LOVEMARKS OR PASSION BRANDS MAY CREATE BARRIERS TO PRIVATE LABELS IN THE DIGITAL AGE

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ABSTRACT

With the growing number of national brands differentiation and brand building was never harder than today. Moreover, the powerful appearence of private label competition opened up a new field within the competitive landscape. Companies realized that good quality and trust is not enough to win consumer's loyalty. They need to be engaged on an emotional level to create loyalty beyond reasons. Lovemarks and Passion Brands concepts elaborate this idea. My article focuses on the introduction of these concepts, and their applicability to retailers. With the digital age, numerous consumers went online, and created an important online community, that is powerful enough even to change the branding strategy of strong brands. Therefore the measurement of emotions within the online community gave a new and additional perspective on brand equity. The article discusses the limits and the advantages of these concepts and methods, with special focus on retail branding.
(Keywords: private label, Lovemarks, passion brands, social media)

INTRODUCTION

Among marketing experts and professionals the story of the Pepsi Cola's blind test is well known. And so is the conclusion: consumers mostly preferred the taste of Pepsi vs. Coke in the blind test, but were not asked if they would be willing to give up their „old" coke for a new one, that tasted „better", considering the results of the blind test. In 1985 the Coca-Cola Company - wanting to revitalize their brand - withdrew its original coke. Consumers started to protest heavily against New Coke. Finally the company decided to return to the original coke formula and rename it to Coca-Cola Classic. It was a painful and expensive lesson even to one of the biggest players among multinational companies. Coca-Cola did not consider the power of their brand equity well enough. Consumers are willing to pay more, and even override their sensual considerations („tastes better") by the power of a brand. Today Coca-Cola is able to sell BonAqua bottled water, which is nothing more than cleaned tap water with little minerals added, for the same price as other real mineral waters. Moreover they would pay ten times more for a mineral water like Evian. *Lincoln and Thomassen* (2008) even suggest that the target segment of Evian is: EVIAN to be spelled backwards...

As a reason of the growing power of retailers and their private labels, some researchers even foresaw the end of national brands. It is a challenging time for producers to keep their brands on the shelves in the stores, and moreover to convince their customers that their price advantage is still worth every penny. The

economic situation, the concentration of retailers and the ever-changing customer behavior gives the prediction for a solution for fighting off private labels: Creating Lovemarks!

The article investigates branding concepts that have been known for some time, but have not been measured online. Therefore extensive secondary research was conducted to analyse the different concepts and attempts in related measurement methods being developed internationally. Therefore the article aims to provide the base for further research and discussion in a field, which has not been investigated in-depth yet.

DISCUSSION

The „new" field of the game: National Brands vs. Private Labels

For decades the competition for national brands was mostly focused on other national brands. Manufacturers tried to build their brands not only to differentiate, but to be trusted. All of them followed the same strategical approach: invest in ATL activities, such as TV commercials, print, cinema, online advertising, etc. The real focus was on building their brand equity. *Brand equity* is defined as „a measure of the brand's ability to capture consumer preference and create loyalty" (*Kotler and Armstrong*, 2010, pp. 260.). But brands are not only there to deliver unique benefits or differentiate themselves from other brands, but they are also in the minds of the consumers. These unique benefits or even trust is not enough to compete with the forthcoming competition of private labels, and their „value-for-money" concept offer. Retailers have also started to build their brands, using similar strategies that manufacturers used to: TV commercials, celebrity advertising, and most of all, in-store marketing (*Kelemen*, 2010a). As a result in the *MillwardBrown Brandz* (*Schept*, 2012) Top 100 most valuable global brands list there are several retailers: Walmart is the 17th most valuable global retailer brand followed by Tesco, Target, Aldi, and Carrefour. All of these retailers have done significant rebranding to strengthen their brand names, naturally using their private label brands as well. In the UK, Marks and Spencer and Tesco are in the TOP 10.

Beside the fact that retailers started to build their brands, there is even a greater challenge for manufacturers. As distributors are the gateways to customers, they control shelf space. And they use this power by pushing more and more their own brands. Walmart cut big brand names Hefty and Glad bags from its food storage shelves in favor of its own Great Value brand. The two big brands were only able to get their shelf space back when Hefty increased its advertising more than sevenfold, and agreed to produce Walmart's own private label brand. Glad increased its ad spending by 58% in 2009 (*Consumer Goods Technology*, 2010). Even such strong brand names as Kellogg's or Ariel can be delisted in a second and lose more than 30% of the Scandinavian market overnight (*Lincoln and Thomassen*, 2010). Although the financial recession changed consumer preferences, experts agree, that only those brands will have a future that can be trusted and recommended (*Schept*, 2012), therefore customers will pull them out from stores. But trust also may not be enough. According to *Kevin Roberts*, the CEO worldwide of Saatchi & Saatchi, only

trust will not make a *lifelong commitment between the customer and the brand*. The company needs to go further and should create love affection, or how he calls these brands: *Lovemarks* (*Roberts*, 2004).

Mark Ritson (2003) conducted a research, where fifteen respondents were selected based on their demographics and their brand loyalty to a range of brands to provide empirical reasons behind strong brand loyalty. For six weeks these brands were withdrawn from their lives, and replaced by generic products in unbranded containers. Some of these brands were: Nike shoes, Vaseline, Lavazza coffee, Heinz ketchup, etc.. The participants were interviewed before, during and after the period of research. Although before the test started, all have identified superior product performance as the basis of their loyalty, during and after the test, many indicated that generic products performed just as well, and in two cases even better than their favorite brands. At the same time, after the test all have returned to their original brand choices. „Interpretive analysis indicated five main types of reasons behind unusually strong brand loyalties: habit, unique sensory stimuli, intergenerational influence, emotional security and fit with personal identity." (*Edwards and Day*, 2007, pp. 54.). Brand loyalty is closely related to brand equity and performance. As from the above research is visible, brands can develop loyalty beyond reason, that makes it almost impossible for generic products to succeed.

Introduction to lovemarks and passion brands

Creating brand loyalty is easier to be said, than done. Academics and practitioners agree that product performance is not enough to win the customer for a lifetime. Brands need to attach consumers emotionally. The above mentioned *Lovemarks* concept defines a Lovemark as 'a product, service or entity that inspires Loyalty Beyond Reason' (*Saatchi & Saatchi*, 2012). This concept is based on the idea that brands are tired, conservative, and cannot understand new customers. According to *Roberts* (2004) people are driven by emotions and not by their rational senses. Brands cannot connect with them unless they follow this new trail. Today, in the digital era, customers' emotions and commitment will make or break a brand's future. Trust is not enough as private labels are catching up on this dimension by providing good and reliable quality. Companies have to create an emotional bond with consumers by being *passionate* about their brands, *involving their customers, rewarding loyalty, focusing on heritage and taking responsibility*. Some Lovemarks, such as Coca–Cola, Nike, Apple, Starbucks, M&M's have been successfully following this strategy. Nike employees are even „corporate storytellers" who share the great stories of the company. Nike stories incorporate heritage, and offer archetypes that people can learn from. But what makes a brand a Lovemark? In Roberts' book, he identifies three major factors that can transform a brand to a Lovemark (*Figure 1*).

These factors are difficult to imitate. One may argue, that in the case of a private label product, from the category: sensuality, the visual and taste elements might resemble enough to a manufacturer's brand to be chosen by the customer, but then let's remind ourselves about the Cola fiasco, that even these two elements can be more than distinctive in consumers' minds.

Figure 1

The factors determining Lovemarks

Source: *Roberts*, 2004

This approach, of considering brands as a part of the consumer's identity on emotional bases, is not newfangled, but comes to the front more and more. *Edwards and Day* (2007) suggest another approach concentrating on the producers' side. In their book – Creating *passion brands* -, they offer a methodology in two phases. In the analytical phase companies have to analyze their brand's aspects and its environment. In the creative phase, using the results of the analysis, the passion brand identity needs to be formed. The authors have generated the „brand trampoline model" (*Figure 2*) to help this methodology. This governing model resembles to a trampoline that has four legs: capability, ideology, consumer and environment. „The points where these four forces intersect is called the Passionpoint; this is where to focus efforts, to create the brand's identity and total marketing offer." (*Edwards and Day*, 2007, pp. 97).

Capability stands for matching the attractive beliefs that the company can offer with its credentials. In other words: what we offer needs to be credible. *Ideology* covers what the brand stands for. *Consumers* are outsiders or mavens who can bring fresh ideas. Last but not least *environmental* issues are to be considered, as consumers' values shifted towards sustainability (*Schept*, 2012). If any of these four factors are not well balanced, it would lead to misdirected brand strategy, therefore the strategic fit among the four factors are essential.

Lovemarks or passion brands are identified by the consumer. *Newlin* (*Ferrante*, 2009) goes even further by defining passion brands as „a brand you feel so strongly about that when you recommend it to a friend and the friend does not love it the way you do, there's a question mark over the friendship, not the brand." On lovemark.com anybody can nominate a brand for a Lovemark. If we look around in

Hungary, we could just as well find some very strong and special local brands that could be nominated as passion brands: Túró Rudi, Pick, Herendi, Zwack Unicum, etc. These brands all have their history, their great stories, created emotional bonds, some based on nostalgia, some on national heritage. What is vital, *they cannot be substituted in the eyes of the customers*, even; if rationally there are better products available. *Bradley et al.* (2007) argues that these Lovemarks also have to be shared by a wide variety of consumers. Even anti-Lovemarks such as the Edsel had diehard supporters, so to be considered as a true Lovemark like: Apple, Google, Target… the brand needs to have substantial emotionally involved customer base.

Figure 2

The Brand Trampoline with a weakness at one leg – resulting in a misdirected brand strategy
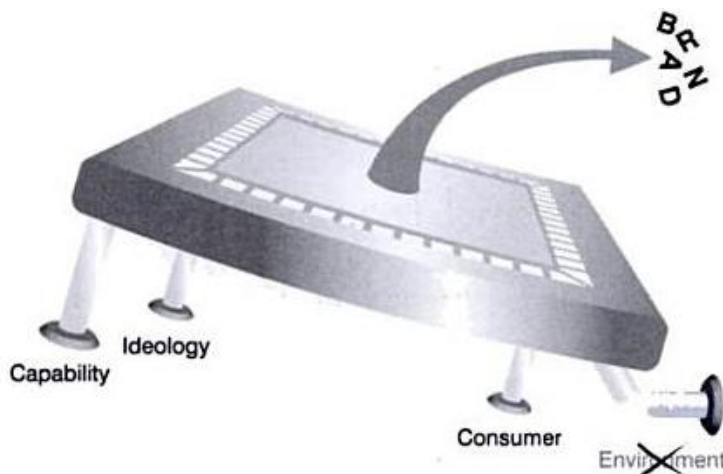
Source: *Edwards and Day* (2005, pp. 102)

Retailers as passion brands
Retailers fought their way up to the level, that they are considered brands in their own right. Even 10 years ago not many would have thought that from those generic private labels such a strong competitive force can emerge. Today the question is how far retailer brand building can go? Can they be passion brands in the future as well?

Kate Newlin (2009) made an omnibus telephone research which asked people to name a passion brand without presetting any categories. They have received lots of answers including sports teams, cities, restaurants, but not any retailers. Retailers either use their name as an umbrella brand for branding their private labels, or in the case of discounters they brand the store itself as they use phantasy brand names. Either way they would need to build their store names into brands. Retailers' private label products can be very good quality, in some cases even better than the manufacturer's brands', and mostly have an undeniable price advantage.

They put a lot of emphasis on their packaging and in-store communication to make sure that comparison with national brands is inevitable by the consumer at the shelves. On lovemarks.com there are several retailers named as Lovemarks: Carrefour, Whole Foods, IKEA ... But would they then be equal to Heinz, Coca-Cola, or M&M's? Certainly this list is not generated from an empirical research study, but the question is valid. Retailers are becoming brands, and today they are in many cases the biggest competitors of national brands. Therefore it is relevant to compare such "true lovemarks" to retailers, as the gap between national brands and private labels are closing, and the future goal seems to be logical: creating a passion brand in retail business as well. To manage this process, *Newlin* (2009) suggests three stages that are particularly relevant to retailers:

1. Market to a mindset (not classic demographics)
2. Differentiate on design
3. Hire Passionistas.

Some leading retailers started to target niche segments with special private labels, such as Tesco functional products for reducing cholesterol or for diabetes**,** Tesco Organic, Lidl's Fairglobe fair trade brand etc. These products have very good quality and enhance the image of the retailer. In the premium segment retailers also try to differentiate themselves from national brands, and create unique packaging for their premium products. But it is not just about the products. *Design* includes shopping bags, credit cards, store atmosphere, sales circulars and loyalty programs. The retailer, Whole Foods, is an upscale, organic food retailer in the US. Its customers share the same values as the store's target segment is very specific so they organized a Valentine's Day shopping night for singles accompanied with wine, champagne tasting, and recepice sharing. People are happy to express their values and identity by shopping at this store. *Hiring passionistas* is key to create a passion brand. Starbucks realized it when they trained their counter help into barristas, who matched the unique feeling of the place and service. Newlin also suggests that price emphasis should be avoided by retailers as well, but as it can be seen later in the Net Base research, that almost all comments for loving a retailer include some reference to price. Therefore, in my opinion, in the case of retailers, price needs to be incorporated in the brand values, but not necessarily as being „cheap".

The case of the "GÓBÉ product" brand

In my research conducted in Hungary (*Kelemen*, 2010b) one of the preferable directions for private label development was a Hungarian private label brand. This would be similar to the "Magyar Termék" (Hungarian Product) trademark, but it would be a separate private label, just like for example Tesco Organic or Spar Vital. The creation of a Hungarian private label brand, as private labels are generally tools to attract shoppers to the given chain, would play purely on an emotional basis, especially on nationalistic feelings. There is an interesting startup company in Transylvania which created the brand *"GÓBÉ product"* in 2010 (*Figure 3*). The brand concept is based on the trend that consumers are returning to nature (*Helyi Termék Magazin*, 2012). Their motto is: "From local producers through local retailers to

local people." They are offering a wide variety of home style food products which are handmade in Transylvania. They distribute it through local supermarket chains, eg. "Merkur- The Transylvanian retail chain." Hereby the concept is important. Under one umbrella brand: GÓBÉ products they are able to offer easily recognizable, local quality food.

Figure 3

GÓBÉ dairy products: Milk, curd and sour cream

Source: http://www.gobetermek.ro/images/termelok/tejtermek/lactis-tejtermekek.png

It is not a private label, but considering the above mentioned theories, it would be a good concept to be followed by big retailers. *According to the brand trampoline model* the brand must be *credible* to support its ideology. In this case the brand name, logo and packaging already suggest the origin of the product as GÓBÉ is a "synonym" for Transylvanian. The *ideology* is to support local producers and local community. Only such products can become a part of the product line which are traditionally Transylvanian and also produced locally. As *consumers* are a part of the local community they can serve as another quality check and also for further development of the product categories. *Environmentally* the brand is similar to a Fair Trade product, and as its core concept, it supports local sustainability.

Lovemarks in the digital age
Companies want to be a part of the online communication platforms to be able to reach and understand the fragmented customer segments and involve their customers. The basic elements include a facebook and twitter account, but blogs and customer forum sites are also expected from strong brands. The web 2.0 technology empowered customers, and gave a unique opportunity for companies to reach them. *Crowd sourcing* is one way to reduce risks of rebranding strategies. According to *Kandusa* (2005): "Crowd sourcing is a distributed, problem-solving and production model. Problems are broadcast to an unknown group of solvers in

the form of an open call for solutions. " Gap learned the hard way, what it means to rebrand the logo of a true Lovemark in the digital age. They have redesigned their 20 years old logo, and published it on their site, but within days the uproar from the internet community - mainly Facebook and Twitter – was so large, that the company decided to hold the new logo, and launched a new crowd sourcing project. In the end Gap decided to remain with its old logo, disregarding the outcome of the crowd sourcing project. The company admitted: „We recognize that we missed the opportunity to engage with the online community. This wasn't the right project at the right time for crowd sourcing." (*Fast Company*, 2012). Gap was not the only brand that has failed to redesign a part of its brand, Tropicana and Facebook did as well.

**Measuring lovemarks or passion brands**
Gap did not expect so much passion about their brand, and they paid a high price for it. They were unable to refresh their logo; they have failed the crowd sourcing project, and upset their customers. But how can one know, how far the brand's customers may go with their emotional attachment to the brand?

There are behavioral – and intermediate ways to measure brand equity (*Winer*, 2007, pp. 189.). These approaches are well defined and widely used, but in the digital age, companies have to consider also new ways to measure brand equity with special attention to emotions. This is especially valid with the rising phenomenon of private labels that are trying to follow the same branding strategies that manufacturer brands do: TV advertising even with celebrities, road shows, product placement.

According to *Mitev and Dörnyei* (2010) *netnography* is a useful qualitative research tool that adopts ethnographic research techniques to the culture of online communities by observing customers' online conversations. Using this method as discovering research can give companies a good starting point to understand their customers or even segment the online community. But certainly companies are also interested in quantitative and easily understandable results. There are several attempts to unite qualitative and quantitative methods. In the case of Lovemarks or Passion Brands the American company NetBase introduced their *Brand Passion Index* in 2010 May (*Netbase*, 2010a) According to their press release „This valuable comparison helps to normalize qualitative data into quantitative reports, helping brands see not only the intensity of passion consumers have, but more importantly *why* consumers feel the way they do.- said Jonathan Spier, CEO and co-founder of NetBase". To generate the index, „its semantic technology reads sentences to surface insights from billions of sources in public and private online information", capturing the amount of chatters people make and the passion level of these chatters. With this technology companies can get a picture about what people are saying online, and most importantly emotions and behaviors associated with the brand. They research certain topics and publish their findings also online in their company blog. Considering retailers, NetBase researched the topic „Back-to-school" and got the below results (*Figure 4*)

Figure 4

Brand Passion Index August 2010. related to Back-to School shopping
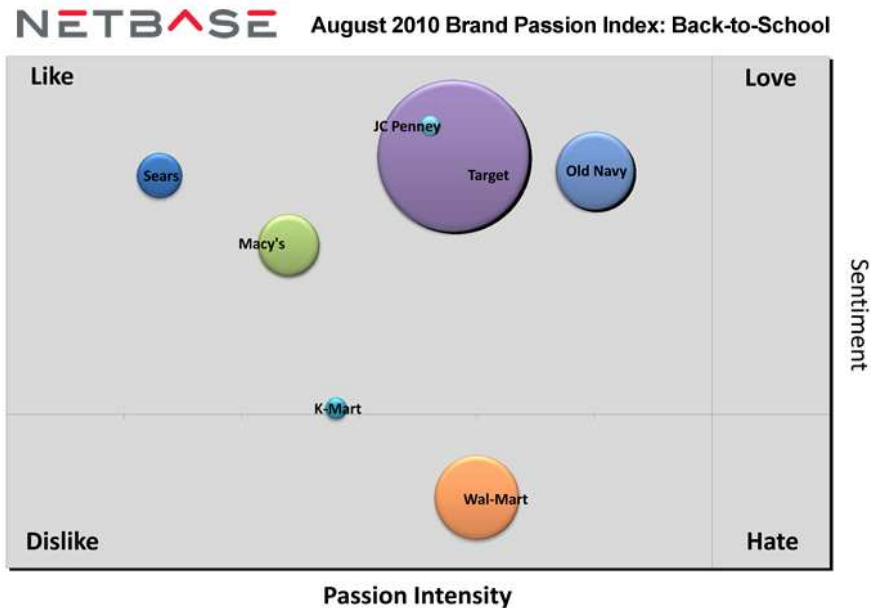
Source: http://cdn.netbase.com/wp-content/uploads/2010/08/bpi-back_to_school.jpg

In the chart the size of the bubble shows the amount of chatter generated on the web, and the placement of the bubble indicates the intensity of passion. In *Figure 4*, we can see that Target generated the most chatter which were mostly positive – love and like feelings-. Some of the comments included in the analysis are noted as follows (*Netbase*, 2010b):

"I love Target because it's one-stop shopping for everything and they are excellent with selection, coupons and prices"

"I love Target because their clearance racks for kids clothes have way more selection and the prices are way cheaper"

Old Navy shoppers were the most enthusiastic and the most passionate about the brand, but they were much less involved in sharing their experience online. What is interesting is that Old Navy is GAP's private label brand, which has reached the best position compared to the other retailers that have manufacturers' and own brands as well.

"I love Old Navy because they have good quality cute clothes at low prices!"

"I love Old Navy because they have the best prices and a wide selection of clothes to choose from"

Walmart shoppers showed the most intense „hate" and „dislike" feelings in a large amount for the poor quality of the clothes and negative shopping experience.

"Personally I don't like Walmart's clothes because the quality is terrible"

From the chart, it appears to me, that Old Navy's customers expressed a much stronger „love" to their brands, but they did not participate as much as Target shoppers did. In the online environment, word-of-mouth communication is a very powerful possibility, if we can involve our customers. Therefore action plans should include different strategies based on these results. Another question raises that „like" and „love" feelings are very subjective. Some people love everything, some choose carefully what they love, but regarding consumer behavior, or even willingness-to-buy, may be the same. Also NetBase's Brand Passion Index is related to topics: such as „back-to-school", Memorial Day supermarket shopping etc., which makes it hard to translate the results to practical action plans. Walmart may perform bad in the back-to-school topic, and much better for example in dog food, even though the brand is the same. Old Navy that is specialized in clothing must do better in that category than any other retailer that has a diverse focus. With all the limits though, the creation of this method highlights the new focus that companies need to follow when building brands, and considers the opportunities social media has to offer in the new competitive landscape with the growing number of digital customers.

CONCLUSIONS AND RECOMMENDATIONS

The economic situation, and the retail competition forces manufacturers to reconsider their activities. Private labels have been a serious threat to manufacturers with leading national brands. Strong retailers started to delist famous market leading brands from their shelves in favor of their private label brands. Moreover several of these strong retailers made it to the TOP 100 most valuable global brands in 2012 (*Schept*, 2012). Today they not only offer good price and value, but private label brands that are preferred by consumers. Retailers may delist even market leaders, if they do not have an emotional bond with customers, and can be substituted in the eyes of the customer. As *Kevin Roberts* (2004) elaborated in his book: „The future beyond brands are Lovemarks". The concepts of Lovemarks and passion brands have been pointed out as the new direction for manufacturer brands, but the application to private labels has been peripheral. It is true, that even though some retailers are listed among the Lovemarks (www.lovemarks.com), but people, when they think about their favorite brands, do not consider retailers. (Certainly I consider as retailers, those stores here, which follow a multilevel private label branding strategy, therefore it does not include Gap, or H&M, that are also not considered as private labels by customers.) This is an opportunity for manufacturer brands that have been trying to build a barrier to the growth of private labels for long. Some Lovemarks brand executives – like GAP's – do not even seem to know that they are passionately loved by their customers, and thus fail to engage with them more deeply. Most strong brands have the necessary "ingredients" already at hand for creating a passion brand, such as mystery, sensuality and intimacy (*Roberts*, 2004), but they need to be strategically incorporated in the brand values and its marketing mix. The Brand Trampoline model (*Edwards and Day*, 2007) gives a good methodology to handle the process of creating a passion brand. By following their advice companies can create brands that focus on engaging the customers emotionally. Unfortunately to turn to

this solution, the company needs to realize that market leadership, and a trusted brand does not equal to a passion brand. To get the companies' focus on the passion level of brands, the traditional brand equity measuring models are not enough. There are new methods: netnography, by which analyzing the online conversations of customers, companies can understand and segment them better. Net Base's Brand Passion Index that measures the amount of chatters on on-line communication platforms considering also the passion level of the comments. The limits of this approach, is certainly that it does not include offline database, and focuses on certain topics, so brands are evaluated in a given category. But it still plays a significant role: it draws the attention of executives to the importance of social media, and the new directions of brand management: creating Lovemarks or so called passion brands.

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FINANCIAL CRISIS NOW AND THEN

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ABSTRACT

Keynes, the British economist, says the state should intervene in the economy: infrastructure needs to be developed, public works have to be organized and social politics are to be improved. If all of the above are achieved, there is a chance of keeping the economy in balance in a time of crisis. In the Great Depression of 1929-1933 Roosevelt's New Deal programme helped the United States to recover from the crisis, conduced to preserve civil democracy and laid the foundations of the welfare state. The so-called sub-prime crisis that began at the end of 2006 represents the culmination of a super boom that started more than 25-years ago. The variable intensity financial crisis originating from the real estate and banking sectors resulted in the decline of the U.S. economy; its slowing economic growth has an impact on the whole world's economy. Therefore, the question is whether there is any way out of the current global economic crisis, like 80 years ago.
Keywords: crisis, economy, global financial and economic crisis

INTRODUCTION

The global economic crisis began with the stock market crash in 1929. In the fear of default, depositors rushed to their banks to withdraw their money. Since banks were not able to pay everyone, they became insolvent and went bankrupt. The banking crisis first caused a crisis in machine industry, then in those industries' that produced consumer goods. Due to the collapse of the USA economy the international trade and financial world also collapsed. In 2006 the financial crisis started again in the USA, in the banking sector, and had an impact on many companies who have since gone bankrupt or were forced to merge with their competitors. This resulted in a downturn in the U.S. economy (limited supply of quality real estate, declining yields) which evolved into a world economic crisis. The American banks, economic and financial institutions suffered losses of billions of dollars that made clear to the American analysts that the country was being hit by a financial crisis and this crisis would soon extend to the entire world.

George Soros, Hungarian-born American investment banker said that "the situation is much more serious than any other time of financial crisis since World War II".

This study analyses the global economic crisis of 1929-1933 and the recent global economic crisis, and tries to draw parallels between the events in these different economic periods. The first part of the study presents the global economic crisis in the two different periods, respectively. The second section provides some examples of the crisis outside the USA, while the third part analyses the implications of the crisis in Hungary. The first part of the fourth section draws

the conclusions and the parallels between the two crises, while the second part includes the forecasts. The study is mainly based on Internet articles and reviews.

The Great Depression (1929-1933)

24 October, 1929 "Black Thursday" - selling fever broke out in the New York Stock Exchange, and the abrupt fall of the high share prices - generated by speculators - reached nearly USD 15 billion loss, thus a global economic crisis began affecting almost all sectors and led to a worldwide social reorganization and to the impoverishment of millions.

October 29, 1929 "Black Tuesday" - the stock market crash reached its low point. Over the preceding six days - due to the loss of almost 50 billion USD - depositors, in the fear of default, rushed the banks, which hence became insolvent and went bankrupt (www.pecsinapilap.hu, 2009).

Thus, the global economic crisis of 1929-1933 began, starting in North America and spreading to South America, Australia and also to Europe in 1931. During the crisis *three waves of bankruptcies* swept the United States of America:

1. October - December, 1930: also leading to banking panics, several banks went bankrupt in the absence of a lender of last resort.
2. June - December, 1931: a wave of bankruptcies caused by the restrictive fiscal policy.
3. December, 1932 - March, 1933: low point of the crisis, the unemployment rate rose from 2% to 25%.

Due to the above-mentioned waves of bankruptcies, banks were closed in a number of states. President Herbert Hoover's program of drastic tax increase led to the decrease of bank deposits, which in turn resulted in a monetary contraction. In the situation thus created neither the general measures (such as savings in general) nor the extreme measures (such as coffee heated locomotives) could help.

Most notably, political distrust and foreign policy using economic instruments for political purposes played major roles in the crisis. In the summer of 1931 the Austrian, the German, and the whole Central European banking system collapsed. During the crisis the world's total production fell by 60%, the number of registered unemployed reached about 30 million at the lowest point of the crisis. Governments intervened to facilitate economic recovery by creating job opportunities through nationalizations, central orders and credit and wage controls.

On 4 March, 1933 Franklin Delano Roosevelt, freshly inaugurated U.S. president, formulated new economic and social policies, which, although heavy handed, helped the U.S. economy to recover from the crisis. Roosevelt's comprehensive crisis management programme, the so-called New Deal (for example, a four-day bank holiday, a new banking law, the ban of gold export) gave hope for a recovery even for those most seriously affected by the crisis.

Roosevelt's measures:
− In the inflationary economic policy, the dollar was depreciated.
− The reopening of banks was subject to authorization; this helped to restore confidence in banks.

- The Civilian Conservation Corps was designed to relieve unemployment. In this programme workers planted forests, built roads, bridges and regulated rivers. As for payment they were housed in camps with free accommodation, meals, uniforms, and one dollar per day pocket money was provided to them.
- To stimulate agriculture, cultivated areas and livestock were reduced, farmers were given a moratorium to repay their debts.
- Maximum working hours and minimum wages were determined, thus the circumstances of fair competition in the industry were created.
- The establishment of the social security system started.
- Unemployment aid was granted.

Besides these measures Roosevelt placed great emphasis on keeping the American public informed. For example, all of America followed his radio address called the "fireside chats." Additionally, the so-called "Blue Eagle campaign" proved to be a great idea, which provided that those who complied with the laws of the New Deal could mark their goods with a blue eagle.

In 1935 the supporters of the conservative economic policy engaged a successful counterattack against Roosevelt as some of the New Deal's acts were found to be unconstitutional by the Supreme Court. Therefore, the President executed the necessary amendments and continued his reform policies; he increased the number of board members from 9 to 15, hence there was no obstacle to the adoption of laws considered unconstitutional.

In general Roosevelt's measures were successful. While the main purpose of the "first" (1933-34) New Deal was economic recovery, the "second" (1935-36) focused on social measures, providing employment for two million people, which helped to stimulate the American economy and, as a consequence, America could recover from the crisis by the end of the decade.

Can the United States recover from the crisis that started in 2007?

Global Economic Crisis 2007-2009

Similar to the global economic crisis of 1929-1933, that of 2007-2009 also began in the United States. In recent years, the lending policy of the United States was characterized by granting mortgage loans to individuals without severe credit scoring, while the central bank kept its base rate at a low level. The value of real estate increased steadily due to balanced economic growth, hence the banks were not afraid of the debtors' insolvency. A sort of lending competition started among the banks as more and more people applied for loans. This led to the offering of more risky loans to more "unreliable" debtors financing ever riskier projects.

In addition, financial products have been launched that allowed credit risk derivatives, which resulted in opaque structures. These complex transactions affected the pillars of the system, i.e. it resulted in the drop of real estate prices, which in turn caused the global financial system to become highly instable.

Due to the deterioration of external conditions, the supply of homes for sale increased in the market as of 2006. In the slowing U.S. economy real estate agencies started to go bankrupt, followed by the banks engaged in mortgage loans. All of the above had an

impact on the interbank markets since banks were only willing to lend to each other with a high credit default swap because of the fear of bank failures. The banks' confidence was shaken since they were reluctant to lend to other banks or individuals.

In recent times, not only real estate but also consumer durables were financed by loans in the USA. However, it was even harder to get loans due to bank failures and the negative news coverage, which led to a decline in consumption. Since economic growth is induced by production and consumption growth, it is understandable that the decrease in consumption led to a decline in production, which in turn increased unemployment and a downturn in economic growth. *These were, in fact, the direct causes of the crisis.*

However, the crisis has indirect causes, too.
1. We arrived to the recession phase of the fifth Kondratieff cycle (*Figure 1*).
    - 1st cycle: The steam engine, 1770's – 1830's
    - 2nd cycle: The era of railways, 1830's – 1870's
    - 3rd cycle: The era of electrical engineering and heavy industry, 1870's – 1900's
    - 4th cycle: The era of oil and the automobiles, 1900's – 1970's
    - 5th cycle: The era of Information Technology, 1970's – 2010

Figure 1

Kondratieff cycles
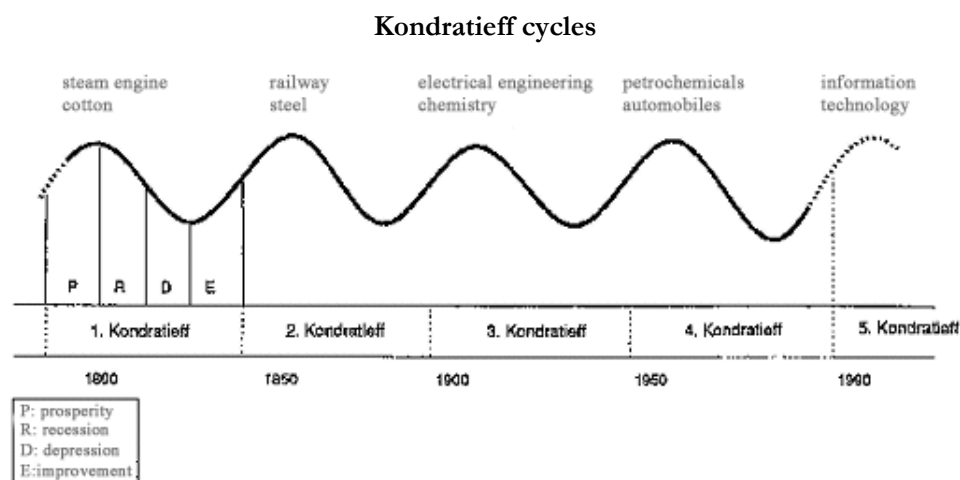
Source: *www.kwaves.com*, 2010

The Kondratieff cycle - also known as K-waves - is an economic theory that posits economic cycles lasting between 40-80 years, besides the "normal" business cycles of 10-15 years. The founder of this theory was Nickolai Kondratieff, a Soviet Russian economist who also helped to develop the first Soviet Five-Year Plan. He published his findings in a report entitled "Long Waves in Economic Life".

The existence of Kondratieff cycles is difficult to prove, since the cycles are long in duration and capitalist economies are relatively young, moreover only 4-6 cycles could have happened so far (*www.kwaves.com*, 2010). However, the global economic

crisis of 2008 fits perfectly to this cycle.

2. The huge storms of the hurricane season in 2008 caused damages for large cities, too. Hurricanes destroyed residential areas and a significant proportion of certain cities. Due to the risk of natural disaster it became more difficult to insure houses in the Southern states.

3. In 2008, America re-elected its president. The presidential campaign absorbed significant amounts of resources, which also had an impact on the poor economic situation of the American economy.

4. The military budget of the USA is huge, many times greater than those of any other nation state.

In addition, the main cause of the crisis was that banks started to lend money to the so-called "subprime" borrowers (subprime borrowers - those who would not apply for a loan in the old credit policy) due to saturation of the credit market. Since banks needed revenue, they used various marketing practices to encourage subprime debtors to borrow and as collateral banks accepted houses, boats, cars or other consumer goods of a high value. In the case of those who became insolvent, the lender bank foreclosed on the debtors' collateral (which the mortgage was based on) i.e. property: boats, cars, consumer goods and any other value to the extent of the liabilities. Among the increasingly fierce lending competition, the number of "unsold" homes and "bad" credits significantly increased, and that finally resulted in the collapse of the housing market, despite its numerous cross-guarantees. The chain reaction of the crisis expanded from the housing market to the banks, insurance companies, and real estate developers, as well as to financial and real estate funds who were involved in the financial and business processes.

Impacts of the crisis over beyond America, now and then (an international outlook, with some examples)

1929-1933

The global economic crisis first broke out in *Austria* in 1931. The banks in Vienna did not realize that following the dissolve of the monarchy there was no longer a need for the large-sized banks, thus, by keeping their branch network they were only able to operate effectively with higher operating costs. Since only the bad clients demanded their services, banks went bankrupt one after the other. Though the state helped those in trouble through bank mergers, only large banks could survive once the crisis had started. In May 1931, Creditanstalt announced its insolvency, which shocked the whole world and led to bank panics. Therefore, the state intervened, the budget undertook the banks' consolidation, however, this almost resulted in state default. In 1934, Creditanstalt merged with Wiener Bankverein and operated as a state-owned single large bank, known as CA-Bankverein. The Austrian bank failures, however, spread to neighbouring Germany too.

In *Germany,* the source of the economic problem lay in the high wages, causing a steady loss of the country's gold reserves, according to certain historians. In July 1931, after the announcement of Austrian Creditanstalt's insolvency, the

Darmstädter- und National Bank went bankrupt, which even the Central Bank was unable to help. With the condition of the re-negotiation of the Treaty of Versailles, France would have given credit to Germany, who did not accept the offer. Due to their "offended policy," Germany was hit the second most after the U.S by the economic crisis of 1929-1933. The dissatisfaction and anger deriving from the crisis helped the Nazis and Adolf Hitler come to power. Hitler pursued a policy under which the government should spend instead of saving. Because of his conqueror plans significant amounts were spent on armaments and on motorway constructions. These public works and employment opportunities not only served to restore the health of the economy, but helped to reduce unemployment as well.

2007-2009

The financial crisis that began the United States caused serious problems worldwide. All member states of the European Union faced major challenges; they introduced a number of measures to ensure financial stability. Many countries had to rescue banks and insurers. More and more countries drew upon the assistance of international financial organizations. The crisis increasingly affected the real economy; factories closed down, reduced production or layed off work force.

In *Germany* three independent payment schemes were established for non-bank deposits, private loans and banking system rescues. The government provided funds up to EUR 70 billion of capital injection for capital investments or for the purchase of the so-called risky positions.

In *Britain*, a capital injection of GBP 50 billion was provided for banking institutions. The institutions had to provide support for those wishing to pay their mortgage, but could not give bonuses to board members. The state helped many institutions with capital injection, including Northern Rock bank, Royal Bank of Scotland, Barclays and Nationwide Building Society.

THE EFFECTS OF THE CRISIS IN HUNGARY, THEN AND NOW

1929-1933

Hungary's economic position seemed to be stabilizing following World War I and the Treaty of Trianon. Favourable sales opportunities arose for our products and our needs could easily be satisfied. Our economic upswing was also highly facilitated by foreign loans.

As of 1929, however, in the worsening financial markets only short-term loans could be taken, which were used to settle our budget deficit. The government drafted a variety of crisis management proposals to increase revenue and reduce expenses. It had to choose between a stable exchange rate or the depreciation of the Pengő currency. Depreciation of Pengő was justified by the fear of inflation. A stable exchange rate resulted in an overvalued currency, which had a very negative impact on our exports.

The crisis had a great impact on *agriculture*, our most important economic sector. Due to the largely opened price scissor, it was difficult to sell Hungarian grain and flour. As in every crisis of overproduction, the global economic crisis of 1929-1933

also led to price reductions in agriculture. As a result, the average price of wheat plunged to its lowest level. The lower prices resulted in lower revenues, which entailed a reduction in mechanization and fertilizer use, and finally this led to the deterioration in yield.

Because of the above-mentioned reasons farmers also got into extreme debt. In 1931 debtor protection entered into force, which defended the indebted farms from mass bankruptcy. This state assistance contributed to the recovery of farms in the mid 30's.

Similar to agriculture, the crisis of overproduction also had an impact on *industry*. During the crisis the volume of industrial production fell by nearly 20%. The largest production decrease was suffered by the iron and steel production industries, mining and metallurgical industries, mechanical engineering, and the timber industry. The production of common, essential products decreased less. By contrast, the textile industry, leather industry, chemical industry, electrical industry and the canning industry actually increased their production.

The major external imbalances also reached the Hungarian economy, which could only be compensated by additional foreign loans. After the bankruptcy of the Austrian bank Creditanstalt, the bank panic also spread to Hungary The Hungarian General Credit Bank fell into the crisis, hence the necessity of a bank consolidation programme arose for its rescue. The government tried to solve the bank panic with a three-day banking holiday. The bank consolidation was not implemented since the state-owned companies were also unable to repay.

However, crude oil and electricity services started to boom after the crisis. The automotive industry had become a leading industry, highways, bridges, tunnels, filling stations and repair shops were built throughout the country. Electrical appliances appeared in households and the radio spread in popularity.

2007-2009

As in other countries, the economic crisis deriving from a financial crisis spread to Hungary, too.

The forint's exchange rate not only depends on domestic internal processes, but is largely affected by foreign investment companies as well. As for investments, safety is one of the most important factors, thus foreign investors prefer safer forms of investments; they invest in securities of developed countries instead of forint denominated deposits or Hungarian government securities.

As the international financial crisis deepened the forint's exchange rate plunged (similar to regional currencies) and the confidence in Hungarian capital markets was significantly damaged. To protect the financial system the government and the central bank of Hungary agreed upon a loan package of about EUR 20 billion with the European Union, the International Monetary Fund and the World Bank, who believed that Hungary, with its allies, is able to ensure effective protection and safety for the Hungarian people, the Hungarian economy and Hungarian businesses. This is obviously not a typical Hungarian phenomenon, since we are facing a global economic crisis and the countries in our region are also having serious problems and they are all trying to mitigate the negative effects of the financial crisis.

The EUR 20 billion loan package represents a guarantee that, if necessary, Hungary will be able to obtain sources with more favourable conditions than market opportunities to stabilize public management and to protect the country and its citizens. This agreement contributed to the stabilization of the forint exchange rate, short- and long-term yields moderated, the government bond market started to operate as normal and the operating conditions of banks and the financial sphere improved.

With the positive effects of the loan package we have tasks to be fulfilled and it also represents a large commitment for our country. For example, the budget deficit per GDP had to be reduced, also several proposed tax laws had to be withdrawn, which significantly affected the last two years' planned budget.

The European Union, the IMF and the World Bank had two requests from Hungary. Firstly, in this recessionary period not to assume more financial obligation than we have for this purpose; secondly, in no way should we forgo revenues. Additionally, we may only intervene in our tax system to the extent that we are able to ensure the same amount of revenue for our budget (www.kormanyszovivo.hu, 2010).

THE EFFECTS OF THE CRISIS

– Our export sales outlook significantly deteriorated as our export partners' economies also weakened. The shrinking export demand negatively affected the corporate sector's profitability primarily, which forced companies to adapt. Their adaptation was mainly manifested in staff reduction, in wage moderation and in investment decisions. The export and import volume declined in 2009 due to unfavourable external conditions. Although businesses can apply for more state support for exports, the outlook is still quite uncertain as it is subject to the changes in the international environment.
– Domestic banks' loan supply is strongly limited. Banks set tighter conditions and apply higher interest rates in lending that are already more difficult and more costly, which sets back retail and corporate sector borrowings.
– Our industrial production has been in constant decline since the second half of 2008. In Hungary, one of the leading sectors of our industry, i.e. the vehicle industry, became vulnerable by the falling demand caused by the crisis - the number of vehicle sales fell by 34% in 2008 compared to 2007.
– The shrinking sales opportunities and the decline of our industrial production consequence the increase of unemployment as the decline in orders and in production enables much fewer people to be employed by companies.
– Rising unemployment negatively affects households' income positions.

CONCLUSIONS

– The global economic crises of the two different periods can be compared to each other mostly by circumstances and the anticipated effects. However, the causes, the real economic effects and the consequences of the global economic crisis of 1929-1933 and of the current one mentioned in this study vary significantly.

- As with any crisis, the state's regulating role becomes more pronounced as in the Great Depression of 1929-1933 and as it is today.
- In general, it can be said that in the post-crisis period it is important to restore foreign trade and develop the internal market as soon as possible, as well as to improve employment.
- The normalization of the banks as financial institutions played an important role in both periods: bank panic then and now, the idea of bank consolidation then and now.
- Bank nationalizations. During 1929-1933, only the state was able to solve the banking crisis in many countries (e.g. in Germany, France, Austria and Italy). Today more and more bank nationalizations are common.
- Overall, today's financial crisis evolved to a global crisis and it is anticipated to be the most serious in a long time. It is already apparant that the crisis causes economic downturn, however, the depth of the recession, its spatial distribution and its expected length cannot be predicted. But as the main message of the global economic crisis of 1929-1933 shows, consumption should be primarily increased in a recession. A crisis can only be avoided by cooperation, but if it has already broken out, then it can certainly only be recovered by cooperation.

FORECASTS

In the forecast of IMF published in April 2009 disappointing growth projections, deeper recession and a longer and more painful recovery are predicted. It is projected that the losses of financial institutions in the global financial market and rising unemployment limit lending more than it is expected for at least another year and a half (www.ecoline.hu, 2009).

Other forecasts say as of 2010 foreign demand brings an upswing as the global economic environment improves and as financial markets calm down, conditions of access to funding sources will become more favourable. However, in terms of export markets a slow external growth can begin only in 2011.

The short term recovery can begin from the recession, leading to a boost demand and to the increase in labour demand, thus a slightly higher employment growth will be expected, accompanied by a gradual decrease in unemployment.

As of 2011 investment activity is expected to increase and national economic investments of the national economy may grow strongly.

Far-reaching consequences, however, would be too early to draw about the current crisis. Some analysts say the crisis will last long due to structural reasons, and it is likely to be extremely serious, multilateral and will have global economic and social consequences, however, its extent is not expected to reach the 1929-1933's crisis level. The state of the world is in many ways different from the conditions of the 1930s.

Other analysts claim, however, it is not the time of the so-called "Great Depression", it is only a "sector downturn" that does not give rise to the national economy that the current crisis is mentioned as a world economic crisis. (*Csaba*, 2009)

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HUMAN CAPITAL IN THE AGRICULTURAL REGIONS

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ABSTRACT

Agricultural activity continues to play a significant role in the economy of the EU's rural areas. Therefore, in connection with the new budget cycle starting the 1st of January, 2014, the elaboration of the Common Agricultural Policy (CAP) has begun. The most important topics of the reforms of the CAP are food safety, supply safety, the agri-environment, the competitiveness of the agriculture and the development of the rural areas. One of the major means for the increase of competitiveness is the increase of the research-development support, and the development of human capital. Agri-education is able to make available new knowledge for everybody, which beyond the increase of productivity, will increase the growth prospect of agricultural firms and decrease unemployment. Thus, it contributes to the increase of competitiveness of the farmlands. According to the above mentioned, the goal of the research was to define how human capital can be measured and according to the results how we can classify the regions. Another task of the research was to circumscribe those regions of the countries of Visegrád (V4), where agricultural activity is outstanding, and to examine in these regions the development level of the human resurse.
Keywords: Competitiveness of the agriculture, development level of the human resource, Principal Component Analysis, Cluster Analysis

INTRODUCTION

The Common Agricultural Policy
In the reform of the Common Agricultural Policy, the support of competitiveness gets a particularly important role, as on the world's decisive parts agricultural productivity clearly has slowed down (*Jambor and Harvey,* 2010). From the several areas of the enchancement of the competitiveness, we have to pay the greatest attention to the increase of productivity. In the future, this has to be helped by the increase of the research development inputs and the innovation costs (*Bureau and Mahé,* 2008), so the owners will be able to produce higher added value products due to the use of more developed technologies. The rise of productivity is inconceivable without the improvement of human capital. Another key area of the reform is rural development, the second pillar of the CAP. In the future, the rural development policy has to put bigger emphasize on the struggle against rural poverty. We need programs dealing with the problems of rural poverty, such as the subservience of the rural economic enchancment and the development of the rural infrastructure (education, health care, etc.). So the improvement of human capital gets an

important role in both pillars of the CAP that contribute to the competitiveness of agriculture and the catching up of the rural areas.

The agriculture of the EU and the countries of Visegrád

The predominant areas of the European Union are covered by lands under agricultural cultivation process and forests that define the character of the landscape, and play significant role in the aspect of the activity of the rural farmlands. Agriculture contributes to the sustainable economical development of these areas. 90% of the EU's territory is rural area, the half on which is under cultivation process. This draws attention to the importance of sustainable economical development of the agricultural areas. Almost 60% of the population of the 27 member states live in rural areas, so rural development is an important policy area. In rural areas, agricultural and forestry activities are the main forms of utilizing the land, so they play a significant role in the life of the rural community. The effect of the enlargement of the EU (at first with 10 new members (Cyprus, the Czech Republic, Estonia, Poland, Latvia, Lithuania, Hungary, Malta, Slovakia and Slovenia) on the 1st of May, 2004, and later on with Bulgaria and Romania) on its agriculture is very significant. In the 15 former member states the agricultural population is 6 million strong and it increased by 7 million farmers. The 12 new member states enriched the former 130 million hectare territory by 55 million hectares of agricultural land, which means a 40% increase. Because of the above mentioned, the aims that serve the mitigation of the territorial inequalities are receiving more and more emphasis in the European Union's Common Agricultural Policy. The existence and status of internal resources significantly influence the position and opportunities of a given territory. We have to underline the role of knowledge and human capital, which in the last few decades led to the spread of the knowledge-based economy and knowledge-society definitions, which fundamentally influence the regions' development opportunities, the adoption to globalization and the formation of the territorial inequalities (*Rechnitzer and Smahó,* 2005). Despite the improvements of the new member states in the past few years in the field of the modernization and restructuring of the agricultural sector, one of the biggest challenges is the improvement of agricultural profitability and the general standard of living in rural communities. The differences in the living standards between the 15 former member states of the EU and the new ones are more emphatic in the rural areas. In these areas the lower incomes and the higher unemployment cause stress. The unemployment occurring in the agricultural sector strengthens the disadvantages of the rural areas. According to former researches, in the rural areas the significant and permanent agricultural origin unemployment contributes to the augment of territorial differences. One solution to this problem is human-capital based local economic development.

RESULTS AND DISCUSSION

The first task of our research was to determine characteristics which allow us to assess the state of development of a region's human resource. We collected indicators from the database of EuroStat 2002-2007, which are the most similar to

Rechnitzer's (2008) human resource dimensions. All of the used indexes are specific indicators and with the use of these indicators we can ensure that the different sizes of the regions do not influence the solutions. Five of the index numbers mark the human factors, we can demonstrate the dimension of the quality of life with 2 index numbers, and 2-2 index numbers express the quality of the innovation milieu, the living standards and knowledge (*Table 1*).

Table 1

Dimensions and indicators

Dimension of the human resource	Indicators
Human factors	Unemployment rate (15 years and over) %
	Employment rates (15 years and over) %
	Population aged 15 and over tertiary education - levels 5-6
	Students in tertiary education (ISCED 5-6) - as % of the population aged 20-24 years
	Pupils and Students in all levels of education (ISCED 0-6) – as % of total population
Quality of life	Internal regional migration, excluding intra-regional migration per 1000 inhabitant
	Net regional migration, excluding intra-regional migration per 1000 inhabitant
Standards of life	Life expectancy at given at birth
	Gross domestic product (GDP) Euro per inhabitant
Network of knowledge	Employment in technology and knowledge-intensive sectors
	Life-long learning - participation of adults aged 25-64 in education and training
Innovation milieu	Human Resources in Science and Technology percentage of total population
	Total R&D personnel and researchers percentage of total employment

The next step is to compress the information content of the thirteen indicators involved in the assey, into a smaller amount of uncorrelated variables. The smaller amount of variance assists in visualising data and helps clear understanding and analysis. According to the previously done Principal Component Analysis, we can determine three factors in the six years of the investigation. The joint explained variance exceeds 90% in every single year, so the three factors successfully retained the information content of the nine indicators chosen by the analysis. The nine examined indicators' communality exceeds 0.8. Communality is a multiplex determination coefficient, so the multiplex correlated coefficient calculated from that, shows the tightness of the relationship between the factors (interpreter variables) and the original variables (result variables). Based on these we can say

that the three principal components concentrate the nine indicators' information content. In all the six years of the analysis, three factors were formed, but not just the number of the factors was the same, but the index number content. The first 2 factors explain 40-40% of the variance of the initial variables. In the first factor, the most dominant is the 'Human Resources in Science and Technology percentage of total population' and the 'Employment rates (15 years and over)%'. There is a stronger than medium relationship between the value of the factor, the 'Gross domestic product (GDP) Euro per inhabitant' and the 'Life expectancy given at birth'. This factor determines *the Employment and living conditions* of the human resources. The second factor characterizes *the Qualification and scientific culture* of the examined regions' human resources. This is confirmed by the content of the index numbers which build up the factor. There is a tight positive correlation between the value of the factor and the 'Population aged 15 and over tertiary education - levels 5-6', the 'Students in tertiary education (ISCED 5-6) - as % of the population aged 20-24 years', the 'Total R&D personnel and researchers percentage of total employment' and the 'Employment in technology and knowledge-intensive sectors'. The third factor explains 15% of the original variance of the variables in those six years. The value of the factor increases if the ratio of the migrating population is on the increase, and the value decreases if the life expectancy at given at birth in the region increases. This factor shows *the negative quality of life* of the region's human resources, precisely express the prevailing depression (*Table 2*).

Table 2

Rotated Component Matrix, 2004

Indicators	Component		
	1	**2**	**3**
Population aged 15 and over tertiary education - levels 5-6	**0.972**	0.163	-0.008
Students in tertiary education (ISCED 5-6) - as % of the population aged 20-24 years	**0.964**	-0.103	-0.049
Total R&D personnel and researchers percentage of total employment	**0.802**	0.525	0.086
Human Resources in Science and Technology percentage of total population	**0.746**	0.639	-0.044
Employment rates (15 years and over) %	0.094	**0.972**	-0.100
Employment in technology and knowledge-intensive sectors	0.074	**0.959**	-0.006
Gross domestic product (GDP) Euro per inhabitant	**0.602**	**0.745**	0.192
Internal regional migration, excluding intra-regional migration per 1000 inhabitant	0.167	0.233	**0.915**
Life expectancy at given at birth	0.238	0.441	**-0.801**

One of the aims of the research is to group the examined regions by the level of the development of the human resource. With the help of hierarchic and non-hierarchic cluster analysis four distinctive groups could be created. This result is justified by discriminant analysis.

The first cluster is called a knowledge creator. The characteristics of the first cluster are the following: highly qualified; outstanding academic culture of the human resource; the employment rate and the living standards are high, but the quality of life is negative, the human resource is featured by depression. The members of this cluster the capital of Czech Republic, the regions that surround the capitals of Hungary and Slovakia. The negative quality of life can be described by the negative effects of the urbanization. From these cities the emigration has already begun agglomeration. This can be seen from the value of the „Internal regional migration, excluding per 1000 inhabitants" indicator which increases the value of the „Negative quality of life, depression" factor. Despite of the high emigration the net migration rate is positive. The GDP per capita in this cluster is two times more than in the second cluster, and three times more than the third and fourth clusters. This cluster can be called, according to Martin, a Knowledge Center Cluster, because the production of knowledge is very important. Moreover, social, economic and administrative processes of the countries are concentrated on these areas, which is strengthened by the increased use of the union's resources.

The second cluster is called an efficient knowledge adopter. The characteristics of the second cluster are the following: the standard of life is good; the rate of the emigration is low; the net migration is positive and the value of the "life expectancy at given at birth" is high. The high average of age shows that this cluster is an elderly cluster. This fact is proved by the low value of the "Students in tertiary education (ISCED 5-6) - as % of the population aged 20-24 years" and the "Population aged 15 and over tertiary education - levels 5-6" indicators. The employment rate in these regions is almost the same as in the first cluster. And the GDP per capita is one and half times more than in the third and fourth cluster. The unemployment rate is two times more than in the first cluster. The 8.11% of the economically active population is unemployed. There are seven regions from Czech Republic and one from the Slovakian Republic (Zapadne Slovensko) in this cluster. So in this cluster it is not knowledge creation that is important, but the adaptation of the received knowledge, which is the main source of competitiveness.

The third cluster is called a depressive knowledge adopter. The characteristics of the third cluster are the following: lowly qualified; low academic culture of the human resource; the value of the "Students in tertiary education (ISCED 5-6) - as % of the population aged 20-24 years" and the "Population aged 15 and over tertiary education - levels 5-6" indicators are higher than in the second cluster. Compared to the other clusters, in this cluster the values of the employment rate, standards of life and the quality of life are low. Six out of the seven Hungarian regions are situated in this cluster. In this cluster the value for depression is high and the value for "life expectancy at birth" and the mobility are low. The attractiveness of these regions is low and the negative balance of migration is the highest compared to the other regions.

The fourth cluster is called a balanced knowledge adopter. The characteristics of the fourth cluster are the following: highly qualified; developed academic culture of the human resource; the employment rate and the living standards are low, but the quality of life is the highest. All of the Polish regions and two Slovakian regions are situated in this cluster. Low depression can be featured in this cluster because of the high quality of life, high value of the "life expectancy given at birth" and the low value of emigration. The attractiveness of these regions is low. Despite the fact that emigration is low in these regions, the net migration balance is negative. In the examined six years, the cluster membership has not changed. It does not mean that the development of these regions has not changed, but the differences between the regions are stabilized.

After we had classified the 35 regions of the countries of Visegrád according to the characteristics of human capital, we examined their agricultural activity. We did the demarcation of the regions dealing with agricultural activity according to the ratio of NACE A-B sector's gross added value and the ratio of the employees in this sector. The ratio of the V4's agricultural gross added value exceeded the European Union's average value in all of the examined six years. The ratio of the Czech Republic's GDP in the first year of the examined period was outstanding, but in the following five years decreased dramatically. From 2004 Poland and Hungary are on the top of the list according to the ratio of their agricultural GDP. The ratio of Slovakia's agrarian gross added value is the lowest and gradually decreasing in the examined six years (*Figure 1*).

Figure 1

GDP in sectors NACE A-B as % of total GDP
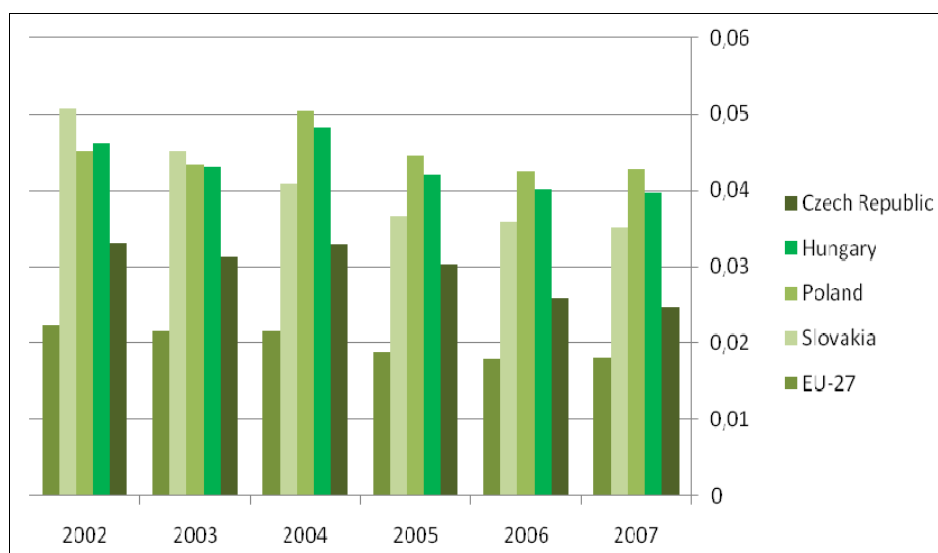
Source: Based on data from *Eurostat*, 2012

The ratio of the employees of the agricultural sector in Poland is twice the EU average, but in the 2002-2007 period we can observe a gradual and continuous reduction. In Hungary the ratio of the employees of the agricultural sector stays under average in 2002 and 2003. From the junction to the EU, this ratio grew above average, however, we can notice a slight decrease here as well. Slovakia's and the Czech Republic's ratio of the employees of the agricultural sector is behind the EU average and continuously decreases in the examined period (*Figure 2*).

Figure 2

Employees in sectors NACE A-B as % of total employees
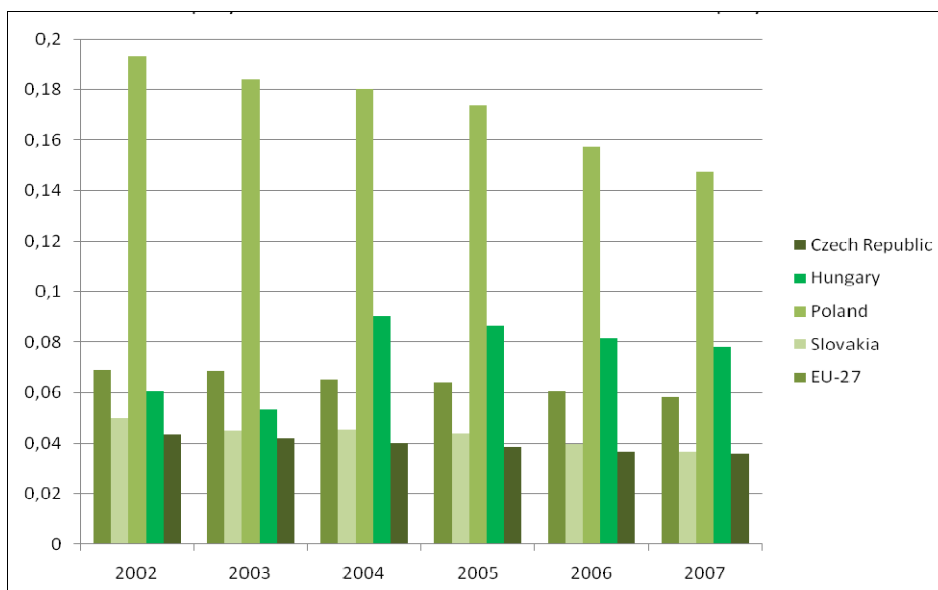
Source: Based on data from *Eurostat*, 2012

Based on the result of the cluster analysis according to the above indicators, the regions can be classified into four clusters. Memberships among the formed clusters didn't change during the six years of research. The agricultural region is considered to have a high ratio of employees in agriculture or a high ratio of gross added value, or both. According to this, the regions of the 2-4 cluster are agricultural regions in the relation of the countries of Visegrád. In the regions of the second cluster 15-25% of the employees work in agriculture and 3-7% of the country's GDP is produced by agriculture. In this cluster there are six regions of Poland. Agricultural work is best utilized in the regions of the third cluster, where 10-15% of the employees produce 8-12% of the national gross added value. In this cluster there are three regions of Hungary and two regions of Poland. In the fourth cluster more than 30% of the employees work in agriculture and more than 7% of the GDP is from this sector. In the mentioned cluster there are three regions of Poland (*Figure 3*).

Figure 3

Agricultural regions of the countries of Visegrád
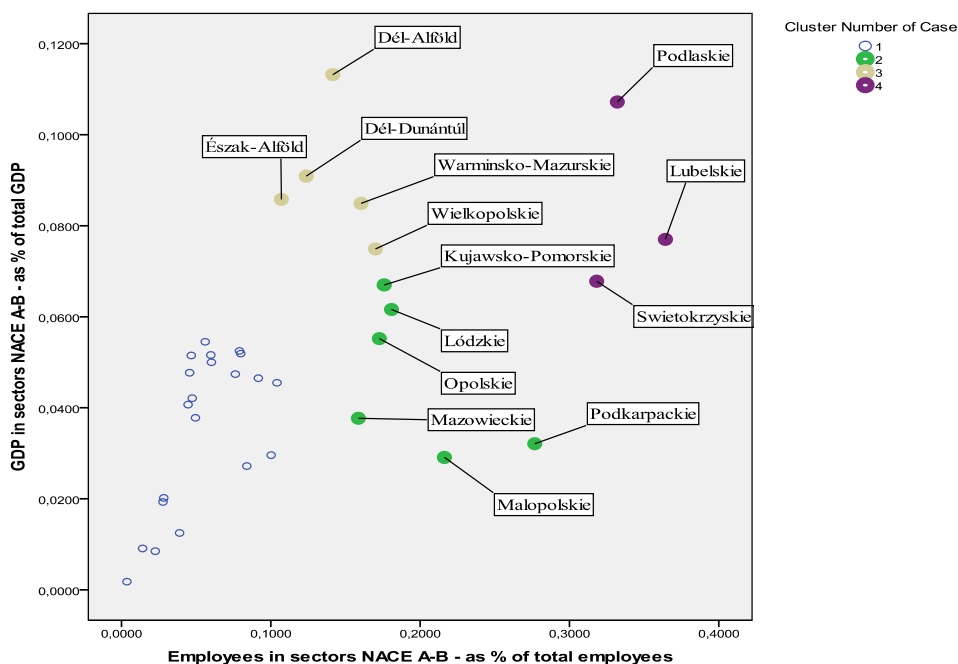
Resembling the agricultural clusters and the clusters according to the level of the development of human capital, we came to the conclusion that the agricultural region can only be found in the depressive knowledge adopter cluster and in the balanced knowledge adopter cluster. This result of our research confirms those things mentioned in the CAP's reform. Those rural areas dealing with agricultural production have lower-qualified human resources, lower quality of life, higher unemployment and migration. These characteristics contribute to more breakaways of the rural regions and to the augment of territorial differences. An important element of the EU's rural development policy is convergence, the catching up of the backward areas.

CONCLUSIONS

At the beginning of our study we reflected on the different criterion with which we can characterize the development of the human resources of a region, highlighting the fact that it is not enough to characterize the development of the human resources according to only some dimensions, as the complex factor of production can influence the ability to create value. Beyond the level and the ability to adapt knowledge, we have to take into consideration the income producing ability, the

health status, the quality of life and the living standards of the human resources. In our analysis using the specific thirteen indicators of the human resource, with the help of principal component analysis, we have chosen the most specific ones and arranged them into three factors. These three factors are characterized thus: "the qualification and scientific history", "the employment and living standards" and "the negative quality of life and depression" of the human resources. Along the three factors, the 35 regions of the Visegrád Countries can be arranged into 4 groups with the help of cluster analysis. Primarily these groups weren't formed according to the development level of the human resources, but the identities and differences occurring in the resources. Later on, with the help of cluster analysis we have chosen the so called agricultural regions. Agricultural regions are those where the ratio of employment in agriculture and/or the ratio of the added value produced by agriculture are above average. With the collation of the two groupings we can determine that the agricultural regions are between the depressive and the balanced knowledge adopter regions. The objective of the future Common Agricultural Policy for the increase of productivity and the improvement of the human capital may contribute to facilitating the catching up of these regions to the more developed areas of the European Union.

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THE ROLE OF WORK PLACE FACILITIES IN THE SELECTION OF THE MODE OF INSTITUTIONAL CATERING

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ABSTRACT

In our paper we present the sub-results of a 1000-member national survey. Our objective was to establish a model that includes the factors which influence the selection of the mode of institutional catering in point of features of consumers and employers as well. During the validation we emphasized workplace facilities to prove that the features an employer offers can affect the way an individual chooses to eat on weekdays.
Keywords: institutional catering, correlation examination

INTRODUCTION

The primary objective of our examination was to synthesise the factors that influence the consumers of institutional catering and to prove that the features employers offer can affect the way an individual chooses to eat on weekdays.

As far as we know, in Hungary complex consumer examinations concentrating on this market have not been carried out so far.

For the establishment of our model we used national and international professional literature. *Table 1* shows the correlation between the model factors and the professional literature.

We also used our preliminary surveys on institutional catering for the establishment of our model. There were four phases in the research carried out in 2003, 2005, 2007 and 2008. The first three surveys were quantitative ones based on pretested standardised questionnaires. The fourth one was a qualitative research that contained seven focus group interviews.

As a result of the examinations we established our model (*Figure 1*), which concentrates on two sets of variables, one of them contains (embraces) the factors that influence consumers and the other one includes the features of the employers.

MATERIALS AND METHODS

To prove that this model is valid we applied a 1000-member national survey carried out in 2009. In the case of the national sample planned for 1000 persons, a conscious sample taking was carried out based on the quota. The national adult employees were regarded as the sampling population, so the compounds of the sample are special from the aspect that the older generation above 60 is in a smaller proportion in it than in the total population of the country.

Table 1

Factors and sources of the model

Model factor	Short explanation, justification, description and source
value system lifestyle	The value system based (food) consumer preferences proved the relationship between the consumers' choices of concrete food and the attitude to general human values (*Grunert et al.*, 1996).
socio-demographic features	The characteristic features of customers based on their socio-demographic features (*Hayden*, 2007; *Nayga and Capps*, 1994).
food consumer preferences	Food consumer preference as a factor influencing eating outside the household (*Blisard and Cromartie*, 2001; *Naylor et al.*, 2009).
habits of nutrition	The impact of the attitude toward cooking on eating outside the household (*Becker*, 1965).
subsidies	Subsidies like luncheon vouchers provided by the place of work (*Mikesné*, 2004).
circumstances of eating at work and general features of the work place	Eating possibilities and facilities provided by the place of work. The number of employees, the ownership structure of the place of work (*Mikesné*, 2004).

Figure 1

**The research model of the factors
affecting the chosen way of institutional catering**
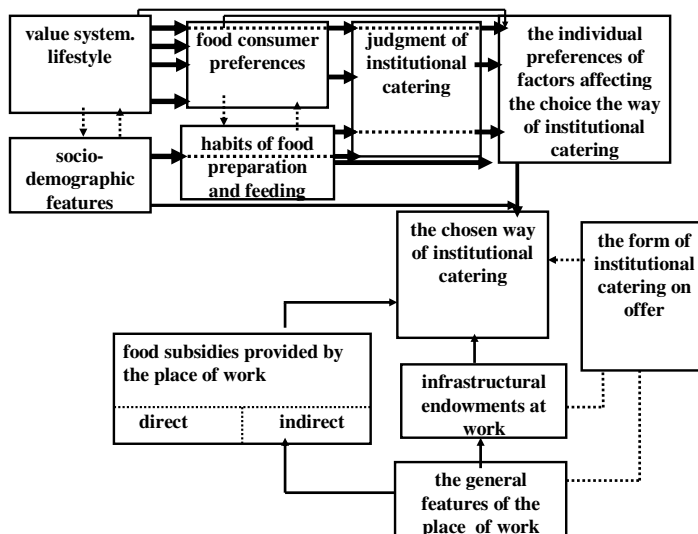
The quotas were formed by regions based on the 2007 employment data of the Central Statistical Office (hereinafter referred to as CSO). The proportion of the most important age group (between 18 and 59) of my research in my sample is the same as their share in the sampling population.

Special attention was paid when compiling the questionnaires for the national survey and even in the preliminary research that they should logically fit to the arc of the whole research.

The questionnaire inquired about food consumption, eating habits, value system and demographic items.

The connection between the research model and the standardised questionnaire used for the national survey can be summarised as follows (*Table 2*).

Table 2

The connection between the research model and the standardised questionnaire used for the national survey

Model factor	Short description	
value system lifestyle	Individual ranking of value factors, free time structure	Criteria attached to the consumer
socio-demographic features	gender, age, marital status, income, qualification, residence, type of residence, qualification, marital status, the size of households, the income situation	
food consumer preferences	judgment of the utility factors of food consumption	
habits of nutrition	eating habits, attitude to cooking, the method of getting information on nutrition	
judgment of institutional catering	judgment of institutional catering based on time, comfort and price	
individual preferences of factors affecting the way of institutional catering	judgment of factors affecting the choice of the way of institutional catering	
catering subsidies ensured by the place of work direct subsidies indirect subsidies	subsidy built in the price of lunch subsidy in the form of hot dishes	Features perceived by the employer consumer
Infrastructural endowments at work	possibility of consuming hot meals, premises reserved for consumption	
general features of the place of work	number of employees, ownership background of the place of work	

In our paper we concentrated on sub-results of the national survey mentioned above. First of all, we would like to prove that the facilities of places work can affect the selection of the mode of institutional catering.

RESULTS

The role of subsidies in institutional catering
We would also like to present how the features that can be linked to the employer can affect the way an individual chooses to eat on weekdays.

In the first step of the examination of this nature we analysed whether there was a correlation between the extent of the costs of institutional catering covered by the place of work and the chosen way of institutional catering (*Table 3*).

Table 3

The correlation of the extent of the direct support provided by the place of work and the frequency of making use of institutional catering

The frequency of making use of the canteen	Percentage of the costs of institutional catering covered by the place of work
	sig=0.000 F=27.584
weekly	45.64
monthly	31.65
never	20.66
total pattern	34.44
The frequency of making use of the restaurant	**Percentage of the costs of institutional catering covered by the place of work**
	sig=0.001 F=7.08
weekly	27.65
monthly	28.77
never	40.69
total pattern	34.44
The frequency of making use of the inn	**Percentage of the costs of institutional catering covered by the place of work**
	sig=.0.000 F=20.94
weekly	22.34
monthly	17.93
never	41.58
total pattern	34.44
The frequency of making use of the fast food restaurant	**Percentage of the costs of institutional catering covered by the place of work**
	sig=0.047 F=3.07
weekly	26.57
monthly	26.71
never	37.56
total pattern	34.44

N=997; Levels of measure: proportional scale and nominal; One-Way Anova

A special attention was paid to this question as according to the specialists, subsidies can be an important drive in spreading institutional catering domestically. The results of our own research also proved the significance of subsidies, as during the factor analysis the statements „could be paid by lunch voucher" and „the place of work should cover part of the costs" created a separate factor group as the elements of subsidies covered and did not merge with any of the service elements. The tightest correlation with the extent of the direct subsidy could be detected in the case of the canteen where a great part of the expenses are covered by the workplace in any form so employees are pleased to go to the canteen. The majority of the people make use of the possibility at places where hot meals at a discounted price are available for the employees.

However, the regular guests of the inns, restaurants and fast food restaurants are employees of such workplaces where the direct form of catering subsidies is not the common practice. Those who have meals at the inns, restaurants and fast food restaurants weekly get direct subsidy of a much smaller extent than the average value of the sample. Of course, it does not imply that they only make use of the examined catering facilities because they are not given lunch at a discounted price at their place of work, but the subsidies certainly do affect the frequency of making use of the certain catering facilities.

If the place of work decides on indirect subsidies, i.e. provides its employees with lunch vouchers, it is favourable for the companies dealing with home delivery, buffets and fast food restaurants (*Table 4*). These are the places where the majority of employees can redeem the vouchers. In the case of the canteen, the correlation can also be shown but the difference is not to such an extent as experienced in the case of indirect subsidies.

Other infrastructural endowments that can be linked to the place of work
The use of certain alternatives is differentiated regarding the possibility of consuming a hot lunch provided by the workplace as well as separate premises available for consuming food.

It holds true in the case of the canteen that most of their regular guests work at such places that provide their employees with the possibility of consuming hot lunch on the spot.

According to the results of the research, a significant number of employees would have the possibility to consume a hot lunch on the premises but they prefer going to restaurants or fast food restaurants at lunchtime and do not make use of this service (*Table 5*).

This phenomenon proves the experience gained during our focus group examinations, i.e. there are such employees who search for solutions outside the place of work despite the possibilities and endowments of the workplace.

The same holds true for the regular guests of the buffets. In spite of the fact that they could choose hot meals for lunch at their places of work, they rather look for cold ones that appease their hunger. Both correlations suggest that the individual eating habits and expectations about food are also decisive in the way they consume at work regardless of the possibilities offered by the place of work.

Table 4

The correlation of the extent of the indirect support provided by the place of work and the frequency of making use of institutional catering

The frequency of making use of the canteen	Percentage of costs covered by the workplace in the form of lunch vouchers
	sig=0.001 F=7.33
weekly	39.00
monthly	35.27
never	26.40
total pattern	31.97
The frequency of making use of the buffet	**Percentage of costs covered by the workplace in the form of lunch vouchers**
	sig=0.029 F=3.58
weekly	37.62
monthly	32.69
never	27.64
total pattern	31.97
The frequency of making use of home delivery	**Percentage of costs covered by the workplace in the form of lunch vouchers**
	sig.0.003 F=5.92
weekly	46.75
monthly	34.60
never	28.98
total pattern	32.05
The frequency of making use of the fast food restaurant	**Percentage of costs covered by the workplace in the form of lunch vouchers**
	sig=0.000 F=8.00
weekly	40.63
monthly	30.24
never	27.26
total pattern	32.05

N=997; Levels of measure: proportional scale and nominal; One-Way Anova

The results show that the great bulk of employees who decide on inns would prefer hot meals at work if they had the chance. The same holds true for almost 30% of those requiring home delivery services. These correlations are also significant from a practical point of view as they suggest that most of the users of these alternatives would be open to using the canteen if this chance were offered to them at work.

The analysis showed that facilities at work have a role in determining what way of eating is chosen by the employee but its weight and extent are not the same in the case of the single alternatives. There are ways of eating whose frequency of usage can be tied to the subsidies and facilities (e.g. canteen) on offer provided by the workplace (fast food restaurant, buffet, restaurant) usage possibilities.

Table 5

**The connection between the infrastructural endowments of the workplace
and the frequency of making use of institutional catering**

Criteria linked to workplace	canteen	buffet	restaurant	home delivery	inn	fast food restaurant
Possibility for consuming hot lunch at the place of work	sig=0.000 Adj.R=16.9* 91.3% of the regs have one and use it	sig=0.000 Adj.R=6.5* 68.4%- of the regs have one but do not use it	sig=0.000 Adj.R=10.7* 87.7%- of the regs have one but do not use it	sig=0.000 Adj.R=4.6* 23.2%-of the regs do not have it but would use it	sig=0.000 Adj.R=5.3* 75.2%- of the regs do not have it and would not use it	sig=0.000 Adj.R=4.5* 73.4 of the regs have one but do not use it
Type of workplace	sig=0.003 state, local government 34.2% Adj.R=2.9**	sig=0.034 foreign 33.7%- Adj.R=3.16*	sig=0.000 foreign 32.2% Adj.R=4.5*	sig=0.012 mixed 58.2%- Adj.R=2.4**	sig=0.019 national 32.8%- Adj.R=2.8**	sig=0.000 Adj.R=4.7* 32.5%-of the visitors who never go there are employed by the state or local governments
Number of employees (at those who make use of the given type of catering facility minimum once a week)	sig=0.000 above 250 persons 38.4% Adj.R=4.1*	sig=0.008 above 250 persons 33.2% Adj.R=2.3**				

*Adj.R >= 2: of 95% reliability a positive deviation from the expected level; **Adj.R >= 3 : of 99% reliability a positive deviation from the expected level; N=997 Levels of measure: Chi square trial, values: AdjR=adjusted standardised residuum; %=the ratio of the number of employees at a given place of work who make use of the given catering type at least once a week

The frequency of using the single alternatives can only be defined by the basic features of the workplace. Among the regular guests of buffets and restaurants, the employees of foreign companies (multinationals) with a large staff represent a higher proportion than expected.

Among those who require home delivery on a weekly basis, again the employees of companies of mixed ownership showed a positive deviation from the expected

value, while in the case of inns, the employees of the national companies are dominant. Among the employees of state-or local government-owned workplaces, the number of those who could not be characterised as having lunch in fast food restaurants at all was higher than expected. They are rather regulars guests to canteens. This result justifies the experts' opinion, i.e. that state-and local government-owned companies lead in directly subsidising catering for their employees by running a canteen successfully and providing hot meals at a favourable price.

CONCLUSIONS

During our empirical research we have concluded that making use of institutional catering does not only depend on the criteria linked to the consumer but also on the features of the concrete place of work.

An important part of our examination was to be able to prove that the direct and indirect support provided by the workplace plays a decisive role in the concrete form of institutional catering the employees choose. On the basis of our research results we have pointed out that the canteen was primarily preferred by the employees where the menu is at their disposal at a reduced price (or subsidised by the company). In contrast, support given in the form of luncheon vouchers mainly boosts the turnover of home delivery, fast food restaurants and buffets. These conclusions indicate that the frequency of visiting the different options for eating out is closely connected to what type of eating facilities the workplace can or wants to provide for the employees.

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MARKET PRICE FORECASTING FOR WHEAT AND CORN

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ABSTRACT

In the course of defining a price forecasting model applicable for wheat and corn in Hungary, first the application of stepwise regression was attempted, however there was a poor fit, and the parameters were not in line with the assumptions either. In addition, an extreme multiple collinearity was found, therefore the ARMA model was tried. Considering that the results for wheat and corn did not show a constant dispersion, and taking into account that in the case of the ARMA model there is a constant conditional dispersion in time, it was necessary to introduce the GARCH process analogous to a conditionally parameterised ARCH(∞) model. Based on the results, the GARCH(1,1) model could be defined. This model has a good fit and can be used to forecast the market price of wheat in Hungary. In view of the results it was possible to set up the GARCH(0,3) model for corn. This model has a good fit and can be used to forecast the market price of corn in Hungary. Based on the aforementioned, we can declare that it is possible to define a price forecasting model predicting the price movements of wheat and corn in Hungary by applying the GARCH model.
Keywords: wheat, corn, market price, forecast

INTRODUCTION

In Hungary, a significant fluctuation in the average price of corn can be observed (*Figure 1*). Between 1990 and 2010, corn prices were changing in a range below the world and the EU market prices. Corresponding to the prices in the EU, a peak could only be observed in 2007 in Hungary.

Based on the data, it is obvious that the United States has a predominant role in the world. Consequently, it is nearly apparent that the commercial prices mostly depend on them, and the various continental as well as regional prices are generated by the US prices. Prices on the world market are regulated by the internal market prices in the USA. This statement is particularly true of the current situation, when supply-based pricing is applied. Accordingly, world prices respond to any news of positive or negative changes in the weather conditions in the crop producing areas of the US (*Tömösi*, 2010).

In Hungary, a significant fluctuation of the average annual wheat price can be observed (*Figure 2*). Between 1990 and 2010, wheat prices were changing in a range below the world and the EU market prices. Corresponding to the prices in the EU, a peak could only be observed in 2007 in Hungary.

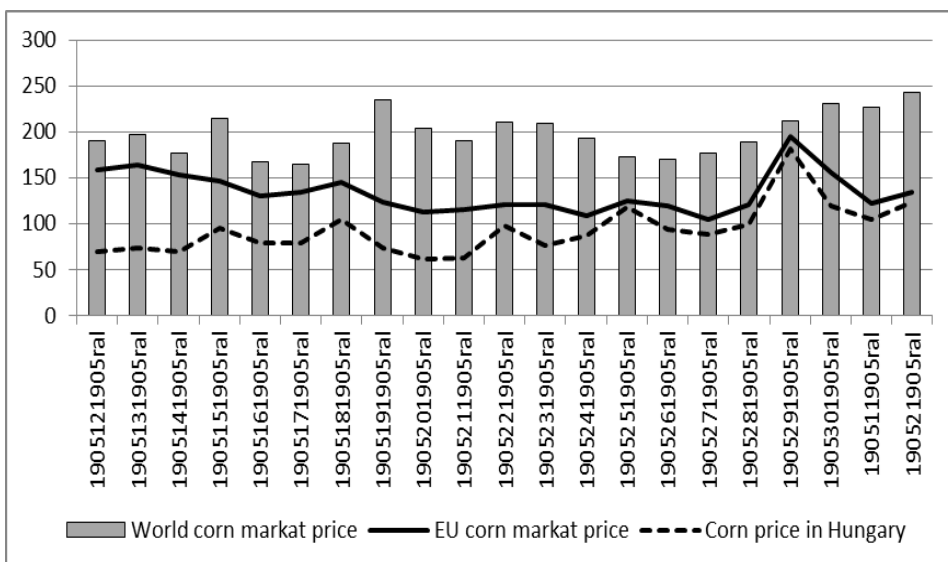Based on the aforesaid, it is apparent that changes in the world market price of agricultural crops may result in substantial fluctuation of prices in the EU and on the internal market of Hungary, as well as in the income from agricultural exports.
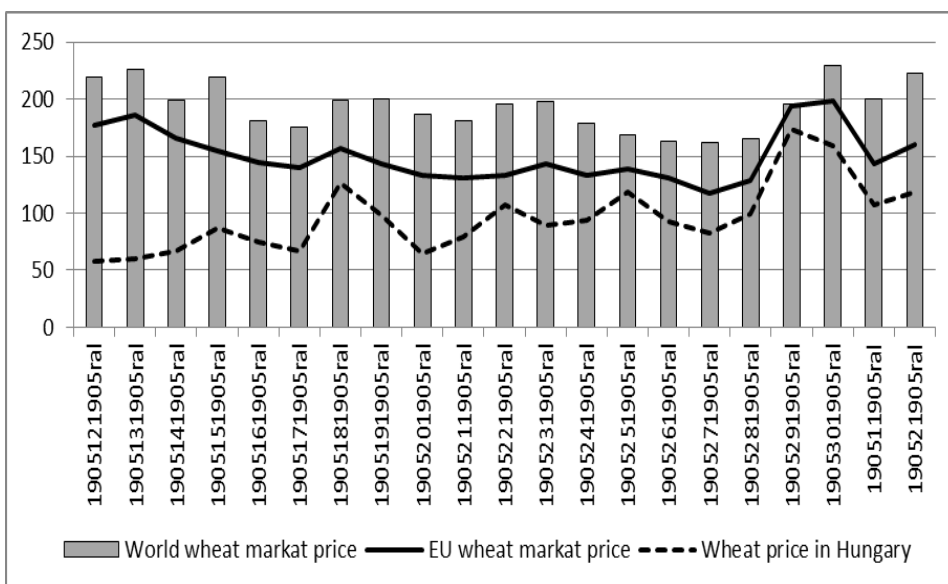
Figure 1

The average annual corn prices in Hungary (EUR/ton)

Source: Based on FAOSTAT and AKII data

Figure 2

The average annual wheat prices in Hungary (EUR/ton)

Source: Based on FAOSTAT and AKII data

It was observed by *Bedő et al.* (2011) that during the recent four years prices vastly increased on two occasions. First, they explained the abrupt substantial rises as a result of speculation, but at the present time, these price changes recurring within a short period of time are no longer considered to occur by chance: they are the outgrowth of continuously growing consumption.

Short-term price fluctuations are too large and frequent, thus influencing the risk management strategy of farmers. Namely, in the case of irregular price fluctuations there is an increased uncertainty. Concerning welfare aspects, the uncertainty of agricultural and rural income experienced without price stabilization is also a problem. Consequently, long-term investments are not made, farmers do not take out loans, and as a result there will be limited or no technological development, and the financing of production can also cause problems. However, price stabilization is not equivalent to stabilizing the income, as the latter is not a function of the supply and demand situation (*Fertő*, 1995).

My research tries to define a model that supports the estimation of prices in order to develop a buying and selling strategy. The objective of this model is to enable farmers to make the most appropriate estimation of the timing for selling their crops. However, it is questionable whether a model for the forecast of price movements of wheat and corn at a high level of accuracy can be developed for Hungary.

MATERIALS AND METHODS

Databases

For the development of the model data pertaining to the period of January 1998 to April 2011 were used. All prices were converted to HUF using the foreign exchange rates for each specific time range.

- *Market price:* AKII market price information system (following: PAIR) database: *https://pair.akii.hu*
- *World market price:* FOB price for the Gulf of Mexico *http://www.indexmundi.com/*; I used prices for the Gulf of Mexico as the World Market price, as most of the overall quantity of corn is loaded to vessels in the Gulf of Mexico
- *Crude oil price: http://www.oil-price.net/?gclid=CLCsuODsq6gCFVUj3wodQ0C8HQ*
- *Quantity of production:* AKII database
- *EUR/HUF exchange rate:* the exchange rate set by the ECB
- *Area payments:* ARDA database.
- Although the area payments are calculated on a per hectare basis, the amount of subsidy was also calculated by using data on the production area and the average yields. The average SAPS payment per hectare increases at a rate of 5% each year.
- *Buying-in price:* ARDA database

For the purpose of the research the net intervention prices actually paid are considered as the buying-in price. The data used pertain to the period of November 2004 - April 2011.

The method of analysis
Essentially, the model was defined in accordance with the instructions of *Ramanathan* (2003). The data were arranged in Microsoft Excel, and IBM SPSS (*Sajtos and Mitev*, 2007) Statistics and the Eviews7 programs were used for the analysis.

To set up the models, the following models/methods were used.

Examination 1

Stepwise regression: Regression-calculation is a method in which a context is analyzed through a metric, dependent and one or more independent variables. The questions of the regression and the correlation differ from each other, in that in the first case the estimated value is searched for. In the regression it is necessary to give the dependent and independent variables as well.

Regression-calculation – similarly to the correlation – works with metric variables. The basic model of the regression is the two-variable linear regression. It means that the movements of a dependent variable are tested depending on an independent variable. It is assumed that the context between the variables is linear, and this would be proved.

The set of a dependent variable is also tested in the multiple variables linear regression, but depending on more independent variables and the context between the variables is assumed to be linear also. Therefore, the multiple variables regression correlates a Y dependent variable with several independent variables (X_1, X_2, …., X_k).

The general form of a multiple variables linear regression model is the following:

$$Y_t = \beta_1 + \beta_2 X_{t2} + \ldots + \beta_k X_{tk} + u_t, \tag{1}$$

The value of the X_t1 is 1, because it is necessary to have an 'intercept'. The t subscript is concerned with the ordinal number of the monitoring and it is changed from 1 to n. The u_t deviation variable is the random component from not observation, and it is the difference of Y_t and Y conditional expected value concerning to X. It explains the presence of the u_t deviation variable: the eliminated variables; the ignorance of the non-linearity; the measurement errors; the purely random; the irregular effects. The number of the independent variables is k, so k, the unknown coefficient of the regression, needs to be estimated.

When just X_{ti} is changing, the magnitude of the change in Y_t is given from $\Delta Y_t / \Delta X_{ti} = \beta_i$.

Stepwise regression
The independent variables are aggregated or eliminated individually to the regression equatation.
Primarily those are introduced to the equation that decisively explains the Y.

Forward selection
Examination begins with no variables in the equation. The variables are introduced individually, but just in the case that it fulfils the predetermined criteria (the order is according to the power of the exposition).

Backward method
Starting with all variables in the model and deleting the variables continuously when the criteria are not met.

Stepwise method
This is the combination of the forward and backward methods: in every step the unfit variables are removed from the equation. The usage is appropriate if the sample is large enough.

Firstly regression was attempted, but the fit was not good because extreme multicollinearity is experienced and after the transformation of the data it did not suit the basic criteria of the regression.

The regression was estimated with the stepwise method, whose advantage is that in every step it verifies the p probability of the previously involved variables. In the case that p is higher than the pout, the variable is going to be dropped from the model.

The endless cycle can be avoided, because the fixed maximum needs to be lower than the pout value. The default PIN (fixed maximum)=0.05 POUT=0.10.

In the model the explanatory variables need to be uncorrelated, hence the tolerance can be $1-R^2$, possibly the variance inflation factor (VIF)=$1/1-R^2$, if there is a close link between the variables, its value can be really high.

The last indices for the independence is the condition index (CI)=$(\lambda_{max}/\lambda_i)^{(1/2)}$, where i=1,…,(p+1) and λ_i the X^TX are uneven, but divided with standard deviation data and formed matrix multiplication's own value.

Examination 2

Autoregressive (AR-) models: A clean autoregressive time series model, whose structure is the following:

$$Y_t = \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + ….. + \alpha_p Y_{t-p} + u_t, \tag{2}$$

where, Y_t is the dependent variable, which concerns the observation on the t-th occasion, after the average is subtracted; u_t is a good playing deviation variable with zero expected value and constant variance, which is not correlated with u_s, if $t \neq s$ (time series like this are called white noise). There isn't a constant term, because Y_t is described by the difference from the average. The Y_t is explained with only its own past values and not with other independent variables. These are the autoregressive or AR-models; its mark: AR (p).

Moving avarage- (MA-) models: The following model is called q ordered moving average- or MA-model; mark: MA(q), and can be written in the following way:

$$Y_t = \upsilon_t - \beta^1 \upsilon_{t-1} - \beta_2 \upsilon_{t-2} - …... - \beta_q \upsilon_{t-q}, \tag{3}$$

where υ_t is the white noise. Therefore, Y_t is the white noise, the linear combination of the variate.

ARMA-models: It is the mixture of the autoregressive and the moving avarage models.

The average form of the ARMA (p, q) model:

$$Y_t = \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \ldots + \alpha_p Y_{t-p} + \upsilon_t - \beta_1 \upsilon_{t-1} - \beta_2 \upsilon_{t-2} - \ldots - \beta_q \upsilon_{t-q} \qquad (4)$$

Engle's ARCH test
Engle (1982) has introduced a new approach to setting up a model for heteroskedasticity for time series data. This model has been denominated as the ARCH (Autoregressive Conditional Heteroskedasticity) model. The following has been assumed as the process generating variance:

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \ldots + \alpha_p u_{t-p}^2 \qquad (5)$$

The process described by the aforementioned equation is called an ARCH process of degree p. The reason for using the term „autoregressive" is that the variance of the deviation variable at time t is a function of the preceding deviation variables brought to a square. The variation in t is a function of the preceding time periods (it is a requirement thereof), that is the reason for using the term heteroskedasticity (*Ramanathan*, 2003).

GARCH-test: generalization of the ARCH-test, model of volatility.

The GARCH methods (Generalised Autoregressive Conditional Heteroskedasticity, which is generalized autoregressive conditional heteroskedasticity) were lead in by *Bollerslev* (1986).

The systematic description of the models were found in *Hamilton*'s (1994) and *Franco's and Zakoian's* (2010) work, and the overview discussion were found in *Mills'* (1993) and *Shams' and Haghighi's* (2013) work.

GARCH-models
The yield observed in the course of setting up the model can be divided to two components: $r_{t+1} = \mu + \eta_{t+1}$ where μ is the anticipated value of the yield (in practice this value can be considered to be zero), and η means the "innovation" (practically: the deviation from the average). The model attempts to manage the variance of innovations (which – in the case of an anticipated value of zero corresponds with the variance of the yields). According to the ARCH model, the conditional variance is a function of the latter observed innovations. In addition, as per the GARCH model, variance is a function of the latter conditional variance as well (variance appraisals). Consequently, two equations are described by the GARCH models: one for the average of the market yield, and another one for variance (this is where the ARCH and GARCH terms are included). In my analyses, the second equation has the leading part. In fact, the equation for variance can be divided to a term autoregressive to a preceding value of variance (a GARCH term), and another term fitting moving average to a residue (an ARCH term).

In a general form, the GARCH (*p,q*) model is:

$$r_t = \mu + \eta_t \qquad (6)$$

$$\sigma_t^2 = \omega + \sum_{j=1}^{p} \beta_j \, \sigma_{t-j\,j}^2 + \sum_{i=1}^{q} \alpha_i \, \eta_{t+1-i}^2 \,, \tag{7}$$

that is, the conditional variance on a specific day can be estimated as a function of the latest q innovation and the latest p conditional variance. In the model, coefficients α pertain to the ARCH terms, and coefficients β apply to the GARCH terms.

RESULTS AND DISCUSSION

Examination 1: Stepwise regression

To define a price forecasting model for wheat and corn applicable for Hungary, first the stepwise regression was used, but poor fitting and multicollinearity were found. The data did not meet the primary conditions of regression even after transformation.

Regression was assessed by using the stepwise model, which has the advantage of testing the probability "p" of the variables formerly included in the model after each specific step, and deleting a given variable if "p" is above the threshold.

A set of additional parameters influencing domestic market prices were incorporated into the model including the market price, the world market price, the oil price, the quantity of production, the USD/HUF exchange rate, the area-based payments (SAPS), and the intervention price.

Wheat model

Among the parameters listed above, the market price for wheat, the quantity of wheat production, and the area-based payments (SAPS) were deleted by the model. At the same time, the following parameters were included: the world market price for wheat, the USD/HUF exchange rate, the intervention price, and the oil price.

For the parameters included, four models were defined. The significance levels and the powers (R^2) were determined for all four models. Based on the results, high powers (over 85%) were found, and all models were statistically significant.

The parameters defining the *market price for wheat in Hungary* were assessed in the model. Based on the results, the equation of the regression model is:

LN_Market_price_for_wheat=
      -8.358+1.095*LN_World_market_price_for_wheat
      -1.047*LN_USD_HUF
      +1.236 *LN_Intervention_price_for_wheat HUF/ton. (8)

Unfortunately, at this point it was apparent from the data that there was collinearity. According to the results of the collinearity tests, the CI index was over 30. Consequently, none of these four models could be accepted for wheat.

Corn model

Among the parameters listed above, the following parameters were deleted by the model: the market price for corn, and the USD/HUF exchange rate. At the same time, the following parameters were included: the world market price and the intervention price (HUF/ton) for corn, the quantity of corn production, the oil price, and the area-based payments (SAPS).

For the parameters included, six models were defined. The significance levels and the powers (R^2) were determined for all six models. According to the results, the value of the corrected R-squared is considerably lower for these models than those found in the case of the models defined for wheat: it varies between only 23.3 and 56.8 %.

The parameters defining the *market price for corn in Hungary* were assessed in the model. Based on the results, the equation of the regression model is:

> LN_Corn_market_price =
> -0.486+0.598*LN_Corn_world_market_priceHUF/ton_
> FOB_price_Gulf_of_Mexico
> + 0.487 * LN_Corn_intervention_price_HUF/ton
> + 0.110 * LN_Corn_Quantity_of_production _million_tons   (9)

It appeared from the data that – similarly to the wheat model – there was collinearity. According to the results of the collinerarity tests, the CI index is over 30. Consequently, we could not accept any of these corn models.

Based on the above, the model found suitable for the forecast of wheat and corn prices in Hungary could not be defined by using stepwise regression and the available set of data. Therefore, it was decided to use another method.

Examination 2: the ARMA-GARCH-model

As the market prices could not be forecasted by using stepwise regression, I made and attempt to use the ARMA-model.

The ARMA(p,q) model:

> $y_t = c + \varphi_1 y_{t-1} + \ldots + \varphi_p y_{t-p} + \varepsilon_t + \varphi_1 \varepsilon_{t-1} + \varphi_q \varepsilon_{t-q}$,   (10)

where $\varepsilon_t \sim$ FAE $N(0,\sigma^2)$ distribution.

The relative dispersion of the market prices of wheat and corn was assessed (*Figure 3* and *Figure 4*).

Since the annual relative dispersion is not constant for wheat and corn (*Figure 3* and *Figure 4*), the GARCH process had to be introduced as well. (In the ARMA model the relative dispersion is constant in time.)

The GARCH-model corresponding to an ARCH (∞) model with parameter restriction:

> $y_t = (\ldots) + \varepsilon_t$ (11)

> $\varepsilon_t = \sigma_t \eta_t$ (12)

The general form of the GARCH-model:

> $\sigma^2 = a_0 + a_1 \varepsilon^2(t-1) + \ldots + a_q \varepsilon^2(t-q) + b_1 + b_1 \sigma^2(t-1) + \ldots + b_p \sigma^2(t-p)$ (13)

Fitting the Wheat model:

ARCH test
Considering the ARCH test, the null hypothesis is that there is no ARCH effect, namely, F-statistic $\sim$ Obs*R^2. Although it does not apply to our case, an ARCH effect can be found (*Table 1*).

Figure 3

The annual relative dispersion of wheat prices (%)
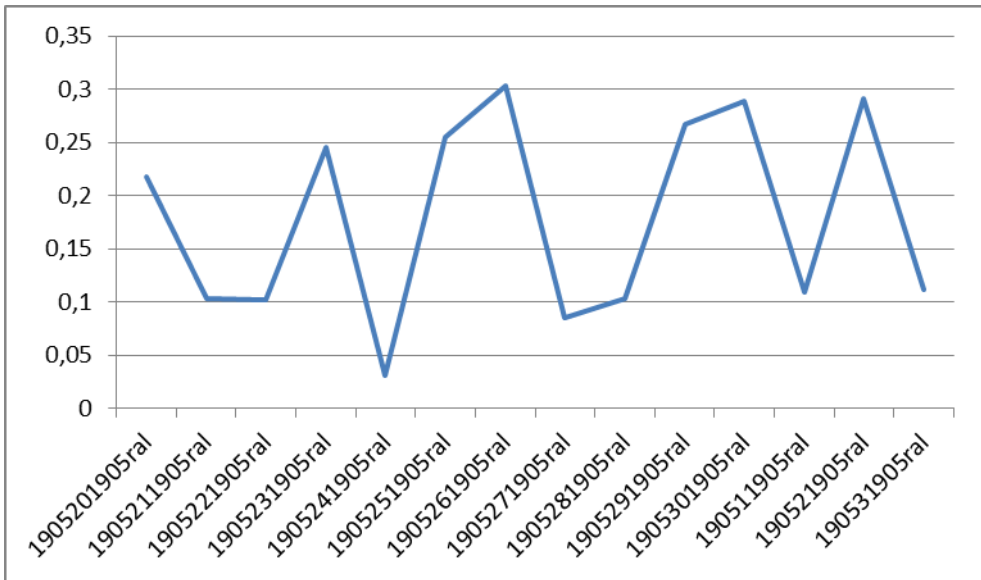
Figure 4

The annual relative dispersion of corn prices (%)
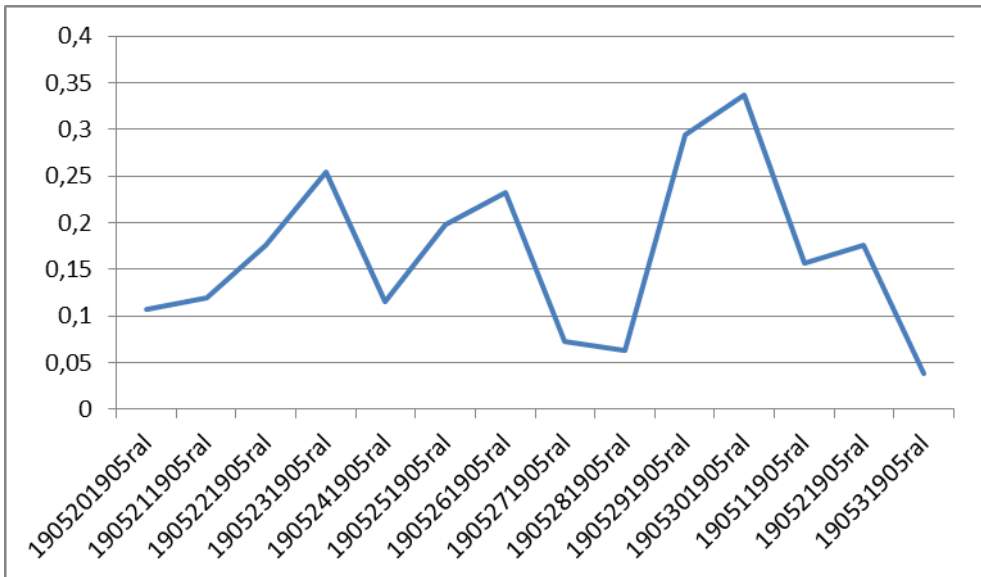
The ARMA model

I ran a self-developed computer program for the ARMA model, and as a result 121 models were defined. The appropriate models were selected by using the SIC and AIC information criteria, as well as the determinant coefficient. Based on this assessment, it was obvious to me that the ARMA(4,5) model could be chosen. After examining the significance of the individual factors, it turned out that the ARMA(4,5) model was inadequate (*Table 2*). Therefore, I decided to use the ARMA(1,1) model and I fitted an additional GARCH model to it.

The GARCH model

Based on the GARCH (1,1) model, this model has a power of 94.17%, which can be considered a very good value, and both the AR and the MA parts are significant (*Table 3*).

Accordingly, the equation for GARCH(1,1) is as follows:

$$Y_t = 30123.96 + 1.022517 * Y_{t-1} + \varepsilon + 0.182353\varepsilon(t-1) \tag{14}$$

$$GARCH = 97623902 + 0.123467 * \varepsilon^2(t-1) - 0.997702\sigma^2(t-1) \tag{15}$$

Fitting and plotting the price forecasting model for wheat based on the above equation (*Figure 5*):

Figure 5

Fitting the price forecasting model for wheat

The results show that the model had a very good fit.

Fitting the Corn model:

The ARCH test
Considering the ARCH test, the null hypothesis is that there is no ARCH effect, namely F-statistic ~ Obs*R^2. Although it does not apply to our case, there is an ARCH (*Table 4*).
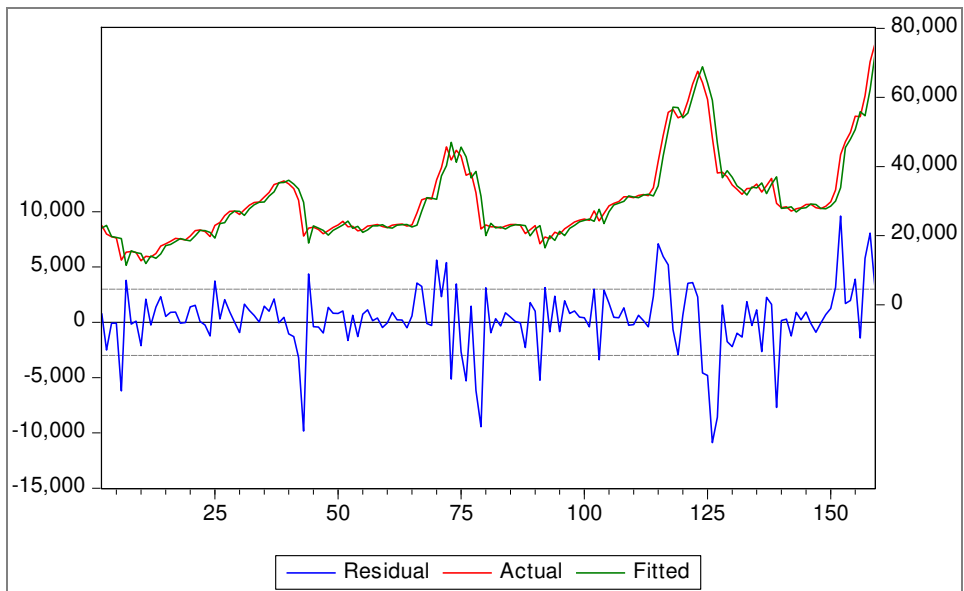
ARMA model
I ran a self-developed program for the ARMA model. As a result, 121 models were defined. The appropriate models were selected by using the SIC and AIC information criteria, as well as the determinant coefficient. The minimum values were determined for AIC and SIC, whereas the maximum value was established for the determinant coefficient, considering that the AIC tends to be overestimated. Based on the minimum value of AIC the ARMA(6,3) model (*Table 5*) should be selected, whereas considering the minimum value of SIC we should decide on the ARMA(3,3) model (*Table 6*). At the same time, in view of the maximum value of R^2 the ARMA(6,7) (*Table 7*) model had to be chosen. However, similarly to the situation experienced in the case of wheat, I found that the factors were not significant and decided to use the ARMA(1,1) (*Table 8*) model by applying the determinant coefficient and the information criteria.

GARCH model
Based on the GARCH (1,1) model, this model has a power of 94.17%, which is considered a very good value, and both the AR and the MA parts are significant (*Table 9*).

GARCH(p,q)
An assessment of GARCH p and q was made for models Garch(1,1) and Garch p=0 and q=0,1,2,3,4, and based on the parameters I considered Garch (0,3) the ideal model.
Accordingly, the equation for GARCH(0,3) is as follows:

$$Yt=42571.83+0.982295*Yt\text{-}1+\varepsilon+0.185554*\varepsilon(t\text{-}1) \qquad (16)$$

$$GARCH=65284433\text{-}1.003803*\sigma^2(t\text{-}1)\text{-}0.983242*\sigma^2(t\text{-}2)\text{-}0.969621*\sigma^2(t\text{-}3) \quad (17)$$

Fitting and plotting the price forecasting model for wheat based on the above equation (*Figure 6*).

The results show that in case of the model defined for forecasting the market price of corn there is an outstanding fitting.

CONCLUSIONS

Examination 1: Stepwise regression
In the course of defining the price forecasting model for wheat and corn applicable for Hungary, first the stepwise regression was used, but the model did not fit well and the parameters were not in line with the assumptions either. Furthermore, extreme multiple collinearity was found, therefore other methods were attempted.

Figure 6

Fitting the price forecasting model for corn
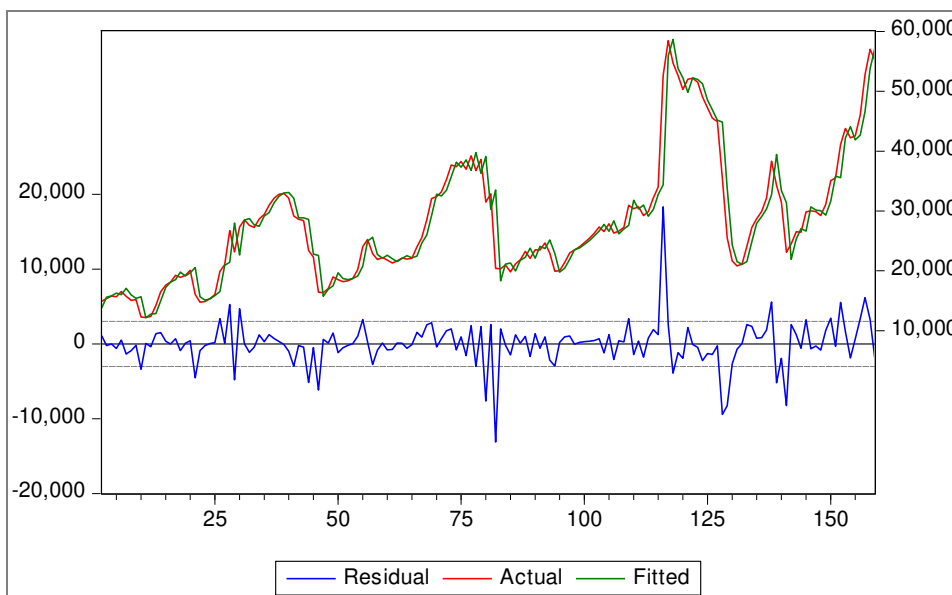
Examination 2: ARMA-GARCH-model

As stepwise regression did not result in an efficient forecasting of market prices, I attempted to apply the ARMA model. Based on our results, a constant dispersion could not be found either in the case of wheat or corn. In view of these results and considering the fact that in the ARMA model the relative dispersion is constant in time, it was necessary to introduce the GARCH process corresponding to an ARCH(∞) model with restricted parameterization.

The results made it possible for me to define the GARCH(1,1) model, which fitted well and could be used for the forecast of the market price of wheat in Hungary:

$$Yt=30123.96+1.022517*Yt\text{-}1+\varepsilon+0.182353\varepsilon(t\text{-}1) \tag{18}$$

$$GARCH=97623902+0.123467*\varepsilon^2(t\text{-}1)-0.997702\sigma^2(t\text{-}1) \tag{19}$$

Based on the results I was able to define the GARCH(0,3) model, which fitted well and could be used to the forecast the market price of corn in Hungary:

$$Yt=42571.83+0.982295*Yt\text{-}1+\varepsilon+0.185554*\varepsilon(t\text{-}1) \tag{20}$$

$$GARCH=65284433-1.003803\sigma2*(t\text{-}1)-0.983242*\sigma2(t\text{-}2)-0.969621*\sigma2(t\text{-}3) \tag{21}$$

Based on the results we can declare that it is possible to define a price forecasting model predicting the price movements of wheat and corn in Hungary by applying the GARCH model.

The importance of defining price forecasting models is that these models can support the market players in decision making through facilitating the development of their buying and selling strategies.

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APPENDIX

Table 1

Wheat model, ARCH test

Heteroskedasticity Test: ARCH			
F-statistic	0.529209	Prob. F(1,155)	0.4680
Obs*R-squared	0.534213	Prob. Chi-Square(1)	0.4648
Test Equation:			
Dependent Variable: WGT_RESID^2			
Method: Least Squares			
Date: 10/23/11 Time: 18:43			
Sample (adjusted): 3 159			
Included observations: 157 after adjustments			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.550991	0.107103	5.144485	0.0000
WGT_RESID^2(-1)	-0.058300	0.080141	-0.727467	0.4680
R-squared	0.003403	Mean dependent var	0.520800
Adjusted R-squared	-0.003027	S.D. dependent var	1.235284
S.E. of regression	1.237152	Akaike info criterion	3.276158
Sum squared resid	237.2345	Schwarz criterion	3.315091
Log likelihood	-255.1784	Hannan-Quinn criter.	3.291970
F-statistic	0.529209	Durbin-Watson stat	1.977664
Prob(F-statistic)	0.468037		

Table 2

Wheat, ARMA(4,5) model

Sample (adjusted): 5 159				
Included observations: 155 after adjustments				
Convergence achieved after 78 iterations				
MA Backcast: OFF (Roots of MA process too large)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	35866.80	3386.888	10.58990	0.0000
AR(1)	0.169251	0.057765	2.929979	0.0039
AR(2)	1.287280	0.110077	11.69438	0.0000
AR(3)	0.040614	0.057484	0.706534	0.4810
AR(4)	-0.608831	0.117719	-5.171916	0.0000
MA(1)	1.284472	0.121186	10.59920	0.0000
MA(2)	-0.042775	0.209487	-0.204191	0.8385
MA(3)	-0.471061	0.248567	-1.895109	0.0601
MA(4)	-0.066845	0.185096	-0.361138	0.7185
MA(5)	-0.199051	0.102804	-1.936229	0.0548
R-squared	0.958681	Mean dependent var		30328.49
Adjusted R-squared	0.956116	S.D. dependent var		12345.45
S.E. of regression	2586.185	Akaike info criterion		18.61610
Sum squared resid	9.70E+08	Schwarz criterion		18.81245
Log likelihood	-1432.747	Hannan-Quinn criter.		18.69585
F-statistic	373.8064	Durbin-Watson stat		1.602631
Prob(F-statistic)	0.000000			
Inverted AR Roots	0.89+0.14i	0.89-.14i	-0.80-0.33i	-0.80+0.33i
Inverted MA Roots	0.71	0.00+.50i	0.00-0.50i	-1.00+0.36i
	-1.00-.36i			
	Estimated MA process is noninvertible			

Table 3

Wheat, GARCH(1,1) model

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Sample (adjusted): 2 159				
Included observations: 158 after adjustments				
Convergence achieved after 56 iterations				
MA Backcast: 1				
Pre-sample variance: backcast (parameter = 0.7)				
GARCH = C(4) + C(5)*RESID(-1)^2 + C(6)*GARCH(-1)				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
C	30123.96	11772.43	2.558857	0.0105
AR(1)	1.022517	0.023895	42.79170	0.0000
MA(1)	0.182353	0.052799	3.453713	0.0006
	Variance Equation			
C	97623902	22014962	4.434434	0.0000
RESID(-1)^2	0.123467	0.018349	6.728852	0.0000
GARCH(-1)	-0.997702	0.000927	-1076.418	0.0000
R-squared	0.941732	Mean dependent var		30152.41
Adjusted R-squared	0.940981	S.D. dependent var		12294.20
S.E. of regression	2986.742	Akaike info criterion		19.42597
Sum squared resid	1.38E+09	Schwarz criterion		19.54227
Log likelihood	-1528.651	Hannan-Quinn criter.		19.47320
Durbin-Watson stat	1.581303			
Inverted AR Roots	1.02			
	Estimated AR process is nonstationary			
Inverted MA Roots	-0.18			

Table 4

Corn model, ARCH test

Heteroskedasticity Test: ARCH			
F-statistic	0.048519	Prob. F(1,155)	0.8260
Obs*R-squared	0.049130	Prob. Chi-Square(1)	0.8246
Test Equation:			
Dependent Variable: WGT_RESID^2			
Method: Least Squares			
Date: 10/23/11 Time: 19:58			
Sample (adjusted): 3 159			
Included observations: 157 after adjustments			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.762794	0.179724	4.244254	0.0000
WGT_RESID^2(-1)	0.017683	0.080276	0.220271	0.8260
R-squared	0.000313	Mean dependent var		0.776438
Adjusted R-squared	-0.006137	S.D. dependent var		2.107485
S.E. of regression	2.113942	Akaike info criterion		4.347643
Sum squared resid	692.6561	Schwarz criterion		4.386576
Log likelihood	-339.2899	Hannan-Quinn criter.		4.363455
F-statistic	0.048519	Durbin-Watson stat		2.001408
Prob(F-statistic)	0.825950			

Table 5

Corn, ARMA(6,3) model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dependent Variable: CORN				
Method: Least Squares				
Date: 10/23/11 Time: 19:10				
Sample (adjusted): 7 159				
Included observations: 153 after adjustments				
Convergence achieved after 48 iterations				
MA Backcast: OFF (Roots of MA process too large)				
C	33337.88	141809.4	0.235089	0.8145
AR(1)	1.319344	0.086599	15.23502	0.0000
AR(2)	-0.270108	0.135164	-1.998367	0.0476
AR(3)	0.686835	0.111926	6.136516	0.0000
AR(4)	-0.945510	0.113556	-8.326343	0.0000
AR(5)	0.093279	0.137153	0.680113	0.4975
AR(6)	0.115614	0.085855	1.346624	0.1802
MA(1)	-0.146116	0.059841	-2.441734	0.0158
MA(2)	0.026384	0.055635	0.474227	0.6361
MA(3)	-1.086533	0.060650	-17.91471	0.0000

R-squared	0.934538	Mean dependent var		28386.53
Adjusted R-squared	0.930418	S.D. dependent var		10389.14
S.E. of regression	2740.479	Akaike info criterion		18.73278
Sum squared resid	1.07E+09	Schwarz criterion		18.93085
Log likelihood	-1423.058	Hannan-Quinn criter.		18.81324
F-statistic	226.8320	Durbin-Watson stat		2.088224
Prob(F-statistic)	0.000000			
Inverted AR Roots	1.00	0.84	0.60	-0.28
	-0.42+.81i	-0.42-0.81i		
Inverted MA Roots	1.07	-0.46+0.90i	-0.46-0.90i	
	Estimated MA process is noninvertible			

Table 6

Corn, ARMA(3,3) model

Dependent Variable: CORN				
Method: Least Squares				
Date: 10/23/11 Time: 19:10				
Sample (adjusted): 4 159				
Included observations: 156 after adjustments				
Convergence achieved after 51 iterations				
WARNING: Singular covariance - coefficients are not unique				
MA Backcast: OFF (Roots of MA process too large)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	35133.64	NA	NA	NA
AR(1)	1.893955	NA	NA	NA
AR(2)	-0.911396	NA	NA	NA
AR(3)	0.017087	NA	NA	NA
MA(1)	-0.738683	NA	NA	NA
MA(2)	-0.057645	NA	NA	NA
MA(3)	-0.315207	NA	NA	NA
R-squared	0.930659	Mean dependent var		28148.32
Adjusted R-squared	0.927867	S.D. dependent var		10428.84
S.E. of regression	2800.934	Akaike info criterion		18.75713
Sum squared resid	1.17E+09	Schwarz criterion		18.89398
Log likelihood	-1456.056	Hannan-Quinn criter.		18.81271
F-statistic	333.3013	Durbin-Watson stat		2.109991
Prob(F-statistic)	0.000000			

Table 7

Corn, ARMA(6,7) model

Dependent Variable: CORN				
Method: Least Squares				
Date: 10/23/11 Time: 19:10				
Sample (adjusted): 7 159				
Included observations: 153 after adjustments				
Convergence achieved after 83 iterations				
MA Backcast: OFF (Roots of MA process too large)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	29726.13	4244.420	7.003578	0.0000
AR(1)	1.756556	0.421671	4.165703	0.0001
AR(2)	-1.052255	0.822224	-1.279767	0.2028
AR(3)	-0.492761	0.687594	-0.716645	0.4748
AR(4)	1.486490	0.393679	3.775895	0.0002
AR(5)	-1.006084	0.451538	-2.228125	0.0275
AR(6)	0.238734	0.289419	0.824875	0.4109
MA(1)	-0.567719	0.437924	-1.296387	0.1970
MA(2)	0.493576	0.414120	1.191867	0.2353
MA(3)	0.667835	0.352652	1.893751	0.0603
MA(4)	-0.613897	0.328966	-1.866144	0.0641
MA(5)	0.255380	0.367693	0.694547	0.4885
MA(6)	-0.068712	0.128831	-0.533348	0.5946
MA(7)	0.202336	0.121497	1.665361	0.0981
R-squared	0.937126	Mean dependent var	28386.53	
Adjusted R-squared	0.931246	S.D. dependent var	10389.14	
S.E. of regression	2724.137	Akaike info criterion	18.74473	
Sum squared resid	1.03E+09	Schwarz criterion	19.02203	
Log likelihood	-1419.972	Hannan-Quinn criter.	18.85738	
F-statistic	159.3674	Durbin-Watson stat	2.091451	
Prob(F-statistic)	0.000000			

Table 8

Corn, ARMA(1,1) model

Dependent Variable: CORN				
Method: Least Squares				
Date: 10/23/11 Time: 19:10				
Sample (adjusted): 2 159				
Included observations: 158 after adjustments				
Convergence achieved after 16 iterations				
MA Backcast: 1				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	33457.58	7225.956	4.630194	0.0000
AR(1)	0.954067	0.028900	33.01298	0.0000
MA(1)	0.205279	0.082303	2.494172	0.0137
R-squared	0.918713	Mean dependent var	27983.59	
Adjusted R-squared	0.917664	S.D. dependent var	10464.50	
S.E. of regression	3002.713	Akaike info criterion	18.87122	
Sum squared resid	1.40E+09	Schwarz criterion	18.92938	
Log likelihood	-1487.827	Hannan-Quinn criter.	18.89484	
F-statistic	875.9091	Durbin-Watson stat	1.905378	
Prob(F-statistic)	0.000000			
Inverted AR Roots	0.95			
Inverted MA Roots	-0.21			

Table 9

Corn, GARCH model

Sample (adjusted): 2 159				
Included observations: 158 after adjustments				
Convergence achieved after 55 iterations				
MA Backcast: 1				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(4) + C(5)*GARCH(-1) + C(6)*GARCH(-2) + C(7)*GARCH(-3)				
Variable	**Coefficient**	**Std. Error**	**z-Statistic**	**Prob.**
C	42571.83	25695.06	1.656810	0.0976
AR(1)	0.982295	0.018476	53.16707	0.0000
MA(1)	0.185554	0.043496	4.266043	0.0000
	Variance Equation			
C	65284433	8145898	8.014393	0.0000
GARCH(-1)	-1.003803	0.000980	-1024.440	0.0000
GARCH(-2)	-0.983242	0.004082	-240.8922	0.0000
GARCH(-3)	-0.969621	0.004209	-230.3573	0.0000
R-squared	0.918180	Mean dependent var	27983.59	
Adjusted R-squared	0.917125	S.D. dependent var	10464.50	
S.E. of regression	3012.531	Akaike info criterion	18.62994	
Sum squared resid	1.41E+09	Schwarz criterion	18.76562	
Log likelihood	-1464.765	Hannan-Quinn criter.	18.68504	
Durbin-Watson stat	1.899356			
Inverted AR Roots	0.98			
Inverted MA Roots	-0.19			