages of respondents expecting a positive impact and a negative impact are practically the same (38.2 per cent and 39.7 per cent, respectively). This is another indication that there is an absence of professional consensus and adequate knowledge about the impact to be expected – on this point, not only the extent is questionable, but also the sign of the impact.

3.2.2. Measures and product development associated with climate change

Although the Hungarian insurance sector is inadequately prepared in an international comparison, it is also true that considerations relating to climate change are increasingly being incorporated into certain insurers' activities and product range.

In terms of *investments*, most investment service providers today offer 'green', 'climate' or 'sustainable' investment funds. These funds primarily seek to invest in the securities of companies the revenues of which are predominantly derived from the leverage of the business opportunities provided by global climate change (environmental management, energy efficiency, 'clean' and 'environmentally friendly' technologies, etc.), the use of alternative resources (renewable energy, water management, agricultural chemistry, etc.) and agricultural activities (biotechnology, animal farming, fish farming, agricultural technology, agricultural meteorology, etc.). Regarding the products, however, an approach of replication and imitation seems to be prevailing in the Hungarian market, essentially consisting in the fact that products that are labelled 'green' in other countries (or underlie such products) have already appeared, but their communication almost entirely lacks the element of adaptation to climate change.

In the field of *agricultural insurance*, the instrument of subsidies on agricultural insurance premiums was reintroduced in 2012 after an 'enforced rest' of 15 years, and currently provides a subsidy of up to 65 per cent on agricultural insurance plans tailored to specific crops. In 2015, the subsidy amounted to HUF 5.7 billion, and was granted to about 8,600 farmers.[21] However, the successful subsidy model and its communication rely exclusively on the security of farming, with a complete absence of climate change considerations and elements of possible adaptation.

[20] Precise percentages: highly negative 4.0 per cent, slightly negative 21.9 per cent, neutral 20.2 per cent, slightly positive 47.4 per cent, highly positive 6.5 per cent.
[21] http://www.biztositas.ma/4-milliard-novenybiztositasi-dijtamogatas-2016-ban

'*Pay-as-you-drive*' car insurance: while these products are being made available by an increasing number of providers in the Hungarian market (e.g. Safe-Line, Vemoco), expert literature has failed to highlight the green nature of the products, focusing on the innovative character and customer experience instead. Nevertheless, this product group can already be considered 'climate-conscious' in that it rewards responsible customers by incorporating appropriate incentives (discounts). Similarly, a new direction in product development may be taken towards the positive discrimination of customers in the field of covering 'green' property or shared movables. The exposure of *home insurance products* to climate change is undeniably high, but this is far from being obvious to customers today. Apart from increased transparency on risks (see German and Austrian maps and applications), the appropriate pricing of risks and the introduction of adequate incentives, initiatives on the required regulatory changes may also be important in this regard. Possible directions include adjustments to construction standards by taking account of climate hazards, the deliberate mitigation of flood risks (e.g. in the course of issuing construction permits in areas at risk), or incentives for investments to prevent natural disasters.

Mention should also be made of *professional liability insurance for construction and design* relating to the stock of buildings. The essence of this plan is that buildings are protected by the processes, materials and technologies used by designers and constructors against risks that could emerge as late as decades after construction, making this one of the areas where adaptation to climate change should start. In Hungary, such insurance follows the common rules for liability insurance, providing cover for the period during which the insurance is in effect. However, through limitations on reporting claims, Hungarian market practice makes this type of insurance virtually useless in many cases, since defects attributable to liability for design or construction rarely emerge in the first few years following construction. Unfortunately, regulations effective as of this year (*Építési Jog 2016*) requiring liability insurance on a mandatory basis also fail to solve this problem; indeed, disregarding elements of quality and consumer protection could lead to severe damage going forward. A meaningful solution could be provided by specifying reasonable liability insurance periods in respect of the design and construction of buildings, similarly to Germany (5 years) and France (10 years). This would presumably increase construction costs, while also improving the tolerance of buildings for meteorological risks, and therefore the stability of their value as well.

4. Summary

Based on the NCCS-2 discussion paper, the challenge of climate change is unquestionably a major risk in Hungary as well, which requires adequate responses. In turn, responses need good questions first. Given the shortfall observed regarding the Hungarian specificities of the insurance sector, we consider that the importance of the issue, good questions and responses, and the development of industry recommendations call for concerted action. In that spirit, it appears advisable to set up an 'inter-departmental' professional body comprising representatives of the Association of Hungarian Insurance Companies (MABISZ), the supervisory authority (MNB), the water authority and the expert and academic community, which could put forward recommendations on a 'climate change adaptation roadmap' for the Hungarian insurance sector in the broad sense, including customers, brokers and the supervisory authority. Since the core responsibilities of the insurance sector arguably include the promotion of prevention and adaptation activities carried out with a view to the management, transfer and mitigation of risk, Hungarian insurance companies may reasonably be expected to play an active role in minimising the negative impact of climate change on Hungary and Hungarian customers.

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Insight into the Hungarian Automotive Industry in International Comparison*

János Rechnitzer – Róbert Hausmann – Tamás Tóth

The paper examines the features of the Hungarian automotive industry[1] in international comparison, in the form of a descriptive analysis. The comparison focuses primarily on the automotive industry of the Visegrád region, Germany and Austria, as well as on processes in the EU. The analysis reviews the academic background of the sector, and then provides an insight into the history of the automotive industry of the Visegrád region, focusing on the socialist past of the automotive industry and the consequences thereof. In the last part of the analysis, we compare contemporary Hungarian industry trends with the features of it in the Visegrád countries and Europe, based on the statistics of Eurostat, by company size and ownership structure, as well as on the corporate income tax return database of the Hungarian tax authority (NAV). The main conclusion of the paper is that the automotive industry shows outstanding productivity within the Hungarian national economy, but on the other hand, the SMEs of the sector are less productive than large enterprises and this difference is the highest in Hungary within the region. In order to change the situation, large foreign enterprises should outsource their higher value added activity in the region and raise wages accordingly, and on the other hand, it would be necessary to strengthen and advance Hungarian-owned SMEs within the value chain.

Journal of Economic Literature (JEL) codes: L61, O31, P23, R11, D41

Keywords: competitiveness, labour productivity, V4 region

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[1] Hungarian automotive industry is the term for the entirety of the automotive undertakings operating in Hungary. For this purpose the governing criterion is category C29 of the Eurostat NACE Rev. 2 nomenclature. According to the definition, this category also includes the manufacture of trailers and semi-trailers, as well as motor vehicle parts. On the other hand, the category does not include the activities related to the manufacture of other transport equipment (shipping equipment, rail transport equipment, air transport equipment, military vehicles, motorcycles and bicycles). In the analysis part, we apply the Eurostat Structural Business Statistics (SBS) rules, by separating foreign-owned and Hungarian-owned companies: a foreign company is a company in which a foreign country's resident shareholder exercises more than 50 per cent of the voting rights or the shareholders' ownership right.

1. Introduction

The analysis intends to provide an insight into the current situation of the Hungarian automotive industry, comparing it, from a macroeconomic aspect, with the Visegrád region and the German-speaking countries, as well as with the trends across the European Union. The choice of this paper's topic follows from the outstanding economic role of the sector in the Visegrád region and in Hungary, the current labour market and labour productivity challenges in Hungary and in the region, as well as from the need to publish up-to-date data and calculations that take account of recent years' automotive industry investments. The paper primarily analyses the factors responsible for the lower labour productivity of the Hungarian (and regional) automotive industry compared to the EU average and that of Western Europe.

The issue is examined, on the one hand, through a detailed academic review of the sector, which tries to find out why and how multinational companies outsource some of their activities and to identify these processes. Thereafter, the paper also touches upon the historic analysis of the automotive industry in the Visegrád region. In addition to applying the qualitative method, two different empirical analyses, based on own calculations, also provide assistance for the further analysis of the research topic, after reviewing the global trends of the automotive industry. One of them draws conclusions, in an international comparison, with regard to automotive industry labour productivity according to enterprise size and ownership (foreign or Hungarian), based on the Eurostat SBS statistics. The other one formulates statements with regard to the current domestic trends of the sector, based on the corporate tax return database of the Hungarian tax authority (NAV).

2. Academic background of the automotive industry

With the rise of globalisation in the 20th century, the automotive industry also underwent fundamental structure changes, including the development of global production systems and the organisation of cross-border market structures (*Dicken 2007*). The development of global production chains was fostered by the expansion of liberalised commercial and investment activities, the institutionalisation of economic integrations and the appearance of a political environment which supports FDI (*Torlak 2004*). The OEM (original equipment manufacturer) companies in the developed countries became multinational and global industry players wished to exploit a broad range of potentials in the developing countries (*Chanaron – MacNeill 2005; Humphrey – Memedovic 2003*).

In relation to the aforementioned process, *Florida and Sturgeon* (*2000*) separate the internationalisation process and the globalisation process, defining the former as the cross-border nature of the economic activities, and latter as the creation of institutionalised, functionally integrated systems. From this aspect,

internationalisation appears as a quantitative change, whereas globalisation represents a qualitative improvement, in the course of which the activity of the individual economic actors becomes part of an internationally coordinated scheme of processes.

In an industry survey, *Florida and Sturgeon* (*2000*) specified four different types of deployment in the area of automotive localisations, based on the motive of the activities and the qualitative assessment of the localisation (*Table 1*). Based on the model, the Central and Eastern European automotive industry centres, and particularly the automotive industry centres of the V4 region, correspond to location type 3, the key deployment factor of which is the cheap labour force and the established infrastructure, while the motive of deployment is the rationalisation of manufacturing processes and minimisation of its costs. The degree of integration in the value chain remains at a low or medium level; production is typically made for external markets, and thus a substantial part of the sales revenue comes from the settlement between the foreign parent and the domestic subsidiary. According to the theory, in model type 3 the activities representing low value added are outsourced, while development almost completely remains the competence of the parent company.

Table 1
Classification of automotive industry localisations

	Type 1	Type 2	Type 3	Type 4
Direction of strategy	Closeness of markets, corporate competitive advantages	Closeness of markets, corporate competitive advantages	Cost reduction, rationalisation, efficiency	Market coverage
Capacity level	High	High	High	Low
Wage costs	High	High	Low	Low
Development	Yes	Occasionally	No	No
Degree of integration	High	High	Medium	Low
Supplying industry base	High	Medium to high	Medium	Low
Export	Low (except for Japan)	Low	High	Low

Source: Edited based on Florida – Sturgeon (2000:13).

In his eclectic paradigm theory, *Dunning* (*1988*) examines the owner-specific and location-specific benefits, as well as the internalisation benefits of international capital investments. Combining this with the classification of deployments, *Dicken* (*1998*) created a general classification of direct capital investments (*Table 2)*. According to Dicken's theory, the automotive investments in the V4 region, initially –

after the political transitions in the 1990s – were clearly implemented with the aim of utilising local resources, but later on, with rationalisation of the already existing investments, they moved to the efficiency-improving phase. The proximity of the European markets also places the market-oriented phase at a reachable distance, and thus, according to the concept, a kind of mixed model of investment motives may appear in the region.

Table 2
General classification of foreign direct investments

	Enforcing strategic advantages	Market-oriented	Efficiency-improving	Exploiting local resources
Ownership-specific advantage	Long-term strategic goals, preserving international competitiveness	Increasing market success, controlling the local market	Rationalisation of already existing investments	Increasing competitiveness
Localisation advantage	Competitiveness of the above factors and the given regional level	Differences in costs, size and nature of market, government policy	Production specialisation and concentration of the national economies	Differences in the costs of the production factors
Inter-nalisation advantage	Competitive and strategic advantages, risk mitigation, market control	Reduction of transaction costs, adjustment to the local requirements	Vertical corporate integration, corporate value chain	Price controls, market control

Source: Edited based on Dicken (1998:185).

The basis for the exploration of the deployment motives of direct capital investments in the automotive industry is presented by Porter's competitive evolution theory (*Porter 1998*). According to this theory, each sector of a national economy can be placed in a phase of the evolution model, while the position fundamentally determines the deployment motives and the range of deployment factors considered during decision-making. When progressing in the model, the determinant factors change from price-sensitive input factors into human capital representing higher value added, and then – after a decline in the innovation motive – it points to the disappearance of the sector, to be replaced by the dominance of other sectors.

In the (1) factor-driven phase, the competitive advantage of the enterprises and the region originates from the general production factors, such as natural resources and unskilled, cheap labour force: the industries obtain a cost advantage. The enterprises usually have no relation with the end-users of the products, and thus the monitoring of market changes is also limited. In the (2) investment-driven phase, the basis of the competitive advantage is also represented by investments in general production factors and the resulting cost reduction, but knowledge and technology transfer also appears. The technology to be invested comes from abroad and is usually widely available in the world market. The duty of the economic policy

pursued by the general government is to improve the infrastructure background, provide skilled labour and spread entrepreneurial literacy and knowledge.

In the (3) innovation-driven phase, high, rising domestic demand urges companies to innovate, which then makes them capable of selling in the external markets with economies of scale advantages. The economy can no longer be characterised by isolated companies, as they are replaced by geographically concentrated vertical, and later, horizontal clusters. In the innovation-driven phase, the government policy is pushed into the background and the private sector's investments in factors of production start to dominate. In the (4) wealth-driven phase, enterprises lose their willingness to innovate, investors no longer invest in research and development to the necessary degree, and thus in the medium run the sector's world market position decreases. As a result of the risk-averse attitude, the region's economy moves to the stagnation phase, where only sectors with historic roots are able to remain globally competitive.

The group of the former Central and Eastern European socialist states appears in the automotive competition as a single market, where the competing national economies form a homogenous community with similar competitive advantages and disadvantages. During the deployment decisions of the sector, the sequence of strengths within the region is determined by the current deployment motives, the proximity of markets and suppliers, as well as the glut of the market (primarily the labour market), which is materially influenced by the governments' investment incentives. After the political transition in the region, the automotive manufacturers typically deployed the assembly of low value added, outgoing models to the V4 countries, for which it employed the labour force characterised by low wage level, and disciplined work culture.

According to the competitive evolution theory, in this period the region was clearly in the factor-driven phase, which after the turn of the millennium moved to the investment-driven phase as a result of the infrastructure developments and government policies. In the years that preceded the 2008 crisis, the OEM parent companies already also deployed certain innovation functions in the region, but this process ended as a result of the recession and it remained in the headquarter regions. Currently, in Porter's competitive evolution theory, the automotive industry of the V4 countries is moving from the investment-driven phase toward the innovation-driven phase, but the speed of the transition depends much more on the delegation of functions by the investor companies than on the host country's policy.

3. History of the automotive industry in the V4 countries

In a large part of the V4 region, industrialisation started with a delay and achieved limited results. The Czech Republic and Poland had major industrial production capacities, while industrial output and employment in Hungary and Slovakia were negligible. In the first half of the 20th century there was an intense period of industrialisation throughout Europe, which resulted, mostly due to central pressure, in pushing agricultural production to the background and focusing on industry. In Western Europe, one of the key sectors of industrialisation was the automotive industry, the development of which appeared as a priority in certain national economies. World War I and II diverted the automotive industry as well to serve war needs, but in the period of peace between the wars and after World War II, the sector focused on the needs of households and the private sector.

In the CEE (Central and Eastern Europe) region, the focus on the automotive industry was less prevalent in the process of industrialisation at the start of the century; the industrial centres focused much more on other sectors (e.g. heavy industry, textile industry, mining), while demand for vehicles were satisfied by import (*Lefilleur 2008*). In the second half of the 20th century, the manufacturing of cars became a priority in socialist countries, first based on Western licences, which was followed by production based on the internally enhanced licences (*Radosevic – Rozeik 2005*). Manufacturers primarily wanted to serve their own markets; sales outside the socialist bloc were rare and of low volume. Due to this, production volumes remained low, and the limited absorbing capacity of the markets and the cooperation among the member states also entailed the postponement of developments (*Lung 2004*).

After the political transition in Eastern Europe, the automotive industry lost its market and started to decline, and the inflow of foreign capital was necessary to turn the process around. By developing their own production capacity, the socialist countries created an opportunity for the assembly sector to strike roots in the region after the privatisation. The companies that invested during the privatisation were often already present in the region beforehand, and by expanding and restructuring their activity, initially they procured the assembly of their lower category and outgoing models, partly for the market of the region and partly for export (*Pavlínek et al. 2009*).

The presence in the new markets of the earlier industrial structures that were capable of adapting the manufacturing technologies, proved to be an adequate base for the Western European automotive companies' brown-field investments, as a result of which the automotive industry districts revived and started to develop. It can be stated that in the decade after the political transition, the industrial centres built on the socialist automotive industry base were one of the first to recover,

and – due to the exportable activity – to generate income and employment in the region (*Lux 2010; Bigos – Kiss 2005*).

Table 3 summarises the CEE region's 20th automotive industry actors and sites until the political transition, inclusive. It can be observed that at several bases of the former socialist automotive industry, activities belonging to this sector are pursued at present as well; the industrial traditions clearly played a role in the deployment decisions after the political transition.

Table 3
Socialist automotive companies in the V4 region

	Settlement	Manufacturer
Czech Republic	Mlada Boleslav	Skoda
	Kvasiny	Skoda
	Liberec	Liaz
	Koprivnicka	Tatra
	Prague	Gottwaldov
Slovakia	Povazska Bystrica	Povazske Strojarne
Poland	Warsaw	FSO
	Sanok	Autosan
	Bielsko Biala	FSM
	Jelcz-Laskowice	Jelcz
	Lublin	FSC
	Tychy	Polski Fiat
Hungary	Győr	Rába
	Szentgotthárd	Rába
	Székesfehérvár	Ikarusz

Source: Own collection.

The Central and Eastern European automotive industry bloc appears as a kind of special production centre in the global manufacture of transport equipment, where after the political transitions, assembly subsidiaries of Western European OEMs were set up on the base of cheap labour force and automotive industry traditions. In 2015, 30 vehicle plants were operating in the V4 region, of which 15 were in Poland, eight in the Czech Republic, four in Hungary and three in Slovakia (*Table 4*). During the deployment processes, the proximity of both the markets and supplier networks was a determinant factor, as a result of which there is regional concentration in the sector.

Table 4
Automotive industry centres in the V4 region

	Settlement	Manufacturer	Brand
Czech Republic	Jablonec	Tedom	Tedom
	Kolin	TPCA	Toyota, Peugeot, Citroën
	Koprivnice	Tatra	Tatra
	Kvasiny	Volkswagen	Skoda
	Libchavy	SOR	SOR
	Mlada Boleslav	Volkswagen	Skoda
	Nosovice	Hyundai	Hyundai
	Vysoké Myto	Iveco	Iveco
Hungary	Esztergom	Suzuki	Suzuki
	Győr	Volkswagen	Audi
	Kecskemét	Daimler	Mercedes-Benz
	Szentgotthárd	Opel	Opel
Poland	Bielsko-Biala	FCA	Fiat, Lancia, Alfa Romeo
	Bolechowo (Poznan)	Solaris	Solaris
	Gliwice	Opel	Opel/Vauxhall
	Gliwice	Toyota	Toyota
	Niepolomice (Krakow)	Volkswagen	MAN
	Polkowice	Volkswagen	Volkswagen
	Poznan	Volkswagen	MAN
	Poznan	Volkswagen	Volkswagen
	Slupsk	Volkswagen	Scania
	Starachowice	Volkswagen	MAN, Neoplan
	Tychy	FCA	Fiat, Lancia, Ford
	Tychy	Opel	Opel/Vauxhall
	Walbrzych	Toyota	Toyota
	Wroclaw	Volvo	Volvo
	Wroclaw	Jelcz	Jelcz
Slovakia	Bratislava	Volkswagen	Volkswagen, Audi, Porsche, Skoda, Seat
	Trnava	PSA	Peugeot, Citroën
	Zilina	Hyundai	Kia

Source: Edited based on OICA (2015).

4. Position of the V4 member states in the global automotive industry

In the 21st century, the market of the automotive industry was fundamentally rearranged; the production hubs moved from Europe and North America to the developing regions, particularly to China and the BRICS countries. While at the turn of the millennium the aforementioned developed regions accounted for almost two-thirds of the output, by 2015 their share in production had fallen to 43 per cent. The outsourcing of production was partly attributable to market pressures (due to cost and production optimisation) and partly to the realignment of the markets, as a result of which the formerly closed Japanese and Korean producers also opened their production chain (*Gauselmann et al. 2010*). It is apparent that the 2008 global economic crisis fundamentally rearranged the automotive industry's output map as well; the advance of China was partially attributable to the OEMs' contingency measures (*Table 5*).

Table 5
Distribution of global automotive industry output

	2000	2005	2010	2015	Change 2000 vs. 2015 (percentage points)
China	4%	9%	24%	27%	+23
Europe	34%	31%	25%	23%	–11
North America	30%	25%	16%	20%	–10
Japan, Korea	22%	21%	18%	15%	–7
South Asia	4%	7%	9%	9%	+5
South America	4%	4%	6%	3%	–1
Middle East, Africa	1%	2%	3%	2%	+1

Source: Edited based on ACEA (2016).

In 2015, the automotive industry produced approximately 91 million vehicle (*Table 6*), which already exceeds the pre-crisis output level. One-third of the EU's total volume is produced by Germany; the 6 million vehicle produced annually makes the national economy the fourth largest – after China, Japan and the United States – automotive manufacturer of the world, and the largest in Europe. The V4 states account for approximately 19 per cent of the EU's total volume, which means the production of 3.5 million units. Slovakia, as the most dynamically expanding automotive producer of the region, reached an annual output of 1 million units by 2015; however, the Czech Republic is still the largest player of the sector in the region.

After the crisis, Poland's automotive industry capacities showed a gradual deterioration, while Hungary – following an opposite path – was able to increase

its output in the sector due to the continuous developments. Although the value added of Austria's automotive industry represents a substantial ratio in the country's gross domestic product, its final product volume significantly falls short of that of the V4 countries. This is attributable to the fact that the Austrian national economy is typically responsible for support activities of higher value added, while the manufacturing of final product remains in the regions offering lower input costs.

Table 6
Output of automotive original equipment manufacturers
(2015)

	Quantity	
	(thousand)	(EU %)
Czech Republic	1,303	7.2%
Poland	660	3.6%
Hungary	495	2.7%
Slovakia	1,000	5.5%
Austria	125	0.7%
Germany	6,033	33.2%
EU	18,177	100.0%
World	90,780	-

Source: Edited based on Eurostat (2016).

5. Position of the automotive industry in the V4 member states

In the following section, we analyse the Hungarian automotive industry in an international comparison. We primarily compare the sector's value added, wage and labour productivity characteristics in the countries of the Visegrád region (Hungary, Poland, the Czech Republic and Slovakia), Germany and Austria, and of the European Union, based on the Eurostat's SBS database and the records of the corporate income tax database.

Performance measurement at the company level is usually interpreted through successfulness (whether the determined objectives are realised) and economic efficiency (whether the objectives are realised through the economical use of the available resources), although the international specialist literature does not have a common position with regard to the measurement methods. At the micro level, the quantification of business productivity is usually captured by management accounting methods (e.g. activity-based life cycle or target cost calculation) and the Balanced Scorecard strategic indicators (*Wimmer 2002*).

Building on, among others, Porter's idea, according to which the competitive advantage often originates from the relation of the activities that form the value chain rather than from the independent activities (*Porter 1986*), we approach the automotive industry's performance measurement from a macroeconomic aspect. The most tangible indicators of these include the assessment of the enterprises' gross value added (GVA), labour cost and labour productivity.[2] According to a study on Hungarian labour productivity (*Palócz 2016*), the productivity of domestic enterprises, as regards the national economy as a whole, lags behind that of foreign enterprises to a larger degree than in the case of the neighbouring countries, and this gap does not narrow when examined based on time series.

The paper of *Gelei* (*2006*) comments on the situation of the Hungarian automotive industry, examining the supplier types and the basic competences of those in the domestic automotive industry's supply chain. The paper deals with the capability structure of automotive industry suppliers, according to which we can categorise domestic suppliers as those with capacity, product, adaptation, network and innovation competences. The key finding of the paper is that the development of corporate competitiveness can be fostered not only among the various supplier types, but also by internal quality improvement within the individual supplier groups, the key factors of which are the available capital and knowledge. Based on that, as a recommendation the author formulates that in relation to the competitiveness of the domestic SME sector it is of key importance that economic policy should support domestic enterprises in the acquisition of capital and knowledge.

The analysis by *Gelei – Venter – Gémesi* (*2011*) also draws a similar conclusion, according to which, it should be a priority for Hungarian economic policy to support domestic suppliers in developing competences and capabilities that help them satisfy more complex customer expectations and thereby move higher in the automotive industry pyramid. According to the study, Hungary already has a competitive supplier base, within which there are also a few innovative, complex domestic enterprises capable of complying with the customers' needs. Providing stronger economic policy support for these may have several positive impacts (*Gelei – Venter – Gémesi 2011:225*).[3]

In relation to the current domestic and regional challenges faced by the automotive industry, the specialist literature puts special emphasis on dealing with the situation of automotive industry clusters. In his essay, *Dominek* (*2012*), highlights the heterogeneity of automotive industry clusters in the Central and Eastern European

[2] Labour productivity (in this paper this corresponds to productivity, i.e. the short version of the term) means the gross value added of the enterprises operating in the automotive industry divided by the number of employees. The value added originates from the Eurostat's SBS statistical database, and means factor cost-based value added. Calculation of the value added: gross operating income – operating subsidies and taxes.

[3] The purpose of briefly presenting the specialist literature analysing the domestic and regional automotive industry is to provide additional sources for immersing in the topic and to describe the scientific background of the empirical examination. Due to limitations on length, we refrain from giving an international outlook, describing foreign case studies in detail and elaborating on the regional features.

region. While in Germany and Austria automotive industry clusters have a longer history and operate as network-oriented regional and business development tools, in the Central and Eastern European countries the biggest problem for the operation of clusters is the shortage of capital and the implementation of the various quality assurance systems, since these represent too big investments for the SME sector.

In the CEE region, both cluster management[4] education and the legal regulation of clusters are still at an early stage (*Dominek 2012:212*). These findings are also corroborated by the paper of *Grosz* (*2012*), according to which, the automotive corporate sector is not yet mature enough for the application of the cluster-oriented and network-oriented development tools. Reasons for this immaturity may include the absence of trust in each other and the low presence of independent products and developments, as a result of which clusterisation would represent an advantage for the participating companies only through the reduction of costs (*Grosz 2012:238*).

The sector in the economy of Germany, the largest European producer, represents a contribution weight of 4 per cent, providing 2 per cent of the employment (*Table 7*). Automotive industry in the V4 member states appears as a priority national economy sector. It accounts for more than 3 and 2 per cent of the gross value added (GVA) and employment, respectively, in all Visegrad states except Poland, thereby being twice the European average. The key motive for relocation is confirmed by the figures, according to which the V4 region, appearing as a more or less uniform region, is below 40 per cent of the EU's automotive industry wage average, and thus the unskilled labour force with low wages is still the largest competitive advantage in the region, serving as a basis for the deployment motives.

Table 7
General indicators of the automotive industry
(2014)

	Automotive industry GVA (gross value added) (as a ratio of total GVA)	Employment (as a ratio of total employment)	Labour costs (EUR/person/month)
EU	1.5%	1.0%	3,998
Czech Republic	4.3%	2.9%	1,561
Poland	1.5%	1.1%	1,209
Hungary	3.9%	2.0%	1,430
Slovakia	3.5%	2.8%	1,562
Austria	1.3%	0.7%	4,981
Germany	4.0%	2.0%	5,918

Source: Edited based on Eurostat (2016).

[4] Cluster management means the management of the business clusters, the representation of their interest and the institution of coordination.

The share of value added in the production value[5] shows the role of the activities deployed in the V4 states in the value chain of the sector (*Table 8*). It can be observed that while the parent countries of the OEM companies produce values around 30 per cent in the indicator, the CEE region – and within that the V4 member states – performing assembly activities, hardly reach 20 per cent, i.e. they typically perform activities that represent lower value added.

The share of the value added, measured in the production value, is carried on to labour productivity indicators, and thus the value added per automotive industry employee ratio reflects a difference of similar degree. Germany shows a value of EUR 106,000, which is well above of the EU average, while the V4 members states, varying at half of the community average, hardly exceed one-third of the German efficiency. Austria's labour productivity is identical to that of Germany, which assumes, in addition to the efficient utilisation of labour force, the performance of activities of higher value added and the competitive advantage arising from technological maturity.

Table 8
Production and efficiency indicators of the automotive industry
(2014)

	Value added (as a ratio of the production value)	Labour productivity	
		(EUR/person/year)	(EU %)
EU	25.5%	68,764	100.0%
Czech Republic	20.0%	43,694	63.5%
Poland	21.8%	31,963	46.5%
Hungary	17.9%	45,268	65.8%
Slovakia	12.7%	39,759	57.8%
Austria	28.4%	104,336	151.7%
Germany	32.1%	106,661	155.1%

Source: Edited based on Eurostat (2016).

In the Visegrád region, automotive industry has the largest role in the national economy in Hungary and in the Czech Republic. In the total value added of the national economy, the share of the automotive industry rose by almost 3.5 percentage points in Hungary between 1995 and 2014. Of this, growth of almost 1 percentage point occurred after 2012. While a similar process can be observed in the Czech Republic and Slovakia, in Poland the ratio of the automotive industry's value added compared to the whole economy value added rose by less than 0.5 percentage point between the early 2000s and 2014, which lags behind the regional

[5] Production value means the definition used in the Eurostat SBS statistics: production value is sales revenue adjusted for changes in inventories, aggregated at the level of the sector.

average. In Austria, the weight of the automotive industry within value added practically stagnated between the mid-1990s and 2014.

Among the countries reviewed, the presence of the sector in the value added was around 3 per cent in Germany already in the early 1990s (with that being the highest one among the countries under review); Germany was able to preserve the high ratio, and even increased it. On the other hand, among the countries examined on the basis of the value added, Germany has lost its leading role by now. Compared to the EU average, the automotive industry is overrepresented, in terms of value added, in the Czech Republic, Hungary, Germany and Slovakia.

Of the Visegrád countries, the highest contribution to the EU's automotive industry value added has been made by the Czech Republic since 2004. It is followed by Poland and Hungary, with Slovakia coming in last. This is also related to the size of the region's countries; nevertheless, the Czech contribution is still outstanding even if this aspect is taken into consideration. Between 2003 and 2014, the Czech Republic increased its share within the value added of the EU's automotive industry production by roughly 2 percentage points, which is attributable, among others, to its historic features (it is traditionally an industrial/engineering industrial country) and its closeness to Germany.

In 2014, Germany accounted for more than 50 per cent of the European automotive manufacturing value added. With this, Germany managed to increase its European weight in the sector by more than 10 percentage points compared to 2000. The strengthening of the German contribution may be attributable to the export orientation and successful business policy of the German automotive enterprises, as well as to the outsourcing of their activities to Central and Eastern Europe.

In Hungary, the automotive industry is highly productive compared to the national economy, but this is the result of the large companies' high productivity. The purpose of the size-based assessment criterion is to present the labour productivity, in the countries under review and in the EU, of the various enterprise sizes pursuing activity in the automotive industry and the relation of this to the intra-industry average and the general productivity of the national economy. In order to determine this, we compared the value added by the individual automotive enterprises to the number of their employees.

As regards the measurement of labour productivity, it should be noted that the difference between the individual countries in this area is attributable to the different degree of capitalisation and capital intensity, rather than to the quality of the labour force or organisational reasons. In Hungary, German-owned companies pursue activity of higher capital intensity than the Hungarian-owned companies, but lower than they would pursue in Germany. The automation that pays off in

Germany under a given capital and labour cost ratio, does not necessarily pay off in Hungary under different capital and labour force proportions.

Thus, when examining the case of the Visegrád region, it is the higher capital intensity that leads to the fact that – of the countries under review – usually the companies that pursue activity in the German automotive industry are the most competitive, while foreign-owned enterprises operating in the territory of the V4 region are of medium competitiveness, but they are more competitive than the domestic-owned ones, and the least competitive enterprises are those in the majority interest of one of the V4 countries. The phenomenon could be resolved by increasing the Hungarian automotive industry's domestic value added and innovation capacity, as part of a longer-term process.

As regards labour productivity, throughout the EU the automotive industry exhibits higher productivity than the productivity of the whole national economy, and the ratio of this is the highest in Hungary among the countries under review. It follows from this that the sector in Hungary has a preferred position within industrial production, which may also be taken into consideration when making investment and reinvestment decisions. On the other hand, the higher productivity advantage also highlights the fact that the Hungarian industrial structure is too concentrated and it would make sense to diversify it, to ensure that upon an eventual automotive industry "shock" the economy remains competitive without a large loss.

Based on the data, it can also be established generally that no matter which country we examine, the labour productivity of large companies will always be materially higher than that of any smaller enterprise, due to economies of scale reasons. However, in Hungary the productivity of SMEs lags behind that of the large companies to a greater degree, but in part this is the result of the larger enterprises' outstanding labour productivity.

Compared to the national economy productivity, apart from the outstanding Hungarian value, the automotive industry's productivity is higher by one and a half times only in Germany and Austria. In a comparison based on enterprise size, Slovakian SMEs are more productive than in other countries of the Visegrád region, and Austrian SMEs are the most productive in the group of countries under review. In the cluster of large enterprises, Polish companies are the least productive, but this is related to the fact that the domestic market is larger in Poland and there are a higher number of domestic large enterprises. When comparing smaller enterprises to the labour productivity of large enterprises, the Slovakian, Polish and Austrian business activities perform the best, while the Hungarian, Czech and German SME sectors are less productive than the EU average (*Table 9*).

Table 9
Labour productivity of certain enterprise sizes in the automotive industry
(2014)

(EUR/person/year)	Micro	Small	Medium	Large	Automotive industry	National economy
EU	68,764	37,347	47,880	73,523	68,764	55,105
Czech Republic	11,079	19,730	24,872	47,556	43,694	27,712
Poland	12,178	19,369	23,671	34,057	31,963	23 171
Hungary	21,546	18,746	23,512	49,093	45,268	20 720
Slovakia	14,815	30,111	30,876	41,395	39,759	30,847
Austria	35,663	67,903	79,325	113,653	104,336	69,067
Germany	32,770	54,006	65,423	111,253	106,661	61,426

	Automotive industry / National economy	Micro / Large	Small / Large	Medium / Large
	Labour productivity			
EU	125%	94%	51%	65%
Czech Republic	158%	23%	41%	52%
Poland	138%	36%	57%	70%
Hungary	218%	44%	38%	48%
Slovakia	129%	36%	73%	75%
Austria	151%	31%	60%	70%
Germany	174%	29%	49%	59%

Source: Edited based on Eurostat (2016).

The productivity of the domestic enterprises is lower than that of the non-resident ones in all countries under review, but the difference is the largest in Hungary. The productivity of the automotive enterprises with domestic majority interest is the lowest in Hungary in the Visegrád region; here the labour productivity of the domestic automotive enterprises reach only 36 per cent of those under foreign control. In the region, the productivity of the automotive enterprises with domestic majority interest is the highest in Slovakia, where the labour productivity of domestic automotive enterprises reaches 67 per cent of those under foreign control. Of the countries under review, the productivity of the automotive enterprise in domestic majority interest is higher than that of the foreign-controlled companies only in Germany. However, this is a clear consequence of the German automotive industry's position in Europe and globally (*Table 10*).

Table 10
Labour productivity of enterprises in resident and non-resident majority interest

(EUR/person/ year)	Resident	Non-resident	Ratio[6]	Ratio of non-residents in value added
Czech Republic	18,863	43,069	44%	92%
Poland	19,866	36,292	55%	87%
Hungary	17,553	48,124	36%	94%
Slovakia	24,657	36,604	67%	93%
Austria	66,469	102,163	65%	77%
Germany	105,410	55,153	191%	12%

Source: Edited based on Eurostat (2016).

6. Efficiency of the Hungarian automotive industry[6]

Although the Eurostat database does not link the aspects of resident versus non-resident ownership with the enterprise size, and therefore a simultaneous analysis of these two criteria is not possible, there may be a strong relation between the Hungarian ownership and the smaller size. Thus, the underlying reason for the different productivity may be also attributable to differences in size and economies of scale considerations rather than to the nationality of the ownership, also in the case of the ownership background criterion. On the other hand, it is not inevitable that the productivity of the Hungarian-owned and/or smaller size enterprises should lag behind that of their international and/or larger peers. To confirm this, below we present two innovative, Hungarian-owned automotive enterprises with relatively high productivity.

Hajdu Autotechnika is a medium-sized enterprise, while Csaba Metál limited company is a large enterprise. Both companies show that there are examples when the Hungarian-owned enterprises are almost able to match the maturity level, technology or productivity of the foreign-owned enterprises of identical size. In recent years, these two companies have substantially improved their position within the value chain as a result of the improved and available foreign language skills of the management, compliance with quality assurance systems and obtaining the certificates, the existence of personal relations with other companies and maximum utilisation of the opportunities arising from those (e.g. export or knowledge transfer), as well as the implementation and use of an adequate corporate governance system. In addition, Csaba Metál is making further efforts to raise its position in the value chain by the infrastructure development of its site, the improvement of its corporate relationship network and by expanding its team of experts.

[6] Ratio of the labour productivity of enterprises in resident and non-resident majority interest.

With a view to making further progress, Hajdu Autotechnika has enhanced the company's learning capability and activity, separated the company's range of activities, organises courses and trainings, and by efficiently capitalising on market competition, taken over tasks from other suppliers.

As a result of the aforementioned efforts, Csaba Metál raised its labour productivity per employee from HUF 3.3 million to HUF 5.2 million between 2005 and 2011, while Hajdu Zrt. increased it from HUF 2.2 million to HUF 9.9 million; thus both of them can be regarded as large and medium-sized companies which have been successful in innovation (*Kazainé 2013; Kiss 2013*). Csaba Metál made a significant progress first of all compared to itself and improved its business organisation in an exemplary manner, while Hajdu's labour productivity exceeded the average of the Hungarian automotive medium-sized companies by HUF 3–4 million by 2011.

In our paper, we also conduct primary research on the domestic base of the automotive industry, as part of which, we analyse the corporate tax return database of the Hungarian tax authority (NAV). Our objective is to verify the Eurostat's macro data, constructing them from micro level, and to eliminate the statistical bias using our own methodology. We make enquiries on the corporate tax return for the enterprises with TEÁOR (Standard Classification of All Economic Activities) codes of 29 (manufacture of road transport equipment), and then estimate the production and value added from the profit and loss accounts, based on our methodology. We identify the production value roughly with the sales revenue (this time we ignore the inventory adjustments), while we interpret value added as the sum of personnel costs, operating profit/loss and depreciation charges. In order to ensure a more pure analysis, we eliminate from the received database the companies that have zero or negative operating profit/loss in the current year and those without employees.

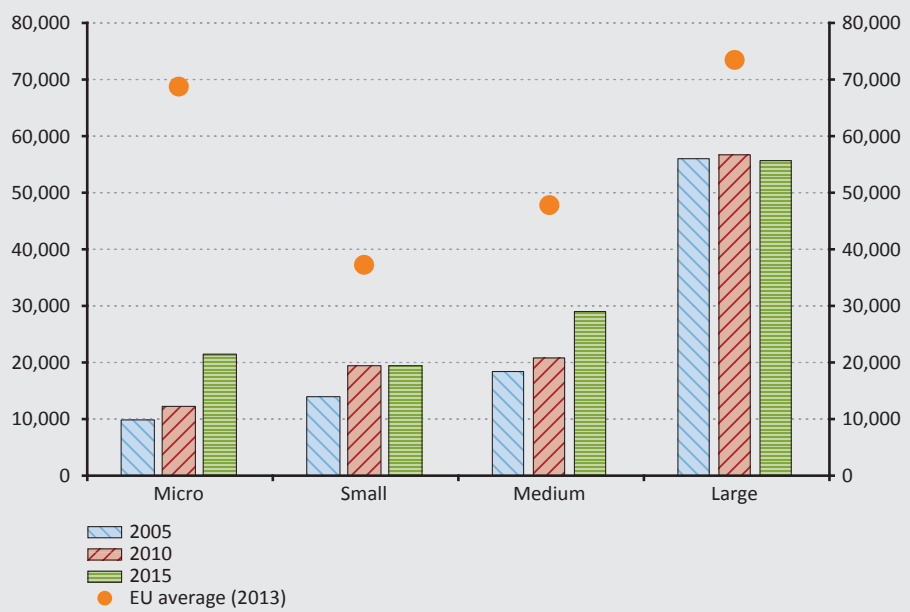
Our database identified 406 enterprises under the automotive industry TEÁOR codes in 2005, of which, after the eliminations (based on the current year's sales revenue, profit/loss or employment criteria), 246 companies were left for the analysis. Having differentiated this based on the number of employees, in 2005 the database contained 118 micro, 64 small, 33 medium and 31 large enterprises, representing a share of 48, 26, 13 and 13, respectively, in the sample. In the 10-year period under review, the number of the sector's actors and their distribution based on size was more or less the same, with a minor shift towards the large corporate sector.

In our paper, we interpret labour productivity as the value added divided by employment, and estimated it at the sector level from the Eurostat macro statistics in the countries involved in the analysis. In the case of Hungary, we also calculate the production efficiency from the aggregate data of the automotive enterprises, obtained from the NAV database, and then compare the results with the Eurostat data. The results obtained in the primary research somewhat differ from the Eurostat

figures, as the purpose of the different methodology and the database cleansing is to eliminate the accounting distortions. A further difference in the methodologies is that while the Eurostat-SBS data are available in euro, the NAV database contains forint data, which we convert to the single currency using the official MNB HUF/EUR exchange rate applicable to the period (2005: 248.05; 2010: 275.41; 2015: 309.90).

Based on the results obtained from the NAV database using our own methodology, it can be stated that according to the size-based differentiation the heterogeneity of the labour productivity can be identified in the Hungarian automotive industry (*Figure 1*). In 2005, the SME sector's productivity was roughly one-quarter of that of the large enterprises, but by the end of the period under review, the SMEs' productivity measured against that of the large enterprises rose to roughly 50 per cent. The reason for the narrowing of the gap is that while the micro, small and medium-sized enterprises substantially increased their efficiency between 2005 and 2015, the productivity of the large corporate sector decreased slightly. However, the increase in the labour productivity of the entire sector falls short of the SME sector's data, as due to the composition effect, mentioned earlier, the output weights shifted toward the large corporate sector.

Figure 1
Labour productivity of the domestic automotive enterprises
(differentiated by number of employees, EUR/person/year)

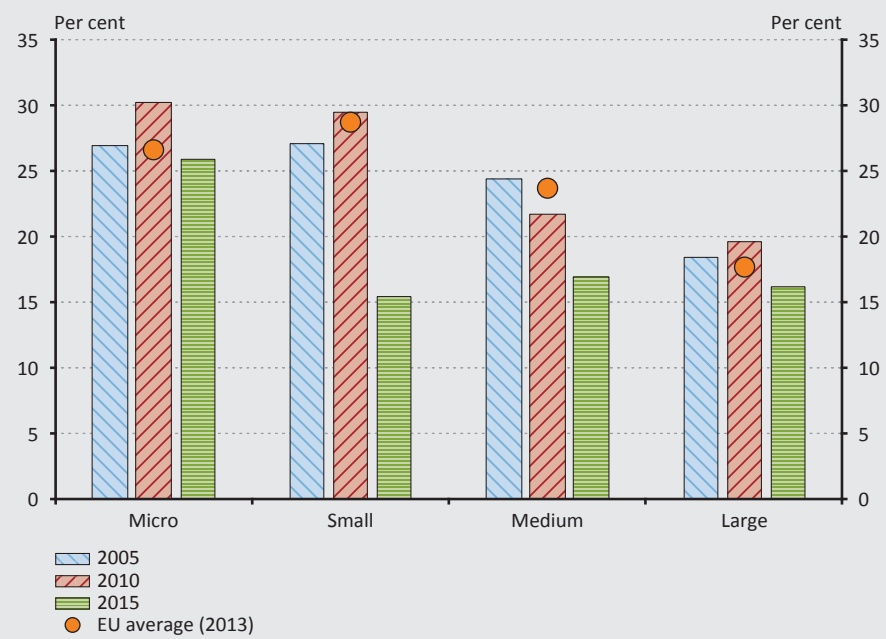


Source: Edited based on the Hungarian tax authority's (NAV) corporate income tax database of 2016

The ratio of the automotive industry's value added measured in the production value reflects the enterprises' position in the sector's value chain. The low value – calculated from the Eurostat statistics – presented before, is characteristic of the automotive industry, as a production sector (where the supplier value has a high share in the sales revenue) and it is also attributable to the low position of the domestic players of the sector in the value chain. On the whole, based on the NAV database it can be established that – at an aggregate level – the Hungarian automotive sector's value added decreased in the production value during the period under review (*Figure 2*).

The values of the small, medium and large enterprise sector all decreased in the last 10 years, with drastic deterioration particularly in the position of small enterprises, which saw a fall of 10 percentage points. The decrease in the share of value added in the production value can also be identified as an industry trend, but to a much greater degree this is attributable to the failure to deploy functions with higher value added in the V4 region. The figures evidence that in the pre-crisis years Hungary was characterised by an increase in the share of the value added in the SME sector, but since 2009 we can see an opposite trend, except for the micro segment.

Figure 2
Value added by the domestic automotive enterprises as a ratio of the production value
(differentiated by the number of employees)



Source: Edited based on the Hungarian tax authority's (NAV) corporate income tax database of 2016.

In the micro segment, if we take into consideration only companies with more than 5 employees, the effect of the owners' own contribution can be eliminated from the sample and their impact on the efficiency ratios can be minimised. It can be established from the results obtained that when we examine micro enterprises with 5 to 9 employees, there is a material shift in the efficiency indicators. When calculating with the new sample in the labour productivity, efficiency fell by 12, 18 and 16 per cent in 2005, 2010 and 2015, respectively, compared to the entire sample, and thus the elimination of the employers resulted in a decline in productivity. The narrowing of the sample also caused significant differences in the size of the value added measured in the production value, but the change is not one-way. There was growth of roughly 3 per cent in 2005 and 2010, while in 2015 there was a fall of more than 4 per cent.

On the whole, it can be stated that the results obtained in the primary research are in line with the Eurostat indicators, despite the methodological differences, and the research performed on the basis of the NAV database confirmed the earlier findings. In the productivity indicators we supported the primary research with the assumption that micro, small and medium-sized enterprises' productivity is roughly the same, currently at less than half of large enterprises' efficiency. However, the degree of the lag decreased substantially during the 10-year period reviewed, as the SME sector's productivity level is approximating that of the large enterprises which show stagnating productivity.

7. Summary

The automotive industry is a sector representing high and increasing weight both in Europe and globally, with different roots in the individual countries. In the CEE region, however, its weight has continuously increased since the political transition. From the end of the 20th century, a kind of relocation process has been observed in the automotive industry, as a result of which the West European original equipment manufacturers deployed certain segments of the production value chain to Eastern Europe. The implementation of the process came as an opportunity offered by the political transition in the former socialist countries and it also became a necessity due to cost-cutting pressure from the market.

The subsidiaries typically performed lower value added, manual assembling activities, while the development functions remained in the competence of the parent company. The motives of the relocation included cheap labour market and the proximity of markets, as well as the flexible labour market and labour market regulation, cheap industrial sites (property) and the favourable taxation. The region's cost and competitive advantage remained in place during the twenty-five years that elapsed since, but the extent thereof decreased in the global market.

In the V4 region (and thus in Hungary as well) the productivity of the automotive industry is well below the EU average and particularly the core areas (Germany, Austria). This is attributable to the fact that the domestic enterprises have technological and economies of scale disadvantages, and as a result of their position in the value chain, they perform low value added activities. Since the 2008 economic crisis, the automotive OEMs relocated a number of activities – of higher value added – to the core regions, and stopped the planned outsourcings to the periphery regions.

The future of the automotive industry in the V4 region has come to a junction, and the path forward essentially leads in two directions. One opportunity is that by the extensive development of the sector, the number and production volume of the assembly plants deployed so far may be expanded: this, however, would mean the continued performance of low value added functions and the absence of development activities, and the provision of cheap labour force which will be increasingly challenging for the host regions in the future. The other possible direction may be the intensive development of the industry, which involves the strengthening of the domestic supplier base and the integration of the development functions instead of the assembly activities. The intensive route diverts the companies toward the employment of qualified labour force, and may encourage the players of the sector to perform development activities. All of this requires the enhancement of the R&D infrastructure and the education of the human resources participating in the developments, which appear as future challenges for the V4 countries' governments and enterprises.

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Financial Supervision in Hungary between the Two World Wars*

Bence Varga

This paper examines the practice of financial supervision in Hungary between the two World Wars, focusing on the period of the Great Depression and the supervisory practice that was employed prior to the crisis and that was transformed as a result. The author would like to establish how the role of the Pénzintézeti Központ as a supervisory body changed after its establishment on 1 June 1916, whether there were other institutions with functions related to the supervisory tasks, and which supervisory tools were used in Hungary during the Great Depression. The paper endeavours to present the contemporary economic conditions and the situation of the financial architecture primarily in line with contemporary thinking, on the basis of the relevant opinions of the experts from the given era.

Journal of Economic Literature (JEL) codes: B20, G28, N24, N94

Keywords: financial institutions, economic crisis, financial supervision, Pénzintézeti Központ

1. Introduction

In Hungary, the first integrated, "top-level" supervisory organisation was established during the First World War, on 1 June 1916, when the Pénzintézeti Központ was created. This was considered a remarkable event, since the efficiency of the earlier supervisory bodies operating in varying structural formations (e.g. representative character) with sometimes excessive scopes of activity and competing against each other was questionable in several cases. However, the Pénzintézeti Központ was functioning in an integrated manner, its activities focused primarily on supervisory features, which were supplemented by other functions linked to supervision (e.g. resolution activities).

Before the Pénzintézeti Központ was established, and even after that, numerous disputes and proposals emerged among professionals about its operation, and its activities were often criticised. The Pénzintézeti Központ faced challenges in fulfilling

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* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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its duties from the contemporary foreign and domestic policy developments, namely the First World War and its consequences, then the subsequent establishment of the Hungarian Soviet Republic, the Great Depression and military build-up before the Second World War; all of these developments had an impact on its operation. It is hardly surprising that, as a result of these events, many reform proposals emerged with respect to the functioning of the Pénzintézeti Központ, and several of these initiatives were also implemented. Some of these could be considered necessary reform measures, since they improved the efficiency of financial supervision in Hungary, but unfortunately there were a few that set back the development of supervision and hindered the Pénzintézeti Központ in fulfilling its supervisory functions efficiently, thereby inviting criticism and attacks.

We now present the general situation of Hungarian financial institutions after the First World War and the changes in financial supervisory practice during the Hungarian Soviet Republic, after which we highlight the reform proposals pertaining to the functioning of the Pénzintézeti Központ and the changes in its role. We then demonstrate the effect of the Great Depression on supervision by outlining the practices of the Pénzintézeti Központ and other institutions notable from a supervisory perspective.

2. The situation of financial institutions after the First World War

During the First World War, "*the concentration of human and material resources [...] for four and a half years left its mark on all walks of life in human society"* (*Diószegi 1970:122*). The chaotic economic and financial situation, the domestic and international crisis, the transition from the wartime economy to a peacetime economy and the inflation triggered by the war[1] all had a direct impact on the functioning of credit institutions. For example credit institutions' equity totalled 2.8 billion pengő before the First World War, while during the period of currency stabilisation, it merely amounted to 0.4 billion pengő, and external funds declined from 4.5 billion pengő to 0.3 billion pengő (*Botos 1994:25*).

After the First World War, 674 banks and savings banks operated on the territory that remained from Hungary, and some of them were characterised by fragmentation, while others were oversized and played a dominant role in economic life. The latter was an "inherited" feature that had been typical of the lending structure before the First World War (*Incze 1955:277*). The fragmentation characteristic of a portion of the financial institutions, coupled with a public sentiment hostile to banks, naturally triggered calls for consolidation and concentration of these institutions. However,

[1] The last time the value of the gold korona and the paper korona was the same was in July 1914, then the paper korona depreciated at an increasing pace until the introduction of the pengő in 1927: the proportion was 1:1 in July 1914, 1:43 in June 1918, and 1:14,443 in the second half of 1926 (*Teleszky 1927:57*; *Botos 2002:44–68*).

despite the wave of consolidation that started, the general trend in the early 1920s was a rise in the number of financial institutions: there were 962 credit institutions at the peak of the process in 1924 (*Botos 1994:108*). The impact of the Treaty of Trianon on the number of financial institutions could be mainly observed in the case of credit unions: at the end of 1917, 1,562 of the 2,430 institutions (64 per cent) were on the other side of the border. As a result of this loss, the number of credit union members declined by 60 per cent, while savings deposits diminished by 41 per cent (*Schandl 1938:53*). The share of financial institutions' equity that was now outside Hungary on account of the Treaty was 34 per cent of the equity of all institutions operating in 1915, which was obviously due to the dominance of the financial institutions in the capital over provincial financial institutions (*Ács 1936:324*).[2] The concentration in Budapest inevitably increased further as a result of the territorial changes in the years after the Treaty of Trianon, and in 1930, 78 per cent of client deposits, 100 per cent of the debentures and bonds issued and 92 per cent of the loans extended were linked to the capital (*Varga 1928:444*). Even at the end of 1924, the volume of savings deposits and current account deposits amounted to merely 16 per cent of the level before the World War, and it had only risen to 74 per cent by the end of 1929.[3] The maturity of the credit lines provided to financial institutions also changed: in 1915, 65 per cent of all the credit lines were long-term, at the end of 1924 this figure stood at only 5 per cent, and even in 1929 it was merely 30 per cent (*Incze 1955:279*). This substantially increased the liquidity risk arising from the maturity mismatch emerging in connection with satisfying demand for longer-term credit.

The continued operation of the subsidiaries of the banks in the capital across the border was also characteristic, and in this context, the priorities included ensuring continuous capital flows to these institutions, maintaining the earlier financial relations, reducing economic isolation and preserving financial integrity. The operation outside the borders did not necessarily entail negative consequences, since some financial institutions could be described as follows: "*they are now ruled by a foreign power, they are in a better position than immediately after the separation, as the tradition they uphold and the inherent confidence and expertise […] lend them great strength*" (*Hantos 1930:684*).

[2] The Hungarian lending structure had already been characterised by the concentration of financial institutions in the capital before the First World War, as the banks in Budapest represented 70 per cent of the total equity and 79 per cent of total external funds in Hungary (*Incze 1955:277*).
[3] When taking into account the difference in the purchasing power parity of the korona and the pengő, the proportion is even less favourable, at 57 per cent instead of 74 per cent.

3. Financial supervision during the First Hungarian Republic and the Hungarian Soviet Republic

After the Aster Revolution, the duties of the Pénzintézeti Központ included the liquidation of financial institutions, the sale of the securities held by these institutions as well as the potential prevention of lending that would have been against the statute (*Jakabb et al. 1997:52*). Similar to other institutions with a financial institution background (e.g. Országos Központi Hitelszövetkezet [National Central Credit Union], Magyar Takarékpénztárak Központi Jelzálogbankja [Central Mortgage Bank of Hungarian Savings Banks], Kisbirtokosok Országos Földhitelintézete [National Land Loan Institution of Smallholders] etc.), the Pénzintézeti Központ became a member of the Takarékpénztárak és Bankok Egyesülete (Association of Savings Banks and Banks, TÉBE), its activities were closely linked to those of the TÉBE, since several duties related to financial institutions (e.g. in connection with consumer protection), were performed by the TÉBE. During the Hungarian Soviet Republic, following the example of the Russian Soviet Republic, banks and later insurance corporations and pension funds were nationalised, and the nationalisation of a given institution was deemed complete when the inspectors sent by the Pénzintézeti Központ finished their review.

In line with the one-man leadership policy, the managing director of the Pénzintézeti Központ was a so-called people's commissar (later business commissar), and the whole board was abolished. The goal was to make the Pénzintézeti Központ the leading bank of the Hungarian Soviet Republic. In addition to the people's commissar (later business commissar), a controlling workers' council and a body of union stewards also operated within the framework of the Pénzintézeti Központ, managing its activities together. Eleven specialised groups were created within the Auditing Department to control the nationalised mines and transport, trading and industrial companies. Already in the Hungarian Soviet Republic, a process started that later unfortunately intensified, namely that the activities of the Pénzintézeti Központ were expanded by several functions, many of which had not been among its original duties, and some functions were not even linked to financial institutions. For example the management of the finances of the nationalised factories as well as their inspection, or the financial implementation of the furniture sale campaign for young couples, for which a separate Furniture Department was set up within the Pénzintézeti Központ (*Jenei 1970:39–45*). During the Hungarian Soviet Republic, the supervision of financial institutions was temporarily assumed by the Pénzintézeti Direktórium (Financial Institutions Directorate), however, its members mainly comprised the staff of the Pénzintézeti Központ (*Csury-Marosi 1931:194*). But after the Directorate was dissolved in June 1919, supervision was again performed by the Pénzintézeti Központ. In connection with the nationalisation of financial institutions, a substantial increase could be observed with respect to the number

of inspections as well as in the number of inspectors. The country was divided into 56 inspection districts, and the representatives of the districts were tasked with the management and inspection of the financial institutions. Yet the activities of the 60 inspectors sent out to review the operation and business management of the financial institutions did not always yield significant results, and the regular inspection at provincial financial institutions was not guaranteed. This lack of success was obviously influenced by the inherited quantitative approach, as the inspectors had to inspect a large number of financial institutions in a relatively short time. For example in case of pension companies, the Pénzintézeti Központ had to inspect 216 entities, completing 60 inspections in 3 months, which, however, can be regarded as substantial. The shortcomings revealed at the institutions under review were primarily linked to wealth and business management and the content of the statutes, and they highlighted the fact that in the case of several companies, financial viability was not guaranteed, therefore their liquidation or merging into another company was warranted. With regard to financial institutions, the Pénzintézeti Központ launched liquidation proceedings at 163 institutions and mergers in several cases. The main reason behind this was not an effort to eliminate the oversized nature or "fragmentation" of the Hungarian financial institution sector, but the ideological position that the financial institution system with the current characteristics was not necessary in the economic order of the Hungarian Soviet Republic (*Jenei 1970:48–52*). However, the measures and the proceedings were not completed due to the fall of the Hungarian Soviet Republic.

4. The initial reforms concerning financial supervision

Driven by a desire to boost public confidence and mitigate the liquidity risks inherent in the operation of financial institutions, greater emphasis was placed on inspections after the First World War, and the number of inspections carried out by the Pénzintézeti Központ almost quintupled between 1918 and 1929, soaring from 189 to 912 (*Jakabb et al. 1997:117*). The intensified inspections were also necessitated by the renewed anti-bank sentiment after the First World War. In 1922, exaggerating the contemporary situation, Rezső Ruppert, an opposition MP, talked about a bankers' reign in Hungary: *"We see that this large Hungarian bankers' organisation that governs our domestic policy as well as our foreign policy […] dictates our every step, not only in political life, but also in the economic sphere."*[4] The more frequent inspections were also warranted by the fact that during the First World War and sometimes after that, financial institutions, temporarily relegating their traditional banking activities to the background, were seeking to realise profits on the trade in goods. This was influenced by the substantial reduction in financial institutions' lending opportunities in wartime, for example the world war

[4] Based on page 35 in Volume XXVI of the minutes of the National Assembly convened for 19 June 1922

had a devastating impact on debenture lending, as the major debenture markets (especially the Austrian, German, Dutch, Swiss and French markets) contracted (*Neubauer 1918:22–24*). In addition, the unfolding inflation also encouraged the reduction of mortgage lending – as well as traditional lending – since Hungary did not represent an alluring opportunity for investors due to the turbulent financial situation, and therefore mortgage lending could only really take off after the financial stabilisation (*Kovács 2006:89*). Especially after the end of the First World War, the alternative activities were encouraged by the fact that the borrowers behind the debentures repaid the loan instalments in the national currency, while banks had to do this in the original currency, which posed a considerable exchange rate risk.

After the First World War, the Pénzintézeti Központ experienced several reforms. Following the World War and the Treaty of Trianon, due to the management of the recurring, substantial and sometimes critical economic issues with respect to the ceded parts of the country, the calls for strengthening financial supervision and extending the Pénzintézeti Központ's activities grew stronger. The role of the Pénzintézeti Központ was also bolstered by the fact that the later unfolding inflation had already become significant in 1918, as *"cash reserves […] had reached an extreme amount, and the repercussions were hardly predictable"* (*Neubauer 1918:22*), which also affected the situation of the banking system through financial destabilisation. In connection with the necessity of the reforms, it must be underlined that there was considerable resistance with respect to the establishment of the Pénzintézeti Központ and there were reservations about its activities and the efficiency of its operation. According to some very extreme opinions, the Pénzintézeti Központ was unable to fulfil its original function: due to its *"anaemic nature"*, there was *"absolutely no need"* for its existence, and the 25 million korona paid by the Hungarian State Treasury to create a loss reserve fund[5] went *"down the tubes"* (*Neubauer 1918:33*). Another example for the "pressure" exerted on the institution was that initially the operation of the Pénzintézeti Központ was limited to merely 5 years, then as a sign of the strengthened confidence and the success of its activities, this was extended to an indefinite term in 1918.[6] One of the substantial changes was that while in 1916 the inspections were based on borrowing or voluntary requests, in 1920 the scope of inspections also covered those members whose share capital was below 40 million korona.[7] The limitation of the scope of inspections by the share capital was warranted by the fact that at that time the inspection system had not been adequately developed, and the inspection of a

[5] The loss reserve fund was created to support the institutions that were in dire distress due to the wartime circumstances and the economic recession as well as the institutions the assistance of which was in the public interest.
[6] Based on Article 1 of Act XV of 1918 Amending Certain Stipulations of Act XIV of 1916 on the Pénzintézeti Központ
[7] Based on Article 10 of Act XXXVII of 1920 on the Pénzintézeti Központ

financial institution engaged in complex business activities would have required a huge apparatus, which was not available back then (*Jakabb et al. 1997:57*). The development of the inspection system was hindered by the fact that inspection was usually performed as a "second job", there were few "full-time" inspectors, which was probably exacerbated by the slightly negative attitude towards inspectors and the alarming rumours from abroad about the profession: for example in England, an inspector was sentenced to two years of forced labour after the court ruled that his negligence had caused material damage (*Éber 1912:60*).

In order to further widen the scope of the inspected institutions, only the members of the Pénzintézeti Központ were allowed to accept deposits and handle public funds from 1 January 1921, and at these institutions the Pénzintézeti Központ carried out mandatory inspections (*Tomka 2000:94*). This significantly strengthened the role and economic importance of the Pénzintézeti Központ, and inspired non-member financial institutions towards joining. Another incentive for joining was that public institutions were only allowed to accept surety by a member of the Pénzintézeti Központ. An initiative was born requiring the prior written approval of the board of the Pénzintézeti Központ for cancelling memberships, however, due to the expected dissuasive effect of this on future joiners, the initiative did not enjoy broad support (*Hantos 1916:80*). Possibly on account of the difficulties connected to financing the First World War, the unfolding inflation and the funding of the budget deficit, the amended Act of 1920 stipulated that the Pénzintézeti Központ *"cooperates in satisfying the credit needs of the state, and performs the duties related to government debt with which the finance minister charges it"*.[8] The strengthening function of the Pénzintézeti Központ was also shown by the fact that increasing the capital of the financial institutions with a share capital below 40 million korona and the relocation of the registered seat of the financial institutions was subject to the prior approval of the Pénzintézeti Központ from 1920.[9] From the perspective of financial institution supervision, another major result from the period between the two World Wars was that from 1925, the Pénzintézeti Központ had the opportunity to carry out inspections at its member institutions at least annually (*Jakabb et al. 1997:12*).

The advanced nature of the theoretical and methodological principles of the period is attested by the fact that the Act of 1916 on the Pénzintézeti Központ considered it a priority that the Pénzintézeti Központ should cooperate with respect to financial institutions' business conduct and business management in order to facilitate the sound development of the financial market, and that this cooperation *"should be based on uniform principles and performed reasonably when possible, and […] that principles in line with institutions' nature and the economic requirements should*

[8] Based on Article 1(5) of Act XXXVII of 1920 on the Pénzintézeti Központ
[9] Based on Article 16 of Act XXXVII of 1920 on the Pénzintézeti Központ

be applied in the business management of the institutions".[10] This approach is also characteristic of the currently applied supervisory methodology, the pillars of which have become widely known in modern supervisory literature as the so-called "equal treatment principle" and the "principle of proportionality". These principles represent security and predictability to the market, and therefore they are important parts of supervisory practices.

5. The changing role of the Pénzintézeti Központ prior to the Great Depression

Later, some tasks appeared among the activities of the Pénzintézeti Központ that were only partly connected to financial institutions or not at all. This was facilitated by Act XXXVII of 1920 on the Pénzintézeti Központ, pursuant to which the Pénzintézeti Központ *"may take part in enterprises serving the public good and the public interest, and may cooperate in conducting and performing the financial and administrative tasks of economic institutions"*.[11] In addition, its activities were supplemented by managing the financial and administrative tasks of economic related institutions. Within the framework of this, the Pénzintézeti Központ initiated the establishment of several industrial companies, for example in the case of the Fuvarhitelintézet Rt. (Credit Institution of Shipping Rt.) founded in 1925, which was mainly created to introduce lien-backed shipping credit. The Pénzintézeti Központ also took part in the founding of the Molinum Malomipari Rt. (Molinum Milling Industry Rt.) (*Jenei 1970:37*), and in several cases, it also acquired shares in connection with the business management of the institutions and with initiating their establishment. The Pénzintézeti Központ was also designated to perform the resolution of the milling companies (23 in all) within the scope of interest of the Pesti Victoria Gőzmalom (Pest Victoria Steam Mill) in 1926 to prevent its insolvency (*Jakabb et al. 1997:73*). The tasks related to resolution and the financial support provided to the milling companies depleted the resources of the Pénzintézeti Központ. The intertwining ties between the Hungarian banking and industrial sectors through lending were also characteristic before the First World War, and this relationship became even stronger after the war from the side of shareholders and bond issuers; not only banks but also savings banks participated in this role (*Hantos 1930:677*). Nevertheless, the overlap between the banking and the industrial sectors paved the way for the expansion of the Pénzintézeti Központ's activities from the tasks related to the inspection of financial institutions to those related to the inspection of industrial companies. The Pénzintézeti Központ also had numerous duties in connection with mortgage lending, and here it has to be noted that from 1923, its activities also included the publication of wheat conversion

[10] Based on Article 5(4) of Act XIV of 1916 on the Pénzintézeti Központ
[11] Based on Article 1(7) of Act XXXVII of 1920 on the Pénzintézeti Központ

prices with regard to the wheat price debenture issues, and the Pénzintézeti Központ also functioned as a so-called trustee[12] (until 1928 together with the Pesti Magyar Kereskedelmi Bank [Hungarian Commercial Bank of Pest]); therefore it also controlled the adherence to the contractual terms until the full withdrawal of the debentures, which demonstrated the strengthening international confidence.

In 1924, measures aimed at the resolution of the finances of the state and stabilising the value of money were employed,[13] which were implemented through the introduction of the so-called "savings korona" as a calculation value,[14] cutting budgetary spending and the overhaul of the system of public services.[15] The activities of the Pénzintézeti Központ were also expanded in this respect, since its tasks now included the settlement based on the calculation value in connection with the introduction of the "savings korona", as well as the supervision of financial institutions with regard to this. Even when in several cases these additional tasks were linked to the Pénzintézeti Központ's original duties, they obviously used up resources and hindered the performance of the supervisory activities. In light of this, it is not surprising that a contemporary expert claimed that the Pénzintézeti Központ had *"somewhat departed from the original idea"* with respect to its functioning (*Rassay 1933:421).* There were also internal calls for returning to the Pénzintézeti Központ's original aims determined by the Act XIV of 1916, and the board discussed this regularly.

The ideas formulated at the time of the Pénzintézeti Központ's establishment were put to the forefront by Act XIII of 1926, which expanded the group of institutions to be inspected, since the Pénzintézeti Központ could conduct reviews *"at commercial companies engaged in the currency exchange business and securities traders from the perspective of public credit"*.[16] The Act XIII of 1926 enabled the members of the Pénzintézeti Központ to acquire funds not only in the case of bankruptcy, but also when satisfying their credit needs became difficult. The expansion of its tasks related to financial institutions was shown by the fact that in accordance with the Act, the Pénzintézeti Központ played a large part in the mergers between financial institutions.[17] Another task linked to financial institutions was that the Pénzintézeti Központ (together with the Országos Központi Hitelszövetkezet) also

[12] The person in a position of trust tasked with representing the interests of bondholders. This function was performed by the Pénzintézeti Központ as a mandate until the institution of trustee was incorporated into Hungarian law (in accordance with Act XXI of 1928 on Industrial Debentures).
[13] This is because by this time, inflation had necessitated the introduction of stabilising measures. In 1924, banknote circulation almost tripled in merely three months, but even before that, during the First World War, it had risen tenfold (*Jakabb et al. 1997:68*).
[14] Based on Article 1 of Act X of 1924 on Certain Measures Aimed at Preventing the Depreciation of the Korona
[15] Act IV of 1924 on Restoring Fiscal Equilibrium
[16] Based on Article 1(1) of Act XIII of 1926 on Amending Certain Stipulations of Act XXXVII of 1920 on the Pénzintézeti Központ; earlier these tasks were imposed on the Pénzintézeti Központ by Ministry of Finance Regulations No. 1300/1923 and 6700/1923, and the fact that these became enshrined in law suggests that the Pénzintézeti Központ strengthened from an organisational and functional perspective.
[17] Based on Article 1(4) of Act XIII of 1926 on Amending Certain Stipulations of Act XXXVII of 1920 on the Pénzintézeti Központ

underwrote a counter-guarantee in certain cases when banks undertook surety in the form of a consortium (*Botos 1994:132–145*). This happened, for example, when the financial institutions stood surety for repaying a loan of USD 5 million disbursed by an American financial group and obtained by the Magyar Export Intézet (Hungarian Export Institution) established in 1928. However, the tasks of the Pénzintézeti Központ not related to financial institutions also continued to expand, as from 1926 it *"provides(ed) loans to currently employed and retired public service employees"*.[18] Act XIII of 1926 lacked several of the stipulations from Act XXXVII of 1920, for example the participation in satisfying the credit needs of the state and the participation in enterprises serving the public good and the public interest. The same Act specified that further duties may only be imposed on the Pénzintézeti Központ by law.[19]

6. The impact of the Great Depression on financial supervision – Further reforms

The financial crisis and credit crunch in Hungary started in July 1931, although certain signs could be observed even earlier, for example with respect to export revenues, which started to nosedive in 1929, primarily on account of the drop in agricultural product prices (*Kovács 2006:97*). The financial market was already characterised by concentration in this period: in 1929, about 40 per cent of the total equity in Hungary (over 600 million pengő) was controlled by two Hungarian banks, the Pesti Magyar Kereskedelmi Bank and the Magyar Általános Hitelbank (Hungarian General Credit Bank) (*Incze 1955:55*). After the number of financial institutions reached its peak (962) in 1924, it gradually decreased due to the economic crisis, and in 1935 there were 426 functioning financial institutions, while in the last year of the peace, in 1938, there were only 396 (*Holbesz 1939:338*).

Both economic policy measures (e.g. the ordering of a general bank holiday, limiting the payments from savings and current account deposits, the transition from the gold standard to controlled foreign currency management, the imposition of a moratorium on transfers) and supervisory policy measures were introduced to manage the crisis. A portion of these measures was linked together at the institutional level due to the Pénzintézeti Központ, since for example with respect to the moratorium on transfers, the Pénzintézeti Központ acted as the trustee for foreign lenders in the so-called credit fixing agreements ("Stillhalte") (*Incze 1955:289*). In order to perform its role in the crisis, the Pénzintézeti Központ

[18] Based on Article 1(7) of Act XIII of 1926 on Amending Certain Stipulations of Act XXXVII of 1920 on the Pénzintézeti Központ
[19] Based on Article 1(12) of Act XIII of 1926 on Amending Certain Stipulations of Act XXXVII of 1920 on the Pénzintézeti Központ

increasingly used its mobility reserves, and in 1931 the total amount of discounted bills rose to 562.7 million pengő from 252.1 million pengő a year earlier.

On account of the economic crisis, 30 per cent of financial institutions operating in the form of a limited company and 10 per cent of credit unions were liquidated (*Schandl 1938:75*), as a result of which the Pénzintézeti Központ's tasks related to liquidation and resolution also increased. By the time of the economic crisis, the Pénzintézeti Központ had gained extensive experience in liquidation and resolution, as there had been other financial institution crises shortly before that. For example in 1927, the Egyesült Budapesti Fővárosi Takarékpénztár (United Savings Bank of the Capital City of Budapest) was on the edge of crisis, and the Pénzintézeti Központ was tasked with preventing a bankruptcy, the reorganisation of the savings bank and its resolution from the loss reserve fund (*Jakabb et al. 1997:82–93*). Dealing with insolvency was also familiar to the institution, as in 1929 the Földhitelbank Rt. (Land Loan Bank Rt.) announced that it was unable to honour its obligations, which was mainly due to its involvement in speculative deals on the stock exchange. However, in this case there was no chance for reorganisation and resolution, thus a so-called composition was concluded. Foreign lenders, seeing the economic situation in Hungary, attempted to take their money out of the country, even at the price of concessions. This, together with the moratorium on transfers contributed to banks' partial resolution (*Varga 1964:63*), and some strengthening in public confidence could also be perceived (*Varga 1933:326*).

During the economic crisis, the emphasis in financial supervision shifted towards the solution of problems requiring immediate action, especially ensuring the smooth repayment of deposits (the Magyar Szavatossági Bank [Hungarian Guarantee Bank] was established in 1931 for this purpose, and its business management was conducted by the Pénzintézeti Központ), and the primary task became the establishment of the upper bound of interest rates that could be applied with respect to banking services by the Országos Hitelügyi Tanács (National Credit Council, OHT) founded in 1931, which was coupled with the Pénzintézeti Központ's inspection and resolution functions. The OHT had partly stipulating, and partly consultative powers: the interest rate determined by it could exceed the bill discounting interest rate of the Magyar Nemzeti Bank (MNB) by up to 50 per cent, and the OHT also set the interest rates for the deposits in savings banks and current accounts. When a financial institution did not apply the interest rate determined by the OHT in its pricing, the OHT, acting in its stipulating capacity, could order the Pénzintézeti Központ to carry out an inspection at the given financial institution. If on the basis of the inspection the Pénzintézeti Központ considered that the financial institution's operation was not maintainable in the future due to its financial and income position, the OHT could order its liquidation on the proposal of the Pénzintézeti Központ (*Jirkovsky 1940:371*). The Magyar Szavatossági Bank, just like

the Pénzintézeti Központ, also had a resolution function: one of its tasks related to this was to provide acceptance credit to financial institutions during their temporary liquidity problems to enable them to meet their obligations, thereby contributing to the continued stability of the Hungarian banking system (*Botos 1994:95*).

The focus of financial institutions' supervision also changed due to the economic crisis. In the second half of the 1930s, a process could be observed, not only in Hungary, that hindered the accumulation of deposits, namely that on account of the crisis of confidence, savings were directly spent on investments by evading banks. As a result, the enhancement of the opportunities for controlling capital formation and capital accumulation gained prominence, just like the fostering of increased deposit formation in financial institutions to promote the "self-financing" of financial institutions. Supporting new deposit placements in financial institutions had already been a priority, since in accordance with the 1920 amendment of the Act on the Operation of the Pénzintézeti Központ, only the members of the Pénzintézeti Központ were allowed to accept deposits from 1 January 1921.[20] Another priority was increasing the control over liquidity, and this was when liquidity considerations became more nuanced: the classification of liabilities, deposits and current account deposits by the level of liquidity (first-, second- or third-grade) was introduced (*Walder 1939:446–455*), and an initiative was formulated – although it was not realised – that in addition to setting the minimum level of liquidity, its maximum should also be stipulated. The increasing prominence of liquidity considerations was warranted by the fact that in the two years after the New York Stock Exchange Crash, American capital in Europe was rolled over for shorter maturities due to the weakened public confidence (the more limited opportunity for acquiring external funds mainly posed problems for provincial financial institutions), thus the frequency of capital inflows became higher, but their amount remained low, and domestic capital formation was also inadequate. In addition, the increase in the volume of deposits did not match the increase in the demand for credit, and therefore financial institutions used almost all their deposits for lending, thereby considerably increasing their liquidity risk, which also contributed to the deepening of the crisis (*Jirkovsky 1940:364*), and the typically deteriorating debtor portfolio also resulted in heightened systemic dilution risk. From the perspective of lending, the initiative pushing the inspection of the so-called "large exposures" in the foreground should be pointed out: a proposal was put forward to follow the most frequent international example and maximise the credit extended to individual debtors in 10 per cent of the share capital. According to the proposal, lending any amount higher than this would have been subject

[20] This provision, in addition to expanding the opportunities of the Pénzintézeti Központ for inspection, discouraged institutions outside the banking system, e.g. farm industrial units, from accepting savings deposits from their employees. Naturally, there were also non-supervisory tools for facilitating deposit creation in financial institutions (e.g. influencing the level of deposit rates).

to the approval of the board of directors and the supervisory board as well as a notification sent to the supervisory authority. From a credit rating perspective, the renewed emphasis on the proposals linked to guaranteeing the availability of information on debtors (a so-called "evidence centre") (taking into account bank secrecy as well), which can be regarded as the forerunner to the modern credit information system, had special significance, just like the proposal on developing the regulation on managing the so-called "incompatibility" situations in the case of certain loan transactions where interests were concerned, which was an early form of the current regulation on internal credits and managing conflicts of interest. The idea of establishing an institution fashioned after the contemporary Czechoslovakian "loan protection body" with similar functions as the "evidence centre" had already been formulated in 1926 in connection with the partially jumpstarted lending after the stabilisation of the korona, and this institution would have *"recorded debtors in the form of a credit register"* (*Domány 1926:455*), but at that time this initiative did not garner widespread support. A cyclicality in the history of supervision is reflected in the approach – obviously in line with the attitude that changed after the economic crisis for understandable reasons – that, with respect to the activities of the financial institutions, similar to certain earlier opinions, supported strict financial supervision and claimed that *"if they cannot perform this responsible and difficult task to the satisfaction of all, they will be constantly in jeopardy of total inspection"* (*Walder 1939:465*).

During the economic crisis, attacks on cooperatives also emerged, which attributed the critical situation to the state subsidies and tax reductions, sometimes considered excessive, provided to the cooperatives. Others believed that this amount could not be considered substantial compared, for example, to the amount spent by the Pénzintézeti Központ on the resolution of financial institutions, in fact, the recovery from the economic recession was to be sought in the cooperative idea: *"without a healthy and strong cooperative movement, there is no way out of the economic crisis"* (*Wanke 1930:5*). The proponents of this attitude also maintained that the public money provided for this purpose was used appropriately. The attacks on cooperatives may also have been triggered by the fact that there was no uniform lending policy on the state support of cooperatives, and therefore in many cases, cooperatives were aided by the state along the lines of a development goal (e.g. agriculture), and as a result, certain cooperatives did not receive support for a long time. This might have been prevented by the establishment of a "top-level cooperative body" or the transformation of the Országos Központi Hitelszövetkezet to ensure the appropriate credit supply, common goods purchases and inspections, as well as the creation of an institution with national jurisdiction representing the interests of the cooperatives, which would have helped facilitate the solution of unsolved issues in connection with the cooperative idea (*Wanke 1930:42*). However, these proposals were not implemented due to the economic crisis, the prominence

of the measures designed to prevent its deepening, then later the additional tasks that emerged on account of the temporary re-annexations and the subsequent armament.

From a banking supervision perspective, it is important to note that after the crisis, the state issued a regulation every year on preparing the balance sheet, which enabled it to tighten its control over banks' operation. In the next 15 years, commercial banks regularly notified the MNB about their activities, and their FX transactions required approval. The MNB regulated the foreign currency, cash, cheque and credit flows through its circulars and guidelines on implementation (*Botos 1994:44*).

7. The change in the scope of activities of the Pénzintézeti Központ and other institutions notable from a supervisory perspective due to the Great Depression

The Pénzintézeti Központ had several tasks related to the economic crisis in addition to the inspections, out of which the preparation of the so-called "debt settlement report" in the agricultural sector deserves special mention – within the framework of which the Pénzintézeti Központ took part in the settlement of the debt of farmers – just like the business management of the Magyar Pénzügyi Szindikátus (Hungarian Financial Syndicate), an institution in charge of agricultural bond issues.[21] The Pénzintézeti Központ also performed public tasks, for example the cross-border settlement of agreements related to the trade in goods and concluded with other countries. It also served the public interest that the Pénzintézeti Központ typically spent a certain portion of the supervisory fees paid by the member institutions on social causes, for example it contributed to the Életbiztosítási Rendezési Alap (Life Insurance Settlement Fund, ÉRA) established after the 1936 collapse of the Phönix Életbiztosító Társaság (Phönix Life Insurance Corporation) – which had its seat in Vienna but had substantial Hungarian exposures – to support aggrieved Hungarian parties. The Pénzintézeti Központ conducted the business management of several organisations, of which the Magyar Investment Rt. (Hungarian Investment Rt.) established in 1930 deserves special mention, since its aim was to mitigate the impact of the recession on the banking system by preventing the fall in listed securities' prices (*Botos 1994:92*). Act XL of 1928 on the Mandatory Insurance for the Old, the Disabled, Widows and Orphans enabled mandatory insurance in Hungary as well as the creation of the so-called "acknowledged corporate pension funds".[22] A part of the supervision of these companies (with respect to the assessment of wealth statements and the examination of prudent operation) was performed

[21] Based on Article 2 of Act XXIII of 1935 on Certain Measures Facilitating the Settlement of Farmers' Debt
[22] Based on Act XL of 1928 on the Mandatory Insurance for the Old, the Disabled, Widows and Orphans

by the minister for public welfare and labour (later minister of the interior) and the Pénzintézeti Központ. From 1 January 1930, the scope of the Pénzintézeti Központ's inspections covered the review of balance sheets from the perspective of insurance considerations as well as the business management of pension funds, and when irregularities were found, a report had to be prepared for the minister.

In 1938, as part of the concentration process characteristic of earlier years, the Pénzintézeti Központ played a pivotal role in the implementation of the merger between the Magyar Általános Takarékpénztár (Hungarian General Savings Bank) and the Magyar Általános Hitelbank. The Tőkepiac Szabályozására Alakult Intézet Rt. (Institution Established for the Regulation of the Capital Market Rt.) was created in 1939 to support the MNB's open market operations, and in addition to assuming a part of its shares, the Pénzintézeti Központ also took control of its business management (*Jakabb et al. 1997:86–106*). With respect to the Vienna Awards between 1938 and 1941 and the temporary re-annexations due to military activities (Zakarpattia Oblast, Upper Hungary, northern Transylvania, Délvidék, etc.) the task of incorporating the financial institutions concerned into the Hungarian lending structure was also assigned to the Pénzintézeti Központ, and this proved to be an especially sensitive area due to the Romanian, Transylvanian Saxon and Hungarian nationalist movements and the economic nation building (e.g. settlement projects, land policy) (*Egry 2006:11*; *Szász 1966:130–137*).

The increasing engagement of the Pénzintézeti Központ was clearly shown by the fact that after the economic crisis, almost all financial institutions in Hungary were members in the Pénzintézeti Központ, then later Ministry of Finance Regulation 10 of 1939 abolished the existing capital limit on inspections,[23] and member institutions were subject to mandatory annual reviews instead of the opportunity of at least annual inspections. Therefore, an institution with strong authorisation, far-reaching review functions fulfilling supervisory tasks and playing an active role in economic life was gradually developed. During the Pénzintézeti Központ's operation before the Second World War, the number of inspections performed increased sevenfold, and the institution carried out 1,048 inspections in 1940 in contrast to the 159 in the year of its establishment, accordingly its staff was also expanded from 17 to 68. The number of inspections carried out by the Pénzintézeti Központ exhibited a growing trend during the economic crisis, peaking in 1931. The number of inspections in that year (1,096) was never exceeded in the period between its founding and 1940 (*Jakabb et al. 1997:107–117*). However, the number of inspections mainly rose in the case of pension funds (the most remarkable increase happened in 1930 when the figure rose from 92 to 163). In this context, we have to note that pension funds were only subject to inspection from 1927, therefore some inspection "lag" could

[23] Based on Article 1 of Ministry of Finance Regulation 10 of 1939 by the Hungarian Royal Finance Minister on Extending the Normal Review Power of the Pénzintézeti Központ

be observed compared to financial institutions, which stimulated the increase in the number of such inspections. During the crisis, the number of inspections at financial institutions grew in 1931, from 749 to 802.

After the economic crisis, reservations about financial institutions became widespread among the public, and the tell-tale signs of a crisis of confidence could also be observed. In order to reduce the anti-bank sentiment and restore confidence, a series of presentations was launched in 1935 with the help of the TÉBE, focusing on the situation of financial institutions and the presentation of the contemporary Hungarian economic climate. In addition, the Yearbook of Hungarian Savings Banks and Banks was published, which was supposed to provide credible information to the public by presenting the Hungarian banking policy, credit situation and the corresponding legal and regulatory issues. Similar to the Pénzintézeti Központ, the TÉBE was also forced to deal with more and more issues and problems that were not part of its original functions (e.g. the measures related to anti-Jewish legislations and regulations). And the inclusion of the members, whose number increased as a result of the re-annexations, as well as their integration into the work of the various bodies gave the institution and the Pénzintézeti Központ further tasks (*Botos 1994:35–46*). In later years, the TÉBE's professional opinion was sought and taken into account ever less during economic policy decision-making, therefore it gradually lost its significance, influence and economic role, and a similar fate was in store for the Magyar Szavatossági Bank and most of the organisations representing and protecting the interests of the sector (*Pető-Szakács 1985:116*).

8. Summary

Hungarian financial supervision was able to respond effectively to domestic and foreign policy events. In the years after the First World War and during the Great Depression, the risks were basically identified and assessed, and in line with that, the inspection goals were determined, the frequency of on-site inspections increased, the supervisory role of the Pénzintézeti Központ was enhanced, and the inspections covered more and more institutions.

Nevertheless, as a result of a process that could already be felt during the Hungarian Soviet Republic and later intensified, the scope of functions of the Pénzintézeti Központ was steadily expanded, and in several cases it included activities that were hardly linked to financial institutions – or not at all – or to the Pénzintézeti Központ's supervisory, inspection or resolution activities.

Although the idea of returning to the original aim of the Pénzintézeti Központ's establishment emerged several times, the domestic and foreign policy events provided only a limited opportunity for this, resulting in the excessive expansion of the Pénzintézeti Központ's activities and the deterioration of its operational efficiency.

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Hart and Holmström's Contributions to Contract Theory*

László Á. Kóczy – Hubert János Kiss

The Prize in Economic Sciences in Memory of Alfred Nobel 2016 was awarded jointly to Oliver Hart and Bengt Holmström for their contributions to contract theory. Contract theory is a field of applied game theory, bringing into focus the conflict between the owner – the principal – and the company's appointed manager – the agent. In this study, we present the Principal–Agent model proposed by Holmström and describe a few offshoots of the original model, before proceeding to discuss Hart's research on the aspects of ownership in Principal–Agent models. Although the two laureates are primarily known for their theoretical models, in our introduction we disregard the unnecessary formulas and illustrate the models with examples.

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1. Introduction

The Prize in Economic Sciences in Memory of Alfred Nobel 2016 was awarded jointly to Oliver Hart and Bengt Holmström for their contributions to contract theory. The term "contract" is often associated with law, but by the same token the concept may well belong to humanities; indeed, any arrangement needs to be phrased and the more important ones are also drawn up in writing. In essence, contract theory is an application of game theory; at most, it only concerns individuals with a specific theoretical interest or those who have signed or intend to sign a contract or undertaken – or have given – an assignment in the past. This encompasses even informal arrangements and does not necessarily involve an official document. The topic at hand, therefore, determines – either directly or indirectly – everyday

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life. Contract theory is concerned with the theoretical foundations of contractual arrangements and agreements; for instance, it seeks to investigate possible ways of ensuring the proper functioning of contractual arrangements or, even more importantly, that compliance with the terms of an agreement guarantees the implementation of its essence.

Below we present an overview of the main results of the theory on the basis of the summary written by the *Royal Swedish Academy of Sciences* (*2016*). This is not the first time the Academy recognised research in the field of (applied) game theory; in fact, the concept is counted among the most successful approaches of recent times, as demonstrated, for example, by the 2014 Prize to Tirole and the 2012 Prize to Roth and Shapley (whose achievements were reviewed in *Biró et al. [2013]*), and the list could continue for a long while. Although plenty of complex models are featured in the literature on game theory in general and on contract theory in particular, in this paper, rather than intimidating interested readers, our goal is to merely offer a glimpse of the problems analysed by contract theory and their solutions.

While Holmström and Hart both applied themselves to contract theory, despite co-authoring a number of articles, they concentrated on clearly distinctive focal points and it is along the same guiding principles that we review first the results of Holmström, and then the findings of Hart.

2. The Principal–Agent problem

Contracts are often assignments, where a *principal* pays an *agent* for the performance of specific tasks. First of all, we review problems of this type by lining up a number of examples.

The conflict between an investor and a fund manager is, for instance, a principal-agent problem. The investor seeks to maximise her return, while the fund manager has a vested interest in collecting a secure income while minimising the amount of work or the number of employees needed. Due to the unpredictability of markets, it is extremely difficult to measure the fund manager's performance *ex post*.

A similar conflict may materialise between a company's owner and manager, although the controversy will be of a different nature. The owner only cares about her profit and the company's value, while the manager wants a high salary, a company car and other benefits. It is even worse when, with a view to achieving these gains, the manager enlarges the company to a larger-than-optimal size through expansion, acquisitions or capital increases. Unless the owner is a professional investor, in the case of listed companies or especially, state-owned enterprises, the manager's performance is measured far too late or not at all. While some market mechanisms may motivate the manager to make good decisions and act in the interests of investors, if the state, as the entity proceeding on behalf of

the owner is also an agent, performance measurement will itself be unreliable and the owner's – i.e. the state's – interests are likely to be compromised. Let us see the solutions proposed by the 2016 Nobel prize laureates.

2.1. The traditional Principal–Agent model and moral hazard

We assume, as is the case in economics in general, that decision-makers are rational, profit-maximising individuals. In the first, classical model the Principal wants to have a task accomplished. If she performed the work herself, she would strive to make an optimal decision to achieve the desired outcome with the least amount of time and capital expenditure. If, however, she chooses to hire an employee to perform the same work, the situation will be completely different. The agent can decide how much *effort a* he is willing to exert to accomplish the task, where *a* falls within the range of a given $[\underline{a}, \overline{a}]$ interval. We assume that the outcome

$$\beta = b(a) + \varepsilon$$

observed by the employer, i.e. the principal, is an increasing function *b* of the work performed, while ε is a random noise term with an expected value of 0, which captures environmental effects outside of the agent's control. The effort generates a cost for the employee, i.e. the agent, which is captured by the function *c*. The agent receives a benefit *t* for his work, the amount of which varies in function of the outcome.

In general, we assume that the Principal is risk neutral and that the payment of the transfer is well within her means. The agent is risk-averse and, with limited resources at his disposal, he is unable to pay a substantial negative *t*. The expected utility of principal *P* and agent *A* can be described, overall, as

$$U_p = b(a) - E(t)$$
$$U_A = -c(a) + E(t) - rVar(t),$$

where *r* measures the agent's degree of risk aversion.

Abstracting, for now, from the conflicts of interest between the parties, an optimal effort *a** can be defined both in case of the concavity or convexity of functions *c* and *b*. Optimal also means that risk is ruled out.

How do all these variables behave when this conflict is also factored in? If the effort is fully observable, the amount of the transfer can depend directly on the effort so that *a** is the ideal choice for the agent even if it involves an extra effort.

Unfortunately, most cases are not so ideal. In general, the agent's effort is unobservable or cannot be verified by a court and as such, the contract cannot or should not be drawn up on this basis. For the most part, only the outcome

of the agent's work can be observed, which already reflects the random effects considered above as a random factor. Thus, for example, in measuring the efforts of the investment fund mentioned in the introduction, in addition to the outcome, the role of luck and investment sentiment should also be considered. On the whole, the measure received is extremely imprecise. Obviously, this needs to be considered in determining remuneration; it is impossible to measure performance strictly on the basis of the outcome. In fact, *Grossman and Hart* (*1983*) warns that a better outcome may well yield a poorer payoff. We should only reiterate the biblical parable of the talents, where the servant burying the single talent entrusted to him is punished, while the servants entrusted with more talents and boldly but lucratively investing them receive praise.

Besides unobservable effort, the agent's *moral hazard* also comes into play. While a smaller effort increases the agent's utility, a lesser outcome might well be the result of other factors and he cannot be clearly accountable for the shortfall. The Principal–Agent problem is intriguing specifically because of this moral hazard.

This problem is reflected in real-life situations in countless forms and the interests of the parties can clash in numerous different ways. The most frequent controversy is the conflict between the owner and the manager. How can the owner ensure that the company works in favour of her interests? It can be generally assumed that the owner is competent; by contrast, the manager knows exactly how he could act in the interests of the owner, but this may not necessarily coincide with his own interests. The owner's interest is usually clear: she wants to see an increase in her company's value. This moral hazard problem can be easily alleviated by offering a block of shares/stock options to the manager that will also make him a shareholder.

2.2. Is there a need for executive bonus schemes?

Amid the media frenzy following the announcement of his Nobel prize, one of the first questions addressed to Bengt Holmström was whether he approved of special executive bonuses. Unfortunately, he replied, the answer is complicated. The previous section concluded that making the manager a shareholder approximates the interests of the principal and the agent: the manager will act as a principal and an agent simultaneously, and his optimal behaviour will be a mixture of the optimal behaviour of the principal and the agent, respectively. Obviously, the higher the compensation package, the less consideration is given to employees' interests, while incentivising will also become increasingly expensive. In extreme cases, the relationship becomes a franchise contract where the agent may retain the entire profit in exchange for a fixed transfer. In such cases, the agent assumes the entire risk which, however, can be undertaken only in the case of risk-neutral agents. If the agent is not risk-neutral, *Mirrlees* (*1999*) proposes a contract that penalises the agent very heavily when he realises outcomes that would have been highly unlikely had the agent's performance been adequate.

Due to the agent's insolvency, this approach can be rarely applied in practice; however, the idea of a model where payment depends on signals that provide information about the actual effort is worth exploring nevertheless. Such signals may comprise general market indicators or the performance of a firm relative to other firms. At the same time, the Informativeness Principle proposed by *Holmström* (*1979*) implies that payment should be a function of some additional signal *s* if and only if it carries new information. Thus, for example, all signals that contribute to separating effort *a* and noise *ε* can be of great assistance. Accordingly, any signal that is correlated strongly with the value of *ε* is useful, while *s* is unnecessary when it is not correlated either with the effort or with the noise. Consequently, executive bonuses should not only depend on the firm's stock price, but also with other observable indicators correlating with the stock price, such as the corresponding indicators of competitors. In consideration of the insights of the Informativeness Principle, *Holmström and Tirole* (*1993*) recommend the use of the stock price as a benchmark. The authors argue that stock price reflects a great deal of performance information, data and other aspects that cannot be extracted from the company's current accounting data.

In practice, such adjustments are often absent, and managers' performance is generally rewarded more in function of luck – a favourable economic environment – than based on his own merit and effort. *Bertrand and Mullainathan* (*2001*) found that this holds primarily for poorly governed – state-owned or listed – companies where the owners cannot stand up for their own interests and do not behave as true principals, while the managers of firms in majority or dominant ownership are less likely to be rewarded for luck. Interestingly, in a conducive market environment the migration of theoretically properly incentivised managers to firms where remuneration incorporates the lucky environment may lead to adverse selection. The situation is the opposite in an unfavourable environment, resulting in a countercyclical effect for the companies of properly incentivised managers.

2.3. Fixed pay or pay-for-performance?

Holmström and Milgrom (*1987*) compared fixed and performance or result based remuneration relying on a linear model where the transfer paid consists of a fixed component *f* and a component determined in proportion to outcome:

$$t(\beta) = f + k\beta,$$

where *k* is the incentive factor. The optimal value of *k* can be determined based on the functions available. Although the formula is somewhat crude, it is very informative in cases where risk is negligible – i.e. the agent is risk-neutral – because in that case *k = 1*; in other words, the highest possible value. In such cases the contract essentially becomes a franchise contract where the fixed component *f* is obviously negative. The other extreme is when the risk or the agent's risk aversion

tends to infinity, $k = 0$ and the agent receives a fixed salary. In general, *ceteris paribus*, the theory predicts a negative relationship between the agent's risk aversion and incentive power. In practice, however, the *ceteris paribus* ("all else equal") assumption may be violated by systemic selection as low-risk and high-risk assignments are not undertaken by the same agents. For example, *Ackerberg and Botticini* (*2002*) studied agricultural contracts in Renaissance Italy and found that even though certain crops were riskier than others, the contracts related to them showed an unexpected pattern, which the authors attributed to the natural adjustment of the tenants.

2.4. Complex assignments

So far, we have examined situations where the agent was expected to perform a single task. In reality, however, most positions are diversified with multi-dimensional results. The agent's work may also involve activities the outcome of which can only be measured over time, imperfectly, or not at all. If remuneration is strictly based on measurable outcomes, all other activities are relegated to the background. As *Baker, Gibbons and Murphy* (*1994*) put it somewhat ironically, "Business history is littered with firms that got what they paid for". This is a recipe for making managers focus on the company's short-term earnings rather than taking its long-term interests to heart. Another example is when a university professor is paid on the basis of his teaching activity and the effectiveness of his research is reflected only indirectly, prompting the professor to take on even more teaching responsibilities at the expense of research. This might also be one of the explanations of why two ingenious European researchers awarded with a Noble prize were once again affiliated with American universities. Indeed, European universities are extremely reluctant to give recognition worthy of a superstar, state subsidies granted to Hungarian universities are only increasingly – albeit minimally – tied to the quality of research for the time being and the incentive hardly trickles down to the teaching staff.

What can the principal do in such a complex situation? If the agent is expected to perform multiple activities the outcome of which cannot always be measured in the short term and all other activities are also considered important, then incentivising the measurable activity/activities may encourage the agent to neglect the non-measurable activities. *Hong et al.* (*2013*) observed that piece-rate bonus schemes introduced in certain Chinese factories led to the deterioration of quality. *Bergstresser and Philippon* (*2006*) found that managers whose remuneration was tied to the value of stock were inclined to neglect the company's long-term goals.

Efforts should be made to strike a balance between various activities even without the presence of external incentives. An agent may prefer one task to another or may delegate a disproportionate amount of time and resources to it for some other reason. In such cases, supporting the disregarded activity may be considered. Thus,

for example, a phenomenon opposing the Hungarian practice can be observed at Western universities: since teachers receive a fixed salary, they tend to prefer research that strengthens their own profile and may be rewarded by a promotion over the long run; consequently, they may put teaching – the activity yielding short-term gains to the university – on the back burner.

2.5. Teamwork

We may face yet another array of problems when a task is to be performed by a team of agents. Naturally, the most interesting cases are those where the effort of individual team members cannot be measured, and the principal can only evaluate and reward aggregate output. In such situations it may be difficult to provide optimal incentives for each agent. *Holmström* (*1982*) maintains that in cases where the compensation of the agents is based on the sharing of some joint output, the outcome will always be inefficient. To resolve this problem, a third party needs to be involved who removes some output from the team in case of inferior performance. Through the liquidation of collateral, creditors are typically well-suited for this role.

When the performance of individual team members is to be evaluated, in line with the Informativeness Principle, the agent's relative performance compared to other agents working under similar conditions could be a useful point of reference.

2.6. Career

Fama (*1980*) and *Holmström* (*1999*) found that, under certain circumstances, moral hazard can be avoided even without the presence of incentives. If the agent considers the expected trajectory of its career, the promise of a good position and higher future pay may motivate him sufficiently to perform well today. In Holmström's model, however, an agent's performance depends both on his effort and on his ability; therefore, a good performance today signals to the principal or, as the case may be, to other potential principals, that the agent's ability is likely to be high. This signal can also be observed by other potential principals, as is the case with the university professor mentioned in the example above. Therefore, the agent's effort was worthwhile even if his employee fails to keep her promise of a pay rise or promotion. This is true to such a degree that, according to Holmström, the effort in fact exceeds the optimal a^* level. However, the power of career incentives decreases over time and in line with the agent's progress in the company hierarchy and explicit incentives should be provided for workers close to retirement. This can be also observed empirically, as demonstrated by the study of *Gibbons and Murphy* (*1992*).

The career model can explain some of the idiosyncrasies exhibited in business life. For example, in studying the decisions of young analysts, *Hong and Kubik* (*2003*) found that they seldom deviated from the decisions of others. This might

be attributed to the high degree of uncertainty surrounding their ability: under such circumstances, a flawed decision may put an end to their entire career.

3. Incomplete contracts

While the most compelling problem in Bengt Holmström's models was the inability to measure performance precisely (or to separate the effects of luck and effort perfectly), Oliver Hart focused on cases where it is impossible to design a sufficiently detailed contract; in other words, where the contracts are incomplete. What can be done in a situation where it is utterly impossible to prepare for all eventualities at the conclusion of the contract? What are the attributes of a good contract amid such uncertainty?

It soon became clear that the main question is who is in control in cases that are not covered by the terms of the contract; i.e. who is in the position to make important decisions. The problem, then, arises as to how to allocate decision or control rights between the parties upon the conclusion of the contract. Since decision and control rights are closely related to property rights, the theory of incomplete contracts is partly dedicated to the issue of the assignment of ownership rights in a given situation.

Suppose there are two companies concluding a long-term contract with each other. One of the companies is the supplier of the other. At the beginning of their relationship, the parties stipulate the main terms and conditions in their contract, defining the quality, quantity and the price of the goods to be delivered by the supplier to the principal. Over time, however, the company ordering the goods may need – as a consequence of technological progress, for instance – products manufactured using a different technology. This, however, would require the supplier to make special investments, which were not covered in the original contract, as the parties could not foresee technological changes at the time. Moreover, under the contract the supplier might be entitled to produce goods that are of a lower quality from the perspective of the principal. If the relationship between the two companies is specific and the principal cannot easily replace the supplier, the supplier's bargaining position will become extremely strong and a *hold-up problem* occurs. For example, the supplier may only be willing to produce the goods in the required quality at a far higher price. Predicting this situation, the principal may not be willing to commit herself and depend on her supplier in the long run, even if this would be the efficient solution.

What is the right course of action in such cases? The obvious answer is that the principal should acquire the supplier at the start, thereby circumventing the problem mentioned above. The main benefit of acquisition/integration is the possibility of efficiency in managing the conflicts of interests arising in cases not covered by the

contract; in our example, the supplier functioning as part of the principal company cannot refuse to deliver special goods and to make the investments necessary for their production.

There are, however, drawbacks. If the manager of the supplier company is not an owner but simply an employee of the principal company, he is less likely to be incentivised for innovation. As an owner, the manager would reap all the benefits of the innovation on his own (e.g. higher profits with lower production costs), whereas the situation is completely different if he is only an employee: in that case, he will not exert any extra effort for making the company more efficient. Advantages and disadvantages should be weighed against each other before deciding whether the companies should continue to function as two separate entities or integration is the optimal solution.

More precisely, the theory (*Grossman – Hart 1986*) dictates that of the two companies the owner should be the one that is expected to make substantial investments in the future that cannot be covered by contractual terms. If such investments are equally important for both companies, they should continue to function as two separate entities. It can also be demonstrated that, as expected, integration or some other kind of joint operation is optimal in cases where the assets of the companies are highly complementary. It is also an intuitive theoretical result that the higher the competition between the suppliers (consequently, the emergence of a hold-up problem is less likely), the less likely it is for the companies to integrate.

The question arises: how realistic are these results? The empirical testing of this theory is problematic: it is not easy to identify the specific investments that are non-contractible but will end up determining the relationship between the parties down the road. *Acemoglu et al.* (*2010*) argue that technology intensity – the importance of R&D – may serve as a reasonable proxy. Consistent with the theoretical results, in their study analysing UK companies the authors found that the likelihood of the occurrence of hold-up problems stemming from technology intensity (i.e. the excessive reliance of a company on its suppliers) increases the likelihood of vertical integration.

Using data derived from the Mexican footwear industry, *Woodruff* (*2002*) examined patterns of integration among footwear manufacturers and retailers. Ownership has both upsides and downsides. Based on the theory we expect the manufacturer to sell the product elsewhere (as opposed to his own store) if the sale requires specific (and non-contractible) investments that the store would only be willing to make if proper incentives are in place; in other words, when it can reap the rewards of its efforts. This is the case in footwear segments with high fashion turnover where it

is imperative for the seller to respond quickly to changes in customer demand and high-quality services are required to attract customers.

4. Application: corporate finance

The general theoretical results have numerous applications. Below we present an example of a corporate finance application in the spirit of the article written by *Hart and Moore* (*1998*). Suppose that a company needs funds for expansion and has no internal resources available for the project. The company seeks out potential investors with the promise of a certain share of future profits. The contract stipulating future profits, however, may not be attractive enough for the investor who may doubt that the expected profits will indeed be realised. After all, the company might squander the investor's money and make the profits disappear by way of creative accounting, spending the funds on paying higher wages or re-investing the money instead of repaying the investor as promised.

What can the investor do? As shown in the previous example, she may choose to buy the company. The decision and control rights will then be transferred to the investor and she can prevent the opportunistic behaviour described above. The investor, however, may also face disadvantages with ownership. The company's management will be less interested in improving the company's efficiency, as the gains from efficiency will be collected by someone else. From the aspect of investors, the main question is how to maximise the efficiency of the company while ensuring that the company uses the investor's funds in the interests of the investor. The answer may be a loan contract under which the company makes a fixed stream of payments to the investor irrespective of profits that ensure an adequate return for the investor. As long as these transfers are made as scheduled, control/decision rights remain with the company. However, if the company defaults, the rights will be transferred to the investor who may dismiss the management or liquidate the company at her discretion.

In fact, this is not only a theoretical result; bank loans, for example, work on the same principles. As long as the borrower can make his monthly instalments, he is entitled to enjoy the benefits of the asset purchased from the loan; if he fails to make his payments, the asset will be seized by the bank. Similarly, numerous securities include, in addition to the expected return and the instalment, clauses

that stipulate the transfer of control/decision rights to the creditor in the event of the company's poor performance.

4.1. Public or private provider?

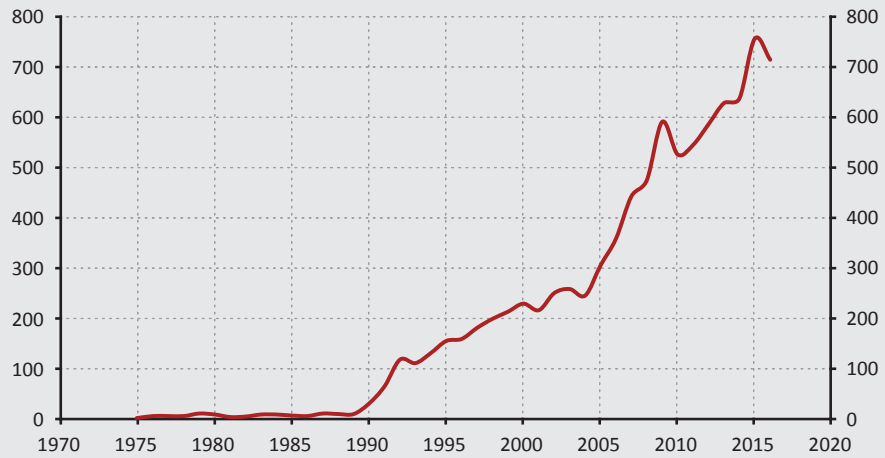
Below we discuss another topic with respect to Hart's work. The costs and benefits of public versus private ownership are often pondered in relation to numerous public services (such as schools, hospitals or prisons). According to the study of *Hart, Schleifer and Vishny* (*1997*), private companies are expected to seek innovative solutions because the shareholders can realise more profits when their company can provide the same service with reduced costs. This causes a problem when cost-cutting is achieved at the expense of quality. By contrast, public sector service providers have little incentive to invest in improving the company's efficiency, but they also have less reason to be concerned about a deterioration in quality if the provider is the public sector. In other words, there is a trade-off between positive (efficiency improving) and negative (quality deteriorating) innovation. In the model of Hart and his co-authors, it is the nature of the given service that determines whether the service should be provided by a private or by a public company. In the authors' view, if high-quality service is a priority or the cost reduction is likely to entail a deterioration in quality, the service provider should be a public sector company, as is the case, for example, with prisons that require the highest level of security. By contrast, private enterprises may perform better in the case of waste collection services.

5. Conclusions

In our brief summary we attempted to present the main results of the two Nobel prize laureates without the mathematical formalisation that tends to characterise theoretical models. We hope that this paper made it clear why it is important and why it is difficult to write contracts that not only provide sufficient incentives to both parties but also lead to efficient results.

The contributions of the two Nobel laureates inspired nearly all branches of economics and have been integrated into numerous areas from finance to behavioural economics. The Figure below illustrates the evolution of the number of references to *contract theory* in the Web of Science database. It may be safe to assume that the sharply rising trend that illustrates the importance of the topic will continue in future.

Figure 1
„Contract theory" – The number of references



Source: Web of Science.

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The Book that Predicted Trump's Victory*

Péter Gábriel

Branko Milanovic: Global Inequality: A New Approach for the Age of Globalization
Belknap Press: An Imprint of Harvard University Press, 2016, p. 320
ISBN-13: 978-0674737136

In the past decades, the world economy has become increasingly integrated. Globalisation is fundamentally reshaping the world economy, and the economic and political consequences of this are more and more evident both globally and within the nation states. Branko Milanovic's book, "Global Inequality – A New Approach for the Age of Globalization" helps us get our bearing as to the winners and losers of globalisation, how globalisation has reshaped income inequalities, and the consequences it has had so far and those that are to be expected in the next decades.

According to the author's judgement, the attitude of developed societies towards social inequalities is rather contradictory. In many ways, they are extremely sensitive to observed income inequalities, for instance, income inequalities related exclusively to gender or skin colour are unacceptable. Governments place great emphasis on reducing these and have made progress in a number of areas. In principle, income inequalities stemming from inherited financial position or family background should also be pressed back, but the inequalities related to these factors are extremely large even in the developed countries, and starting off life with equal chances is rather a myth also in developed countries. Finally, the citizens of more developed countries form a community with the citizens of other countries only to a small degree, and therefore, reducing income inequalities between the individual countries does not represent a priority. This is particularly important in light of the fact that global income inequality can currently be attributed primarily to the differences between countries. In the case of a person selected randomly from among the world's population, his place in the global income distribution is two-thirds determined by the county he lives in.

Emphasising income inequalities within nation states is partially understandable, as nations typically form a natural community, and the economic policies influencing

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the inequalities relate primarily also to the nation states. The author does not declare a definite attitude regarding the moral issues arising in the context of global income inequalities. However, he argues very clearly in favour of the fact that when analysing income inequalities it is absolute necessary to look beyond the limits of national states, as with the world economy becoming more integrated and the strengthening of globalisation, even the changes in inequality within national states can only be interpreted in the knowledge of global changes.

The first part of the book describes how global inequality and inequality within individual countries have changed over the centuries, paying special attention to the last few decades, which at the same time represent the period of strengthening globalisation. The analysis is broadly supported by the fact that – largely due to the author's previous work – by linking national surveys conducted among the population, a detailed database is available on the changes of the global income inequalities observed in the past few decades.

Globalisation exerts a dual effect on income inequalities. On the one hand, inequalities between countries have declined – primarily due to the rapid growth of China, India and other Asian countries. This certainly represents important progress, as rising inequalities between countries was practically uninterrupted from the beginning of the 19th century on. This trend turned around in the past few decades. While globalisation has mitigated income inequalities between countries, inequalities within the countries typically increased. In the developed countries, for instance, as a consequence of growing markets and investment possibilities, the wealthiest were the clear beneficiaries of globalisation, while the lower middle class can be deemed as the losers of globalisation due to the increased supply of cheap labour and the reorganisation of production chains.

The author presents in detail the factors that led to the changes of inequality. For this, he reverts to the hypothesis that can be originally linked to Kuznets. The original hypothesis attempted to explain the development of income inequality during the industrial revolution and after that. Based on the arguments, in the case of major technological changes new technologies increase the return on capital, and since capital is distributed in a very unequal way, income inequality also tends to grow. With the spread of technological innovations and the strengthening of competition, the return on capital lessens, which may also cause the reduction of inequality. Parallel to this, technological development increases the demand for a more educated workforce, and, thus, a larger scope of community services become available. The increase in the level of education of the workforce allows for an increase in the income of wider social strata, which in turn reduces income inequality.

In the 1970s and 1980s, supporters of Kuznets' hypothesis expected a gradual reduction of inequalities, which however was not supported by the data for past decades. Inequality within national states typically increased further. According to the author's argument, this can be explained by the fact that newer technological changes initiate newer inequality cycles. Accordingly, the increase in inequalities observed in the USA is also primarily the consequence of the information technological revolution. However, even the author highlights that, in addition to those attributable to technological changes, a number of other factors also influence the development of income inequality. In the past decades, the extent of the increase of inequality was for example expressly large in the Anglo-Saxon countries, while in certain European countries inequality increased to a smaller extent or not at all, primarily as the consequence of the increasing state re-distribution.

The second part of the book deals with the economic, social and political consequences of increasing income inequality, as well as the resulting economic policy dilemmas.

One of the potential consequences of the income inequalities between countries is migration from the economically less developed regions toward the developed ones. In the author's view, due to the administrative constraints, migration currently contributes far less to the mitigation of global inequalities than it could. Gradual easing of administrative constraints and quotas can however cause both the sender and recipient countries to face major challenges. For the management of these, the author recommends multiple solutions. One would be to give priority to temporary work permits valid for a certain period, the condition of which would be for the employee to return to the sender country for a pre-defined minimum period of time. This could significantly reduce the risk of brain drain for sender countries, and could support the transfer of technology. In the developed countries, the waiver of uniform citizen rights and obligations should also be considered. By restraining the rights of immigrants, the acceptance of boosting migration could increase. Parallel to the boosting of migration, more intensive international coordination seems necessary as well. In the lack of such, for example, those from among the recipient countries that strive after greater income equality may face adverse phenomena, as poorer and less educated migrants would be more likely to choose these countries as their destination, while more educated and wealthier immigrants may rather prefer other countries.

Another important social consequence of increasing income inequality is the weakening of middle class in the developed countries. As a result of the decrease in the political importance of the middle class, democratic institutions may weaken, programmes supporting the poorer strata may be repressed and populism may gain ground. As the consequence of the above processes, the stability and global

dominance of developed Western democracies may decline continuously, and the world can become increasingly multi-centred.

At the end of the book, the author attempts to give a longer-term prediction for the development of income inequalities. His vision of the future is ambiguous. So far, globalisation has been characterised by the "winner takes all" principle, which may further strengthen as a result of technological development. This may further increase income inequalities, for example on account of the expected growth of the rate of products and services that can be sold multiple times. The effectiveness of economic policy instruments targeting the mitigation of income inequalities may lessen. Currently, one of the most effective instrument is to increase the level of education of the society. However, in the developed countries this already seems to be reaching its limits. A high level of education becomes more general, and thus the wealthiest would excel in terms of their education to a lesser degree. In terms of enrichment, social relations and luck will play an increasing role. While in the developed countries an increase in income inequality is more likely to materialise, global inequality may decline further – primarily due to the rapid growth of Asian economies. However, as the development of Asian countries approximates to the global average, their growth will reduce global income inequality only to a lesser degree. In the future, primarily the rapid growth of African countries could contribute to the reduction of global inequality, but for the time being there are no signs that would suggest this.

Although the future is uncertain and difficult to predict, there is one thing the author is certain about: analysing inequalities will remain a constant focus of economics, and as the world economy is becoming increasingly integrated, it is unavoidable for the study of the inequality to step beyond the limits of national states.

The Fed and the Financial Crisis*

Ádám Plajner

Ben S. Bernanke
The Federal Reserve and the Financial Crisis – Lectures by Ben Bernanke
Princeton University Press, 41 William Street, Princeton, New Jersey 08540, 2013, 134 p.
ISBN: 978-0-691-15873-0

Ben Bernanke was the chairman of the Federal Reserve System (Fed) between 2006 and 2014. The book is a transcription of his series of lectures given in March 2012 at George Washington University, consisting of four parts. In these lectures, Bernanke presents the main functions of the central bank in an understandable form, taking the approach of economic history. He then summarises the activities of the Fed going back to its establishment and gives a detailed explanation of the causes of the latest financial crisis, presenting the essence of the crisis management actions of the Fed, and finally he draws some conclusions.

In his first lecture, he presents the role of central banks in the economy and outlines the activity of the US central bank, from its establishment until the end of World War II. Readers well-versed in economics will be familiar with the main functions of the central bank and the related tools. In the framework of monetary policy, the central bank tries to motivate or restrict the economy primarily by influencing interest rates, while in order to maintain financial stability, if necessary, it provides – as the lender of last resort – liquidity to financial institutions that need it, thereby preventing the emergence of a market panic and bank crises. This last function would have been needed quite often from the second half of the 19th century in the United States, since classic bank panics developed many times, sometimes even in the wake of unwarranted rumours. There were many runs by depositors on banks owing to loss of confidence, and these caused the failure of a large number of banks, until the Fed was created in 1914.

The first 15 years of operation by the Fed was a favourable period economically, which ended with the stock market crash of 1929 and the crisis that it triggered. It resulted in a severe economic depression, deflation, high unemployment, and the loss of market confidence once again led to several bank runs. In the opinion of

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Bernanke, from a historical perspective we can now conclude that the policy of the Fed pursued during that period – which intentionally let several thousand banks fail, among others – was not appropriate. Finally, the crisis was overcome by a more loose monetary policy and implementation of the deposit insurance system in 1934.

The second lecture briefly reviews the years after World War II and then presents in detail the causes leading to the most recent crisis. The central bank was granted independence in 1951, which enabled monetary policy to become more effective, but since it eventually grew too loose, by the end of the 1970s inflation had got out of control. This was overcome during the mandate of Paul Volcker, and then for a period of almost 20 years that started in 1987, when Alan Greenspan was the chairman, the economy of the United States was characterised by relatively stable inflation and growth. However, from the end of the 1990s housing prices had gone through a period of very strong increases, and the classic process of a bubble development could be observed. People expected this increase to continue forever, and so more and more people borrowed loans for housing, which was facilitated by the increasing relaxation of the lending conditions. More and more risky customers received loans with constantly dropping down payments, practically without any check of creditworthiness. Eventually, however, housing prices became so high that demand dropped very sharply, and thus the process of price collapse started.

In the meantime, very complex financial products were created related to mortgage loans, and insurance against non-payment by debtors (credit default swaps – CDSs) became common. Even institutions specialised in these products were unable to assess the actual risks involved. Bernanke also states that there were serious deficiencies on the side of the regulator as well: for example, Lehman Brothers was practically not subject to any meaningful regulation. He himself also acknowledges that the Fed did not pay enough attention to surveying and controlling systemic risks. On the other hand, he stands by his position that monetary policy played no special role in housing prices getting out of control.

In his third lecture, he presents the process of how the even more risky securities created by bundling hundreds or thousands of high risk loans with even other types of debt elements led to a crisis of confidence in the financial markets. Investors could purchase these securities sliced up into tranches carrying various levels of risk with relative confidence, since the rating agencies gave the best ratings to these, and they could even receive a guarantee from specialised insurance companies in the case of default on the underlying mortgage loans. It was not even really the defaults that caused the real problem, but rather the fact that no one knew which investors held the most risky parts and who would have to bear the largest losses. This was what led to the crisis of confidence and the total freezing of the market. The investment banks holding the securities had to sell their assets, and the wave of selling pushed the prices of the securities to rock bottom.

The Fed started to provide a significant volume of liquidity, granting over 21,000 loans, not only to banks but also to other financial institutions. Bernanke highlights two cases. On the one hand, giving loans to money market funds, by which they contributed to stopping the withdrawal of capital from these funds, and on the other hand, the bailout of one of the largest insurance companies in the world, which was necessary because the losses incurred on the underlying mortgage loans jumped up to such heights that the obligation to repay these pushed this huge institution to the edge of bankruptcy. This posed a global risk in the opinion of the Fed, so they provided liquid funds amounting to as much as USD 85 billion to the company. In the opinion of Bernanke this step was unavoidable, but at the same time, he expressed his grave concerns subsequently as well.

Finally, in his fourth lecture he focuses on the lessons learned from the crisis, the directions of development in the operation as a central bank and as a supervisory agency. He emphasises that basically, there were not really many new elements not known previously in the management of the crisis. The central bank simply fulfilled its function as the lender of last resort, and the state recapitalised certain financial institutions and provided a guarantee for their bonds. But there were also novelties: communication of the positive results of the stress tests of the banks contributed greatly to the recovery of confidence in the market. Launched in March 2009, the unconventional monetary policy tool of quantitative easing successfully contributed to the reduction of longer-term yields, and the transparent communication of actions planned for the future and forward guidance also served to comfort the markets.

After learning the lessons of the crisis, the financial supervisory agency received stronger powers, an organisation with an overview of the entire system was established, capital requirements were tightened, from time to time stress tests are performed in order to explore their risks, and by now exotic financial instruments have also become more transparent. However, the most important element is probably the attempt to resolve the “too big to fail” problem: work started on creating the conditions of a regulated failure. It is the final conclusion of Bernanke that in the future the central banks must not give priority to monetary stability over financial stability. Monetary policy is a tool that is useful, but not omnipotent.

Simplification, Efficient Governance*

Attila Korencsi

Cass Robert Sunstein:
Simple(r) – The Future of Government
Simon & Schuster, New York, 2013, p. 260
ISBN: 978-1-4767-2659-5

American professor of jurisprudence Cass Robert Sunstein was involved in research at a university before being requested for an assignment that he had always desired: he gets a chance to develop legal norms. Sunstein was head of OIRA (White House Office of Information and Regulatory Affairs) between 2009 and 2012, during the most difficult period since the Great Depression. However, periods of crisis always result in creating new values the hard way, or returning to tried and tested but forgotten old ones.

This book is about how things can be made more simple. Important things are simple, and the entire complicated world rests on these simple truisms. If we manage to identify these simple but important things, they will answer many of our seemingly complicated questions. Sunstein also explores these fundamental issues, and in his book he presents the essence of his experiences gained in the simplification of the work of government, legislation.

How can governments improve, how can they manage their affairs more efficiently? Is efficient governance better governance as well? It is beyond doubt that as a result of efficient governance the intentions of decision-makers are implemented almost without obstructions, but this is still only a technique. Substance, the object of regulation is an equally important, what is more, a determining factor. There is a choice of values underlying the intention of improving governance. We must decide what is it that we want to do and what is it that we do not. Efficiency expresses the intermediary tools that we apply in order to implement our choice of values. The choice of values by the regulators must be formulated, it must be communicated to the target group of regulation in such a manner that the intention should be clear, and the norm should be understandable and possible to be observed. This could be the basis of efficient governance.

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The government is responsible for managing social and economic challenges. Some of these come from outside the scope of control of the government, i.e. they must be considered as given factors, to which responses must be given. On the other hand, some of these factors are within our scope of control, and concerning these we must be proactive. If we respond to a challenge by overregulation, we could lose the power of simplicity. Sometimes too much is less and weaker.

Does the reduction and simplification of rules mean a less regulated status? Naturally, the rule that the right middle ground must be found applies to this matter as well. Not every life situation requires rules of the same depth and level of detail. The essence must be captured, and if we can pinpoint it, then many related questions will be resolved almost by themselves. The major rule will automatically settle the consequential and related issues as well. A case in point is the Ten Commandments. It is a set of a small number of rules that are highly accessible and cover many areas that need to be regulated. They are efficient because they capture the substantial issues, and they are value-principled, because there is a definite choice of values. They settle the fundamental issues, the details follow from this. Naturally, sophisticated social and economic systems require an appropriately detailed system of norms, at the same time, it is also necessary to maintain structural accessibility, so that the fundamental values can be still captured in any system of relations however complex they may seem.

During times of crisis one must concentrate on the essential matters. This intention is also embodied in legislation. We need a regulatory system that mitigates the burdens on society, maintains flexibility and the freedom of choice for the citizens. No one likes living in a jungle of rules, especially when the problems and burdens imposed by the crisis encompass and weigh on our lives anyhow. We need to establish order in the sea of problems. And of course, order should not be created, but rather maintained. But situations can also occur where the maintenance of order is upset, resulting in disruption, and we must accept the difficulty that comes with putting things in order.

Sunstein supports a simple approach that incurs low costs and maintains freedom. He considers governance based on the knowledge of realities as a governance capable of significantly improving the quality of human life. He takes into account the results of behavioural economics. Behavioural economics takes a complex approach to the exploration of the factors influencing the economic, social processes, studies the social, cognitive and emotional factors and their implement on economic decisions, at the level of both the individual and institutions. It integrates the psychological and neo-classical economic theories and establishes behavioural models. It analyses the factors that influence people when they make their choice from alternative options and is mindful of how people actually act, and not only of what action could be assumed, modelled according to economic

theories. Creating a foundation of experiential facts for decisions is at least as important as paying attention to common sense when making decisions.

We make decisions based on actual facts, instead of dogmas, hunches and anecdotic information. If by dogmas we mean such fixations whose connection with reality is at least unverified, then naturally, it is sometimes justified to reject them. But the question remains: can everything be changed? Why are dogmas considered unchangeable? There is no way to avoid the need to explore the content of the dogma as well. If we explore that, we may find ourselves facing values that should be preserved and carried on. Loyalty and creativity are two concepts that never exclude each other, indeed, if we are lucky, they could deliver the best results when applied together.

Sunstein intended to simplify regulation in an effort to counter unjustified complexity, accumulating burdens and costs. Whenever the law allowed it, in their work at the OIRA they always insisted on carrying out a thorough analysis of the expected costs and benefits arising from the new legislation. They focused on economic growth and job creation, ensuring that neither of these aims should be subordinated to the other.

The existing statutes also had to be reviewed from time to time, to check whether they still served their intended purpose. The basis of deregulation is to assess whether they are necessary, and if so, they are efficient in their existing form, or they should be amended while preserving the purpose of the regulator. The regulator must ask the questions of what will be the result of regulation, what do I want it to result in? Today, we have a constantly widening scientific toolset to answer these questions. Assessment must be made prior to creating the statutes and also after they have become law, and in this work we could use as a guideline the following principle that is simple but expresses the essence: what is good should be done, what is bad should be avoided. Naturally, both of these actions require lots of courage.

As presented by Sunstein, in the United States the OIRA is the regulatory arena. No federal executive legislation is allowed to be introduced without the participation of the OIRA. Executive orders on the implementation of laws and defining the detailed rules are often essential pieces of legislation in the American legal system, because several laws are almost inapplicable in themselves, they refer so many questions to the powers of the executive government agencies. Naturally, the legislator does not leave the task of creating the detailed rules to another body out of laziness, but rather because it knows that its fundamental task is the development of a strategy, to decide conceptual matters, and it also knows that the detailed rules should be defined at the level where the creator of the rules has access to the necessary information.

The OIRA reviews these draft executive pieces of legislation before they are issued. The professional staff of the OIRA reviews the drafts and sends them for assessment to the ministries and offices affected by their topic. This is a wide public administration alignment process, which ensures the involvement of the affected parties and the appropriate sharing of information.

However, we can ask the question of what is the use of all this? Why do we spend money on regulatory authorities? The citizens consider their expectations important. They need safe food, clean air, potable water, etc. But rules are also required for these to be available. Naturally, it makes a difference how many rules there are and what are their contents.

No society can function without rules. As Friedrich Hayek put it, the state cannot be passive in any social system. The state should be at least reflective, but often also proactive. The state should have an opinion on the things going on in the world, and it should also shape them by regulation wherever it is considered necessary. An efficient, competitive system also requires a reasonably designed and constantly maintained legal framework. A well-chosen regulatory framework also regulates and controls the regulators. Therefore, an architecture of choices is also necessary for the creators of the choices.

This book is not the first time where Sunstein has dealt with the world of motivating, influencing rules, also called nudges. Together with Richard Thaler they wrote a very successful book on the nudges promoting and motivating happiness and health.[1] A nudge does not enforce decisions, rather it preserves the freedom of choice, but offers you the opportunity to make the decision that best suits your own interests. These are rules that facilitate choosing, provide information, call attention to the choices and motivate to make a choice. Making things simple and transparent, so that everyone should find their choice among the offered opportunities.

Free market and personal freedom are the freedom of choice. This is the typical American life principle. The individual knows what they want, what is good for them. To let people take their own routes. This is also the freedom of error. This American feeling goes back to the initial "occupation" of the country, but since then the world has become more complex many times over, at least as far as the accomplishments of technical and technological developments in the world around us are concerned. People have always required assistance with making their own decisions, they requested advice from wise people and also relied on the experiences of others. Today, we need this more than ever before, and most of us take assistance from others for our decisions. The nudges also fulfil this function of assistance from the state, they provide information, but leave the choice to the individual. The world

[1] Richard H. Thaler, Cass R. Sunstein, Nudge: Improving Decisions About Health, Wealth, and Happiness (*New Haven, CT: Yale University Press, 2008*).

of incentives is based on the accurate understanding of human thinking and action. The best incentives result in significant benefits at low cost.

Human thinking consists of two cognitive systems. The first is automatic, instinctive, intuitive, and the second is pondering, interpreting, capable of handling different relations and complex situations. When we perform a cost-benefit analysis, we slow down our fast, automatic decision-making, pondering the opportunities, evaluate the costs and the expected benefits.

People are prone to procrastinate their decisions. One of the elements of procrastination is that we only think for the short run, it is difficult to plan for the long run. The future seems incalculable. This also depends on whether we are capable of long-term thinking. Do we have a vision of the future? Do we place today's decisions in a wider perspective? Should we dare make a commitment? These questions apply both at individual level and the level of the society. We must make our decisions shaping our future in the present. The people of the modern era have lost the horizon. However, our present short-sightedness is dangerous. We must explore what it is that hides the perspective. We must identify these things blocking our view, we must assess whether they are really necessary or can be removed.

Concerning the automatic rule, the starting assumption is that the automatic rule serves the interests and protects the rights of the people. Such an automatic rule is, for example, when a service provider is not allowed to send advertisements or disclose our details to another service provider for marketing purposes, unless we specifically request that. If we do not request that, it may not do so under the automatically applied rule. In another example, in one European country the organ donation rate is 99 per cent, while in another it is only 12 per cent. The reason of the difference is that in one it is an automatically applied rule that the intact organs of every deceased person may be used for transplantation, unless that person expressly declared earlier that they excluded this option. In the other country the organs may only be used if the person expressly consented to that earlier. This is a significant difference in terms of the method and the outcome.

People are prone to laziness, which is one of the major inherent flaws of human nature. We are happy about a regulation if we do not have to do anything. It confirms our opinion that the regulation must be right, since this is the direction considered appropriate by the majority and by the leaders. This is the better choice, not the other one.

So what can we say about a good automatically applicable rule? It reflects the choice most well-informed persons. On the other hand, when the opinions are too diverse on a particular issue, we should not apply an automatic rule, i.e. when several, equally good competing alternative options exist.

An individual identifies better with the norms followed by society than with the regulations of the state. The state is far away, and no one has made a judgment on the adequacy, appropriateness of the statute of the state. However, if the social majority follows the norm of the state, then it is presumably a proper rule, and an individual is also a member of society, they feel this medium closer to themselves, they resonate more with it. The internal identification expected for observing the norms develops better if the majority of the society follows the norm. If the norm is followed because of fear of sanctions, as result of external coercion, then ultimately, the rule will be observed, but internal motivation will be lacking. Naturally, social pressure is also a kind of external coercion, but after all, people belonging to the same community as we have verified that the norm is appropriate.

Normative regulation also has a function expressing social expectation. Representing society, the legislator recognises the need for the rule, formulates the norm and makes sure it is implemented. This requires everyone to adapt, ultimately to one another.

Pieces of legislation are the way the social norms are expressed. On the one hand, they articulate the social consensus concerning the subject of the regulation, on the other hand, they have a role in conveying the choice of values of the government, in shaping the opinion of society on various things.

What does simplification in legislation mean? Less rules, more common sense. However, the Dodd-Frank Act, intended to reform Wall Street, is not known for its simplicity or brevity, although its main objectives are the prevention of financial abuse and aspects of consumer protection. The aim is not to suppress federal competences, but rather to make governance much more efficient, much less disorganised and counter-productive, to make it and simple, whenever possible, without a major reduction of the functions of the state. This can be quite a revolutionary aim in itself. Simplification may result in more freedom of choice in certain areas, while in other areas the result may even be more rules with more detail. Professionally competent public administration and politics conveying choices of value joint provide successful operation. The more there is consensus in society on the value system to be followed, the less the chance and the need for bureaucratic regulation. The United States of America is proud of its constitutional order, and the provisions and authority of the Constitution is never challenged. Naturally, it is not the letter that deserves respect, rather the legal culture of several centuries that carries the written rule and converts it to value.

The New Silk Road into the Future Report on the Lámfalussy Lectures Conference of 23 January 2017*

Ferenc Tóth

On 23 January 2017, the Magyar Nemzeti Bank organised for the fourth time the meeting entitled Lámfalussy Lectures Conference, with about 450 participants, in commemoration of Sándor Lámfalussy, an outstanding European economist of Hungarian descent. Several renowned economists, politicians and representatives of the business sector participated in the conference – including Prime Minister *Viktor Orbán, Jacques de Larosière*, former Managing Director of the IMF and former Governor of the Banque de France, former president of EBRD, *Tien Gouli*, Chairman, Bank of China Ltd. and *Sir Paul Tucker*, former Deputy Governor of the Bank of England.

With regard to the national day of mourning ordered for Monday in memory of the Hungarian victims of the bus tragedy in Italy, the Lámfalussy Gala traditionally preceding the conference was cancelled, and thus as an exception, the Lámfalussy and Popovics prizes founded by Magyar Nemzeti Bank were awarded as part of the Lámfalussy conference. By granting the Lámfalussy Prize, MNB recognises outstanding professional performances that exert influence on international monetary policy. The Lámfalussy Prize was awarded to *Jacques de Larosière* this year. The Popovics Prize, commemorating the first Governor of the MNB, is a recognition awarded by the central bank to outstanding professional achievement in the field of economy and finances. The Popovics Prize was awarded to *Barnabás Virág,* Executive Director of MNB.

In his opening speech, *György Matolcsy,* Governor of Magyar Nemzeti Bank noted that the purpose of the conference was to build strong political, intellectual, economic, financial and human bridges between Europe and Asia, more specifically between the European Union and China. Europe is a strange continent: over the last 500 years a unique European success story has been built. However, in the first half of the last century we devastated Europe, in the second half we managed to rebuild it and to develop very strong cooperation in the framework of the European Union. The introduction of the euro started out as a promising venture, and at first it proved to be a great success, but after 2008 it turned out that huge mistakes had been made in the European Union and in the euro zone. As a result, the vision of the future of the

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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European Union was shattered, and many jobs were lost. The position of the common European currency was also weakened, and one of the reasons for this weakening is rooted in the economic policy of the European Union. Sándor Lámfalussy emphasised the importance of financial stability several times, which is strongly required in order to ensure growth and create jobs, so we can rebuild the future of a crisis-torn Europe. However, this should not be accomplished by introducing austerity measures, because such measures lead to loss of jobs and the lack of GDP growth and loss of trust, resulting in an unsustainable macroeconomic course. We need financial stability in order to rebuild Europe and make the euro successful, so that we once again should have economic growth, a European vision of the future and jobs. The main message of the opening speech is the recommendation that we should build strong bridges between Europe and Asia, primarily with China. One of the beneficiaries of the "One Belt, One Road" concept of China could be the European Union, within that the Central East European region, and especially Hungary.

Concerning the future of European integration, in the opinion of *Jacques de Larosière* we are lacking a long-term vision of the future, a clear strategy. We need more powerful convergence, homogeneity among members of the euro zone in terms of economic performance, since at present their indicators of competitiveness are substantially different. For that purpose a "Ministry of Convergence" should be set up, which would promote implementation of the required economic adjustments. The European Union is not capable of levelling off the structural disparities among the member states. This could have been an aim, but it was excluded at the very beginning, although at least a minimum level of consistency is very important and should be one of the pillars of the European Union. The real question is whether the European system sounded the alarm bells in time, to warn about the problems. The answer is: no, this did not happen, despite the warning statements of ECB. Finally, the market signals triggered reactions, but too late. In total, the convergence of the member states of the European Union is a failure. We do not need a Europe where the volume of regulations keeps rising and the investors are burdened with more and more constraints, but rather one where capital may flow freely in both directions. In addition, it is important that we cannot request additional fiscal austerity in countries where unemployment is already high.

In his lecture *Tien Gouli*, Chairman, Bank of China Ltd. said that the "One Belt, One Road" initiative of China offers a vision of the future and several opportunities. It connects two markets of outstanding importance. On one end Europe can pride itself on its developed technology and great experiences, on the other end we have Asia with its fast growth, huge demand and ample labour force. They mutually complement each other, and once these two markets have been integrated, it will become the longest economic corridor of the world, with the largest potential. This initiative was suggested by Chinese President Xi Jinping in 2013 and was also highly appreciated by the UN. Hungary was the first European country that signed the relevant cooperation agreement with China.

The first priority area is infrastructure, with the purpose of implementing infrastructure connections. He highlighted the development of the Budapest – Belgrade railway line, expected to be completed in 2017, which means a connection of key importance in the Chinese – European mainland and sea express routes, and which will contribute to Hungary becoming a regional transport and logistic hub.

The second emphasis is on production, on our support of capacity cooperation between China and Europe, furthermore, the creation of economic and commercial cooperation zones. Leaders of Europe and China have reached consensus in coordinating the Chinese initiative with Juncker's investment for Europe. The third focal point is on institutions and systems, in order to facilitate trade and investments.

Regarding financial resources, the Asian Infrastructure Investment Bank (AIIB) and the European Bank for Reconstruction and Development (EBRD) will play a significant role. China joined the latter in 2016.

In his speech, Prime Minister *Viktor Orbán* recalled his memories of Sándor Lámfalussy, who worked with him as an advisor, and who could differentiate between the current political regime and the country, which is a sign of great wisdom. Sándor Lámfalussy was a person of open mind and integrity. The Prime Minister explained that we believe in a democracy based on argumentation. The euro required firm political will. Sándor Lámfalussy said that politicians would eventually recognise the need to establish a fiscal and political union to support the monetary union.

We learned from Sándor Lámfalussy that politics, the stability of politics, is the basis of successful economic policy. A prerequisite for a strong economy is that representatives of the financial world and politics should draw the cart in the same direction. When the MNB was in opposition, Hungary underwent much unnecessary suffering. Since the MNB has not been in opposition and seeks cooperation with the current administration, economic growth has been spectacular.

Since 2008 a paradigm shift has been happening in world economy and politics. It is a benchmark of success how well the individual countries are able to follow this change. After 1990 the world was unipolar for 20 years. The new paradigm is about a world with multiple centres of power, but there is no consensus on this.

One of the key questions is: How should we interpret today's world situation? The President of the largest state, the USA, has resolved to accomplish great changes. One of his key statements is this: "Every nation has the right to put itself first." The era of multilateralism is over and the time of bilateral relations is starting. This is good news for us. There will be more poles, more models, which open up space for bilateral solutions. Today, the world economy is sustained by the existence of different economic models. This opens up opportunities.

Russia has survived the attempts of the West to isolate it and topple its political regime, the low oil prices, the sanctions, the operations of NGOs. It would not be reasonable, especially in Europe, to ignore the power and also the opportunity provided by Russia.

It is important to realise that long forgotten commercial roots are being revived. One of the first steps in this process is the "One Belt, One Road" initiative of China.

The other important question is: What does Europe look like, as seen from Central Europe? The answer is: we can hardly recognise it. It is struggling with four great crises at the same time, but so far it has not been able to settle any of these appropriately:

1. growth, competitiveness crisis,

2. demographic crisis,

3. security/public safety (terror) crisis.

4. foreign policy crisis (Syria, Ukraine).

The European continent has been increasingly weaker, it is drowning in debt and economic growth is slow. From a global player it has become a regional player, and it has to fight even for that status. Europe has set ambitious objectives, but it has not been able to deliver on any of them (e.g. that the euro should be one of the reserve currencies of the world, that it should build up a security policy relying on its own power, and develop the economic region of Eurasia). We are not talking about a general decline, but rather the failure to accomplish specific objectives. The reason is: Brussels has become captive to the utopia of a supranational Europe. This is an illusion. Europe has always been strong when it was controlled from several centres of power.

The fundamental question is: how can we make Europe competitive.

1. We should abandon the illusion of federalism.

2. Europe should be made multipolar. This is exactly the aim set by the Visegrád countries for themselves, and they want to become one of these poles, also competing with the rest of the European poles.

3. Europeans should embark on new types of cooperation schemes, e.g. with the USA (instead of the now dead free-trade agreement) and with China. Let us reconsider the question of Russia. Let us participate in the competition for concluding agreements, from which we are constantly left out.

4. The financing of the individual European national economies should be reconsidered. EBRD understands this problem quite well and knows the right direction, Hungary is interested in expanding the activities of this bank, especially in Central Europe. The Bank of China is here, and supports us with financing issues.

5. There should be more emphasis on innovation in a European context. The position of Hungary is good in this, but we should increase the appropriations allocated for this purpose in the Hungarian budget as well.

Connected to the thoughts of Mr. De Larosière, concerning the issue of demography it is safe to say that a nation or community that is not capable of reproducing itself does not believe in its own future. As for the common foreign and security policy, it is a substantial issue whether or not we can defend the continent without America. The solution is a security cooperation between Germany and France, in order to create a common European defensive alliance.

It can be said about Hungary that from a black sheep it has become a success story. In 2010, there was no economic growth, public debt exceeded 85 per cent of GDP, inflation could not be pushed down below 6 per cent, the deficit of government finances was out of control, it stood at 7 per cent, unemployment was hovering in the range of 11.5 to 12 per cent. Now, the public debt to GDP ratio is on a declining path, the deficit of government finances is steadily hovering around 2 per cent, the economy is growing at a rate of about 3 per cent, the unemployment rate is about 4.5 per cent and is approaching full employment. This required political stability, without it there is no economic success. We need a tight, equitable fiscal policy, the creation of a work-based society, and the establishment of a dual training system. Opening to the east is part of the Hungarian recipe.

The panel meeting held in the morning, moderated by *Dániel Palotai*, Executive Director and Chief Economist of Magyar Nemzeti Bank, discussed the topic of "Can the Silk Road Tune up Growth? Opportunities in the European-Asian Economic Cooperation". It was also about the future of the European integration.

Dr. CHEN Zhimin, Dean and Professor, Fudan University presented the "New Silk Road" concept and the three-level commitment of China to Europe. These three levels are: the level of the state, the subregional level and the level of the European Union. In his opinion, the essence of the "One Belt, One Road" initiative is the establishment of an economic network. We need projects aimed at creating connections: transport connections, connections between commercial and financial policies, connections between people. We need flexible agreements adapted to the local conditions.

Dr. YAN Xuetong, Dean and Professor, Tsinghua University explained that in his opinion bilateral agreements are easier to conclude than multilateral ones. Cooperation extends not only to the economy, it should also focus on politics, security and culture, otherwise its effects will be limited. Cooperation at the level of the state is not enough, it is also important that relations be established in the private sector. Countries should not and cannot copy the models of other countries, because they are so different. In the Chinese – Hungarian cooperation, Hungarians

are able to retain their characteristics and their uniqueness. The experience of foreign countries should be utilised in such a manner that we should convert them in a way suitable for our own country, nothing should be adopted as it is.

Senior economist *Erik F. Nielsen*, Group Chief Economist, Global Head of CIB Research, UniCredit Bank AG noted that in the majority of the euro zone per capita GDP growth is still similar to that of the USA. Naturally, the euro zone has its own problems, as do other countries. He considers the Chinese initiatives to be a great idea, for a number of reasons, including the support provided by the initiative to the growth of investments in the public sector. This is one of those areas where countries of West Europe are rather weak, especially in the build-up of infrastructure between states. This initiative should also be welcome because it strengthens competition. He highlighted the role of the private sector in the cooperation with China. He emphasised that he fully respects and admires China for the results it has accomplished over the last 40 years, especially in the field of growth and the elimination of poverty and privation on the largest scale ever. In addition, it has also seen amazing development in the field of tools and institutions of governance.

After that, *Ivo Maes*, Senior Advisor, National Bank of Belgium and Robert Triffin Chair, Catholic University of Louvain reviewed the book "Alexandre Lamfalussy – Selected Essays" he edited and presented the professional career of Sándor Lámfalussy.

The title of the discussion forum of the panel moderated by *Jacques de Larosière* was: "The future of European integration. What are the centrifugal forces threatening it and what should be done about it?".

Sir Paul Tucker, former Deputy Governor of the Bank of England raised the following issues in his discussion opening speech: the banking union, the monetary union, the capital market union and the institutions of the EU. He noted that it was important to ensure that the legislation of the Union should be in accordance with the values and interests of the given member state. The establishment of the banking union is a great accomplishment, but it should have been created much earlier. At the same time, it cannot be deemed completed. For example, the European deposit insurance system is missing, which would be a precondition for financial stability. In addition, a certain degree of fiscal union is also necessary. Several options may exist for a way out of the fundamental competitiveness problem: 1. German wage inflation should significantly exceed the level of the countries of the periphery 2. a significant transfer of resources should take place from Germany and the Nordic countries towards the southern countries, 3. some countries should leave the euro zone.

The capital market union could improve the operation of the euro zone by assigning the risks to the private markets, and let them price the incurred risks.

Paul De Grauwe, Professor, John Paulson Chair in European Political Economy at the London School of Economics and Political Science, shared his thoughts on the future of the euro: the euro zone is characterised by low growth and high unemployment, the system was already developed wrongly in the stage of design. The solution is a political and budgetary union and a kind of consolidation of national debts. Fiscal policy should focus on government investments, since the austerity programmes have so far led to a drop in government investments. Germany in particular should launch more investments of this kind, since it can practically finance itself at no cost. It is difficult to understand why the governments are unable to find investments whose return rate exceeds 0 per cent. A kind of integration "fatigue" can be felt, and although the political union seems far away, small steps should be taken in this direction.

Thomas Mayer, Founding Director, Flossbach von Storch Research Institute, gave a presentation with the title of "Future of European integration – centralisation is dividing Europe". He sees two major problems: the lack of efficient control on the Schengen borders, and the euro as the only currency of the euro zone. Upon its birth, the euro was provided with two characteristics: 1. Commodity money (means for exchange and store of value); 2. State money (financial instrument, the central bank is the Lender of last resort not only for banks, but also for governments). It must be decided which of the two is the real identity of the euro.

Europe needs a more modest vision of the future: the EU can only be created as the political community of several distinct nations, in such a manner that fundamental sovereignty is retained at national level, certain areas should be delegated to Union level, and various circles of integration should be established in European Union.

György Szapáry, Chief Adviser to the Governor of Magyar Nemzeti Bank, said that now is the first time in the history of the Union that the Union is divided by multi-dimensional political issues, as well as non-technical economic issues, such as the Maastricht criteria, financial requirements, which have generated complex and time-consuming disputes but did not create such a deep division. He spoke about migration, Brexit, Russian sanctions and the issue of Turkey. He highlighted that the FX rate agreements preceding the euro had been worse than the euro. For the European economic integration to be strengthened, we need responsible governments and stronger institutions that honour the rules.

György Matolcsy closed the conference by stating that Hungary intends to continue acting as a bridge between Europe and Asia in the future as well, in which the Lámfalussy Conference is an important station. Several valuable thoughts have been stated and many important questions have been raised, which we can respond to together.

7th Annual Financial Market Liquidity Conference*

Péter Csóka – Dániel Havran

7th Annual Financial Market Liquidity Conference (AFML2016)
Department of Finance, Corvinus University of Budapest – *Game Theory Research Group, Centre for Economic and Regional Studies, Hungarian Academy of Sciences*
Budapest, 17–18 November 2016

Established in 2014, the *Financial Research Centre* of the Department of Finance of the Corvinus Business School organised an international conference on 17–18 November 2016 at the Corvinus University of Budapest, in cooperation with the "Momentum" *Game Theory Research group* of the Centre for Economic and Regional Studies of the Hungarian Academy of Sciences[1].

In autumn 2016, a conference on the subject of financial market liquidity was organised for the seventh time, with about 170 registered participants, including not only actors of international and domestic scientific life, but also our interested corporate partners and students. The keynote speaker of the conference was *Anthony Saunders* (NYU Stern School of Business), a renowned professor of financial institutions and international banking, Head of the Department of Finance (Stern) between 1995 and 2006. Other speakers were *Carlo Acerbi* (MSCI), *Nihat Aktas* (WHU Otto Beisheim School of Management), *Jonathan A. Batten* (Monash University), *Zsuzsa R. Huszár* (National University of Singapore), *Christoph Kaserer* (Technische Universität München), *Andrew Kalotay* (Andrew Kalotay Associates, Inc), *Dimba Kier* (Morgan Stanley), *Rosario N. Mantegna* (Palermo University), *Balázs Szentes* (London School of Economics), and *Niklas Wagner* (Passau University). In addition to the 11 invited speakers, there were 39 speakers who applied in response to the call for participation, and the scientific

* The views expressed in this paper are those of the author(s) and do not necessarily reflect the offical view of the Magyar Nemzeti Bank.

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[1] http://www.uni-corvinus.hu/index.php?id=conference2016

board of the conference accepted their applications; eight of these applicants were able to participate with a poster.

The conference was opened by Dean Mrs. Zita Zoltay Paprika. She highlighted that this year is the first time when there is a triple parallel panel as well, and this year the journals Studies in Economics and Finance (editor-in-chief: Niklas Wagner) and Finance Research Letters (editor: Jonathan A. Batten) were paying special attention to the articles of the participants.

We are proud to say that the conference accomplished its purpose this year as well, which was to bring together actors of scientific and practical financial life for a friendly discussion of the most recent liquidity-related results in an interactive atmosphere. We thank our sponsors (Foundation of the Department of Finance, Pallas Athéné Domus Scientiae Foundation, BSE, CFA Society Hungary, KELER KSZF, MSCI, Magyar Nemzeti Bank, Morgan Stanley, HAS Momentum Programme, OTP Bank) for their support.

The next conference will be held on 16–17 November 2017, with Andrew Karolyi (Cornell University) as the keynote speaker. We recommend it to practicing professionals and managers who would like understand and explore the most recent answers of science given to questions generated by market needs, thereby acquiring a competitive edge in making both operating and strategic decisions.

Further useful information is provided on the website of the conference:

http://liquidityconference.uni-corvinus.hu/

INSTRUCTION FOR AUTHORS

Manuscripts should be submitted in accordance with the following rules.

- The length of the manuscripts should be limited to 40 000 characters (including spaces) but a ± 50 per cent deviation is accepted. Manuscripts should be written in Hungarian and/or English.
- Papers always begin with an abstract which should not exceed 800–1000 characters. In the abstract a brief summary is to be given in which the main hypotheses and points are highlighted.
- At the bottom of the title page a footnote is to be given. The footnote contains every necessary information related to the paper (acknowledgement, relevant information etc.). This is followed by the name of the institution and position the author works at, e-mail address in Hungarian and English.
- Journal of Economic Literature (JEL) classification numbers should be given (three at least).
- Manuscripts should be written in clear, concise and grammatically correct Hungarian and/or English. Chapters and subchapters should be bold.
- Manuscripts should contain the list of references with the first and surname of the authors (in case of non-Hungarians the initials of the first name is required), the year of publication, the exact title of the book, the publisher, the place of publication. In case of papers, the exact title of the journal, the year, the volume, and the pages should be indicated. References in the text should contain the surname and the year separated by comma. When citing, the exact page be indicated.
- Tables and figures are to be numbered continuously (chapters and subchapters should not contain restarted numbering). Every table and figure should have a title and the units of quantitative values are to be indicated. Tables and figures are to be made by MS Word and Excel in Hungarian and English. Notes and sources are to be put directly at the bottom of the tables, figures.
- Equations should be aligned to the right and should be numbered continuously in parenthesis. (Chapters and subchapters should not contain restarted numbering.)
- Manuscripts are to be sent to the Editorial Office of the FER only. Papers are peer-reviewed by two independent and anonymous reviewers.
- Manuscripts should be sent as attachment by e-mail in MS Word file. Figures and tables should be sent in MS Excel file both in Hungarian and English.
- In case of further questions related to the manuscript visit the following website: *http://english.hitelintezetiszemle.hu/letoltes/authors-guide-en-1.pdf*

Thank you!

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