# 2 FINANCIAL AND ECONOMIC REVIEW

June 2017
Vol. 16. Issue 2.

# Financial and Economic Review

Scientific journal of the Magyar Nemzeti Bank



Publisher: Magyar Nemzeti Bank
Publisher in Charge: ESZTER HERGÁR
H-1054 Budapest, Szabadság tér 9.
www.hitelintezetiszemle.hu
ISSN 2415–9271 (Print)
ISSN 2415–928X (Online)

Cover design: MARIANNA IZSÓNÉ BIGAI

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Published regularly in every three months.
HU ISSN 2415–9271 (Print)
HU ISSN 2415–928X (Online)

Page setting and printing:
Prospektus – SPL consortium
H-8200 Veszprém, Tartu u. 6.

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# An Analysis of the Incomes and Current Personal Transfers of Hungarians Living Abroad

*Orsolya Csortos – Balázs Kóczián*

*The funds transferred or available for transfer home by households working abroad appear in several items of the balance of payments, which often leads to misunderstandings. This paper therefore attempts to define these concepts. It is necessary to clarify and understand the concepts associated with remittances because they may represent more stable sources of external funding compared to other external sources, and may also shape economic growth, improve the current account and thus contribute to reducing the risk premium and improving investor sentiment on the country. After illustrating the economic significance of the compensation of employees and transfers, we shed light on their trends in recent years in Hungary. The United Kingdom's referendum on EU membership in June 2016 lends particular relevance to the topic. We show that the compensation of employees working temporarily abroad significantly exceeds the current personal transfers of Hungarian households permanently living abroad, and these significantly improve the current account. Hungarian workers in Germany and Austria received the majority of wages, while the United Kingdom also plays a prominent role alongside Germany in current personal transfers made by Hungarian households living permanently abroad. At the scale of the European Union, the volume of compensation of employees and current personal transfers decreases in parallel with the level of economic development.*

**Journal of Economic Literature (JEL) codes:** F24, E01, F43, J61

**Keywords:** remittances, foreign worker incomes, external funding, labour flow

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The views expressed in this article are those of the authors and do not necessarily reflect the official view of the Magyar Nemzeti Bank. The authors would like to thank the staff of the Magyar Nemzeti Bank's Macro Finance and External Balance Department for their input for this research and the anonymous editors for their constructive comments.

The manuscript was received on 9 December 2016.

DOI: http://doi.org/10.25201/FER.16.2.527

## 1. Introduction

After Hungary joined the European Union, the number of Hungarian citizens working abroad started rising as workers took advantage of the free movement of labour and differences in wage levels. As the number of Hungarians working abroad has increased, the value of compensation of employees and current personal transfers has also risen. Although papers on the significance of working abroad (*Bodnár – Szabó 2014*) and on the volume of worker remittances (*Kajdi 2015*) have already been published, trends in the foreign compensation of employees and current transfers in recent years have not been represented in a breakdown by country or analysed in depth. The outcome of the United Kingdom's referendum on European Union membership held in June 2016 is what primarily shed light on the significance of the matter from a Hungarian perspective.

In the second chapter of our paper, we define the concepts linked to remittances and present the available data and constraints on obtaining data. Chapter 3 provides an overview of the potential economic impacts of the compensation of employees and transfers based on the literature. Chapter 4 gives an in-depth analysis of trends in the compensation of employees and the current personal transfers of Hungarians working abroad. Chapter 5 places Hungarian trends in an international context, while Chapter 6 sums up the main findings of the study.

## 2. Defining the concepts related to remittances

*The funds transferred or available for transfer home by workers living and working abroad appear in several items of the balance of payments, and thus the following chapter attempts to clarify these concepts.* However, before we give an overview of where the funds received from households working abroad appear in the balance of payments statistics, it should be noted that the balance of payments shows transactions between resident and non-resident households. In the balance of payments, residence is not primarily defined based on the economic agent's citizenship, but on where its "fundamental economic interests" are tied to (*MNB 2014*). In other words, a Hungarian citizen can be a resident in either Hungary or Germany. To put it simply, an economic agent is a resident in the country where he or she lives habitually, over the long term. Residing abroad for more than one year is generally regarded as long term, with a few exceptions such as exchange students and diplomats (*IMF 2009*). The following section presents a structured classification of the indicators that exist in relation to remittances, first presenting the two indicators that can be directly observed in the balance of payments.

**(1) Compensation of employees temporarily working abroad**

*Compensation of employees is recognised among primary incomes in the balance of payments and shows the amount of gross labour income earned by workers temporarily living abroad (working abroad for less than one year).* As the balance of payments records transactions between resident and non-resident agents, which is the wage paid to the Hungarian worker by a foreign employer in case of short-term work abroad, the balance of payments shows the gross wage. As a result, this time series shows the amount of wages received from non-resident economic agents instead of the amount of money transferred home by resident agents. As workers then pay taxes on these wages in the country in question[1] and spend a portion of their income on the cost of living, which is difficult to quantify, presumably only a portion of employees' income is actually transferred home. For this reason, it would be misleading to call this indicator a remittance, as only a portion of it can be transferred home.

**(2) Current personal transfers of households permanently living abroad**

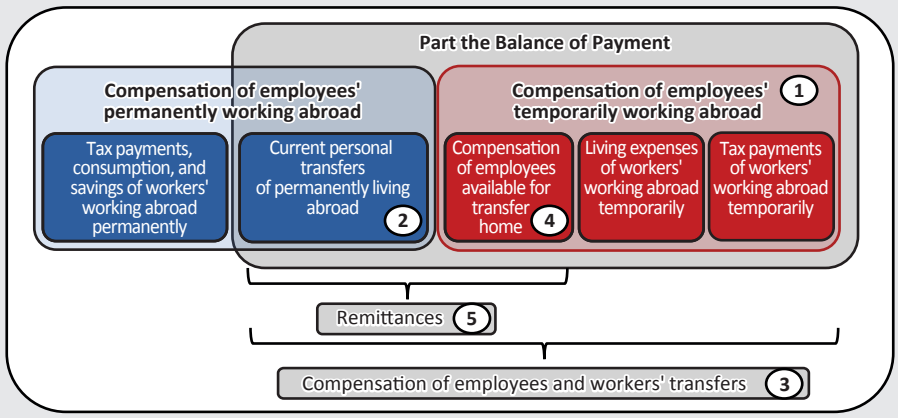
*The secondary incomes of the current account show the amount of money transferred home to domestic households by households living permanently abroad.* When a household moves abroad for the long term (for more than one year) and its economic interest shifts to the new country, it becomes a non-resident agent and from this point on, the transaction of receiving wages from its non-resident employer is no longer included in the original home country's balance of payments data (as the transaction takes place between two non-resident agents). At the same time, as a household living abroad is now a non-resident agent, transfers by this household to a household in Hungary give rise to a transaction between a resident and a non-resident agent, which is thus recognised among the secondary incomes in the balance of payments (called current transfers in the earlier balance of payments methodology). This item of the balance of payments also contains other items that are addressed in-depth later in this study.

*It is therefore apparent that several items of the current account contain elements that workers living abroad could transfer home; however, in our view, neither one of these nor their sum should be referred to as remittances.* In order to understand and analyse the amount of money that domestic households working abroad may be transferring home, new concepts should be defined. Using precise terminology is rendered difficult by the diverging use of terminology in international statistics and the fact that the international literature often fails to clarify the above concepts. Amongst others, the World Bank refers to the sum of concepts (1) and (2) as personal remittances. By contrast, the terminology used by Eurostat offers a more accurate description of the concept used by the institution for its analyses

[1] This is recognised among the secondary incomes of the current account.

("workers' remittances and compensation of employees"), which also refer to the sum of items (1) and (2). Besides these international organisations, numerous other domestic and international authors proceed similarly, so this concept also calls for definition. *Figure 1* illustrates the relations between concepts related to remittances.

**Figure 1**
**Concepts regarding remittances**




### (3) Compensation of employees and workers' transfers

According to our definition, similarly to Eurostat and the World Bank, this item contains the compensation of employees temporarily working abroad and transfers of workers permanently living abroad [(1)+(2)]. However, this item contains the tax burden on the compensation of employees and the portion of income used to cover the cost of living, in other words the sum of (1)+(2) is not transferred home in full. As a result, referring to the sum of items (1) and (2) as remittances would be inaccurate in spite of the fact that this is the terminology often used by the literature and the press.

### (4) Compensation of employees available for transfer home

This concept refers to the value of compensation of employees (1) less taxes, social contributions, costs of living and consumption expenditures. However, quantifying these items is problematic[2] for several reasons that go beyond the scope of this paper.

[2] Taxes and social contributions are recognised among the secondary incomes of the current account. Although data on the consumption expenditures abroad of domestic residents is available as it is considered a domestic service import, there is uncertainty within this category on the portion represented by consumption of short-term migrant workers and by domestic tourists traveling abroad.

**(5) Sum of current private transfers (2) and compensation of employees available for transfer home (4)**

In our opinion, this concept sums up all of the items that workers temporarily and permanently living abroad could transfer home, and thus for the sake of simplicity, we will refer to this concept in the rest of this paper as "remittances". According to our definition, remittances include transfers by households working abroad for the long term (working abroad for more than one year) and the portion of the compensation of employees working temporarily abroad (working abroad for less than one year) less taxes, which has not been spent on consumption. However, as highlighted in the previous section, because there is no accurate data on the latter item, the precise volume of remittances is difficult to quantify, which is particularly problematic because most analyses attempt to investigate the impacts of the contents of these remittances.

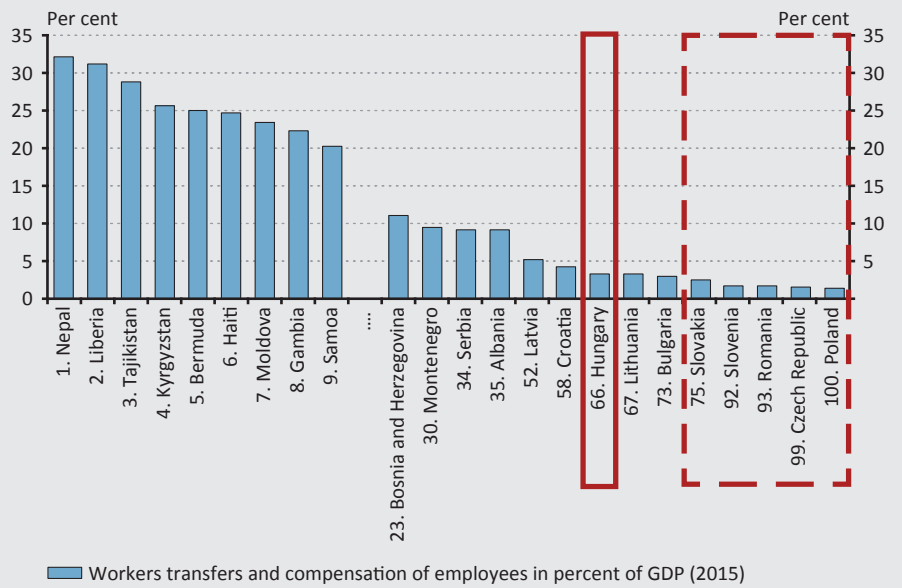
## 3. Economic impacts of compensation of employees and transfers based on the literature

*This chapter presents the economic impacts of the compensation of employees and current transfers from several aspects.* Here again, we would stress that most of the literature uses the term "remittances", possibly stemming from the fact that they attempt to analyse the impacts of remittances [(5)], which we have also described, that make the most sense economically. By contrast, as highlighted earlier, the term "remittances" most often refers to the sum of items (1) and (2), i.e. compensation of employees and current personal transfers [(3)]. For the sake of consistent terminology, we have no choice other than to use the cumbersome but accurate expression "compensation of employees and transfers" as the majority of the literature bases its analyses on World Bank data, which is consistent with this expression [(3)]. Although the concepts of remittances and compensation of employees and transfers are often used inaccurately in various analyses, their qualitative economic impacts (on income distribution, welfare, growth and the balance of payments) and broad trends are largely identical. The only significant differences can be found in the degree of impact on individual variables, as remittances form a subset of compensation of employees and current personal transfers.

*According to the World Bank data, compensation of employees and current personal transfers as a percentage of GDP is typically the highest in the Asian and African countries, while Hungary's figure is considered moderate (but significant by regional standards)* (*Figure 2*). According to the World Bank's data, compensation of employees and current personal transfers exceed 20–30 per cent of GDP in many Asian and African countries, so much of the literature tends to focus on developing, lower-income countries when analysing these transactions. Compensation of employees and current personal transfers as a percentage of GDP in Central and

South-eastern Europe and the Baltic States amount to less than 10 per cent; compared to this, Hungary's figure of 3.3 per cent is moderate, but slightly exceeds the regional average for Central and Eastern Europe. *With this in mind, this paper focuses mainly on the impacts of compensation of employees and current personal transfers in the economies of the region and less so on the impacts of migration and the trends exhibited in the poorest countries.*

**Figure 2**
**Compensation of employees and current personal transfers as a percentage of GDP**
*(2015)*




*Source: World Bank.*[3]

*The impacts of compensation of employees and current personal transfers are typically classified in three groups by the literature* (*OECD 2006*). The first topic is the impact of compensation of employees and current personal transfers on income distribution, poverty alleviation and individual welfare, the second topic is the impact on growth, employment and productivity, and the third topic is the impact on the balance of payments. That said, other classifications for analysing the impacts are also possible, such as the one used in a European Parliament analysis (*European Parliament 2014*) which distinguishes micro-level and macro-level impacts. As this paper relies on aggregate data, we essentially adhere to the OECD classification.

[3] http://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data.

### 3.1. Impacts on income distribution and welfare

*The impact of compensation of employees and current personal transfers on income distribution is unclear based on empirical studies, while it may alleviate the risks associated with poverty.* They may either decrease (*Ahlburg 1996; Taylor 1999*) or increase the Gini coefficient that measures social inequality (*Adams 1991*). The impact on income distribution may be influenced by the stage of the migration wave that a country is currently experiencing. During the initial phase of migration, typically wealthier families may seek work abroad, which may increase inequalities (*World Bank 2011; Stark et al. 1988*). In later stages of migration, poorer groups may also seek work abroad to a greater extent, and thus their compensation and current personal transfers may also alleviate social inequalities in the longer run (*Stark – Taylor – Yitzhaki 1988*). Many empirical studies reveal a rise in consumption expenditures among households that are recipients of incoming transfers, which face lower chances of sinking into poverty compared to those which receive no funding from abroad (*Ratha 2013*). In addition, compensation of employees and current personal transfers shield households from external shocks and act as a form of social insurance in countries plagued by frequent political or economic turmoil (*Kapur 2004*).

*Compensation of employees and current personal transfers may boost economic and household welfare by generating higher income available for education spending*. Some studies point out that migration and compensation of employees and *current personal* transfers have a positive impact on the host country's human capital (*de Haas 2007*). It is also possible that the funds received following emigration do not compensate for the loss generated by the brain drain of highly skilled labour, but this exceeds the scope of our paper's objectives. The *IMF* (*2016*) study shows that in CESEE[4] countries, the qualification and education of emigrants is significantly higher than the national average.

*Several studies show that compensation of employees and current personal transfers may play a pronounced social role beyond their financial and economic significance.* While the bulk of analyses focused on the monetary and financial impacts of inflowing funds, their non-financial and in-kind forms are just as significant. *Levitt's* (*1998*) paper shed light on the significance of the cultural and social impacts of migration. The "transfer" of non-financial and in-kind benefits may have a significant impact on social development through numerous areas such as education, healthcare, gender equality or the brain gain.

[4] Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Kosovo, Latvia, Lithuania, Macedonia, Moldova, Montenegro, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia, Turkey, and Ukraine.

### 3.2. Growth impacts

*Compensation of employees and current personal transfers may stimulate economic growth through various channels.* Numerous studies have shown that the continuous influx of compensation of employees and *current personal* transfers *mitigates the volatility of output* (*IMF 2005; World Bank 2006; Chami et al. 2008*), while several empirical analyses have shown that they have a positive impact on the host country's *economic growth* (*Solimano 2003, World Bank 2006*). That said, several authors stressed that the impact on growth depends on numerous factors (such as its absorption). Compensation of employees and transfers stimulate *consumption and investment* and may thereby mitigate the degree of recession and foster a pickup in the host country's economic growth. In addition, absorption by consumption or investment also has secondary or *multiplier effects.* Such multiplier effects include expanding retail sales, which boosts demand and ultimately, output and employment as well (*Lowell – de la Garza 2000; Ratha 2003*). Indirect impacts may also be generated by the fact that incoming compensation of employees and *current personal* transfers *free up funds* that can thus be used for *investment,* which has a positive impact on *employment* and growth. *Léon-Ledesma – Piracha (2001)* estimate that in 11 Central and Eastern European countries, compensation of employees and *current personal* transfers significantly increase the economy's funds available for investments.

*That said, compensation of employees and current personal transfers may also have adverse impacts on growth.* The impacts on employment, inflation and imports depend on the flexibility with which the supply side of the economy is able to react to higher demand in the wake of the compensation of employees and *current personal* transfers received. For instance, if supply is unable to adequately adjust to increased demand, it may result in *inflationary effects* (*Adams 1991; Barajas et al. 2011; El-Sakka 1999*). There is a high likelihood that the funding received is spent by the recipient households on consumption goods (generally imported goods), instead being used for domestic investments or savings. In line with this, several authors (*Alper – Neyapti 2006; de Haas 2007*) found that compensation of employees and *current personal* transfers may only foster investments and economic growth over the longer run. Meanwhile, the receipt of compensation of employees and *current personal* transfers and constant reliance on such may decrease labour market participation and the number of hours worked (*Buch et al. 2002; Chami et al. 2003*). Rising inactivity may also increase the wage level and the inflow of funds may lead to appreciation of the real exchange rate (*Chami et al. 2008; Bourdet – Falck, 2006; Barajas et al. 2011*). The *IMF* (*2016*) demonstrates that the influx of compensation of employees and *current personal* transfers significantly *increases labour market inactivity* by increasing reservation wages. In extreme cases, reliance on incoming funds may be a unique source of contagion: if the country

sending the funds is affected by a crisis, the recipient countries will also feel an adverse effect (*Alvarez–Tinajera 2010*).

*Compensation of employees and current personal transfers may have a positive impact on economic prospects through financial deepening.* According to the *IMF's* (*2016*) calculations, in countries where reliance on compensation of employees and transfers is high (remittances exceed 10 per cent as a percentage of GDP), they may foster deepening of the financial system, which is generally measured through private sector credit and deposits as a percentage of GDP. The funds received may increase private sector *bank deposits and thus the stock of extended credit,* which may ultimately stimulate investments (*Aggarwal et al. 2006; Giuliano and Ruiz-Arranz 2005, 2009; Gupta et al. 2009; Ratha 2013*). Compensation of employees and *current personal* transfers received may enable the *accumulation* of financial and non-financial assets, which in turn improves access to financial services and investment opportunities (*Orozco et al. 2005; IMF 2005*). *Yasseen* (*2012*) demonstrates a positive correlation between compensation of employees and *current personal* transfers and the *level of financial system development* in emerging countries. That said, these positive impacts may wane as migration becomes permanent or increases.

*In light of these findings, the link between compensation of employees and current personal transfers and economic growth is not clear, and the potential positive impacts are not a silver bullet in and of themselves and cannot replace adequate economic policy for any country* (*Stratan et al. 2013*). The right economic policy and development strategies are best able to ensure that the compensation of employees and transfers received by developing countries exert a positive impact on growth. In addition, the adverse effects of emigration and reliance on compensation of employees and *current personal* transfers can be mitigated with economic policy measures that create an economic and institutional environment that does not promote additional emigration or supports the return of emigrants, that fosters greater labour market activity of those who remain in the country and supports the allocation of the funds received to investments rather than consumption (*IMF 2016*).

### 3.3. Impact on the balance of payments

*Compensation of employees and current personal transfers have a positive impact on and foster the achievement of a sustainable current account over the long run.* The fact that compensation of employees and *current personal* transfers have turned out to be a more stable source of funding and are less cyclical compared to other external funding (such as international aid, FDI or credit, see below for more details), has numerous positive consequences for the balance of payments and its sustainability (*IMF 2005; Ratha et al. 2009*). The advantage of compensation of employees and *current personal* transfers is that their utilisation is not tied to the use of high import-content investment projects, they do not have to be repaid

and are not subject to any interest. Most research also emphasises that higher demand for imports is the result of economic development, structural changes in consumption and capital goods production or changes in international labour distribution (*Glytsos 1993; Straubhaar 1988*).

*The stability of compensation of employees and current personal transfers contributes to the economic stability of the recipient country.* Maintaining the current account at a level that does not jeopardise the sustainability of external debt is essential for open economies (*Holmes 2006*). *Buch and Kuckulenz* (*2010*)[5] showed that by positively impacting the current account, compensation of employees and *current personal* transfers decrease a country's risk premium and improve investor sentiment by reducing external debt; ultimately, these factors result in better financing conditions which fosters investment and economic growth. *Hassan and Holmes (2015*) showed that compensation of employees and *current personal* transfers result in less persistent shocks affecting the current account and quicker ensuing adjustment. Furthermore, *Bugamelli and Paternò* (*2009*) demonstrated that compensation of employees and current personal transfers decrease the likelihood of current account crises and thus the likelihood of financial crises. By contrast, certain studies point out that the funds received may push property prices up in the recipient country, which may lead to the misallocation of funds and pose a risk for financial stability (*Stepanyan – Poghosyan – Bibolov 2010*).

## 4. Trends in the compensation of employees and current personal transfers in Hungary

As we have demonstrated so far, compensation of employees and current personal transfers may have various macroeconomic impacts, and thus an in-depth investigation of their trends in Hungary is warranted. As shown in Chapter 2, referring to the sum of the two items as remittances would be misleading, as households working temporarily abroad can actually only transfer a portion of their gross wages back to Hungary, as the remainder is used to pay taxes and cover the cost of living.[6] This chapter and paper do not attempt to give an estimate of the value of remittances by Hungarian working abroad, but instead strive to provide an overview of data included in the balance of payments, i.e. of the trends in Hungarian households working abroad temporarily [(1) in our list above] and transfers by Hungarian households working abroad over the longer term (2). The following chapter presents these items in-depth.

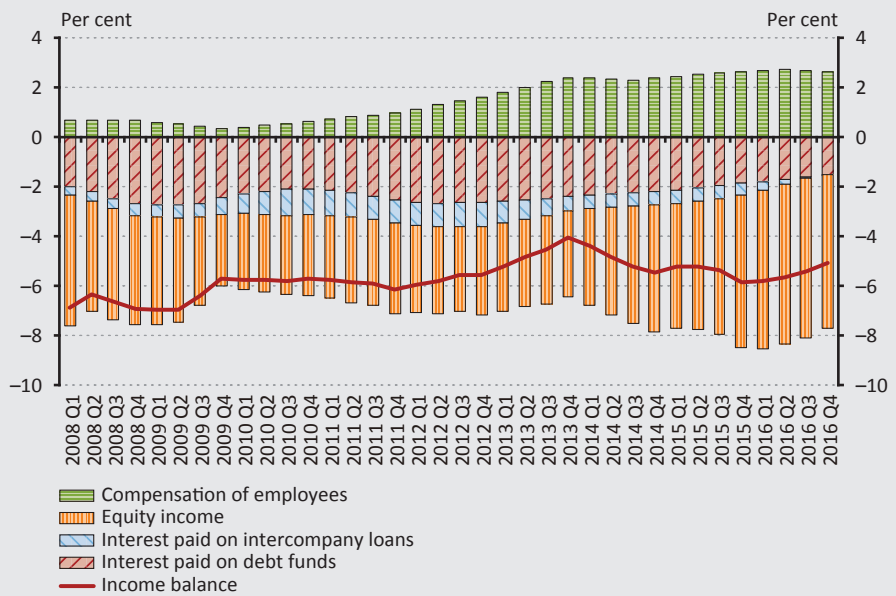
[5] Similarly, several empirical studies emphasise that remittances decrease the current account deficit (*Buch et al. 2002*; *Buch – Kuckulenz 2004*; *Nayyar 1994*).

[6] It should also be mentioned that these two items are also included in balance of payments data, as tax payments are recognised among transfers (for instance, the value of income spent abroad on consumption in the value of import) while the saved portion of income is reflected in the increase of financial assets.

### 4.1. Where are compensation of employees and transfers reported among data?

*Compensation of employees is included in the income balance* (*among primary incomes*) *and its balance has decreased the income balance deficit more and more in recent years.* Gross compensation of employees (including taxes) is included in the income balance. The balance of this item (that is, the difference between the revenues and expenses) has decreased the income balance deficit by nearly 3 per cent of GDP in recent quarters and has increased the current account surplus (*Figure 3*). Nevertheless, the income balance deficit amounted to 5–6 per cent of GDP, as the profit of corporations in non-resident ownership and interest paid on foreign loans significantly exceeded this item.

**Figure 3**
**Developments in the items of the income balance**
*(four-quarter values as a percentage of GDP)*

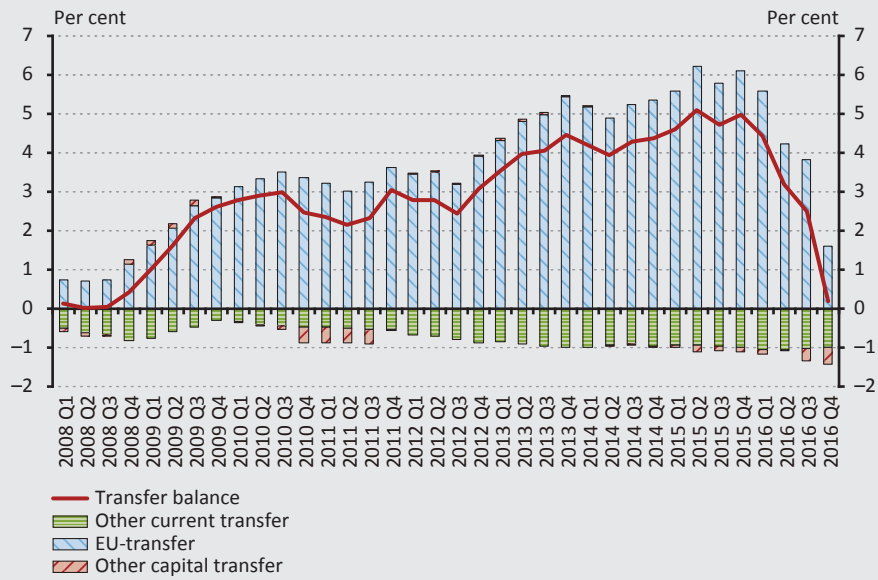



*Source: MNB, HCSO.*

*Current transfers by households working permanently abroad are recognised among the secondary incomes of the current account.* Households working permanently abroad are classified as non-resident for the reasons described earlier. Unrequited transfers by non-residents to domestic agents are recognised among other current and capital transfers, a subset of secondary incomes. Similarly to the MNB's analyses, we refer to these as the transfer balance along with other

primary incomes and the items of the capital account (*Figure 4*). That said, other current transfers also include other items such as taxes on wages paid to the host country of households working temporarily abroad. Therefore, the fact that the balance of other current transfers besides EU transfers broadly exhibits net payment means that taxes paid by households working temporarily abroad exceed current private transfers by households living permanently abroad. That said, current private transfers by households working permanently abroad can be studied based on other data reporting entities (such as Eurostat, which publishes data supplied to national statistical bodies). Based on this, their value in recent years was around 0.5 per cent of GDP, which fell far short of the wages of households working temporarily abroad. In terms of trends in the transfer balance surplus, the absorption of EU transfers is a dominant factor.

**Figure 4**
**Developments in the items of the transfer balance**
*(four-quarter, GDP proportionate transactions)*




*Note: Transfers by long-term migrant workers are recognised among other current transfers.*
*Source: MNB, HCSO.*

It is worth noting that while so far we have relied on data from the balance of payments, the following part of our paper presents the data on compensation of employees and current private transfers published by Eurostat (among balance of payments data), in the context of which we provide an overview of transfers of

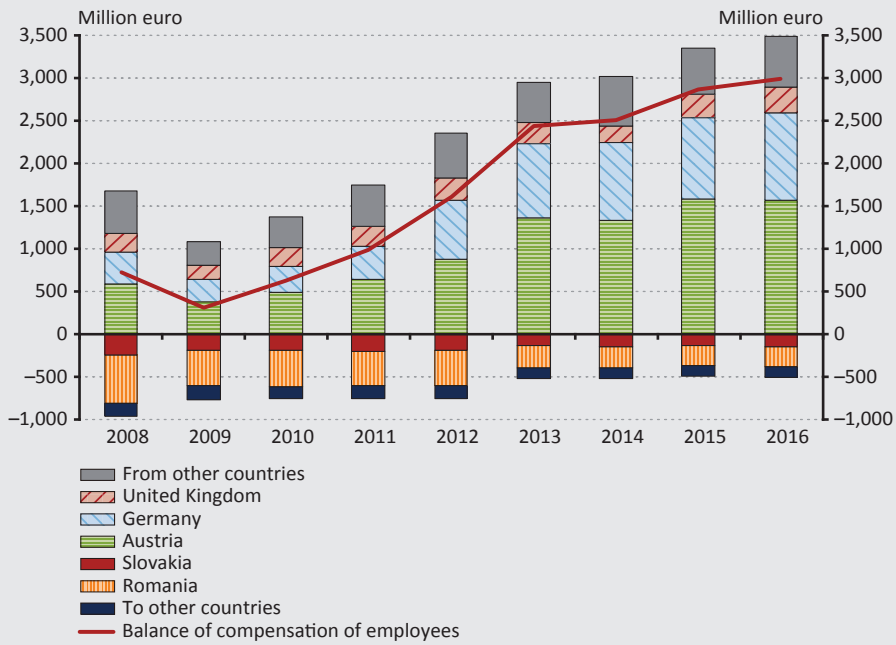
households working permanently abroad alongside compensation of employees, which partly contain actual remittances. Eurostat allows for an in-depth analysis of data on the compensation of employees and transfers in a breakdown by country.

### 4.2. Compensation of employees by households working temporarily abroad

*Compensation of employees decreased following the crisis, in part due to rising unemployment, but has increased gradually as growth stabilised and the last restrictions on work within the European Union were lifted.* Compensation from temporary work abroad amounted to around EUR 1.2–1.5 billion prior to the crisis, before dipping significantly in 2009. The fact that the crisis affected neighbouring countries and that rising unemployment presumably affected migrant workers to a greater extent (which confirms the hypothesis presented in the chapter on theory whereby remittances may also be a channel of contagion) may have played a pivotal role in this. At the same time, the influx of external funds in Hungary (meaning the influx of debt liabilities and net FDI) contracted to a far greater degree after the crisis because – as mentioned in the chapter on theory – foreign wages decreased to a smaller extent, in other words they were a source of more stable funding for economic agents. Compensation of employees subsequently started climbing gradually and amounted to nearly EUR 3 billion by 2013; however, as explained earlier, only a portion of these wages is actually available for remittance. The increase began in earnest after 2010 and was felt in Germany to the greatest degree, as shown by the data broken down by country. The fact that Germany's last restrictions affecting Hungarian workers were lifted in early 2011 also played a significant role in this. Factoring in the wages of households working temporarily working in Hungary, compensation of employees contributed EUR 2.5-3 billion to the current account between 2013 and 2016, which also contains taxes and the cost of living.

*Germany and Austria are the main destinations for Hungarian workers seeking temporary work abroad* (*Figure 5*). Temporary work abroad typically includes seasonal and border worker. Taking this, plus the differences in wage levels among countries into account, it comes as no surprise that the vast majority of foreign wages come from temporary work abroad in Austria followed by Germany, which is located farther from Hungary but is still at an accessible distance and is easily accessible. This coincides with the data derived from the labour force survey published in the Statisztikai Szemle (*Lakatos 2015*). Approximately three quarters of the nearly EUR 3.5 billion in total compensation of employees came from these two countries in 2016. It is also worth noting that the wages of short-term (non-resident) workers in Hungary amounted to nearly EUR 500 million. Workers temporary living in Hungary generally came from neighbouring countries, mainly from Romania and Slovakia. This is presumably due to workers living in these countries whose native language is Hungarian.

**Figure 5**
**Compensation of employees temporarily working abroad and in Hungary**




*Source: HCSO, Eurostat.*

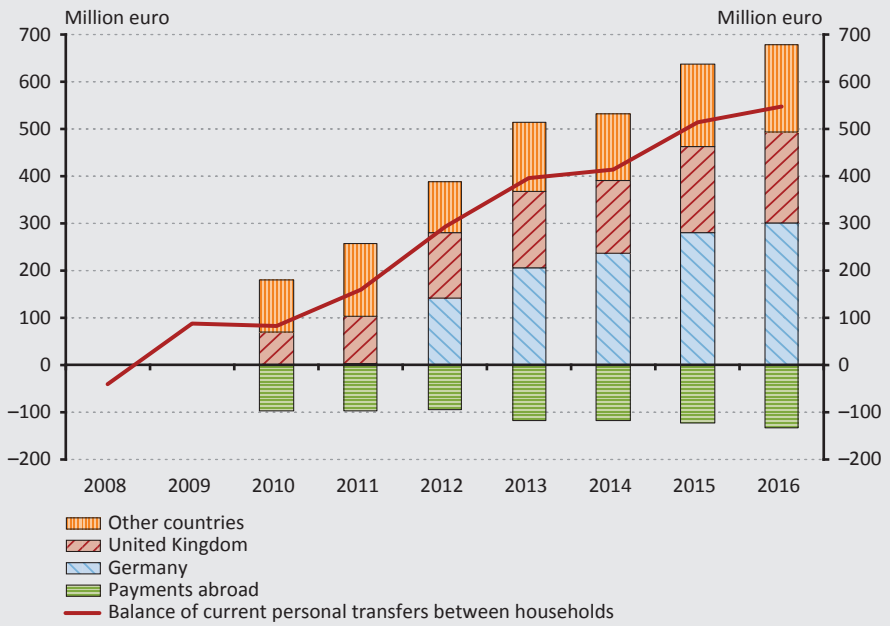
### 4.3. Current personal transfers by households working permanently abroad

*Current personal transfers made while working permanently abroad only rose significantly after the crisis, presumably due to the fact that Hungarian workers may have emigrated en masse in the wake of the recession that followed the crisis.* The value of current transfers rose significantly and stood at EUR 700 million by 2016, i.e. a far smaller amount than the compensation of employees; however, this amount was fully transferred home. In terms of permanently working abroad, current personal transfers before 2008 were insignificant, falling short of EUR 100 million. Current transfers by Hungarian households working permanently abroad increased significantly following the crisis, presumably in the wake of rising unemployment in Hungary. This may also stem from the fact that the last restrictions affecting Hungarian workers were lifted in 2011, and accordingly remittances from Germany started climbing after this turning point.

*From 2012 onwards, the bulk of current transfers by households working permanently abroad came from Germany, followed by the United Kingdom* (*Figure 6*). Current personal transfers grew significantly in 2012 and 2013 mainly in the wake of rising transfers from Germany, as a result of which current personal transfers

exceeded the amount received from the United Kingdom, the highest up to that point, by 2013 and 2014. Current personal transfers from Germany amounted to around EUR 300 million by 2016 while current transfers from the United Kingdom, which ranked second, amounted to approximately EUR 200 million. An additional EUR 15–20 million is transferred from countries ranking below Germany and the UK (including Sweden, Ireland, Spain, Italy, the Netherlands, Slovakia and Belgium), and fewer transfers are made from other EU countries. In terms of transfers by workers permanently stationed in Hungary, transfers to Germany account for the bulk of their value, while transfers outside the European Union are also significant.

**Figure 6**
**Current personal transfers from employees permanently working abroad**



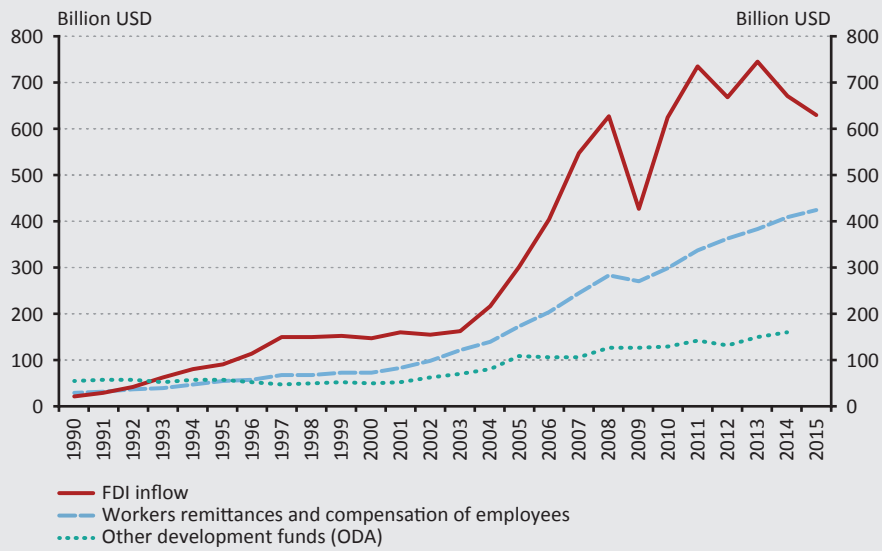

*Note: Current transfer data in a breakdown by country published on Eurostat is only available from 2010.*
*Source: HCSO, Eurostat.*

## 5. Remittances in an international comparison

*The investigation of compensation of employees and current transfers is not a new topic, but more studies have focused on this matter in the recent past.* This stems partly from the increasing compensation of employees and current transfers by workers living abroad, which mostly characterises developing countries. According to the World Bank, compensation of employees and transfers to developing (low and middle income) countries amounted to over USD 420 billion in 2015 and

can therefore be regarded as a significant source of external funding alongside FDI (*Figure 7*). In line with this, compensation of employees and transfers may amount to triple the amount of official development funds in certain countries, and may thus exert a market impact on social welfare and economic development. In addition, remittances are a more stable source of funding compared to FDI and portfolio investments, as confirmed by the 2009 trends in the data. While the influx of FDI contracted by nearly one third over a one-year period, remittances only fell by 5 per cent. In terms of the volume of compensation of employees and transfers, the World Bank's data revealed that over 20 per cent originate from the United States (mainly to Mexico, China and India) followed by Saudi Arabia, the United Arab Emirates and the United Kingdom. India, China and the Philippines should be highlighted among the recipients of the largest amounts: these countries absorb nearly 30 per cent of global compensation of employees and transfers.

**Figure 7**
**Development of external funds globally**

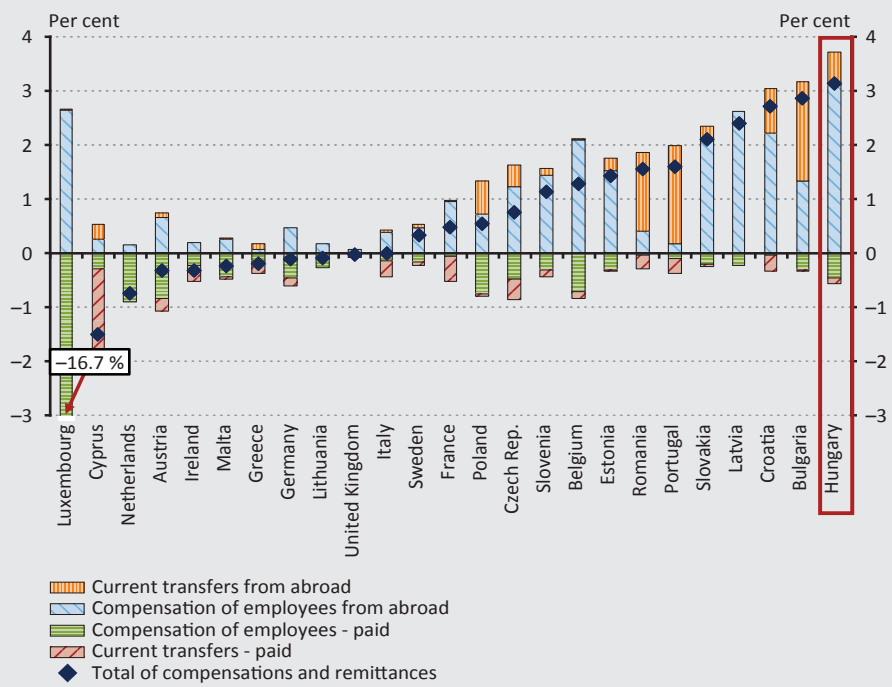



*Source: World Bank, http://blogs.worldbank.org/peoplemove/trends-remittances-2016-new-normal-slow-growth.*

*Within the European Union, Hungarian workers abroad boast the highest wages as a percentage of GDP, while their current transfers are not salient (Figure 8).* If we compare the countries of the European Union, the compensation of employees working temporarily abroad from Hungary exceed the wages observed in other European Union countries. In this regard, we should keep in mind that as mentioned

earlier, a portion of this is used to pay taxes and cover the cost of living, and thus the balance of payments surplus is not increased by the total income earned (the precise amount of which is not known). The 0.6 per cent of GDP represented by transfers by households working permanently abroad is not extraordinary in a European comparison. The amount of current transfers is in line with the regional average, which in some instances even exceeds Hungary's figure. It should also be noted that the geographic position of countries may also play a role in shaping revenues from work abroad. As seen earlier, Austria and Germany are the two key countries for Hungary from this perspective, both of which are located nearby. That said, the data for Greece is worth looking at: wages from temporary work abroad are negligible, which may be linked to the fact that Greece does not have any European Union neighbour on land besides Bulgaria.

**Figure 8**
**Current transfers and compensations of employees in the EU**
*(percentage of GDP, 2016)*

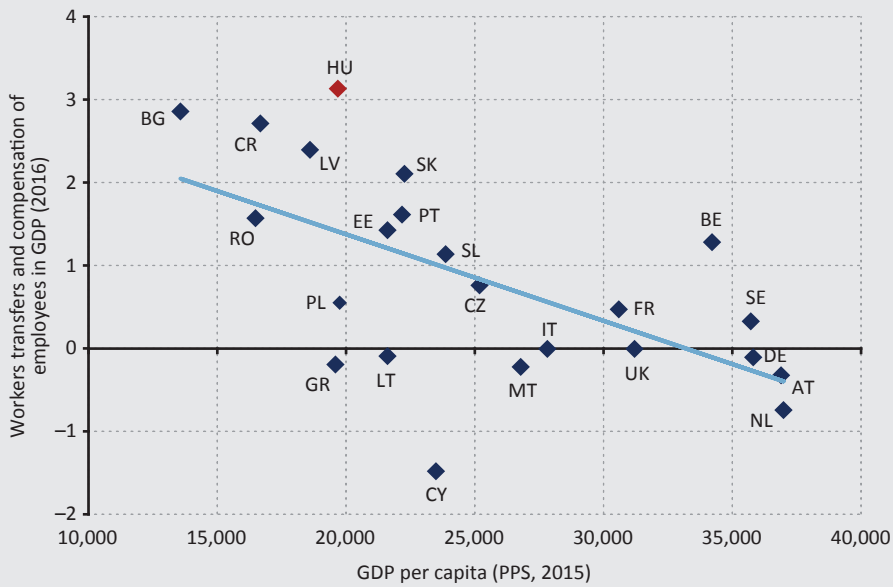



*Source: Eurostat.*

*In countries of the European Union, the value of compensation of employees and transfers decreases proportionately as GDP per capita rises, which is linked to wages that increase in line with the level of development* (*Figure 9*). A comparison

of foreign incomes and transfers with GDP per capita, a measure of economic development, shows that migrant workers transfer far less funds home in more advanced economies, while compensation of employees and transfers are far higher, particularly in the countries that joined the European Union in 2004 or later. Concurrently, countries with higher GDP per capita generally exhibit lower compensation of employees and transfers. This is due to the fact that one of the main motives of seeking work abroad may be to earn higher wages. Thus, countries with higher GDP per capita attract a greater number of foreign workers than the number of its own citizens who emigrate for work.

**Figure 9**
**Correlation between current transfers and compensation of employees and economic development**




*Source: Eurostat.*

## 6. Conclusions

In summary, a distinction should be made between the amount of compensation of employees and current transfers by households working abroad for the long term and remittances, as the first two items include elements (such as taxes and the cost of living) that are not actually transferred back home. It is necessary to clarify and understand the concepts associated with remittances because they may represent more stable sources of external funding compared to other external sources.

According to several references in the literature, compensation of employees and transfers and remittances may have a positive impact on economic growth through the stimulation of internal consumption. Meanwhile other authors argue that these transactions may also have negative consequences, for instance through labour market impacts. Compensation of employees and transfers improve the current account balance, which may also have a positive influence on a country' investor sentiment.

A review of Hungarian data reveals that the wages of workers temporarily living abroad far outstripped transfers by households permanently living abroad. Germany and Austria are the leading destinations for Hungarian households seeking temporary work abroad due to the differences in wage levels and their geographic proximity. Germany followed by the United Kingdom are also key countries in terms of long-term work abroad and current transfers. Hungary mainly attracts workers from neighbouring countries (such as Romania and Slovakia), most of whom tend to seek temporary rather than permanent work. European data show that less compensation of employees and transfers are absorbed by more advanced European Union (core) countries, while countries having joined the European Union in 2004 or later are leading sources of migrant labour and major absorbers of remittances.

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# Experiences of the National Deposit Insurance Fund on the Age Composition of Depositors and on the Distribution of Deposit Amounts

*Katalin Csaba-Kalló – Balázs Vajai*

*In the span of two years (2014 and 2015), ten credit institutions were liquidated in Hungary. Depositors were reimbursed by the National Deposit Insurance Fund (NDIF) in the total amount of HUF 219 billion. This is the first time that the depositor database of the liquidated credit institutions is subject to research. The basic features of the compensation data are presented with the assistance of descriptive statistics tools in the dimensions of the paid-out compensation amounts and the age of depositors. We confirm the hypothesis that the paid-out compensation amounts follow an extreme value distribution, more specifically, a Weibull distribution. The distribution shows that above HUF 5 million, the number of reimbursed depositors grew only moderately, while the paid-out compensation amounts increased significantly. Moreover, in making a comparison between the age distribution of reimbursed depositors and the age distribution of the Hungarian population we found that the savings deposited with the liquidated credit institutions are consistent with Modigliani's life-cycle hypothesis.*

**Journal of Economic Literature (JEL) codes:** D14, D18, G21

**Keywords:** household saving/personal finance, consumer protection, banks

## 1. Introduction and motivation

In 2015, the Hungarian household sector held about 20 per cent of its financial assets (HUF 9,000 billion) in bank deposits and bank bonds (*Boldizsár – Koroknai 2016*). This substantial volume allotted to bank financing underlines the key significance of deposit insurance as a tool for building and maintaining confidence in the banking sector. By strengthening confidence in the banking sector, the existence of the deposit insurance scheme serves as a safeguard for the stability of the financial system. At present, pursuant to the authorisation granted under Act CCXXXVII of

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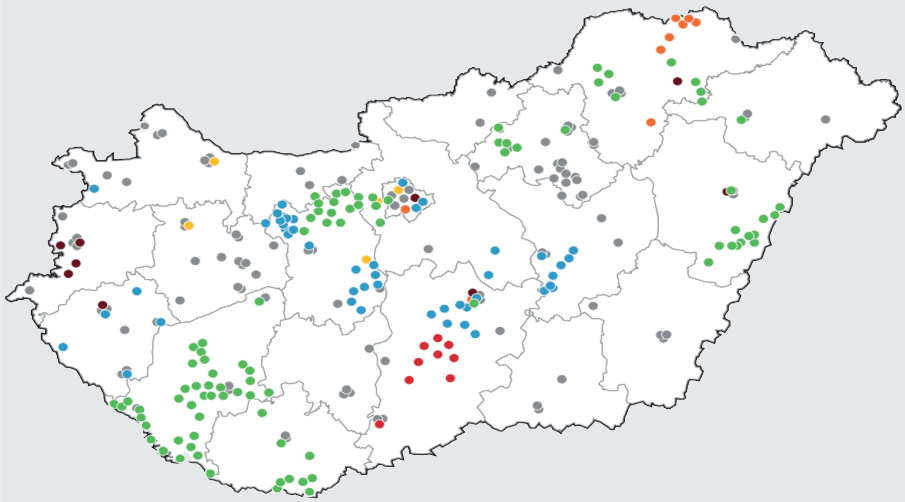
This article presents the authors' views and does not necessarily reflect the official opinion of the National Deposit Insurance Fund.

The manuscript was received on 19 December 2016.

DOI: http://doi.org/10.25201/FER.16.2.2839

2013 on Credit Institutions and Financial Enterprises (Act on Credit Institutions), the Hungarian deposit insurance scheme is operated by the National Deposit Insurance Fund (NDIF). Within twenty working days, the NDIF pays compensation to depositors – both private individuals and legal entities entitled to compensation – if their accounts held at a credit institution are frozen due to the insolvency of the credit institution. Starting from 2011, the NDIF pays compensation in forints up to a maximum amount of EUR 100,000 per depositor and per credit institution on aggregate, whereas it

**Figure 1**
**Deposit insurance compensations and their regional distribution since 1993**



DRB Bankcsoport (DRB, ÉRB, BRB, DDB) (2015)*
73,000 — 103 (345)

Tisza Takarékszövetkezet (2014)*
7,100 — 8.6 (28.6)

Széchenyi Kereskedelmi Bank (2014)*
1,400 — 14.5 (48.3)

Széchenyi István Hitelszövetkezet (2014)*
2,700 — 8.8 (29.3)

ALBA Takarékszövetkezet (2014)*
12,000 — 8 (29)

Orgovány és Vidéke Takarékszövetkezet (2014)*
30,000 — 54 (196)

Körmend és Vidéke Takarékszövetkezet (2014)*
10,000 — 22(80)

Soltvadkert és Vidéke Takarékszövetkezet (2012)*
17,000 — 33.1 (120)

„Jógazda" Takarékpénztár (2011)*
5,500 — 9.1 (35)

Általános Közlekedési Hitelszövetkezet (2010)*
1,190 — 3.1 (10.5)

Rákóczi Hitelszövetkezet (2000)
1,400 — 0.305 (1)

Reálbank (1999)
14,000 — 8 (27.5)

Iparbankház (1995)
9 — 2 (6.8)

Agrobank(1995)
0 — 0.5 (17.2)

Heves és Vidéke Takarékszövetkezet (1993)
1,300 — 0.262 (0.9)

Number of reimbursed depositors
Amount of reimbursement in billion HUF (million EUR)
* During 20 working-days

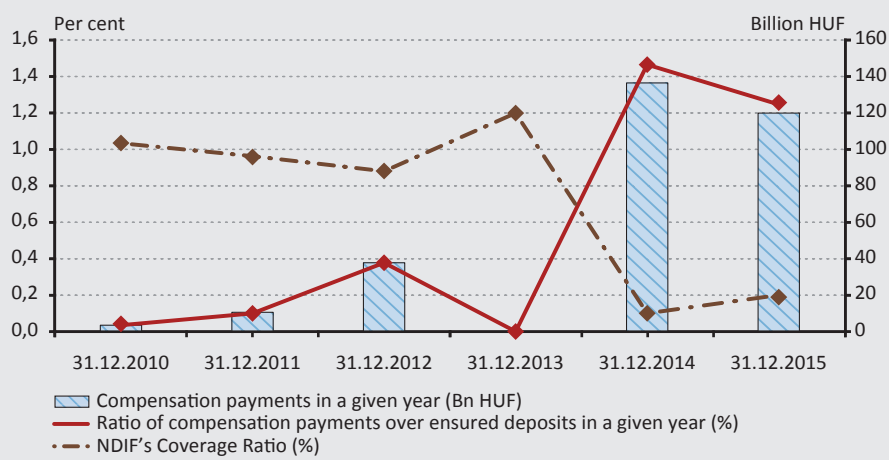
*Source: Edited from the NDIF's database.*

had previously paid the forint equivalent of EUR 50,000 (*National Deposit Insurance Fund, 2017*).[1] According to the NDIF's calculations, it has paid HUF 275 billion in compensation to nearly 177,000 customers since its establishment in 1993 (aggregated at nominal value). The locations of the branches of closed down credit institutions in *Figure 1* suggest that the liquidations affected depositors nationwide.

As indicated on the map, 18 credit institutions have been liquidated since the foundation of the NDIF. Liquidations were concentrated in the past two years with the closure of 10 credit institutions, of which two institutions generated the largest volume of compensations so far (Orgovány and Region Savings Cooperative and, composed of four banks, the DRB Bank Group[2]).

The substantial amounts paid out in compensation in 2014 almost depleted the NDIF's reserves and it was in this financial situation that the NDIF faced the liquidation of the DRB Bank Group in 2015. After entering into a bridging loan agreement with the MNB, the NDIF obtained refinancing through the issue of NDIF bonds within three months. The effect of compensation obligations is illustrated by the changes in the NDIF's coverage ratio in *Figure 2.* The coverage ratio is an indicator of the asset position, i.e. funding of deposit insurance institutions, which compares the liquid assets of the Deposit Insurance Fund to the theoretical compensation obligation of the Fund at the member institutions at a given time. If a credit institution goes bankrupt, the funds available for the compensation of depositors originate primarily from two sources of

**Figure 2**
**Changes in the NDIF's coverage ratio arising from compensation events**




*Source: Edited from the NDIF's database.*

[1] In exceptional cases, the compensation limit may be increased by an additional amount of up to EUR 50,000. Deposits placed before 1993 remain fully covered by a state guarantee until withdrawn.
[2] The four banks comprising the DRB Bank Group are BRB BUDA Regional Bank, DRB Southern Transdanubian Regional Bank, Southern Transdanubian Savings Bank and ÉRB Northern Hungarian Regional Bank.

revenue: the deposit insurance fees paid by the member institutions in the current year and the proceeds from the return on the investment of the accumulated fees into government securities (*NDIF 2016:19*).

Until 2013, the coverage ratio of the NDIF was stable and consistently hovered around 1 per cent; by 2014, however, it had fallen to 0.1 per cent and it has remained at this level ever since. With this value, as of 31 December 2015 the NDIF recorded one of the lowest coverage ratios among European deposit insurers. Under European Union regulations,[3] the coverage ratio of deposit guarantee schemes must reach the 0.8 per cent target level by 3 July 2024. At the current replenishment level of the Fund, reaching the target level and fulfilling the obligations undertaken in relation to the bond issue will require a substantial amount of contribution on the part of member institutions. This is because 1.47 and 1.25 per cent of the NDIF's compensation obligation for the total stock of covered deposits had to be paid out in compensation over the past two years, respectively. It should be noted that the 0.8 per cent minimum target level to be achieved in compliance with the European Union directive would have been insufficient to cover the compensation needs in both years. Therefore, existing compensation experiences should also be considered upon the calculation of the target level as an addendum to the minimum regulatory requirements.

This is the first time in years that the depositor databases of the credit institutions liquidated in Hungary are being analysed for scientific purposes, and the results are presented in this study. The experiences of previous compensations have only been analysed from the perspective of depositors' reactions so far, based on calls received by the NDIF (*Kiss 2015*).

The findings of this analysis can be utilised for various purposes; for example, they reveal the typical amounts placed by customers in the liquidated institutions and give an insight into the age composition of aggrieved depositors. From this information we can draw conclusions about savings and banking habits. In addition, the distribution of deposit amounts can be used for the calculation of the optimal deposit insurance compensation limit.

## 2. Data and methodology

Of the credit institutions liquidated in Hungary, we analyse the depositor databases of institutions liquidated in 2014 and 2015, which cover 77.1 per cent of all depositors reimbursed since 1993 and 79.5 per cent of the total compensation amount. This study focuses on the analysis of compensations paid out to private individuals in the amount of HUF 188.9 billion, but we also touch on the protection provided to companies (HUF 10.8 billion). The total database also contains the compensation amounts paid on joint accounts[4] (HUF 0.5 billion), which might be the subject of

[3] Article 10(2) of Directive 2014/49/EU of the European Parliament and of the Council
[4] Typically condominiums.

further research. The units of the database comprise compensation amounts by depositor and by credit institution. Accordingly, if a depositor was affected by the liquidation of more than one credit institutions, the compensation associated with the depositor will be shown in more than one row. The NDIF reimbursed depositors up to the compensation limit for all of their accounts and deposits[5] secured by insurance. The value range of the compensation amount associated with the deposits is the forint equivalent of EUR 0–100,000.[6] The statistics are compiled by stripping out compensations amounting to 0. Customers not eligible for compensation typically had outstanding debts or their consolidated account showed a balance of 0. These items are excluded to ensure that the average compensation amount and its standard deviation remain unbiased. Since the database does not contain the original deposit amount, we have no information on the amount of unreimbursed damages. We will see, however, that relatively speaking, few deposits achieved maximum repayment. Apart from the compensation amounts, the data available on depositors include their date and place of birth and the postal code of their permanent address. This information is suitable for further research; a review of the possibilities and the expansion of the database are in progress.

The database of the depositors of liquidated credit institutions is analysed with descriptive statistics tools in the dimensions of paid-out compensation amounts and the age of depositors. In the first step, we examine the arithmetic mean, the standard deviation and the distribution of the compensation paid. The results of the statistics are also analysed at the institution level, in order to explore potential institution-specific features. In view of the distribution of paid-out compensation, we formulate and then test the hypothesis that the paid-out compensation amounts follow an extreme value distribution, more specifically, a Weibull distribution. We analyse the age distribution of reimbursed depositors in comparison to the age distribution of the Hungarian population. For this, we supplemented the database provided by the NDIF with the relevant demographic data collected from the Hungarian Central Statistical Office (*HCSO 2015*). The calculations and in part, the graphics, were prepared with the assistance of an R programme package.

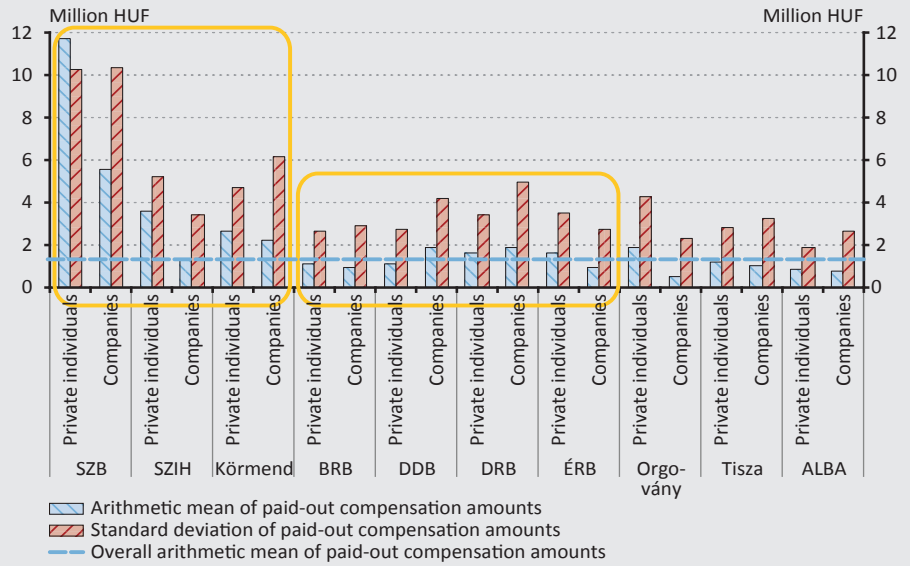
## 3. Compensation experiences and conclusions

### 3.1. Descriptive statistics, institution-specific findings

In the first step, we analyse the depositor database of each liquidated credit institution with respect to the arithmetic mean and standard deviation of the paid-out compensation amount. The overall average of the compensation paid out to private individuals and companies is HUF 1.7 million, which is indicated in *Figure 3* with a horizontal dotted line. We interpret the statistics of the individual institutions in comparison to the overall average.

[5] Documentary deposits, deposit accounts, current accounts, bank accounts, payment accounts.
[6] Converted at the HUF/EUR exchange rate effective on the day of the reimbursement.

**Figure 3**
**Arithmetic mean and standard deviation of paid-out compensation amounts**



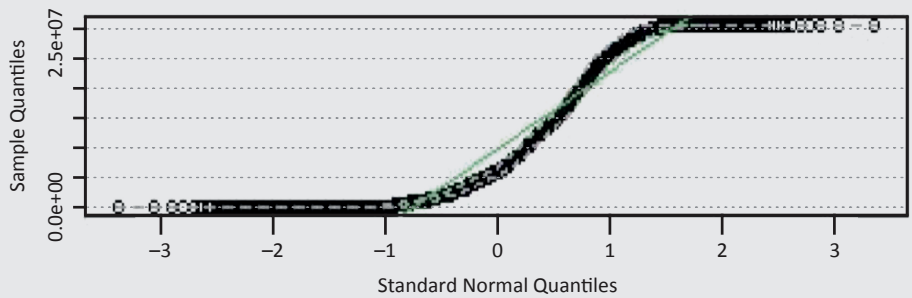

*Source: Edited from the NDIF's database.*

The arithmetic mean is far higher than the overall average at Széchenyi Commercial Bank (SZB), at Széchenyi István Credit Cooperative (SZIH) and at Körmend and Region Savings Cooperative (Körmend). This may be attributed to the fact that these three credit institutions were interests of the same owners; consequently, they may have had coordinated fundraising policies. Presumably for similar reasons, the four institutions of the DRB Bank Group (BRB, DDB, DRB, ÉRB) also exhibit arithmetic means close to one another, distributed around the overall average. The average compensation amount of the remaining three credit institutions typically falls short of the overall average. While this research is not intended to explore the reasons behind the credit institutions´ default, it should be pointed out that of the ten liquidated institutions, ownership concentration posed a risk of cross-financing at seven institutions. Therefore, in our view, exploring and monitoring the ownership/interest structure of individual institutions would be advisable from a supervisory perspective.

We may conclude, overall, that the statistics of Széchenyi Commercial Bank deviate from the rest of the credit institutions in several regards. Per deposit, the average amount of compensation is more than seven times the overall average (HUF 11.8 million) for private individuals and more than three times the overall average (HUF 5.5 million) for companies. The Bank's clientele was explicitly dominated by major depositors (private banking segment). At around 200 per cent, the relative deviation was high at all of the institutions except Széchenyi Commercial Bank, where relative deviation was around 90 per cent in the case of private individuals. The statistics of

Széchenyi Bank diverge from the values of the rest of the institutions even in respect of the distribution of the compensation amounts. While the assumption of normality for the distribution of the compensation amounts can be clearly rejected[7] at all of the other institutions, the distribution of compensation amounts approximates the normal value at Széchenyi Commercial Bank. *Figure 4* (Q-Q plot) illustrates this.

**Figure 4**
**Q-Q plot analysis of the distribution of Széchenyi Bank compensations**




*Source: Edited from the NDIF's database.*

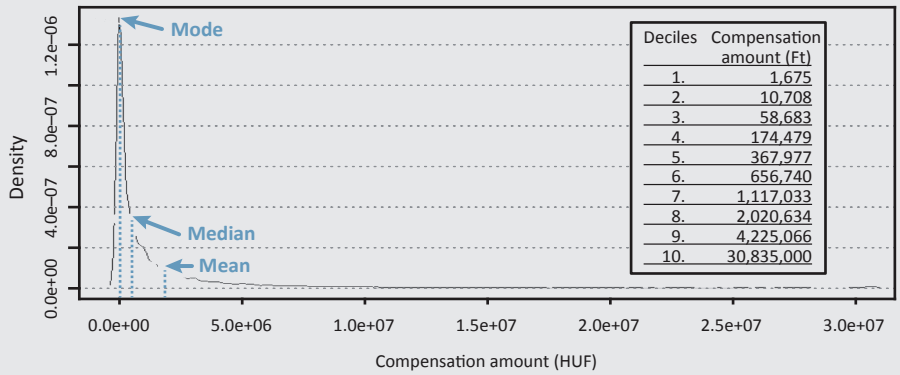
Since the shapes of the distribution function for each institution except Széchenyi Bank are very similar to one another and to the distribution of all compensations, we present below the analysis of the distribution of the total population.

### 3.2. Distribution of compensation amounts

The distribution of compensation amounts provides insight into the typical amounts deposited at the compensated institutions *(Figure 5).* The distribution function of the total population is strongly left-skewed (Mode < Median < Mean), and the right tail of the distribution is drawn out along the length of the horizontal axis. There are no outliers; therefore, in *Figure 5* we present only the left edge of the distribution function graphically, indicating the decile values describing the entire distribution. The most frequently observed, typical compensation amount (mode, i.e. the maximum value of the function) is only around HUF 100,000. The median is also low: HUF 368,000; in other words, for half of the deposits the compensation was less and for the other half of the deposits it was more than this amount. The arithmetic mean of the compensation amount is HUF 1.7 million per deposit, even higher than the seventh decile. Therefore, the shape of the distribution function indicates that typically, a higher number of lower-amount compensations were paid out. This may be because the deposit insurance covers not only deposits with an agreed maturity, but also current accounts where – in the lack of an agreed maturity – typically smaller amounts are held.

[7] Based on the Kolmogorov–Smirnov test. In all nine cases, the mean was far higher than the average; in fact, it exceeded even the third quartile in eight cases. The distribution, therefore, was left-skewed compared to a normal distribution at all nine institutions. The analysis covered both private individuals and companies.

**Figure 5**
**Part of the distribution function of the compensation amounts and its decile values**

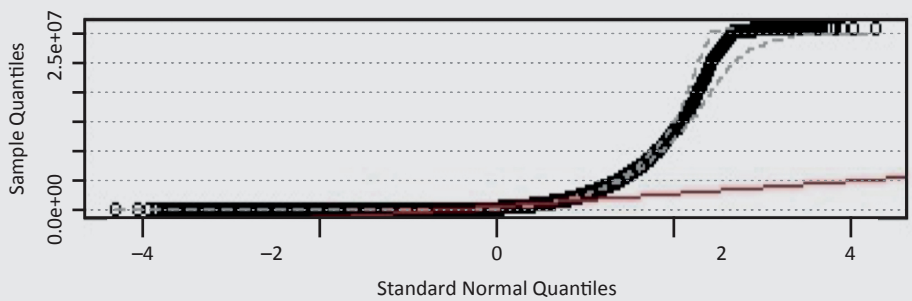



| Deciles | Compensation amount (Ft) |
|---|---|
| 1. | 1,675 |
| 2. | 10,708 |
| 3. | 58,683 |
| 4. | 174,479 |
| 5. | 367,977 |
| 6. | 656,740 |
| 7. | 1,117,033 |
| 8. | 2,020,634 |
| 9. | 4,225,066 |
| 10. | 30,835,000 |

*Source: Edited from the NDIF's database.*

The decile values of the distribution also indicate that even with a maximum compensation amount of HUF 4.2 million (9th decile) only, 90 per cent of the deposits could have been reimbursed. The fact that the distribution is right-skewed and peaked[8] suggests that the assumption of normality can be rejected. This conclusion was also confirmed by the Q-Q plot analysis.

**Figure 6**
**Normality testing with Q-Q plot analysis**




*Source: Edited from the NDIF's database.*

Based on the graphical representation of the distribution function, we formulate the hypothesis that the compensation amounts follow an extreme value distribution, more specifically, a Weibull distribution.

[8] The K-indicator – a measure of peakedness – stands at 0.175, which describes a more peaked distribution than the normal distribution (0.263).

If x > 0, k > 0, λ > 0, the distribution function of the Weibull distribution can be written as:

$$F\left(x;k,\lambda\right)=1-e^{-\left(x/\lambda\right)^{k}} \qquad (1)$$

where:

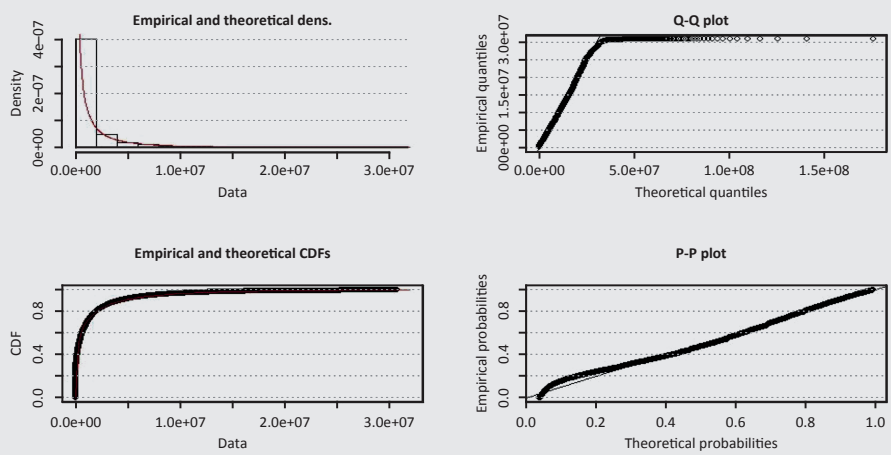
*k* is the shape parameter; its estimated value, in this case is: *k* (0.44)

*λ* is the scale parameter; its estimated value, in this case is: *λ* (696,305)

The k<1 value of the shape parameter indicates that the distribution is drawn out to the right; in other words, the frequency of payments strongly decreases towards higher compensation amounts. Accordingly, a potential increase in the compensation limit would significantly raise the compensation amount, but barely increase the number of depositors.

We tested the hypothesis by comparing the empirical and the theoretical distribution; the results are shown in *Figure 7.*

**Figure 7**
**Testing the Weibull distribution**




*Source: Edited from the NDIF's database.*

The empirical distribution of the compensation amounts shows that above HUF 5 million, the number of reimbursed depositors grew only moderately, while the paid-out compensation amounts increased significantly.

### 3.3. Conclusions based on the distribution of compensation amounts

Based on the analysis of the distribution of compensation amounts, we can expect the conclusion that from a deposit insurance perspective, the optimal deposit insurance protection limit is far lower in Hungary than the amount currently required by the European Union (EUR 100,000). This view is supported by the information available on the distribution of the deposit amounts of operating banks: it shows that at the end of 2015, the insured deposit amounted to less than HUF 5 million in the case of 97 per cent of the private deposit accounts covered by the NDIF.[9] Therefore, with a potential reduction of the protection limit to HUF 5 million, except for 3 per cent, the deposits of all currently insured private individuals would remain guaranteed, while the insured deposit portfolio would decline by HUF 2,426 billion, which represented 42 per cent of the total insured deposit portfolio of private individuals at the end of 2015.[10]

In summary, at first sight, a drastic decline in the insured deposit portfolio would render the deposit guarantee scheme cheaper as the insured deposit portfolio would require a far lower level of reserves and consequently, the fee payable to the deposit insurer would also decline. At the same time, however, there is a need to model the behaviour of smaller depositors dropping out of the deposit guarantee scheme. Indeed, the reduction of the protection limit may lead to a confidence crisis and massive deposit withdrawals, which would jeopardise the stability of the financial system. The definition of an optimal deposit insurance protection limit would be mainly driven by the aforementioned factors. The quantification of such an optimal value is outside of the scope of this study and should be the subject of further research.

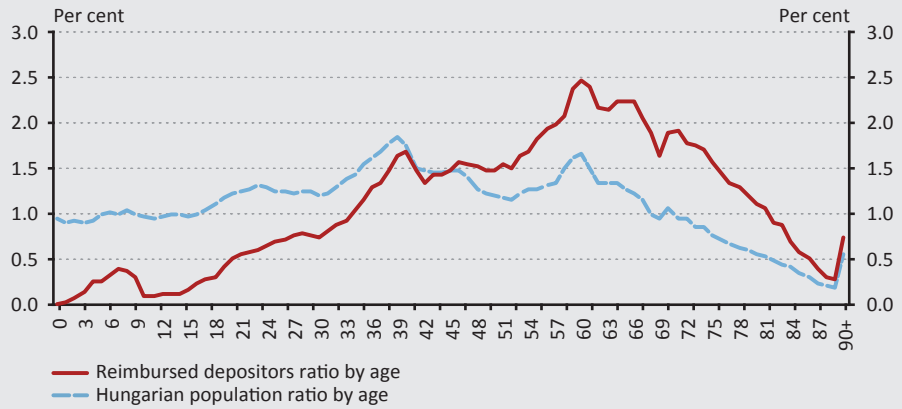
### 3.4. Age composition of reimbursed depositors

We also analysed compensation data in the dimension of depositor ages. With respect to the mean and deviation of the ages of reimbursed depositors, there are no significant differences between the credit institutions. The average age of depositors ranges between 52 and 60, while the deviation varies between 15 and 21 years. The high standard deviation may be partly attributed to the fact that current account and current account related products (overdraft facilities, debit cards, credit cards, etc.) are used by all age groups.

We analysed the age distribution of reimbursed depositors in comparison to the age distribution of the Hungarian population in such a manner that the same chart shows the ratio of reimbursed depositors by age to all reimbursed depositors and the ratio of the population by age to the total Hungarian population *(Figure 8).*

[9] Calculated from the NDIF's database.
[10] Calculated from the NDIF's database.

**Figure 8**
**Comparison of the distribution of reimbursed depositors and the Hungarian population by age**




*Source: Edited based on the NDIF and HCSO (2015) databases.*

As shown in *Figure 8,* it is only in the case of age groups 40–45 and above 90 years that the two curves are aligned with one another. On the whole, therefore, the depositors of the liquidated credit institutions do not represent the demographic distribution of the Hungarian population. The ratio of young persons with deposit and current account products in the liquidated credit institutions is far lower than their ratio to the total population by age. At around 1.5 per cent, the two ratios are roughly identical in the age group of 40–45. The proportion of those above 45 years of age within the depositors is higher than would have been warranted by their ratio to the total population. The ratio of depositors by age peaks at 60 years of age (2.5 per cent), which is one per cent higher than the ratio of the 60-year-old population to the total population. As the ages increase, the curve of reimbursed depositors approximates that of the total population from above and the two curves overlap at the age group of 88 and above. The comparison of the proportion of reimbursed depositors and the Hungarian population by age group also reveals that the curve of reimbursed depositors tracks the demographic jumps of the Hungarian population („Ratkó children" and „Ratkó grandchildren"). Consequently, banks may conclude from our analysis that they should use demographic trends as a baseline in the evaluation of their portfolios.

In addition, the positioning of the two curves relative to each other suggests that the number of accounts and deposits placed in the liquidated credit institutions is consistent with Modigliani's life-cycle hypothesis (*Modigliani, 1986*). Modigliani's life-cycle hypothesis is one of the basic models applied in the research exploring households' propensity to save. According to the hypothesis, households make rational decisions about their consumption patterns over their different life-cycles, and adjust their savings behaviour to these decisions. The savings rate of young

households is either low or negative (they are more likely to borrow funds) as their relatively low income is coupled with high expenditures (housing, child-rearing). Later on in the medium stage of their life cycle households with higher income allocate a larger portion of their income to savings in order to save up for their post-retirement lives when, according to the basic assumption of the model, their income drops down to zero (*Modigliani, 1988*). It should be the subject of further research whether the distribution of average compensation amounts by age supports Modigliani's life-cycle hypothesis empirically.

### 3.5. Conclusions based on the age composition of reimbursed depositors

In summary, the analysis of the age composition of reimbursed depositors suggests that, in line with Modigliani's life-cycle hypothesis, ages below 40 – including, in particular, young adults and minors – are under-represented in the portfolio of new deposits relative to their ratio to the total population. From the banks' perspective, this result might be an indication that designing products targeting the young generation has significant potential. Consequently, even banks have a vested interest in promoting financial literacy and incorporating bank account management into the education system.

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# The Role of Individual Firms in Aggregate Fluctuations: Evidence from Hungary

*Norbert Czinkán*

*This paper investigates the role of activities by Hungarian firms in generating aggregate fluctuations for the time period 2000–2013. The paper decomposes aggregated sales volatility into a macro-sectoral and firm-specific component and finds that shocks to individual firms contribute significantly to aggregate fluctuations. The relative contribution of idiosyncratic shocks to sales volatility at the aggregate level is 55.5 per cent for the whole economy and 56.4 per cent for the manufacturing sector. The main mechanism through which firm fluctuations manifest themselves in aggregate fluctuations is input–output linkages.*

**Journal of Economic Literature (JEL) codes:** E32, F12, F14, F41

**Keywords:** Aggregate fluctuations, Firm-level shocks, Macro-sectoral shocks

## 1. Introduction

Individual firms seem to play an important role in generating business cycles. A new wave of recent research has uncovered that idiosyncratic shocks to firms do not average out at the country level, and most importantly, they contribute largely to aggregate fluctuations (*Gabaix 2011; Acemoglu et al. 2012; Di Giovanni et al. 2014*). Is this result also true for Hungary, a small economy but one of the most open in the world? Or do firm-level fluctuations wash out at the aggregate level and macro- and sectoral-level shocks shape the business cycle instead?

This paper investigates whether shocks to individual firms in Hungary manifest themselves in aggregate fluctuations. To address this question, closely following the methodology of *Di Giovanni et al.* (*2014*), I first decompose yearly firm-level sales growth rates into an idiosyncratic and macro-sectoral component. Idiosyncratic shocks are calculated as the deviation of firm growth from the sectoral average growth in each year and capture any event that affects firm growth independently from country and sector-level shocks. Second, I aggregate firm-level sales growth

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Financial support from the *Spanish Ministry of Economy and Competitiveness* (BES-2013-064132) and the *Summer Visiting Researcher Programme of the Central Bank of Hungary* is gratefully acknowledged. The views expressed in this paper are those of the author and do not necessarily reflect the views of the *Central Bank of Hungary*. All remaining errors are my own.

The manuscript was received on 16 September 2016.

DOI: http://doi.org/10.25201/FER.16.2.4063

and its idiosyncratic and macro-sectoral component to the country level by weighting the individual components by their contribution to total sales. Finally, I compute the standard deviation of the aggregated components and analyse the relative standard deviation of the idiosyncratic and macro-sectoral component to aggregate sales growth volatility.

According to the results, at the firm level the vast majority of shocks hitting firms are idiosyncratic, whereas the macro-sectoral component plays a relatively less important role in explaining firm sales growth. Interestingly, those idiosyncratic shocks do not wash out at the country level. In addition, the relative standard deviation of the firm-specific component is strikingly high: 55.5 of aggregate fluctuations can be explained by idiosyncratic shocks for the whole economy and 56.4 per cent regarding the manufacturing sector. These results are robust for different growth and trimming definitions and also for incorporating heterogeneous reaction to shocks.

The paper distinguishes two main channels through which individual firms can alter aggregate sales volatility. First, *Acemoglu et al.* (*2012, 2017*), *Carvalho* (*2014*) and *Barrot and Sauvagnat* (*2016*) emphasise the linkage channel, according to which idiosyncratic shocks to individual firms through input-output linkages are also able to generate aggregate fluctuations. A shock, hitting an upstream or downstream partner, propagates and is amplified in the production network, eventually causing sizable aggregate effects. Second, according to Gabaix (2011), idiosyncratic shocks to firms cannot average out since the firm size distribution is too fat-tailed (granularity hypothesis): some firms contribute such a large share to GDP growth that shocks to those giants can shape the business cycle.[1] As for Hungary, evidence suggests that idiosyncratic shocks manifest themselves in aggregate fluctuations through the linkage channel: its relative contribution to the aggregated idiosyncratic component is around three times more important than the granularity channel.

For a long time, most economists did not study the differences across firms, but focused mainly on differences across countries and industries in order to understand aggregate fluctuations. It is well-documented that idiosyncratic shocks to a single sector can have sizable aggregate effects (*Long and Plosser 1983; Stockman 1998; Koren and Tenreyro 2007a; Carvalho and Gabaix 2013*). Recently, the increased quality and accessibility of firm-level data has turned attention towards to individual firms. Recent studies, starting with the seminal work of *Melitz* (*2003*), have uncovered that firms are surprisingly heterogeneous even within narrowly defined industries and markets, motivating research on the role of individual firms in generating business cycles. *Gabaix* (*2011*) demonstrated theoretically and

[1] Consider the case of Finland's Nokia or South Korea's Samsung, for instance. Nokia contributed around 25 per cent to Finland's GDP growth over the period 1998–2007, and the performance of Samsung is also of great significance for the economic success of South Korea.

empirically that firm-level shocks do not necessarily average out at the country level if the economy is "granular" enough: using US data he showed that the top 100 firms have sizable effects on the GDP dynamics. *Di Giovanni et al*. (*2014*) used a wider data base of French firm-level balance sheet and customs information and argued that firm-level fluctuations manifest themselves in aggregate volatility with a relative standard deviation of 80 per cent. Findings are similar to Sweden (*Friberg and Sanctuary 2016*) and Belgium (*Magerman et al. 2016*) as well.

Nevertheless, there is still little empirical evidence on individual firms generating aggregate fluctuations. The main motivation of the paper is to contribute to the emerging applied literature on the role of individual firms in aggregating business cycles. To the best of my knowledge, this is the first paper providing empirical evidence on the role of individual firms on business cycles on Hungarian firm-level data. One might think that the contribution of firm fluctuations to the business cycle is less important in Hungary since, compared to the aforementioned examples, the Hungarian economy is smaller and more open, implying that the country is more exposed to foreign shocks and hence the importance of idiosyncratic shocks are much more moderate and macro-sectoral fluctuations play a higher role in aggregate volatility.[2] Indeed, in Hungary macro-sectoral shocks matter more (with a relative standard deviation of 70 per cent) compared to France (53 per cent) and Sweden (58 per cent), but firm-level fluctuations are still very important (56.4 per cent).

The remaining part of the paper is structured as follows. *Section 2* introduces the econometric model to decompose firm sales growth rates into a macro-sectoral and idiosyncratic component and analyses the contribution of those components to aggregate sales growth volatility. *Section 3* provides data description, *Section 4* summarises the main results and finally, *Section 5* concludes.

## 2. Econometric implementation

Closely following *Di Giovanni et al*. (*2014*), I first decompose the firm-level yearly sales growth rates $\gamma_{ft}$ into a macro-sectoral and idiosyncratic component:[3]

$$\gamma_{ft} = \delta_{jt} + \varepsilon_{ft}, \tag{1}$$

[2] According to the World Bank (http://data.worldbank.org/indicator/NE.TRD.GNFS.ZS?end=2013&start=1960), Hungary was the 13th most open economy in the world in 2013: the sum of exports and imports accounted for 165 per cent of GDP, whereas for France the trade openness measure was 59 per cent, for Sweden 83 per cent and for Belgium 162 per cent. As for a GDP comparison: compared to Hungary, the economy of Belgium is 3.7 times larger, the Swedish economy is 4 times larger and the French economy is 20 times larger.

[3] Due to data restrictions, I cannot use exactly the same estimation procedure as *Di Giovanni et al.* (*2014*), who had data on export sales at the destination level for the firms and decomposed firm sales growth rates into an industry-destination and an idiosyncratic component, since I do not have information on destination-level exports.

where $\delta_{jt}$ denotes the industrial average growth rate, encompassing macro-sectoral demand and cost shocks, and $\varepsilon_{ft}$ is the idiosyncratic shock component that is simply the deviation of firm-level sales growth rate from the industrial average growth rate.[4]

The ultimate purpose of the paper is to assess the impact of firm-specific shocks $\varepsilon_{ft}$ on aggregate fluctuations. To do so, I first calculate the aggregate sales growth rate $\gamma_{At}$ as the weighted sum of the macro-sectoral and idiosyncratic growth rates:

$$\gamma_{At} = \Sigma_j w_{jt-1}\delta_{jt} + \Sigma_f w_{ft-1}\varepsilon_{ft}, \quad (2)$$

where $w_{jt-1}$ is the share of sector $j$'s and $w_{ft-1}$ is the share of firm $f$'s sales in total sales. Note that if we want to quantify the relative contribution of the idiosyncratic component to aggregate sales growth volatility, the use of time-varying weights complicates the analysis since we cannot disentangle the effect of the time-varying sectoral and firm-level sales shares and the associated growth components. Instead, one can fix weights for a certain period $\tau$ and work with the following stochastic process:

$$\gamma_{At|\tau} = \Sigma_j w_{j\tau-1}\delta_{jt} + \Sigma_f w_{f\tau-1}\varepsilon_{ft}, \quad (3)$$

where weights $w_{j\tau-1}$ and $w_{ft-1}$ are fixed over time at their $\tau - 1$ values combined with period $t$ shocks.

Next, I compute the variance of the stochastic process $\gamma_{At|\tau}$, which is denoted by $\sigma^2_{A\tau}$ and decompose it into the variance of the idiosyncratic and macro-sectoral component:

$$\sigma^2_{A\tau} = \sigma^2_{J\tau} + \sigma^2_{F\tau} + \mathrm{COV}_{\tau}, \quad (4)$$

where $\sigma^2_{J\tau} = \left(\Sigma_j w_{j\tau-1}\delta_{jt}\right)$ denotes the volatility of the aggregated macro-sectoral component, $\sigma^2_{F\tau} = \left(\Sigma_f w_{f\tau-1}\varepsilon_{ft}\right)$ is the firm-specific volatility, and $\mathrm{COV}_{\tau} = \mathrm{Cov}\left(\Sigma_j w_{j\tau-1}\delta_{jt}, \Sigma_f w_{f\tau-1}\varepsilon_{ft}\right)$ is the covariance of shocks from different levels of aggregation.

### 2.1. Estimation

The estimation procedure involves two steps. In the first stage, firm-level sales growth rates are decomposed into a macro-sectoral and an idiosyncratic part, and then in the second stage, those three terms are aggregated to the macro-level using the respective fixed industrial and firm-level weights. Finally, I compute the relative standard deviation of the aggregated macro-sectoral and idiosyncratic component to aggregate sales growth volatility.

[4] For a motivating heterogeneous firm model framework, see *Annex A*.

The macro-sectoral shock $\delta_{jt}$ is the average growth rate of sales of all firms selling in sector $j$. The firm-specific shock $\varepsilon_{ft}$ is simply computed as the deviation of $\gamma_{ft}$ from $\delta_{jt}$, or putting it differently, as the residual in a regression of firm sales netting out industry-year fixed effects.

The estimator for $\sigma^2_{F\tau}$ is the sample variance of the $T$ realisations of the time series $\Sigma_j w_{f\tau-1}\varepsilon_{ft}$ while the estimators for$\sigma^2_{A\tau}$ and $\sigma^2_{J\tau}$ are the sample variances of the realisations of $\gamma_{At|\tau}$ and $\Sigma_j w_{j\tau-1}\delta_{jt}$ respectively. The framework of *Di Giovanni et al*. (*2014*) allows for cross-sectional and time dependence in the data-generating process, but nevertheless jointly stationarity for $\varepsilon_{ft}$ and $\delta_{jt}$ – variables describing growth rates – is assumed. In order to be comparable with other findings in the literature, the results are always presented in terms of relative standard deviations ($\sigma_{F\tau}/\sigma_{A\tau}$).

**3. Data description**

The analysis uses balance sheet information of Hungarian firms with double-entry bookkeeping collected by the National Tax and Customs Administration of Hungary (NAV) over the 2000–2013 period. It contains in total 434,956 firms including 45,211 firms in the manufacturing sector during the time period analysed. *Figure 1* shows that the aggregated real sales growth in the data, although it is slightly more volatile, follows the Hungarian business cycle and hence our database represents the economy of the country well.

To construct real sales growth rates at the firm level, I first deflated sales using 2-digit sector-specific output deflators provided by the Hungarian Central Statistical Office (HCSO) and then calculated the sales growth rates $\gamma_{ft}$ as the log difference between the real sales level of two consecutive years.[5] Since I do not have information on mergers and acquisitions, I trimmed the data at the bottom and top 1 per cent level of sales growth rates.[6]

*Table 1* presents means and standard deviations of firm-level real sales growth rates for the whole economy and for the manufacturing sector. The weighted average real sales growth rate during the sample period was –3.78 per cent (–1.63 per cent) for the whole economy (manufacturing firms), due to the huge negative impact of the recession on sales in 2009 (see *Figure 1*), whereas the unweighted average yearly firm-level real sales growth rate was 2.46 per cent (0.08 per cent) with a standard deviation of 0.6085 (0.5446). The difference between the weighted and unweighted average growth rates can be explained by the faster growing small firms (*Haltiwanger 1997*). Large firms fluctuate less: moving up on the firm size percentile

[5] The robustness of the results to different growth definitions is presented in *Section 4.4*.
[6] See the exact cut-off values in *Annex B* and the robustness of results to different trimming cut-off values in *Section 4.4*.

**Figure 1**
**Growth of aggregate sales and GDP growth**


*Note: This figure plots the time series of the growth rate of real GDP and aggregate real sales growth over the period 2001–2013.*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

ladder, firms tend to have lower levels of growth volatility and the largest 100 and 10 firms are even more stable. These findings also hold for France (*Di Giovanni et al. 2014*) and Sweden (*Friberg and Sanctuary 2016*).[7] According to average square root of the *Herfindahl index* (*0.0667*), sales in Hungary are more concentrated than in France (0.0301) or in Sweden (0.055). The difference in concentration ratios is even greater for the manufacturing sectors.[8] The higher concentration implies that the Hungarian economy is more "granular", and that idiosyncratic shocks to large firms have the potential to manifest themselves in aggregate fluctuations through the fat-tailed firm size distribution.

[7] Volatility levels for Hungary are higher due to the more permissive trimming cut-off values.
[8] See the distribution of firm size and firm sales growth in *Annex B*.

**Table 1**
**Description of firm-level yearly real sales growth**

| | Whole economy | Manufacturing |
|---|---|---|
| **Mean** | | |
| Weighted | –0.0378 | –0.0163 |
| Unweighted | 0.0246 | 0.0008 |
| **Standard deviation** | | |
| Average | 0.6085 | 0.5446 |
| 0–20 size percentile | 0.8387 | 0.7789 |
| 20–40 size percentile | 0.6038 | 0.5572 |
| 40–60 size percentile | 0.5380 | 0.4799 |
| 60–80 size percentile | 0.4963 | 0.4210 |
| 80–100 size percentile | 0.4210 | 0.3559 |
| Top 100 | 0.3952 | 0.3387 |
| Top 10 | 0.2815 | 0.2489 |
| **Average Herfindahl index** | **0.0667** | **0.1630** |

*Note: This table presents means and standard deviations of firm-level yearly real sales growth $\gamma_{ft}$ for the whole economy and for the manufacturing sector. Sales percentiles are constructed on a yearly base. HHI is the Hirschman–Herfindahl index of the total firm sales shares.*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

*Table 2* summarises means and volatility levels of yearly industry-level real sales growth rates and sectoral importance for each 2-digit NACE industry. Industries with the top-five sales shares are: wholesale and retail trade; electricity, gas, steam and hot water supply; sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel; manufacture of radio, television and communication equipment; manufacture of motor vehicles and trailers. Industries are heterogeneous in both growth rates and volatility. Among the industries with a share of at least 1 per cent, the fastest growing ones were: financial intermediation (9.02 per cent); manufacture of radio, television and communication equipment (5.68 per cent); manufacture of rubber and plastics products (4.93 per cent); and manufacture of (electrical) machinery (4.39 per cent). While the post and telecommunications (–2.35 per cent), the construction (–1.69 per cent), the sale, maintenance and repair of motor vehicles and motorcycles (–1.11 per cent) and the wholesale trade sector (–0.84 per cent) underperformed relatively. The sectors construction, financial intermediation, manufacture of fabricated metal products, and real estate activities were the most volatile, whereas the food products and beverages, chemicals, coke, refined petroleum products manufacturing; the retail trade and post and telecommunication sector had the most stable growth path.

**Table 2**
**Descriptive statistics at industry level**

| Code | Division definition | Mean | St. Dev. | Share | # firms |
|---|---|---|---|---|---|
| 51 | Wholesale trade and commission trade | –0.84% | 0.2354 | 17.91% | 40,716 |
| 52 | Retail trade, except of motor vehicles and motorcycles | 0.72% | 0.1686 | 7.08% | 54,376 |
| 40 | Electricity, gas, steam and hot water supply | 3.40% | 0.1771 | 5.81% | 545 |
| 50 | Sale, maintenance and repair of motor vehicles and motorcycles | –1.11% | 0.2240 | 5.64% | 16,903 |
| 32 | Manufacture of radio, television and communication equipment | 5.68% | 0.2349 | 5.30% | 1,031 |
| 34 | Manufacture of motor vehicles, trailers and semi | 2.77% | 0.1951 | 5.23% | 375 |
| 45 | Construction | –1.69% | 0.3357 | 4.87% | 47,862 |
| 74 | Other business activities | 3.30% | 0.2694 | 4.47% | 77,117 |
| 15 | Manufacture of food products and beverages | –0.72% | 0.1717 | 4.44% | 5,036 |
| 23 | Manufacture of coke, refined petroleum products and nuclear fuel | 2.45% | 0.1511 | 3.78% | 10 |
| 24 | Manufacture of chemicals and chemical products | 3.27% | 0.1716 | 2.82% | 730 |
| 64 | Post and telecommunications | –2.35% | 0.1532 | 2.61% | 1,631 |
| 65 | Financial intermediation, except insurance and pension funding | 9.02% | 0.2753 | 2.32% | 1,031 |
| 01 | Agriculture, hunting and related service activities | 0.25% | 0.2460 | 2.22% | 10,339 |
| 28 | Manufacture of fabricated metal products, except machinery and equipment | 2.19% | 0.2733 | 2.07% | 7,463 |
| 70 | Real estate activities | 0.24% | 0.2727 | 2.06% | 27,971 |
| 63 | Supporting and auxiliary transport activities; activities of travel agencies | 2.55% | 0.2216 | 1.84% | 4,968 |
| 60 | Land transport; transport via pipelines | 3.08% | 0.1922 | 1.84% | 10,799 |
| 29 | Manufacture of machinery and equipment n.e.c. | 3.91% | 0.2309 | 1.74% | 3,794 |
| 25 | Manufacture of rubber and plastics products | 4.93% | 0.2168 | 1.47% | 2,055 |
| 31 | Manufacture of electrical machinery and apparatus n.e.c. | 4.39% | 0.2215 | 1.46% | 1,115 |
| 72 | Computer and related activities | 2.65% | 0.2541 | 1.25% | 16,654 |
| 92 | Recreational, cultural and sporting activities | 0.57% | 0.2052 | 0.96% | 12,835 |
| 26 | Manufacture of other non | –1.36% | 0.2165 | 0.96% | 1,811 |
| 66 | Insurance and pension funding, except compulsory social security | –1.05% | 0.2103 | 0.90% | 97 |
| 55 | Hotels and restaurants | 1.02% | 0.1872 | 0.83% | 21,282 |
| 22 | Publishing, printing and reproduction of recorded media | –5.73% | 0.1963 | 0.82% | 7,349 |
| 27 | Manufacture of basic metals | –6.94% | 0.2438 | 0.67% | 332 |
| 21 | Manufacture of paper and paper products | –2.16% | 0.1590 | 0.47% | 541 |

**Table 2**
**Descriptive statistics at industry level**

| Code | Division definition | Mean | St. Dev. | Share | # firms |
|---|---|---|---|---|---|
| 62 | Air transport | 3.09% | 0.1754 | 0.44% | 102 |
| 85 | Health and social work | 8.82% | 0.1777 | 0.43% | 16,385 |
| 90 | Sewage and refuse disposal, sanitation and similar activities | 3.92% | 0.2159 | 0.41% | 1,134 |
| 20 | Manufacture of wood and of products of wood and cork | –2.13% | 0.2154 | 0.39% | 3,161 |
| 36 | Manufacture of furniture; manufacturing n.e.c. | 1.30% | 0.2244 | 0.37% | 3,565 |
| 33 | Manufacture of medical, precision and optical instruments, watches and clocks | 0.98% | 0.2400 | 0.34% | 1,684 |
| 67 | Activities auxiliary to financial intermediation | –7.20% | 0.2619 | 0.31% | 6,324 |
| 16 | Manufacture of tobacco products | 6.17% | 0.1589 | 0.28% | 5 |
| 17 | Manufacture of textiles | –7.16% | 0.2192 | 0.28% | 1,329 |
| 41 | Collection, purification and distribution of water | 0.85% | 0.0984 | 0.28% | 350 |
| 71 | Renting of machinery and equipment and of personal and household goods | 2.39% | 0.2404 | 0.26% | 2,091 |
| 35 | Manufacture of other transport equipment | 4.21% | 0.2651 | 0.24% | 289 |
| 18 | Manufacture of wearing apparel; dressing and dyeing of fur | –9.67% | 0.2248 | 0.20% | 2,717 |
| 02 | Forestry, logging and related service activities | –0.21% | 0.1556 | 0.17% | 1,881 |
| 19 | Tanning and dressing of leather; manufacture of luggage, handbags and footwear | –1.35% | 0.2238 | 0.15% | 549 |
| 73 | Research and development | 7.61% | 0.2769 | 0.14% | 2,287 |
| 80 | Education | 2.35% | 0.2607 | 0.13% | 7,277 |
| 93 | Other service activities | 1.81% | 0.1669 | 0.12% | 5,392 |
| 37 | Recycling | –4.65% | 0.2462 | 0.12% | 263 |
| 11 | Extraction of crude petroleum and natural gas | 7.15% | 0.3139 | 0.12% | 34 |
| 14 | Other mining and quarrying | –0.56% | 0.2816 | 0.11% | 433 |
| 61 | Water transport | –0.22% | 0.2196 | 0.03% | 117 |

*Note: This table presents the average industry-year level growth* $\frac{1}{T}\sum_{t=2000}^{2013}\delta_{jt}$ *and its standard deviation. Industries are ranked by "Share" referring to the share of an industry in total sales.*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

## 4. Results

This section describes the main results. First, I show that the bulk of the aggregated volatility is due to the intensive margin after decomposing sales growth rate volatility into an extensive and intensive margin component (*Section 4.1*.). Second, I describe the firm-level results (*Section 4.2*.), and then I aggregate the components at the country level to summarise the contribution of the firm-specific and macro-sectoral component to aggregate sales volatility (*Section 4.3*.). *Section 4.4*. checks the robustness of the results using a different definition of firm-level sales growth and trimming rules and different methodology to compute idiosyncratic shocks. Finally, *Section 4.5*. investigates the possible mechanisms through which idiosyncratic shocks can manifest themselves in business cycles.

### 4.1. Decomposition of total firm sales into intensive and extensive margin

Following *Di Giovanni et al*. (*2014*), total aggregate sales $X_t$ by all firms in period $t$ are defined as $X_t \equiv \Sigma_{f \in I_t} x_{ft}$ where $x_{ft}$ is the sales of firm $f$ in year $t$, and $I_t$ denotes the set of firms $f$ and output industries $j$ at $t$. First, I decompose the growth rate of aggregate sales into intensive and extensive components. The intensive component at $t$ is defined as the growth rate of sales of firms that had positive sales in both year $t$ and year $t-1$, whereas the extensive margin is the contribution to total sales of appearance and disappearance of firm sales. The exact decomposition of the log-difference growth rate of total sales is the following:

$$\tilde{\gamma}_{At} \equiv \ln \Sigma_{f \in I_t} x_{ft} - \ln \Sigma_{f \in I_{t-1}} x_{ft-1} = \ln \frac{\Sigma_{f \in I_{t/t-1}} x_{ft}}{\Sigma_{f \in I_{t/t-1}} x_{ft-1}} - \left( \ln \frac{\Sigma_{f \in I_{t/t-1}} x_{ft}}{\Sigma_{f \in I_t} x_{ft}} - \ln \frac{\Sigma_{f \in I_{t/t-1}} x_{ft-1}}{\Sigma_{f \in I_{t-1}} x_{ft-1}} \right) = \gamma_{At} - \ln \frac{\pi_{t,t}}{\pi_{t,t-1}}, \quad (5)$$

where $I_{t/t\text{-}1}$ is the set of firms active in both $t$ and $t-1$, and $\pi_{t,t}$, $\pi_{t,t\text{-}1}$ are the share of output produced by this intensive sub-sample of firms in period $t$ and $t-1$.Using equation (5) the impact of intensive and extensive margins on aggregate volatility can be expressed as:

$$\tilde{\sigma}_A^2 = \sigma_A^2 + \sigma_\pi^2 - 2\mathrm{COV}\left(\gamma_{At}, g_{\pi t}\right), \quad (6)$$

where $g_{\pi t} = \ln(\pi_{t,t}/\pi_{t,t-1})$ is the extensive margin component of equation (5), $\sigma_\pi^2$ is its variance, $\sigma_A^2$ is the variance of the intensive margin growth rate $\gamma_{At}$, and $\mathrm{Cov}(\gamma_{At}, g_{\pi t})$ is the covariance between the two terms. Intuitively, the volatility of total sales consists of three elements: the volatility of sales of incumbent firms, the volatility of entries and exits during the sample period and the potential covariance between them.

Although 34.5 per cent of the firm-year observations belong to the extensive margin (of which 15.7 per cent are entering, 15.1 per cent are exiting and 3.7 per cent are reentering firms), according to *Table 3*, the majority of sales volatility is due to the intensive margin. Its contribution to sales volatility is 86 per cent (97 per cent), whereas the relative standard deviation of the extensive margin is only 23 per cent (20 per cent) for the whole economy (manufacturing sector). In both cases, the covariance between the intensive and extensive margin is negligible. These findings are similar to France and confirm the choice of conducting the analysis on the intensive margin.

**Table 3**
**Contribution of extensive and intensive margins on sales volatility**

| | Whole economy | | Manufacturing | |
|---|---|---|---|---|
| **Variables** | **St. Dev.** | **Rel. SD** | **St. Dev.** | **Rel. SD** |
| Aggregated growth rate | 0.0733 | 1 | 0.0855 | 1 |
| Intensive margin | 0.0628 | 0.8575 | 0.0828 | 0.9683 |
| Extensive margin | 0.0171 | 0.2341 | 0.0168 | 0.1961 |

*Note: This table presents the standard deviations of the intensive and extensive margins, in absolute and relative terms with respect to the actual aggregated real sales growth rates, for the whole economy and for the manufacturing sector over the period 2000–2013.*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

### 4.2. Properties of shocks at firm level – the first stage

First, I investigate the properties of the components of firm-level sales growth rates $\gamma_{ft}$. Following equation (1), we can express sales growth rates as the sum of a macro-sectoral $\delta_{jt}$ and an idiosyncratic growth rate $\varepsilon_{ft}$. *Table 4* presents summary statistics of the mean and standard deviation of firm-level real sales growth rates and its components, along with the correlation coefficient of the idiosyncratic and macro-sectoral component with firm-level sales growth rates for the whole economy and for the manufacturing sector.

*Table 4* strengthens the previous findings that shocks hitting firms are mostly idiosyncratic: the error term $\varepsilon_{ft}$ plays the most important role in explaining firm-level sales growth $\gamma_{ft}$ rates (*Haltiwanger 1997; Di Giovanni et al. 2014; Castro et al. 2015; Friberg and Sanctuary 2016*). Both for the whole economy and for the manufacturing sector, the correlation between firm-level sales growth rates and its idiosyncratic component is very close to one. The macro-sectoral component is less volatile and also less correlated with firm growth, but compared to the French data the correlation is slightly higher which is not a surprise after seeing that the

Hungarian economy is more concentrated. *Table 4* implies that firm performance is driven by more firm-specific characteristics, such as demand shocks to the certain variety produced by the firm, productivity shocks or managerial skills, rather than country-specific or industry-specific shocks, i.e. seemingly similar firms within the same industry exhibit substantially different behaviour: in the fast-growing industries, a large share of firms experience substantial declines, whereas, in declining sectors many firms grow rapidly.

**Table 4**

**Description of firm-level real sales growth rates and their firm-specific and macro-sectoral components**

| Whole economy | | | | |
|---|---|---|---|---|
| **Variables** | **Obs.** | **Mean** | **St. Dev.** | **Correlation** |
| Firm-level Sales Growth Rates | 1,561,644 | 0.0246 | 0.6085 | 1.0000 |
| Idiosyncratic growth component | 1,561,644 | 0.0000 | 0.6040 | 0.9926 |
| Macro-sectoral component | 700 | 0.0340 | 0.1611 | 0.1216 |
| **Manufacturing sector** | | | | |
| **Variables** | **Obs.** | **Mean** | **St. Dev.** | **Correlation** |
| Firm-level Sales Growth Rates | 213,146 | 0.0008 | 0.5446 | 1.0000 |
| Idiosyncratic growth component | 213,146 | 0.0000 | 0.5387 | 0.9891 |
| Macro-sectoral component | 332 | 0.0058 | 0.1705 | 0.1470 |

*Note: The idiosyncratic growth component $\varepsilon_{ft}$ is the deviation of the yearly firm-level sales growth rate $\gamma_{ft}$ from Lotte the macro-sectoral component of growth $\delta_{jt}$.*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

### 4.3. Role of firm-specific shocks in generating aggregate fluctuations – the second stage

After having demonstrated in the previous section that the variation in firm-level sales growth is mainly caused by idiosyncratic shocks, the next question is whether the idiosyncratic component of firm growth also has an impact on aggregate fluctuations.

The relative contribution of the idiosyncratic part is calculated as the time average of the ratio of the standard deviations of the aggregated firm-specific component and aggregated sales growth on the intensive margin:

$$\sigma_{F\tau}^{rel} = \frac{1}{T}\sum_{\tau=2001}^{2012}\frac{\sigma_{F\tau}}{\sigma_{A\tau}}. \quad (7)$$

The average relative standard deviation of the macro-sectoral component is computed in the same manner:

$$\sigma_{J\tau}^{rel} = \frac{1}{T}\sum_{\tau=2001}^{2012}\frac{\sigma_{J\tau}}{\sigma_{A\tau}}. \quad (8)$$

*Table 5* presents the main results. The time average of the relative standard deviation of the aggregated firm-specific component is 56.5 per cent (56.9 per cent), whereas the average relative contribution of the macro-sectoral component is 69.5 per cent (73.1 per cent) for the whole economy (manufacturing sector).[9] At the country level, the relative importance of macro-sectoral shocks has increased, while the contribution of idiosyncratic shocks has declined, but over time the aggregated impact of the firm-specific component is far from negligible and has a relative importance similar to the macro-sectoral shocks. Compared to the findings of *Di Giovanni et al.* (*2014*), the estimated overall impact of firm fluctuations is lower in Hungary (56.5 per cent) than in France (80.1 per cent), whereas the relative contribution of macro-sectoral factors is higher (69.5 per cent versus 52.9 per cent), which can be a consequence of the much higher trade openness of Hungary that makes the economy more vulnerable to macro-sectoral shocks.

**Table 5**
**Aggregate impact of firm-specific shocks on aggregate volatility**

| | Whole economy | | Manufacturing sector | |
|---|---|---|---|---|
| | St. Dev. | Relative SD | St. Dev. | Relative SD |
| Firm-level Sales Growth Rates | 0.0838 | 1.0000 | 0.0967 | 1.0000 |
| Idiosyncratic growth component | 0.0464 | 0.5554 | 0.0540 | 0.5642 |
| Macro sectoral component | 0.0566 | 0.6950 | 0.0702 | 0.7311 |

*Note: This table presents the average standard deviation of the aggregated firm-specific* $\frac{1}{T}\sum_{\tau=2001}^{2012}\sigma_{Ft}$, *macro-sectoral component* $\frac{1}{T}\sum_{\tau=2001}^{2012}\sigma_{J\tau}$ *and the aggregate sales growth volatility* $\frac{1}{T}\sum_{\tau=2001}^{2012}\sigma_{A\tau}$ *in absolute and relative terms –* $\sigma_{F\tau}^{rel} = \frac{1}{T}\sum_{\tau=2001}^{2012}\frac{\sigma_{F\tau}}{\sigma_{A\tau}}$ *and* $\sigma_{J\tau}^{rel} = \frac{1}{T}\sum_{\tau=2001}^{2012}\frac{\sigma_{J\tau}}{\sigma_{A\tau}}$, *respectively.*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

[9] See *Figure 3* in *Annex B* for the time series of the standard deviations of the aggregated sales growth rates ($\sigma_{A\tau}$) and its firm-specific $\sigma_{F\tau}$ and macro-sectoral $\sigma_{J\tau}$ component defined as in equation (4) for the whole economy.

### 4.4. Robustness

Note that so far I have calculated idiosyncratic shocks simply as the deviation of the yearly firm-level sales growth from the corresponding sectoral growth. However, firms can react heterogeneously to different shocks: larger and older firms have the experience to smooth shocks affecting sales. Also, as *Vannoorenberghe* (*2012*) found, firms involved in international trade can hedge domestic and foreign shocks by switching across markets if those shocks are not perfectly correlated. Moreover, exporters, older and larger firms are also more productive and hence those firms, by using more sophisticated production technologies, have a better chance to adjust to a shock. Location also matters: local labour market conditions, infrastructure or savings of local people may have an impact on firm growth as well.

To control for heterogeneous response to shocks and for location, I re-estimate the idiosyncratic growth component $\varepsilon_{ft}$ as follows:

$$\gamma_{ft} = X_{ft} + d_{jt} + d_{rt} + \varepsilon_{ft} \tag{9}$$

I regress sales growth rates $\gamma_{ft}$ on a set of firm covariates $X_{ft}$ including age, the logarithm of total sales at time $t-1$ as a proxy for firm size, and the export share of sales. Also, I net out industry-year fixed effects $d_{jt}$ as before and I control for transitory regional-level local shock by adding region-year fixed effects $d_{rt}$. The first row of *Table 6* indicates that, surprisingly, the contribution of idiosyncratic shocks to aggregate sales growth volatility is virtually the same after controlling for local time-varying effects and heterogeneous response to shocks of firms by netting out size, age and export openness. The relative standard deviation of aggregated firm fluctuations is 54.4 per cent (56.5 per cent) for the whole economy (manufacturing sector) compared to the baseline results of 55.5 per cent and (56.4 per cent), respectively.

**Table 6**
**Aggregate impact of firm-specific shocks on aggregate volatility – robustness**

| | Whole | Manufacturing |
|---|---|---|
| Heterogeneous response to shocks | 0.5441 | 0.5647 |
| **By different sales growth definitions** | | |
| symmetric growth rates | 0.5491 | 0.5668 |
| "classic" growth rates | 0.7041 | 0.6373 |
| **By different cut-off rules** | | |
| 1 | 0.5554 | 0.5642 |
| 5 per cent | 0.5532 | 0.6228 |
| 10 per cent | 0.5536 | 0.6200 |
| Trimming rule of Di Giovanni et al. (2014) | 0.5231 | 0.6173 |

*Note: The table reports averages of the relative standard deviation of the firm-specific component* $\frac{1}{T}\sum_{\tau=2001}^{2012}\frac{\sigma_{ft}}{\sigma_{At}}$ *for the whole economy and for the manufacturing sector. Idiosyncratic shocks are calculated for "Heterogeneous response to shocks" using equation (9). Symmetric growth rates are calculated as* $\gamma_{ft} = (X_t - X_{t-1})/(X_t + X_{t-1})/2$. *The "classic" measure of sales growth is computed as* $\gamma_{ft} = (X_t - X_{t-1})/X_{t-1}$. *The different cut-off rules are: sales growth rates above and below the top 1 per cent, 5 per cent and 10 per cent. The rule of Di Giovanni et al. (2014) deletes growth rates below –50 per cent and 100 per cent.*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

I also experiment with other definitions of firm growth. It can be argued that measuring firm-level growth as the log difference of sales may be misleading since smaller firms experience higher growth in absolute value hence the log differences become an imprecise proxy for growth (*Kalemni-Ozcan et al. 2014*). To check whether the growth definition modifies the main results I use two additional measures. The first one follows *Davis* (*2006*) and is calculated as $\gamma_{ft} = (X_t - X_{t-1})/(X_t + X_{t-1})/2$. In particular, it yields a measure that is symmetric around zero and bounded between –2 and 2, affording an integrated treatment of births, deaths, and incumbents. The "classic" measure of sales growth is simply computed as $(X_t - X_{t-1})/X_{t-1}$. Results with the symmetric measure are almost exactly the same as the baseline relative contributions: 54.9 per cent versus 55.5 per cent for the whole economy and 56.7 per cent versus 56.4 per cent for the manufacturing sector. With the classic growth measure, however, the relative contribution of idiosyncratic shocks to aggregate volatility is even more pronounced: 70 per cent (64 per cent) for the whole economy (manufacturing sector). This is not a surprise taking into account that the majority of the firms are micro and small firms, with high and volatile average growth at the intensive margin (see *Table 1*) and the log difference method possibly underestimates the contribution of individual firms.

Results are also robust to different cut-off rules: sales growth rates above and below the top 1 per cent, 5 per cent and 10 per cent.[10] The relative contribution of the firm-specific component varies between 55 per cent and 58 per cent (52 per cent and 62 per cent) for the whole economy (manufacturing sector). Without dropping any firm-year observations, those values are higher, as expected: 71.4 per cent (78 per cent).

Note that these criteria for outlier treatment are far more permissive compared to those used by *Di Giovanni et al.* (*2014*), who dropped observations with a growth rate higher than 100 per cent and lower than –50 per cent.[11] Nevertheless, I find it unreasonably restrictive to apply these to the Hungarian data. The cut-off rule of *Di Giovanni et al*. (*2014*) would result in losing one third of the observations, mainly the fast growing micro and small firms (25 per cent of the firm-year growth rates are higher than 100 per cent, and more than 8 per cent of the observations have a growth rate of less than –50 per cent). Also, there is no reason to exogenously employ the trimming rule of French data on the Hungarian data, due to the structural differences between the two economies. Another additional difference in my outlier treatment is that I do not drop manufacturing (service) firms with annual sales that are less than EUR 766,000 (EUR 231,000).[12] Employing the trimming rule of *Di Giovanni et al*. (*2014*), we can compare the French results to the Hungarian results: In France, idiosyncratic shocks have a higher relative importance in generating business cycles than in Hungary. The relative standard deviation of firm fluctuations is 80.1 per cent (68.9 per cent) in France, whereas in Hungary idiosyncratic shocks contribute with a relative standard deviation of 52.3 per cent (61.7 per cent) to aggregate sales growth volatility for the whole economy (manufacturing sector). Once again, the main reason beyond the differences could be the huge difference in relative trade openness between the two countries: Hungarian firms face a higher risk of being exposed to foreign shocks and hence idiosyncratic shocks to firms matter less for aggregate fluctuations. But still, their contribution is far from negligible and has a similar impact in terms of magnitude compared to macro-sectoral disturbances.

### 4.5. Mechanisms through which idiosyncratic shocks manifest themselves in aggregate fluctuations

After having demonstrated that idiosyncratic shocks do matter in generating business cycles, the next step is to understand the underlying mechanisms through which firm-level fluctuations shape aggregate sales growth volatility. Is it due to

[10] See the precise values of real sales growth at firm-level for the cut-off values in *Annex B*.
[11] *Friberg and Sanctuary* (*2016*) trimmed sales growth above 200 per cent and below –50 per cent for the sake of the comparability with the results with *Di Giovanni et al.* (*2014*), however, note that the latter cut-off rule is more permissive and hence one cannot directly compare the two results.
[12] The reason for dropping those observations in *Di Giovanni et al*. (*2014*) was the unsuccessful matching between balance sheet and trade data, a problem I do not face.

the "granular" firm-size distribution that the performance of some giant firms has a huge impact on the whole economy of the country or are shocks propagating and being amplified through input-output linkages? To distinguish the channels, I decompose the aggregated firm-fluctuation component $\sigma^2_{F\tau}$ into a variance and covariance component:

$$\sigma^2_{F\tau} = \Sigma_f w^2_{ft-1} Var\left(\varepsilon_{ft}\right) + \Sigma_g \Sigma_f w_{gt-1} w_{ft-1} \mathrm{Cov}\left(\varepsilon_{gt}, \varepsilon_{ft}\right), \quad f \neq g. \tag{10}$$

According to equation (10), the volatility of the aggregated idiosyncratic shocks encompasses two channels. The first one is the variance of individual shocks, which is called after *Di Giovanni et al.* (*2014*) the DIRECT term and is driven exclusively by the firm-size distribution, and the covariance of shocks across firms (second term), which I will refer to as the LINK component. The former captures the effect of the distribution of the shocks to firms on aggregate volatility, while the latter captures the contribution of firm-to-firm linkages, i.e. the effect of business partnership (or rivalry) between firms according to which a shock hitting a certain firm also has an effect on other firms in its network, and/or time-invariant and transitory local shocks, such as independent events to a certain group of firms in the same location having an impact on their sales growth.

*Table 7* clearly shows that the idiosyncratic-shock component is mainly driven by the LINK component, whereas the DIRECT channel plays a negligible role in aggregate fluctuations. The LINK component explains around 88 per cent of the average variance of the aggregated firm-specific, whereas the DIRECT component only 16 per cent if one estimates idiosyncratic shocks by using equation (1).[13] These findings are similar to the results of *Di Giovanni et al.* (*2014*) with the slight difference that in France the link component more closely follows the firm-specific component, as the French economy is less concentrated and thus large firms have even less chance to shape aggregate fluctuations.

By controlling for heterogeneous firm response to shocks and common local shocks to firms operating in the same geographical area, according to equation (9), the findings are similar, with a slight decrease of the relative importance of the LINK component (84 per cent) and a moderate increase in the DIRECT component (18 per cent). These results suggest and strengthen the recent findings of *Barrot and Sauvagnat* (*2016*), according to which firm-level shocks propagate through vertical and horizontal connections between firms: shocks to input providers have an impact on downstream partners, and the other way around, a troubled (a growing) output buyer negatively (positively) affects the sales of the upstream partner. Seemingly, even if the Hungarian economy is "granular", shocks to large firms cannot generate

[13] See *Figure 4* in *Annex B* for the time series of the channels.

business cycles on their own, but firm-to-firm linkages do: idiosyncratic shocks affecting firms can be amplified causing sizable aggregate effects.

**Table 7**
**Impact of the DIRECT and LINK component on the aggregated firm-specific component**

| | (1) | | (2) | |
|---|---|---|---|---|
| | **Variance** | **Rel. Var.** | **Variance** | **Rel. Var.** |
| Aggregated idiosyncratic component | 0.0022 | 1.0000 | 0.0020 | 1.0000 |
| DIRECT | 0.0004 | 0.1632 | 0.0004 | 0.1843 |
| LINK | 0.0019 | 0.8837 | 0.0017 | 0.8439 |

*Note: This table presents the average variance of the aggregated firm-specific* $\frac{1}{T}\sum_{t=2001}^{2012}\sigma_{Ft}^2$ *and its DIRECT and LINK component computed as in equation (10) in absolute and relative terms –* $DIRECT_{rel} = \frac{1}{T}\sum_{t=2001}^{2012}\frac{DIRECT_t}{\sigma_{Ft}^2}$ *and* $LINK_{rel} = \frac{1}{T}\sum_{t=2001}^{2012}\frac{LINK_t}{\sigma_{Ft}^2}$*, respectively. In the first specification, idiosyncratic shocks to firms are estimated following equation (1), while in the second one as in equation (9).*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

## 5. Conclusions

The aim of the paper was to analyse the role of Hungarian firms in generating aggregate fluctuations. The analysis quantifies the impact of idiosyncratic shocks on aggregate sales growth volatility and found that – at the individual level – it was mostly idiosyncratic shocks that hit firms and that macro-sectoral factors play a relatively smaller role. This result simply implies that deviation from sectoral growth varies substantially across firms: many of them were growing despite the recession and during booms one can also find numerous declining firms.

Interestingly, in contrast to the decades-old common wisdom that idiosyncratic shocks average out at the macro level, the second-stage results of the paper indicate that firm-level shocks are also capable of shaping the business cycle; moreover, they make a very high relative contribution to the aggregated sales growth volatility. Even though Hungary is one of the most open economies of the world and is exposed to sizable foreign and sectoral shocks, almost 50 per cent of the aggregate sales volatility is due to firm-level fluctuations, events that affect firm performance independently of macro-sectoral components.

Evidence suggests that the large contribution of firm-specific factors to aggregate fluctuations is driven by firm-to-firm linkages: shocks to a single firm can propagate and be amplified through production networks. The fat-tailed firm-size distribution plays a relatively less important role in generating business cycles. Although Hungarian sales are quite concentrated, the results also imply that – on its own – the performance of large firms has a moderate impact on aggregate volatility.

The surprisingly high importance of firm-level shocks in generating business cycles underlines the necessity of future research on understanding the determinants of firm-level disturbances. Quantifying the sources of firm-level fluctuations would provide valuable insight for policymakers as well.

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## Annex A. The model: A multi-sector heterogeneous firm framework

This section presents a simple multi-sector heterogeneous firm model in the spirit of *Di Giovanni et al*. (*2014*) to motivate the decomposition of aggregate sales growth into a macro-sectoral and firm-specific component.[14] Consumers derive utility from the following Cobb-Douglas function:

$$U_t = \prod_{j=1}^{J} \left( C_{jt} \right)^{\varphi_{jt}}, \tag{11}$$

where $C_{jt}$ is consumption of sector $j$ at time $t$, and $\varphi_{jt}$ is a time-varying demand shock for sector $j$. Let $Y_t$ denote aggregate expenditure at time $t$, and $Y_{jt}$ the expenditure in sector $j$. By using the Cobb-Douglas utility function, expenditure on sector $j$ is a fraction $\varphi_{jt}$ of total expenditure: $Y_{jt} = \varphi_{jt} Y_t$.

Sectors are CES aggregate of $\omega_{fjt}$ varieties $f$ available at time $t$:

$$C_{jt} = \left[ \Sigma_{f \in \Omega_{jt}} \left( \omega_{fjt} \right)^{\frac{1}{\theta}} \left( C_{ft} \right)^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta-1}{\theta}}, \tag{12}$$

Where $\omega_{fjt}$ is a time-varying demand shock for variety $f$.

In this model framework, each firm sells a unique variety within sector $j$ and hence has some market power. Firms are also heterogeneous in productivity denoted by a time-varying unit input requirement $a_{ft}$ having a cost of $c_{jt}$ in sector $j$ at period $t$. The input bundle can have cost of labour and capital, respectively. In this manner, sales by a firm is given by:

$$x_{ft} = \omega_{fjt} \frac{\varphi_{jt} Y_t}{P_{jt}} \left( \frac{\theta - 1}{\theta} c_{jt} a_{ft} \right)^{1-\theta}, \tag{13}$$

where $P_{jt}$ is the price level in sector $j$ at time $t$.

The sales growth rate $\gamma_{ft}$ of firm $f$ between time $t-1$ and time $t$ is in log difference form:

$$\gamma_{ft} = \tilde{\delta}_t + \tilde{\delta}_{jt} + \varepsilon_{ft}, \tag{14}$$

where $\tilde{\delta}_t = \Delta \log Y_t$ is the aggregate ("macroeconomic") shock to demand, $\tilde{\delta}_{jt} = \Delta \log \varphi_{jt} + \left(1-\theta\right)\left( \Delta \log c_{jt} - \Delta \log P_{jt} \right)$ captures the sectoral demand and cost shocks, and $\varepsilon_{ft} = \Delta \log \omega_{ft} + \left(1-\theta\right)\left( \Delta \log a_{ft} \right)$ is the firm-specific demand and cost shock.

[14] The difference between my approach and that of *Di Giovanni et al.* (*2014*) is that – because of data restrictions – I decompose total (domestic plus export) firm-level sales growth rather than firm destination-level sales growth since I do not observe the export destinations.

However, note that I cannot estimate the macroeconomic $\tilde{\delta}_t$ and industrial component $\tilde{\delta}_{jt}$ separately without further restrictions. But my goal is similar to *Di Giovanni et al*. (*2014*) in the sense that ultimately I am not interested in investigating the impact of those two components, but rather the firm-specific shocks on aggregate sales volatility. Finally, I encompass macro and industrial shock into a macro-sectoral shock $\delta_{jt} = \tilde{\delta}_t + \tilde{\delta}_{jt}$ and use the following equation for estimation:

$$\gamma_{ft} = \delta_{jt} + \varepsilon_{ft}. \tag{15}$$

In this manner, idiosyncratic shocks $\varepsilon_{ft}$ are estimated as the deviation of firm-level sales growth rates $\gamma_{ft}$ from the industrial average growth rates $\delta_{jt}$.

## Annex B. Extra tables and figures

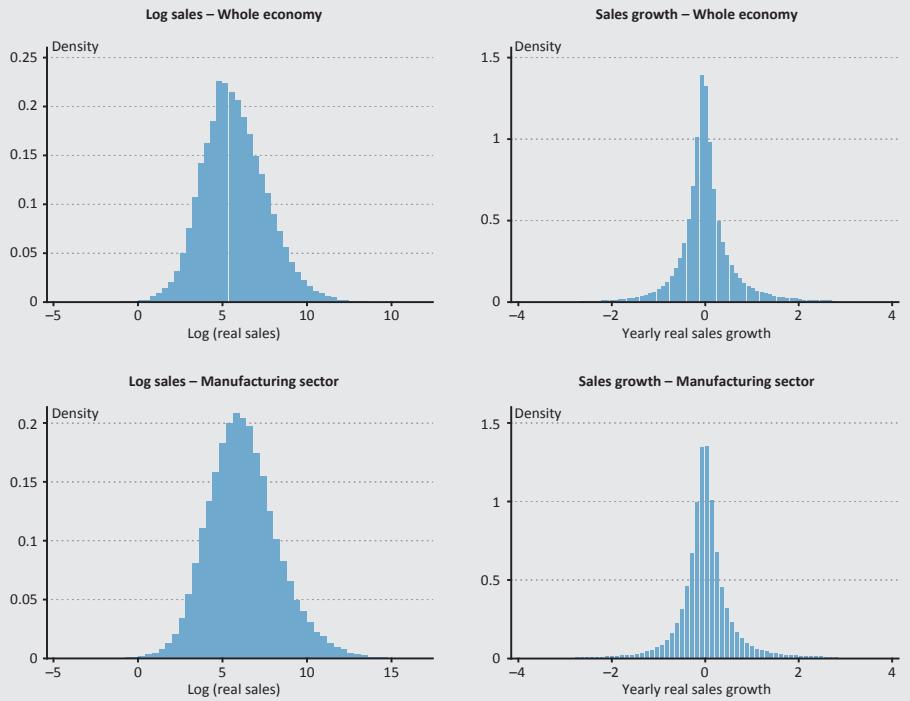
**Table 8**
**Top and bottom real sales growth cut-off values**

| | Whole economy | | Manufacturing | |
|---|---|---|---|---|
| percentiles | bottom | top | bottom | top |
| 1% | –2.0574 | 2.7523 | –1.7836 | 2.3081 |
| 5% | –0.9282 | 1.2185 | –0.8255 | 0.9515 |
| 10% | –0.5813 | 0.7158 | –0.5377 | 0.5688 |
| 25% | –0.2258 | 0.2418 | –0.2288 | 0.2067 |
| 50% | –0.0079 | | –0.0159 | |

*Note: This table presents the top and bottom percentiles of firm-level real sales growth rate used for outlier treatment.*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

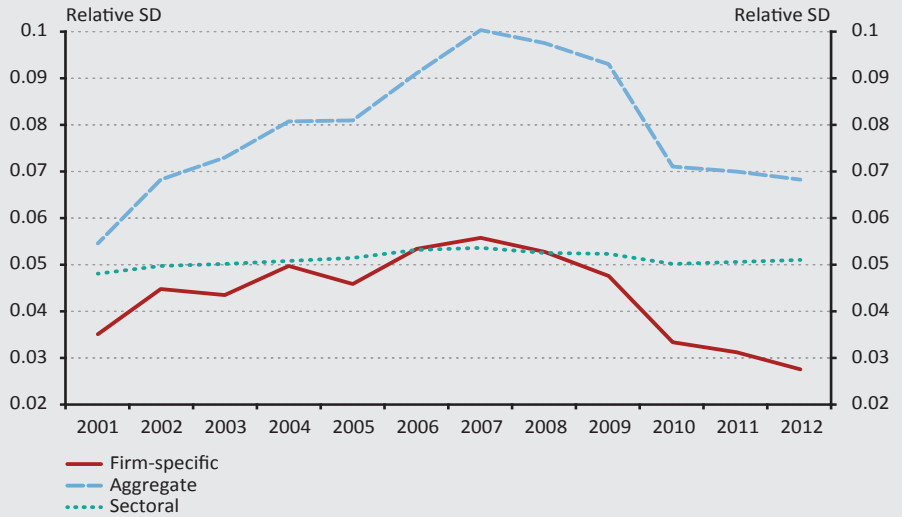
**Figure 2**
**Distribution of sales and yearly sales growth rates**




*Note: This figure presents the distribution of the logarithm of average real sales (first column) and the yearly growth rate of real sales at the firm level (second column) for the whole economy (first row) and for the manufacturing sector (second row).*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

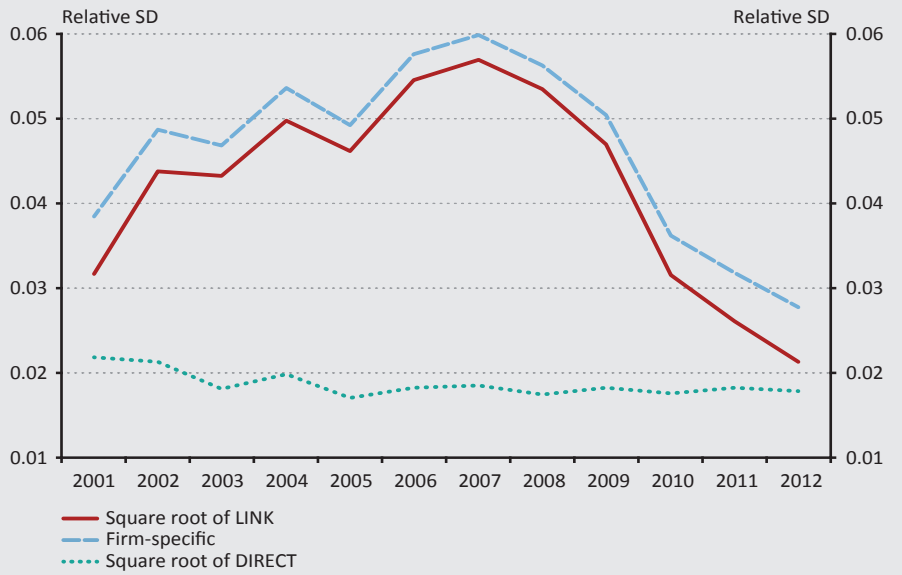
**Figure 3**
**Aggregate sales growth fluctuation and its components**




*Note: This figure plots the time series of the aggregated sales growth volatility $\sigma_{A\tau}$ and its firm-specific $\sigma_{F\tau}$ and macro-sectoral component $\sigma_{J\tau}$ over the period 2001–2012.*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

**Figure 4**
**Contribution of individual volatilities and covariance terms to firm fluctuations**




*Note: This figure presents the decomposition of aggregated firm-level fluctuations $\sigma_{F\tau}$ into the square root of the DIRECT and LINK component following equation (10) over the period 2001–2012.*

*Source: Computation based on the data of the National Tax and Customs Administration of Hungary (NAV).*

# Social Responsibility in the Operation of Central Banks

*Csaba Lentner – Krisztina Szegedi – Tibor Tatay*

*In our study, we set out from the hypothesis that the social responsibility of central banks is peculiar, since these were established decidedly for the benefit of the common good. For the interpretation of their social responsibility, we first examine the concept of corporate social responsibility (CSR) in corporate practice. After this, we transpose the interpretation of CSR, applied to the operation of central banks. We interpret the concept of economic, legal, ethical and philanthropic responsibility in connection with the activity of central banks. Using examples, we shed light on how we specifically interpret the individual components of corporate social responsibility in the central bank practice, via the activity of the Magyar Nemzeti Bank, the US Federal Reserve, the European Central Bank, and the central banks of the Netherlands, Denmark, Spain, Poland and the Czech Republic.*

**Journal of Economic Literature (JEL) codes**: M14, E58 E44, G28

**Keywords**: corporate social responsibility, CSR, central bank, public awareness, financial stability, business ethics, central bank

## 1. Introduction

After the 2008 crisis, crisis management required that central banks modify their previous monetary policy mindset based on neoliberal economic views. As an effect of the circumstances, it seems that the monetary policy practice of the leading central banks changes permanently. According to *Akerlof and Shiller* (*2011*), the most destructive effect of the crisis is that there is lack of confidence in the participants of the economy regarding the future. In 2008, the initial freeze-up of the financial markets resulted from banks' shaken confidence in each other. After the disappearance of liquidity, mistrust later spread further to the other economic participants as well. Public confidence was undermined in connection with money and the money creation processes of central banks. Analysing this process, *Braun*

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The manuscript was received on 22 December 2016.

DOI: http://doi.org/10.25201/FER.16.2.6485

(*2016*) called attention to how far the *folk theory of money* is from how money actually works. Recognising this, the fellow workers of the British central bank (*Jakab – Kumhof 2015*), the Dutch central bank (*De Nederlandsche Bank 2016*), and the Magyar Nemzeti Bank (*Ábel–Lehman–Tapaszti 2016*) attempted to dispel the doubts, clarifying the widespread mistakes, with their articles, in order to maintain the authenticity of central banks (*Braun 2016:1084*).

The behaviour of the financial sector has not changed fundamentally since the crisis: short-term profit is still at the forefront, instead of long-term prudence. It is necessary to return to the essential question of how the financial sector can serve the welfare of society. Financial stability is essential for this. In order to restore confidence, changing behaviour and culture, integrity, transparency, strengthening of the ethical dimension, and assuming corporate responsibility are necessary as the fundamental criteria of financial stability (*Lagarde 2014*).

It is a social expectation that the culture of the financial institutional system be transformed. Changing the central bank mentality must assist in this transformation of financial organisational culture (*Shirakawa 2010*). In changing this mentality, the short-term objectives characterising the period before 2008 are replaced by objectives focusing on the medium and long term, and at the same time the search for new roles can be observed at central banks (*Pesuth 2016*). The new roles can stem from the changes in the tasks of central banks stipulated in legal regulations. Rephrasing the roles can be voluntary, implemented by rearranging the focal points of the tasks set under the previous framework of legal regulations.

It now appears that central banks also see the implementation of their tasks in a framework which is different from their monetary policy thinking prior to 2008. The focus on ensuring financial stability has changed the role of central banks as well. In addition to the traditional monetary control tasks, their mandate includes the task of supervising and regulating the financial sector as well. Since the outbreak of the crisis, supporting economic growth has also received a greater role, in addition to uninterrupted financial stability as a new mandate. Expansion of the mandate has also made it necessary to broaden the set of instruments (*Ábel et al. 2014*). At the same time, the question has arisen as to what approaches should be applied for the successful fulfilment of the multiple mandates. Another question is how the changed role and new expectations can be fulfilled with efficient organisational behaviour and a guidance culture adjusting to these changes (*Kahn 2016*).

In the decision-making and implementation of tasks, it is necessary to pay more attention to the social impacts. A stronger focus on social responsibility has already been part of the corporate sector (primarily by large enterprises) for quite some time. This approach has also taken root in the banking sector, and to a certain extent in the organisational operation of central banks as well. In the following, we

summarise the concept and development of the CSR approach and way of thinking, and its interpretation for central banks. This topic was already examined in our earlier research (*Lentner et al. 2015*); in this article, we rephrase – supplement and update – our previous thoughts.

## 2. Concept of corporate social responsibility (CSR)

Significant advances in the concept of corporate social responsibility (CSR) have been seen in recent decades, both in terms of theory and corporate practice (*Szegedi 2014*). The current CSR approaches extend well beyond the early interpretation of the concept, when it arose in connection with managers that they not only had economic responsibility vis-à-vis the owners, but also social responsibility vis-à-vis society as well (*Dodd 1932:1149*). There are several versions of CSR definitions, of which *Dahlsrud* (*2008*) distinguished five main dimensions, analysing in detail almost forty CSR definitions:

1. Environmental dimension – keywords: cleaner environment, environmental stewardship, environmental concerns in business operations;

2. Social dimension – keywords: contribute to a better society, integrate social concerns in business operations, positive and negative impact of companies on society and communities;

3. Economic dimension – keywords: contribute to economic development, long-term profitability

4. Stakeholder dimension – keywords: relations with stakeholders, dialogue with stakeholders, involving stakeholders;

5. Voluntariness dimension – keywords: voluntary actions beyond legal obligations.

As shown in the list, the economic, social and environmental pillars of sustainable development appear in the CSR definitions, supplemented with the stakeholder approach and the voluntariness dimension. The stakeholder approach has typically appeared in connection with the corporate sphere. To the question why we should listen to stakeholders, the answer is ethical obligation, as it was deduced by *Evan and Freeman* (*1988*) in connection with the stakeholder theory. The connection between the CRS model and the stakeholder approach is important, because the latter names the parties vis-à-vis whom the company undertakes responsibility, and – according to one of the best known and most accepted definitions of CSR – this comprises economic, legal, ethical and philanthropic responsibility (*Carroll 1979:500*). In terms of responsibility, it is not the strength of the stakeholders that is important, but their legitimacy (*Carroll 1991*). Table 1 summarises the four areas of responsibility of CSR, building on each other.

**Table 1**
**Areas of corporate social responsibility**

| Area of responsibility | Contents of responsibility |
|---|---|
| Economic responsibility | Includes the maximisation of earnings per share, maximisation of profit, strong competitive position, high level of operating efficiency, and long-term profitability. |
| Legal responsibility | The company must meet its economic responsibility within the legal frameworks. This means compliance with laws, legal regulations and local regulations; moreover, that the company is defined as a law-abiding corporate citizen, and its goods and services should comply with the legal requirements. |
| Ethical responsibility | It means the compliance of norms and requirements that go beyond legal responsibility and are not included in legal regulations. With respect to customers, employees, owners and communities, these reflect honest and fair behaviour protecting and respecting the moral requirements of stakeholders. |
| Philanthropic responsibility | The companies contribute to enhancing welfare and the quality of life as good corporate citizens, for example with the support of the arts, education or community with voluntary activities. These are of discretionary and voluntary nature. |

*Source: Edited based on Carroll 1991.*

The theoretical experts dealing with the operation of companies also agree, in general, that companies must behave responsibly, in an ethical manner, but there is a question of how this can be implemented in practice and how it affects the economic performance of companies (*Chikán 2003*). In connection with the economic benefits of corporate social responsibility, *Kurucz, Colbert and Wheeler* (*2008*) have shown that this can be deducted from the decrease in costs and risks, competitive advantages, increases in reputation and legitimacy, and value creation stemming from win-win type situations. *Margolis, Elfenbeien and Walsh* (*2009*) analysed 167 empirical studies from the past 35 years and established a positive connection between CSR and financial results, on the basis of philanthropic contributions, explored abuses and transparent operations. According to the recommendation of *Carroll and Shabana* (*2010*), this connection must be handled in a complex manner, and the support of stakeholders is also necessary for the positive connection. CSR is an ethical obligation of companies, irrespective of whether it can be recovered economically or not. At the same time, the rising expectations of corporate stakeholders of such a nature and the market recognition of responsible companies increasingly result in the recovery of CSR, which moves the integration of the approach into practice in a positive direction.

According to *Archie Carroll* (*2015a*), the researcher who received the Lifetime Achievement Award in CSR in 2012, the concepts of corporate citizenship, business ethics, stakeholder management, sustainability and creating shared value are competing versions of corporate social responsibility, and attempts are made to consider one as a part of the other or many people already use these as synonyms,

and this trend will strengthen in the future. In corporate practice, the approach of sustainability is attractive, since it is rather neutral and it expresses positive contribution related to the future, while corporate social responsibility urges responsibility in the present as well, whereas business ethics is less popular because of its critical approach (*Carroll 2015b*). Just as sustainable development requires a fundamental shift in attitudes (*Kerekes 2009*), corporate social responsibility also presses for changes to the business model.

In practice, however, at most companies, we find charitable events in connection with CSR and increasing the efficiency of operation appears as an objective at a significant portion of these, but the requirement of true transformation of the business model only is perceptible at a small part of companies (*Rangan et al. 2015*). With its approach of transforming the business model, corporate social responsibility addresses the concept of social enterprise, which aims for the solution of a social problem, in addition to economic sustainability. The concept of sustainable development suggests that each enterprise must be a social enterprise at the same time, and vice versa, creating harmony among economic, environmental and social objectives, and thereby contributing to sustainable development.

## 3. Interpretation of the elements of CSR in connection with central banks

The social responsibility of central banks has arisen especially regarding the last crisis. The American central bank made extraordinary efforts to handle the crisis and save the financial system, in order to avoid a global financial collapse. The responsibility of central banks is significant not only in terms of direct measures, but also in connection with the subsequent regulation (*Schoen 2016*). The social responsibility of central banks is peculiar, as these were established specifically for the benefit of the common good. Their objectives and tasks are stipulated in legal regulations. Thus, central banks are institutions promoting the achievement of specific economic policy objectives. According to their tasks, they are organisations performing state authority tasks as well. Therefore, the social responsibility formulated by *Carroll* (*1991*) can only be interpreted in a modified form in this sphere.

Naturally, the specific elements of CSR appear in various forms at the individual central banks. The regulatory environment, mandate and scope of the individual central banks are different. After the 2008 crisis there were problems which had to be handled similarly, such as the management of macro-prudential risks, but there were also problems to be treated in completely different ways. For example, the treatment of stability risks related to foreign exchange loans in Hungary was unique. Hence, in the following we would like to shed light on the elements of social responsibility and the acceptance of the approach on the basis of the practices of individual central banks.

### 3.1 Economic responsibility of central banks

The economic responsibility of central banks differs from the profit maximisation valid for business enterprises, but the concepts of a high level of operating efficiency and long-term success can be interpreted, taking into account the restrictions of legal regulations. The economic responsibility of the central bank is unique, as its objectives are macroeconomy-level economic policy objectives, and its tasks are special tasks stipulated in legal regulations.

In the case of the *Magyar Nemzeti Bank* (*MNB*), *Lentner et al.* (*2015:28*) summarised this characteristic supported with statements highlighted from the legal regulations: "The primary objective of the MNB shall be to achieve and maintain price stability. Without endangering its primary objective, it shall support the maintenance of stability of the financial intermediary system and the increase of its resilience. It shall support the sustainable contribution of the financial intermediary system to economic growth. It shall support the economic policy of the government with the instruments available to it."

Within the scope of fundamental tasks stipulated in the MNB Act, it determines and implements monetary policy. MNB is entitled to issue the legal tender of Hungary. "In the interest of maintaining the external stability of the Hungarian economy, it shall form and manage official foreign exchange and gold reserves, it shall perform foreign exchange transactions, and it shall supervise the payment, settlement and security settlement systems" (*Lentner et al. 2015:39*). In order to perform its tasks and in the sphere of data reporting obligation existing to the ECB, "it shall collect and disclose statistical information". The MNB "shall establish the macro-prudential policy for the stability of the entire system of financial intermediation", with the objective to enhance the resilience of the system of financial intermediation and to ensure its sustainable contribution to economic growth. To this end, the "MNB shall explore the business and economic risks threatening the system of financial intermediation as a whole, it shall promote the prevention of the development of systemic risks and the reduction or elimination of the evolved systemic risks; furthermore, in the event of disturbances to the credit market it shall contribute to the balanced functioning of the system of intermediation in financing the economy through stimulating lending and – in the event of excessive credit outflow – by restraining lending. The MNB shall fulfil the role of a resolution authority. Moreover, it shall perform the supervision of the system of financial intermediation and it shall ensure the undisturbed operation of that. It shall protect the interests of parties using financial services" in order to increase public confidence (*MNB Act 2013, Lentner et al. 2015:39*).

Despite the restrictions of the legal regulations, the central bank has a large room for manoeuvre in implementing its objectives. Due to the exclusive focus on the price stability objective between 2001 and 2013, the other possible objectives of the MNB for supporting the economy were relegated. This was similar to the policy

of the leading central banks established from the 1990s. Since 2013, the MNB has reinterpreted its economic role (*Matolcsy 2015*). In accordance with its core task stipulated in the Act (*MNB Act 2013*), it played a role in the conversion of foreign currency household loans into forint, the stimulus of corporate lending, and the promotion of financing the state. The conversion of foreign currency household loans into forint helped to increase the stability of the banking system and resolve the uncertain position of households. Stimulating the lending activity of banks to enterprises took the form of the funding for growth scheme, and then the market-based lending scheme. The central bank has set the objective of promoting economic growth by supporting lending. The objective of the self-financing programme, started in 2014, was to support the obtaining of cheaper funds of the state from the market. Between 2002 and 2010 the significantly increased government debt and the high exposure of foreign exchange within government debt made Hungary vulnerable. These factors made debt financing significantly more expensive. With the self-financing programme, the MNB aimed at decreasing the ratio of foreign exchange debt within the overall debt, increasing financing in forint and achieving a greater role of domestic participants in this financing.

After the 2008 financial crisis, there were also changes in the responsibilities and objectives of the leading central banks. The immediate management of the crisis and then the mitigation of the consequences required the utilisation of significant state funds from the governments as well. In order to avoid the subsequent assistance of financial institutions using state funds, the task of financial stability was emphasised strongly among the objectives of the central banks, in addition to the objective of maintaining price stability. The task of maintenance of financial stability was rephrased as a task of the central bank in the United States, but the European Central Bank can also be mentioned as an example in this sphere (*Neményi 2012*).

The crisis directed the attention to the importance of the stabilising role of central banks all over the world. The European Central Bank initiated comprehensive examinations in the European banking system. Significant resources were deployed by the Fed for controlling financial stability, and the macro-prudential approach has become an important accessory in the instruments assisting a healthy economy (*Yellen 2014*). The extraordinary liquidity measures by the European Central Bank tangibly decreased financial market tensions (*Szczerbowicz 2015*). Legislators expanded the tasks of central banks all over the world, and the decision-makers of central banks also reassessed the economic role of their institutions. Since 2008, central banks have utilised non-standard instruments to restore global growth (*Ságí 2010*).

The innovative measures that became necessary because of the financial crisis can be described with the expression “reliable vigilance” at the European Central Bank. The crisis was the symptom of the exaggerations and imbalances that accumulated in the decade before 2008 at households, enterprises and financial institutions,

especially the accumulation of debt and risk, and rising capital gearing. Although the quick state measures mitigated these, the crisis still resulted in another disturbance: the rapid increase in government debt. The standard and non-standard instruments of monetary policy decision-making reflected the fundamental conviction and responsibility of the decision-makers. The task of central banks is to ensure stability. From the economic processes of the past thirty years, the ECB learned that actions must occur in a predictable manner which is comprehensible for the affected parties, in a framework consistent with the objective of price stability. However, a balance between predictability and flexibility which is necessary under unexpected circumstances also has to be found. In the extraordinary period of the crisis, the non-standard instruments used by the central banks had less predictable effects, based on their very nature. The global environment, in which decisions have to be made, is characterised by significant complexity and uncertainty, and thus quick measures may be necessary in the future as well. It is very important that an attempt must be made at crisis prevention rather than crisis management. This often requires measures that are more difficult to understand for outsiders. The utilisation of standard and non-standard instruments raises the ethical approach of obligation and consequence. Under normal circumstances, compliance with norms may work well, but under unusual circumstances, these cannot always be complied with, and instead the consideration of the consequences of the decisions and the responsibility for these come to the fore. Both approaches must be present at the same time in the operation of central banks (*Trichet 2010*).

**Table 2**
**Objectives of the Fed for supervision, regulation and financial stability**

| Objective | Measure |
|---|---|
| Strengthening the stability of the financial sector | Development of guidelines, policies, instruments and standards. Co-operation with the economic participants for the elaboration of an interdisciplinary approach related to stability risks. Development of macro-prudential guidelines decreasing the likelihood of the development of a crisis and its negative consequences. |
| Monitoring financial markets and industry practices and structures | Development and implementation of a forward-looking, proactive approach aimed at the forecasting and management of potential system risks. Supervising and monitoring individual institutions and infrastructures, with special regard to those that have a significant influence on the financial system and the macroeconomy. Development of a new supervision programme. |
| Crisis prevention | Ensuring the availability of appropriate crisis management tools, financial data of appropriate quality.<br>Analysis of the role of financial stability policy in the implementation of monetary policy. Analysis of the efficiency of the various macro-prudential policies and their connection to monetary policy. Monitoring financial stability risks, analysis of the relation between the financial and real economy, evaluation of guideline alternatives potentially affecting system risk. |
| Scientific research on finance | Pursuing domestic and international studies on stress tests, macro-prudential regulation and instruments, and other financial stability topics. Publication of the results in scientific journals and conferences. |

*Source: Edited based on Fed (2014).*

The Single Supervisory Mechanism (SSM) began operation in the European Union at the end of 2014. The SSM includes the ECB and the supervisory authorities of the participating countries in one system. The objective of its foundation is to guarantee the safety and stability of the European banking system, to increase financial integration and stability, and to guarantee the consistency of supervisory work (*ECB 2015*).

In our interpretation, the economic stimulation measures of central banks implemented with the use of non-standard instruments are actions to be classified to the sphere of economic responsibility. Except for the interest rate changes used for inflation objectives, in connection with the economic cycles, the leading central banks did not take such steps in the approximately two decades prior to the crisis.

Although the achievement of full employment appears among the objectives of the Fed since its foundation, and the attainment of this objective is promoted by the stimulation of economic growth, achieving this objective was less prevalent in the monetary practice of the twenty years before the crisis. The Fed started the policy of quantitative easing (QE) in 2008, which it continued until the end of 2015, amended in several phases. The quantitative and the supplementing qualitative easing primarily improved the liquidity of the financial markets, but also had a favourable effect in terms of stimulating growth indirectly, by improving corporate financing conditions. In its monetary policy, the Fed also made its full employment objective a threshold value expressed in the employment rate via its forward guidance (*Csortos et al. 2014*). Thus, there is no doubt that the importance of the labour market within the objectives has increased. The ECB has lagged behind compared to the Fed. After the initial easing, it considered austerity measures, and only from autumn 2014 did it introduce a non-standard measure that was aimed at economic stimulus, also in an indirect manner. The delay made the recovery from the recession more difficult, while the social requirement in the European Union that the monetary authority should also support growth has increased more and more. The participants of the market interpreted the asset purchase programme, which started in Q4 2014 and was then expanded from the beginning of 2015, unanimously as an economic stimulus measure (*Lentner et al. 2015:40*). At the same time, the asset purchase programme also helped to decrease fluctuations in government securities market yields. In 2016, the ECB launched a corporate asset purchase programme, which it intends to continue at least until the end of 2017. The declared objective of secondary market asset purchase is to support reaching the inflation target and to improve the conditions of borrowing of households and companies (*ECB 2017*).

Thus, we can interpret the economic responsibility of central banks in such a way that central banks have to be more sensitive to the social effects of crisis phenomena. In addition to the above, we ascribe to the economic responsibilities

of central banks the efficient, modern and undisturbed performance of the activities among its tasks. As an example, such activities include the efficient operation of payment and settlement systems, satisfying the requirements of the economic participants. Another element of economic responsibility is the efficient operation of the organisation of the central bank. This level can essentially be interpreted identically with the CSR element of business enterprises.

### 3.2 Legal responsibility of central banks

The legal responsibility of central banks differs from that of companies. Due to their unique role, the issue of legal responsibility of central banks requires a much more subtle interpretation.

In its authority responsibilities, the *Magyar Nemzeti Bank* performs the supervision of the financial markets and financial organisations. In this role, it also appears as a dispenser of justice. Based on the authorisation of legal regulations, the MNB itself is a creator of legal regulations. The opinion of the MNB must be requested when creating legal regulations related to its activities and the operation of the financial institutional system, and other legal regulations specified by law. Thus, in addition to compliance with legal regulations, the formation and interpretation of legal frameworks and having the legal regulations complied with are connected to the legal responsibilities of the central bank. The tasks of the MNB have been expanded from 2013 and it also operates as the supervisory organisation of financial enterprises, in addition to monetary policy. This task is aimed at performing the supervision of the system of financial intermediation, and ensuring the undisturbed, transparent and efficient operation of the system of financial intermediation. It must facilitate the prudent operation of the persons and organisations constituting a part of the system of financial intermediation. This task includes monitoring the careful exercise of rights by the owners and exploring undesirable business and economic risks. It applies preventive measures to mitigate or terminate risks which have already formed and to ensure the prudent operation of the individual financial organisations. The MNB protects the interests of users of the services provided by financial organisations in order to strengthen public confidence in the financial intermediary system. It operates a Financial Arbitration Board for the out-of-court settlement of disputed issues among consumers and financial organisations or persons (*MNB Act 2013*).

The MNB also played a considerable role in creating the legal regulation providing the framework for the conversion of foreign currency household loans into forint. It elaborated the rules of implementation of this conversion. In connection with this, it elaborated the settlement rules of costs found by the courts as charged unlawfully on the foreign currency household loans.

As the repository of monetary policy, the MNB influences the demand and supply of the domestic currency. From the 1990s the central banks set almost only the objective of price stability for themselves according to the neoliberal principles, and they applied only a few instruments from the available set of instruments of monetary policy. For the implementation of objectives of wider horizon corresponding to its economic responsibility, the MNB has transformed and expanded its business and applied a set of instruments as well. *Kolozsi and Hoffmann* (*2016*) have shown that the operation of the monetary set of instruments cannot be considered simply as a technical task, since the efficiency of monetary policy is determined by the set of instruments. The operation of the set of instruments represents a system of rules transformed for the banking system. Within the legal frameworks, the reformation of the business and applied set of instruments required legal background work, and it has been mapped in legal responsibility as well.

We start the overview of the *international trends* of changes in the area of legal responsibility of central banks with the case of the Fed. The fundamental tasks and responsibilities of the Fed are regulated by the Federal Reserve Act, passed in 1913. As an effect of the responses to the 2008 crisis, there have been significant changes in the regulation of the American financial system (*Biedermann 2012*). In his speech of 17 June 2009, president Barack *Obama* (*2009*) emphasised that the reason for the crisis was that regulation did not prevent the abuses and culture of irresponsibility, and that fundamental reform was necessary in order to restore confidence. The objectives of the Dodd-Frank Wall Street Reform and Consumer Protection Act, passed in 2010: "facilitating the financial stability of the United States, improving the accountability and transparency of the financial system, terminating the phenomenon of "too large to fail", protecting the American taxpayers by terminating capital injections, and protecting consumers from the abuses widespread in the financial sector…"[1]. One of the fundamental changes affecting the Fed is that the maintenance of financial stability has been added to its objectives. Moreover, on the basis of the Act, the Fed performs not only the supervision of bank holding companies, but also the supervision of "non-bank" financial institutions, and develops and publishes its recommendations for enhanced prudential requirements vis-à-vis such institutions. In the case of inappropriate supervisory body measures, the Fed is entitled to take action in the case of "non-bank" financial institutions as well (*Székely 2012*). The importance of the supervisory authority function is emphasised by *Kecskés and Halász* (*2013*)*:* The requirement of finding the persons responsible often arose during the crisis. The political situation was often criticised, saying that it created too mild rules in accordance with interests of the business lobby. Although strict reforms were introduced in the United States in 2002, the strict rules themselves are not capable of guaranteeing the long-term predictable

[1] *Lentner et al.* (*2015:42*) presents the provisions of the *Dodd-Frank Act 2010* this way.

operation of the economy. This is because ensuring strict and effective compliance with the rules is essential for this.

*Lentner, Szegedi and Tatay* (*2015:41*) presented in detail the fundamental tasks of the European Central Banking System, which were regulated by the Statute approved in 2012 (*ECB 2012*). The independence of the ECB was laid down in the institutional framework conditions about the uniform monetary policy (the Treaty and the Statute). The ECB is entitled to pass decrees of obligatory force if such are necessary for the performance of the tasks of the European System of Central Banks (ESCB), and in the other specific cases indicated in the legal regulations made by the EU Council. In the subject of scope and execution of EU legal regulations related to the prudential supervision of credit institutions and the stability of the financial system, the ECB can provide advice to the Council, the Commission or the authorities of the member states with competence, and these can consult with the ECB (*ECB 2012*).

We can interpret the other elements of legal responsibility of the ECB within the framework of the single supervisory mechanism, started at the end of 2014. The ECB, as an independent EU institution, performs its supervisory function connected to banking supervision by taking into account the European interests in such a way that it establishes a uniform approach in connection with the supervision of daily level, it implements co-ordinated supervisory steps and corrective measures; moreover, it ensures the consistent application of the decrees and supervisory guidelines. The ECB, together with the national supervisions, is jointly responsible for the efficient and consistent operation of the single supervisory mechanism. Its jurisdiction includes supervisory revision, conducting on-site inspections and other inquiries, and issuing and revoking bank licences. Its task is the examination of the purchase and sales activity of the banks related to controlling stake, ensuring compliance with the prudential rules of the EU, and the establishment of a higher capital requirement, a so-called buffer, in order to avoid incidental financial risks (*ECB 2014b*).

### 3.3 Ethical responsibility of central banks

The ethical responsibility of central banks goes beyond the performance of the tasks stipulated in the legal regulations. This responsibility, undertaken voluntarily and going beyond the legal regulations, may be manifested towards those involved in several ways. It can be stated generally that the authenticity, independence and accountability of the central bank are important. Opinions on the factors determining the confidence in the central bank are divided. According to a study using questionnaires, this is connected to professionalism and independence, and not to transparent operation (*Kril et al. 2016*). On the other hand, a recent comprehensive study has shown that transparency contributes favourably to decreasing uncertainty (*Naszódi et al. 2016*).

Building on its previous traditions, the MNB rephrased its strategy of social responsibility, which has changed significantly since 2013. Ethical values have received an emphasised role in this. Independence, responsibility and endeavour for the common good are fundamental values of the MNB. Strengthening public confidence and genuine and transparent operation are considered as its important tasks. As another area of ethical responsibility, the MNB has indicated strengthening financial consumer protection as an objective. Within the framework of this, it pays increased attention to the legality and honest nature of the relationship between financial service providers and customers. All of these efforts support the strengthening of confidence in the financial system (*MNB 2014*).

The publications of the MNB provide information to the participants in the economy. The decisions and operations of the central bank have become more transparent as a result of these publications. Moreover, they also increase well-informedness in financial processes. At the Spanish central bank, transparency appears as an outstanding value, whose purpose is to support obtaining public information and to promote the accountability of the public sector (*Banco de España 2017a*).

The MNB provides support for its employees for starting a family and developing a healthy lifestyle. To implement equal treatment, it has announced the basic principle of "equal salary for equal work". It strives for environmental consciousness in the course of its operation (*MNB 2014 b*). Responsibility for the employees is also prominent at the Danish National Bank, for example they pay attention to diversity according to gender, age and seniority, the education and development of the employees, and a healthy workplace. Moreover, the bank organises career evenings and provides PhD scholarships for replacement (*Danmarks Nationalbank 2017a*).

The system of values of the Fed also includes ethical values, in addition to performance values (*Fed 2014*). The pillars of this are accountability, integrity and taking into account independent points of view. Accountability means that the Board of Governors of the Fed are accountable and responsible vis-à-vis public opinion, the government of the US and the financial community. According to the expression of integrity, the Board of Governors behaves with the public, the financial community and its employees complying with the highest norms of integrity. The point of view of independence is that the regional structure of the system supports the diversity of employees, the diversity of input sources and independent professional judgement (see in more detail: *Lentner et al. 2015:42*).

In a previous article, we presented the statement of the Chicago Fed, a member bank of the Fed, as follows: "corporate social responsibility is regarded as a natural extension of their service vision. They consider co-operation among the internal and external stakeholders (schools, experts, civilians, local community organisations) as important, and it is their conviction that the CSR activity results in better business

performance and a stronger organisation. In 2011 a CSR Council was established from bank leaders, the task of this is the elaboration of the CSR strategy." (*Lentner et al. 2015:42*). We also presented that, in the sphere of ethical responsibility, the Fed emphasised within the framework of CSR the importance of diversity of employees, diversity of suppliers, community development and the preparation of policy studies, and environmental protection. Based on the principle of diversity of employees, they support the diversity of work environment based on the involvement of colleagues, in which the employees are respected and handled in a fair way and equal chances are provided for them. After the entry into force of the Dodd-Frank Wall Street Reform and Consumer Protection Act, passed in 2010, separate minority and women's' organisations were established. According to the principle of diversity of suppliers, they are committed to the diversity of suppliers, which includes the involvement of enterprises owned by minorities and women. The achievement of economic growth objectives is assisted with the study and support of fair access to financial services, with community development and with the preparation of policy studies. The point of view of environmental protection integrates several such business practices to the daily activity whose objective is a cleaner and healthier environment (*Lentner et al. 2015*).

Several ethical elements were included in the formulation of the mission of the European Central Bank. An example for this is that in the course of the implementation of the objectives of the ECB, outstanding importance is attributed to authenticity, confidence, transparency and accountability (*ECB 2014a*). The ECB clearly formulates its tasks and the method of executing those. It regularly informs the public about its evaluation related to the economic situation and what monetary policy can achieve and what is beyond its scope.

In order to promote price stability and based on the principle of independence, neither the ECB nor the national central banks, nor the members of their decision-making bodies can request or accept directions from the institutes and bodies of the EU, the governments of the EU member states, or from any other body. The ECB provides all the important information related to its strategy, its evaluations and political resolutions and its procedures to the public and the markets, in a transparent and timely manner. Public monetary policy and efficient communication with the public are very important. It publishes its monetary policy strategy and provides information on its regular evaluation related to economic developments. Thus, the markets can better understand the monetary policy steps, and, thanks to this, they can form their expectations more efficiently and accurately, facilitating acceleration of the necessary economic adaptation, and improving the efficiency of monetary policy. In accordance with the democratic basic principle, the ECB, as an independent institution endowed with a public service mission, owes responsibility and settlement to the citizens and the elected representatives of

those. The responsibility assumed by the ECB is shown by the fact that in its regular reporting framework it exceeds its obligations stipulated in the legal regulations. Instead of the obligatory, quarterly report, the report is published each month. Moreover, members of the Governing Council inform the public about topical issues in speeches. The president and the vice-president hold regular press conferences.

The ECB regulates the behaviour expected of the members of the Governing Council in a code of conduct, with special regard to independence, conflict of interest and confidentiality. In a questionable case, the members can turn to an ethics consultant (*ECB 2002*). The ethical framework system related to the personnel of the ECB contains provisions related to confidentiality, the use of resources, behaviour at the workplace (i.e. the prohibition of harassment and bullying), conflicts of interest, the acceptance of gifts, private activities, procurement, fees, awards, relationships with external persons, and insider trading. Colleagues can request assistance from the ethics commissioner and can report abuses to the commissioner (*ECB 2011*).

Considering the practice of other central banks, the Dutch National Bank is outstanding in terms of the complex approach and institutional nature of corporate social responsibility within the organisation. Sustainability constitutes an integrated part of their mission, "Working on trust", and they place great emphasis on CSR appearing among the key obligations of the bank. The following aspects form a part of their corporate social responsibility: integrity and compliance with rules, environmental consciousness and sustainable procurement, diversity in a wider sense – which includes gender, cultural background, age, sexual orientation, physical disability, religious persuasion and qualification as well – moreover, playing a role in the various spheres of society. The bank holds a wide-ranging dialogue with its stakeholders and, in order to increase transparency, it has prepared a CSR report from 2010 on the basis of the guidelines of the Global Reporting Initiative, applied already widely in the corporate CSR area and becoming more and more widespread in the area of the public sector as well (*De Nederlandsche Bank 2017*).

### 3.4 Philanthropic responsibility of central banks

In our earlier article (*Lentner – Szegedi – Tatay 2015*), we dealt with the issue of the philanthropic responsibility of central banks in a separate chapter. By this, we mean voluntary activities that contribute to social development.

The burdens of the economic crisis highlighted the deficiencies of participants in the economy in the area of financial culture. A higher level of financial knowledge and deepening the financial culture promotes financial stability (*Kovács 2015*), and at the same time higher financial culture provides protection with respect to individual viewpoints as well. The role of culture influencing behaviour also carries ethical values. This is why improving information and financial culture plays an important role via education. The Magyar Nemzeti Bank places great emphasis on increasing

the well-informedness of users of financial services and decreasing the information asymmetry (*Csiszárik – Szigeti 2015*). "The Magyar Nemzeti Bank considers as its objective the support of financial education, research and science, not only at the domestic, but at the international level as well. This includes, *inter alia*, the international publication of articles and publications of high professional level and organising conferences with the participation of domestic and international experts. It considers the following as important: playing the role of retaining, mediating and creating value; providing supports of professional nature; assisting groups in disadvantageous situations; and improving equal opportunity. It conducts charitable donations and participates in the purchase of national cultural assets (*MNB 2014 b*)."

The Fed promotes the organisation and completion of various studies, publications and conferences aimed at developing financial culture. In addition to financial research and conferences proper, analyses and conferences of wider, economic and social aspect appear as well, for example the research of young employees, research on the welfare of American households, and an economic mobility conference (*Board of Governors of the Fed 2014*). Moreover, the member banks of the Fed perform active community activities. It is the mission of the Employee Action Group of the Fed, as a good citizen, to undertake responsibility for the communities in which they work and live, assist in the life of others and strengthen the community. Their activity includes diverse programmes such as voluntary painting of houses, collecting toys for families, collecting baby clothes for expectant mothers, and cooking food for homeless shelters (*Fed of Minneapolis 2014*). The series of such activities include mentoring secondary schools, assisting in the reading and mathematical knowledge of primary schools' pupils, donating blood and collecting donations for AIDS, cancer and diabetic patients (*Fed of New York 2014*).[2]

In order to develop financial culture, the European Central Bank publishes popular materials, videos and games on its website, which are primarily aimed at the younger generation and their teachers (*ECB 2014b*). Moreover, many publications are published on the website of the ECB. Developing financial culture appears prominently at the central banks of several European countries as well. The National Bank of Poland, for example, supports research and organises conferences and seminars on the role of central banks in the economy, within this, among others, about the topics of monetary policy, financial stability and the competences of central banks (*Narodowy Bank Polski 2017*). In connection with the topic of consumer protection, the Czech National Bank promotes the development of financial knowledge with the following: distribution of manuals and workbooks among teachers and students, and the organisation of seminars and interactive exhibitions (*Czech National Bank 2017*). The Danish National Bank assists economic culture with the Danish Journal of Economics scientific journal, PhD scholarships,

[2] See *Lentner – Szegedi – Tatay 2015:44*.

and with an award rewarding women economists (*Danmarks Nationalbank 2017b*). Supporting economic research, education and university students is the objective of the Spanish National Bank as well, and humanitarian and social work, and the creation of non-profit centres also appear (*Banco de España 2017b*). The Dutch central bank considers itself as part of the society, which appears in community work, sponsorships, assistance, and the support of the cultural, educational and welfare sphere as well (*De Nederlandsche Bank 2017*).

## 4. Summary

During crisis management, the social responsibility of central banks has become more prominent. It has become a social expectation that central banks should set to themselves further objectives in addition to the maintenance of price stability. Their mandate has been expanded and maintaining financial stability has become an objective to be achieved, similarly to the implementation of the inflation target. In order to achieve the stability objective, central banks have significantly modified the set of instruments applied. Because of the modification of the declared objectives and the system of objectives, we have identified the changes occurring in the practice of market regulation of central banks in the system of framework of social responsibility primarily among the sphere of economic and legal responsibility.

In the system of framework of social responsibility, the ethical dimension serves the more efficient operation of the central banks, better corresponding to the requirements of the age, in addition to the legal frameworks. The philanthropic dimension assists in more efficient communication, strengthens the financial culture of the society, and thus enhances financial stability.

Central banks can play a significant role in maintaining the confidence in the banking system and the economy, which may be promoted by the approach of social responsibility adjusted to the characteristics of central banks. With appropriate adaptation, the economic, legal, ethical and philanthropic expectations applied in the corporate model of CSR can be interpreted for central banks as well. The social responsibility of central banks is peculiar, since these banks were established decidedly for the benefit of the common good; they are organisations promoting the achievement of specific economic policy objectives and performing state authority tasks as well. As an effect of the economic crisis, it is evident that the social responsibility of central banks has increased. They have to be sensitive to the social impacts of economic processes and play a role in ensuring that the irresponsibility of some participants of the financial sector cannot cause a significant utilisation of public funds, a recession in the real economy and social tensions.

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# Endogenous Imbalances in a Single Currency Area

*Eszter Boros*

*This paper aims to identify the risks and real economic drivers of crises inherent in the monetary union over and above the current institutional challenges, seeking an answer to what fundamentally drives possible economic disturbances and what may impede the self-correction of markets. After analysing the available data, the author concludes that the euro area's real economic homogeneity and market adjustment performance exhibit a mixed picture. The centre-periphery fault line may both give rise to and preserve imbalances. The author concludes that to prevent this and to reap the expected benefits of the euro, a comprehensive and targeted competitiveness, structural and regional policy framework is called for.*

**Journal of Economic Literature (JEL) codes:** E42, E52, F33, F36, F45

**Keywords:** single currency area, optimum currency areas, imbalances, euro area adjustment

## 1. Single currency areas: the risk of an imbalance spiral

The protracted crisis of the European Economic and Monetary Union (EMU) since 2010 and its slow recovery lend special relevance to the study of single currency areas. When seeking explanations and analysing the long-term viability of the area, identifying possible systemic issues, in addition to assessing individual member state responsibility and current crisis management, seems inevitable. If such issues are not addressed, they may pose recurring challenges to even adequately specified crisis management mechanisms.

The euro area crisis is a very complex set of issues stemming from global economic and financial developments, economic thinking that defines the adoption of the euro, a lack of adequate preliminary development of institutional frameworks and their loose application. The time that has elapsed since the onset of the crisis is apparently insufficient to clearly outline the emerging direction. At the same time, however, the entire period of the use of the euro is too brief and noisy to firmly

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The manuscript was received on 19 November 2016.

DOI: http://doi.org/10.25201/FER.16.2.86118

identify or rule out the significance of specific factors. It is underpinned by the fact that the introduction of a single currency is in and of itself a diverse (one-off) event, so the background and degree of the indirectly triggered processes may at least partially diverge from the impacts that prevail during long-term functioning. This paper therefore aims to identify the risks and real economic drivers of crises inherent in the monetary union, over and above the current institutional challenges. Although the elements of the special set of criteria described below and used with respect to the EMU in Part 3 may be linked to various degrees to the specific characteristics of the 2010 euro crisis, over the longer term, they may even play a pivotal role in the degree to which the monetary block must "permanently adopt crisis management".

As we know, the economies that make up the single currency area use a single currency in lieu of their own currency, which presumes uniform monetary policy. The key issue of this scheme is the constraint of zone-level assessment which creates an unsurmountable problem for the euro area's central bank. As long as an economy has its own currency and monetary policy, it can use the currency exchange rate as a channel for (at least) short-term adjustment, while markets have less power to push the entity into a liquidity crisis and ultimately, insolvency (*Csajbók – Csermely 2002*; *Krugman – Obstfeld 2003; De Grauwe 2012a; De Grauwe 2013*).[1] By contrast, joining the monetary union means giving up the exchange rate tool and adopting a monetary policy tailored to the entire zone, which may render the generated (public) debt similar to foreign currency debt.

It can of course be assumed that small, open economies already have limited ability to take advantage of exchange rate adjustments and therefore giving up their own currency is not such a great sacrifice (*Palánkai 2012*). However, the risk of endogenous imbalance nuances this finding. *It is not always possible to set an interest rate that is suited to the entire zone.* Asymmetrical developments in certain regions of the area create a dilemma for the central bank: it either hikes the interest rate which curbs inflation in the region exhibiting an upswing *and simultaneously* deepens the recession in the other region, or does the opposite by attempting to prevent the risk of deflation in the latter while simultaneously further spurring inflation in the other regions by cutting the interest rate (*Mundell 1961; McKinnon 1963*; *Kenen 1969*). Whichever path it chooses, *a harmful feedback is created within the system, and* members of the currency area are highly likely to become stuck in imbalance unless alternative adjustment mechanisms come into play.

Although the literature typically presents this monetary policy paradox through the example of exogenous changes such as asymmetrical external demand shocks, the issue may also arise as a result of endogenous processes. This case is first and

[1] Ultimately, we can always presume that the entity can assume liabilities by creating money through its central bank.

foremost linked to the introduction of the single currency and is very similar to the findings made with regard to the euro crisis (Part 2). *Hale – Obstfeld* (*2014*) offer a model-like presentation of the fact that if the creation of a monetary block entails a decline in internal loan interest rates, it not only increases gross capital flows, but also increases the *proportion* of intra-area financing. According to the model, cheaper credit means that projects with lower potential for success are also launched. This in turn results in the *concentration of credit risk within the currency area.* This also creates contradictory requirements for the zone's central bank (which also takes into account financial stability) if lending is markedly unidirectional. An initial interest rate decrease can be presumed in part due to transaction costs and in part due to the reduction of certain risks, but may obviously also stem from flawed risk perception and excessive market optimism. Due to the single key policy rate and financial market integration, the level of interest rates in member states cannot diverge significantly over a longer term (*De Grauwe 2012a*), so the problems of imbalance stemming from this must be faced later down the line. *The likelihood of unilateral lending patterns increases in line with the area's heterogeneity.*[2] In such a scenario, addressing asymmetries is more difficult not only from a monetary, but also from a political perspective, as due to the internal inter-linkages, part of the zone's debt problems can only be resolved to the detriment and at the expense of the lending members (*Baldwin et al. 2015*).

The above facts confirm that, first and foremost, imbalances should be approached from a gross perspective. This is a novel stance insofar as – prior to the onset of the global financial crisis, during the period referred to as the "great moderation" – the severity of the financial stability consequences stemming from gross capital flows was not recognised (*Bracke et al. 2010*; *Borio – Disyatat 2011; MNB 2011; MNB 2014*). Gross flows and stocks deserve special attention because *the assets of others are not available for the repayment of the debt of certain economic agents and sectors,* even if the whole economy otherwise has extensive net external claims. The net external position, with the exception of valuation changes, varies in function of the joint balance of the current account and the capital account. The net financing deficit/surplus for the period is equal to the financial account of the balance of payments, which is, however, derived from financial transactions, the gross value of which is greater than their net balance. In the era of global financial markets, the difference between gross and net numbers takes on several orders of magnitude, and financing patterns are typically complex and feature variable risk profiles. *At the same time, some arguments support the fact that the current account balance remains a relevant economic policy variable* (*Obstfeld 2012a*). *Financing positions that remain unidirectional for sustained periods are often symptoms of tensions accumulating within the economy.* In the longer term, the economy's role as

[2] The Hale–Obstfeld model already pertains to the centre-periphery relationship within the area.

borrower or lender determines the primary pressure on economic agents and the banking system. Unidirectional net patterns may signal unsustainable processes for the market, which is linked to the sudden stop of liquidity. (In a basic scenario, the [sovereign] members of currency areas are particularly sensitive to such situations.[3]) Thus, even if the great crisis of the past period and its ramifications did not present as a traditional current account crisis (*MNB 2014*), the growing unilateral swings of current accounts were indicative of the underlying imbalances.

These swings can be linked to the endogenous disturbances of currency areas in the following manner: In the case of asymmetrical developments, the entity in the positive branch will acquire a current account surplus in the wake of growing demand for its exports. It will also have the opportunity to lend to the economies buying its products (*see De Grauwe – Ji 2012; De Grauwe 2013*). Growing imports and decreasing exports give rise to the need for external borrowing (current account deficit) in the latter economies. Meanwhile, we arrive at the dilemma of a single monetary policy: inflation must be curbed in the first type of entity while deflation must be curbed in the second type, sooner or later.[4] Let's assume that the central bank, focusing on the latter, cuts the interest rate. It is clear that in such a scenario, it is worthwhile for the second entity to borrow even more and to purchase even more from the former entity. Even if the local downturn/slump resolves, the current account deficit continues to swell simultaneously with the other entity's current account surplus. Here too, the accumulating debt is greater in gross terms and exhibits a more complex pattern, but the dynamics of the current account balance shed light on the imbalance disturbance in the case of this specific endogenous problem. A similar process can be described if the root of the asymmetry is a sudden decline in the price of financing, which means lower interest rates than before for *a part* of this area (see *Hale – Obstfeld 2014*).

The primary channels for preventing the endogenous spiral could be labour mobility and/or flexible price and wage adjustment. Labour mobility enables the area in the positive branch to absorb the labour of economies experiencing a downturn in the event of an asymmetric development. This decreases unemployment in the latter entity while mitigating (wage) inflationary pressure in the former entity. Price and wage adjustment theoretically impacts competitiveness according to a logic similar to the devaluation and appreciation of the exchange rate. If prices and wages fall in a currency area member in recession, exports and capital flows may increase and the economic downturn may resolve. In parallel, in the entities experiencing an upswing, rising prices and wages hurt competitiveness while rising import demand fosters successful internal devaluation (price and wage cuts) in

[3] Later in this paper, we address the practical differences that stem from currency area "simply" encompassing regions or sovereign states.
[4] The price level of domestic products decreases due to the slump in demand.

the former economies. Unilateral current account dynamics are adjusted. An important observation is that competitiveness is not only made up of price-type factors. Whatever the case may be, the described mechanism certainly points to the necessity for one element, namely the importance of increasing the consumption (expenditure) of the economy experiencing an upswing during times of adjustment.

The brief presentation of alternative mechanisms also shows that this is a slower process that faces more obstacles compared to bespoke monetary policy and exchange rate-led adjustment. As a result, the sacrifices of joining the currency area cannot be ruled out. In other words: it is *not a given that any economic grouping can operate a currency union.* Although we have not stated it explicitly so far, it is apparent that certain benefits hoped for may create significant leeway for monetary unification efforts. For entities closely linked by trade and other areas, lower transaction costs, the avoidance or mitigation of exchange rate and other risks, improved price comparability and the resulting pick-up in trade and potentially even greater economic significance for the currency promise huge benefits.

Taken together, the substantial benefits and risks warrant the *existence of guidance for investigating the viability of currency areas of differing composition.*

The literature known as the *theory of optimum currency areas* (OCA) attempts to provide such points of reference. A currency area is optimal if it enables the dilemma of monetary policy to be averted. The conditions for an optimum currency area can be summed up as follows (*Table 1*[5]).

The most perfect functioning of the above alternative adjustment mechanisms is necessary: *labour and capital mobility* (1–2) and *price and wage flexibility* (3). With regard to the latter, it should be added that cutting prices and wages may encounter resistance and secondly, its impact is not always clear as it may exacerbate the burdens of deleveraging in the presence of indebtedness. Otherwise, it is characteristically slow, in which a coordination issue also plays a role (*Krugman 2011*).

[5] See also *Benczes 2014*; *Szijártó 2014*.

**Table 1**
**Optimality criteria and their economic reasons according to the OCA theory**

| | Criterion | Link to optimality |
|---|---|---|
| 1. | Labour mobility | Supports the correction of imbalances<br>Obstacles: labour force heterogeneity, language and cultural background |
| 2. | Capital mobility, integrated financial markets | Supports the correction of imbalances and risk-sharing and synchronicity within the zone |
| 3. | Price and wage flexibility | Supports the correction of imbalances; Adjustment via internal devaluation is not without its own issues even if there is sufficient flexibility |
| 4. | Product market openness, level of integration | Multiplying benefits from using a single currency and (where applicable) more limited sacrifices from losing the country's own currency exchange rate |
| 5. | Diversified economies | No member should be substantially exposed to large-scale unilateral (partial) economic shocks |
| 6. | Similarity of economic structures | Similar industrial structure, sectoral proportions, similar technologies and work organisation within sectors, etc. creates greater symmetry |
| 7. | Synchronous business cycles, similar inflationary preferences and growth | Maintenance of symmetry |
| 8. | Similarity of institutional law, culture and language | Supports the maintenance of symmetrical situations and the effectiveness of the necessary adjustments as a general framework |

*Source: Edited based on the pioneering work on the OCA theory (Mundell 1961, McKinnon 1963, Kenen 1969) and Krugman 2011 and De Grauwe 2012a.*

As discussed earlier, the sacrifice of losing the currency exchange rate is mitigated by *the large degree of economic openness of members towards each other* (4). This also multiplies the benefits stemming from the use of the single currency. With the requirement of diversified economies (5) the inclusion of excessively specialised members, who are thus unilaterally exposed to partial economic shocks, can be avoided. *The similarity of economic structures* (6) ensures that turbulences shift the economies in a similar direction. The synchronisation need also appears in the requirement pertaining to *the matching of business cycles, the similarity of inflationary preferences and growth rates* (7). The deviation of the latter factors results in certain entities being forced to accept outcomes other than their preferences for a sustained period. Finally, *legal and institutional similarity, cultural and linguistic proximity* (8) – as a supplement to the traditional OCA conditions – can be mentioned as a general framework condition of symmetry (8).

The theory of optimum currency areas fundamentally follows the cost-benefit principle when defining the composition of monetary blocks. Based on this feature, it can be linked to the metallist monetary theory which derives the value of money from the pursuit of efficiency by the private economy. In a broader sense, the OCA was created within the framework of the new classical economic mainstream,

anchoring the primacy of market adjustment and monetary policy. Accordingly, it does not display the aspects that relate to the harmonisation of the scope of monetary and fiscal policies (*Goodhart 1998; Barba – De Vivo 2013*; *Cesaratto 2015*). Thus, it ignores the so-called cartelist approach (*MNB 2011*; *Ábel et al. 2016*), based on which a certain state involvement is necessary for the stability of money, or in a wording more tailored to our topic: some type of fiscal adjustment and coordination mechanism is needed. The existence or the lack of indications related to the uniform fiscal frameworks is relevant because it leads to differences in whether the members of the currency area can be regarded as "simple" regions or as countries. Markets perceive and treat the federal states of the USA differently than the member states of the euro area (*Giavazzi – Spaventa 2010*), which is attributable to a large extent to the degree of fiscal sovereignty of EU Member States. If we strictly follow the OCA criteria for defining the composition of a monetary block, we shall not incorporate fiscal coordination mechanisms or unify certain budgetary funds among the participants.[6] In this sense, the framework can be considered deficient. But this deficiency does not make it unfit for the purposes of the study, that is, the analysis of the possibility of system-level tensions. Fiscal and other institutional mechanisms within the discourse related to currency areas primarily appear with a crisis management, crisis prevention and early warning function. Creating these functions may prove to be of fundamental importance (Part 2), but it fails to trace back all of the driving forces of imbalances and is unable to eliminate them.

In the following, this article reviews the background of the establishment of the EMU and the weaknesses revealed during the crisis (Part 2). Thereafter, it examines the performance in the euro area in terms of alternative adjustment mechanisms and the other homogeneity criteria of the OCA, with special regard to the period following 2010 (Part 3).

## 2. The euro as a single currency

Western European integration efforts had already yielded significant results by the 1960s, such as total customs union, common agricultural policy, the uniformisation of product regulations and the free movement of persons. Members also cooperated in the coordination of monetary and exchange rate policies. Expanding relationships naturally presented the opportunity for the single currency, and in a timely manner, due to the demise of the Bretton Woods system and the increasing volatility of national currencies (*Delors Report 1989*; *Ingram 1973*; *Krugman 2011*). The attainable benefits seemed significant based on the estimates regarding the reduction of transactional costs, the elimination of exchange rate risk and the expansion of trade (*Frankel – Rose 1998, 2002*). Finally, the general introduction

[6] It is not certain that we shall not deal with fiscal issues at all, but these may primarily arise as the source of entity specific shocks (see *Part 2*).

of the euro as a single currency took place in 2002. Today, the euro is the official means of payment of 19 EU Member States.

The crisis makes the evaluation of the euro's past fifteen years rather difficult if we accept the probable statement that the crisis is the result of systemic issues and harmful internal mechanisms. Some significant stability and macroeconomic risks associated with the currency union have materialised and represent substantial uncertainty for the future. Meanwhile, in terms of the attainable "traditional" benefits – reduction of transactional costs, etc. – the area may have obtained substantial profits, although the results and conclusions regarding the scale, the distribution and further prospects of such profits show great differences (*Santos Silva – Tenreyro 2010*; *De Sousa 2011*; *Mongelli 2013*; *Petersen et al. 2013*). As to how significant the convergence is among the economies and what direction it points to, the evidence is rather contradictory (see *Neményi – Oblath 2012; Magas 2016*). Part 3 addresses this issue.

When preparing for the single European currency, numerous authors used the OCA theory as an evaluation framework. Already during this period, results showed that the block of countries wanting to introduce the euro failed to meet the optimum currency area criteria in several respects. According to the summary of *Pisani-Ferry* (*2012*)*,* asymmetries between member candidates, weak market adjustment mechanisms and the destabilisation risk of uniform monetary policy entailed by these factors appeared as an identified threat, which was difficult to estimate in advance. Although, as we know, it does not follow from the OCA theory, it is to be noted that already at the time of preparing for the currency union, there were some who drew attention to the significance of fiscal adjustment and coordination mechanisms (*Godley 1992*; *Feldstein 1992*).

At the same time, the edge of every identified problem was blunted by the *frequent argumentation that the euro may endogenously transform the area into an OCA, because it accelerates economic integration, convergence and synchronization* (*OMOM Report 1990*; *Bayoumi – Eichengreen 1997*; *Frankel–Rose 1998*; *Pisani-Ferry 2012*; *Estrada et al. 2013*). If a monetary union is an optimum currency area (OCA), in principle, it is able to avert endogenous disturbances. However, the 2010 crisis showed that "the process of perfection" of the expected speed certainly did not take place, and *in a suboptimal scheme,* broader economic policy coordination, a fiscal adjustment mechanism ensuring the stability of the single currency, and even coordinated macro-prudential policy are certainly needed.[7] When the euro was

[7] It was only after the 2008 global crises that the relevance of this issue was more broadly recognised following the much higher capital flows, asset bubbles and financial imbalances (APFI). The need for macro-prudential policy is hence first warranted by general, global reasons rather than causes related to the currency area. It is another question that, as we have seen, in heterogeneous monetary blocks which are weak in alternative adjustment, the APFIs are given special endogenous incentives as well. Hence, all other things being equal, the higher the need for macro-prudential regulation, the less optimal the area.

introduced, these aspects did not take hold, or they were applied with a different emphasis. Certain structural and regional funds were appropriated to mitigate economic differences between members (*Delors Report 1989*), but the magnitude of these funds was not substantial in the light of the wide-ranging fiscal powers and economic policy decision-making held by the Member States. The level of freedom of economic governance of the various Member States was accounted for as the source of entity-specific shocks. To handle the issue, fiscal sustainability rules were recommended first of all (*Delors Report 1989; MNB 2011*). The "no bail-out" declaration emphasised the rules, and at the same time, expressed *the limitation of the risk community* (*Kiss J. 2011*). While markets did not take this declaration seriously for a long time, when the crisis erupted, the uncertainty arising from it proved to be rather harmful. In a broader sense, this is related to the fact that when creating the EMU, neither crisis management procedures, nor any crisis management fund were institutionalised. The reason for this is that – in addition to the prospect of moral hazard – *the great majority of systemic risks, and as such, the prospect for the private sector to become excessively indebted were not among the threats considered* (*Nemény – Oblath 2012; MNB 2011*). The role of lender of last resort of the European Central Bank was also not clearly stipulated in the narrower monetary policy system (*De Grauwe 2012b, 2013*; *Baldwin et al. 2015*).[8] Therefore, the EMU was created as an interim scheme in which members became regions from a monetary perspective, but otherwise remained sovereign states.

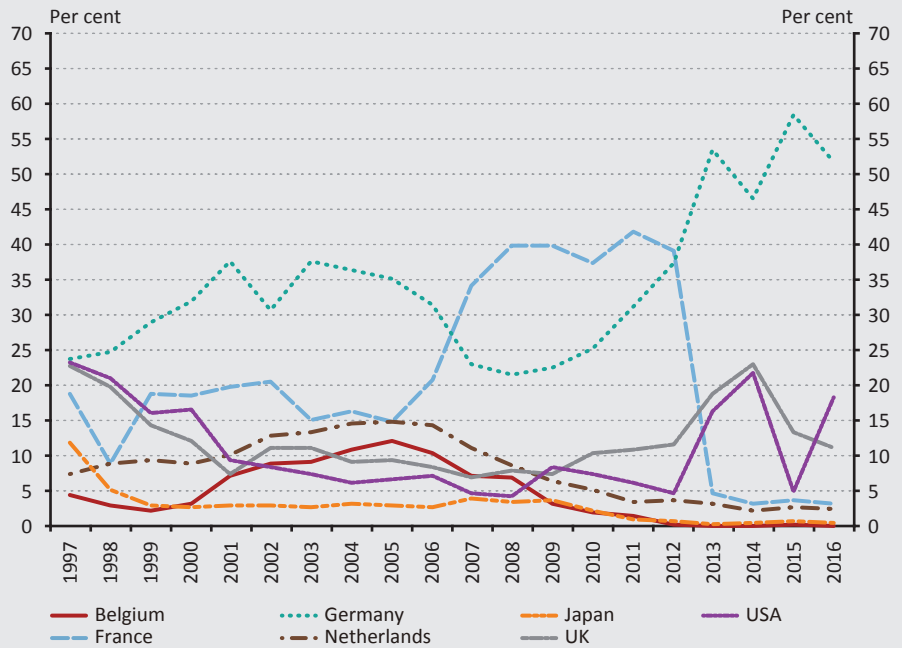
It follows from the foregoing that the common crisis explanations which associate the issues with the responsibility of the indebted economies are only partially valid. Non-compliance with the rules, overheated lending and protracted recovery as symptoms are the *effects* of the institutional background's weaknesses on the one hand and the endogenous disturbances presented in Part 1 on the other hand. Until 2010, economies on the periphery, i.e., Portugal, Spain, Greece, Italy and Ireland built up various forms of debt problems with practically the same background. In Greece and partially in Portugal, this was primarily manifested as government debt, but in Spain and Ireland, the indebtedness of the private sector (households, construction industry and banking sector) surged to an extremely high level, accompanied by asset price bubbles (as shown by *Nemény – Oblath 2012*). (These economies got into trouble despite the fact that their governments complied with the Maastricht criteria regarding public deficit and indebtedness for a long time.)

The lending boom after 2002 was made possible by the *cheap loans flowing in from the centre of the zone*, which were dominantly mediated by the banking sector by

[8] This can be clarified in that the central banks of the Member States still had certain leeway in defining and evaluating eligible collateral for central bank loans (*Ruparel – Persson 2011*). Thus, they can also classify among eligible collateral the government papers of the Member State. By doing so, commercial banks are incentivised to purchase these papers, which, in turn, may alleviate the Member State's financing difficulties. It is another question that all of this increases bank-state exposure, by increasing systemic risk.

establishing complex bank-bank/bank-state interlacements. The single currency considerably deepened the integration of financial markets, both the magnitude and the ratio of gross capital flows among Member States surged, as the phenomenon of home bias decreased, and portfolio diversification in the euro area picked up momentum (*De Grauwe 2012a; Pagano – von Tadden 2004*). Money flows were driven by the level of interest rates fast becoming uniform, which meant low or even negative real interest rates for the countries in the periphery, which had previously only had access to more expensive financing. The reduction of transaction costs and the disappearance of exchange rate risks obviously played a role in that, but also some kind of erroneous risk perception which levelled the yield of periphery government bonds with that of German government securities.[9] The debtor-creditor

**Figure 1**
**Share of foreign banks within consolidated bank receivables from Greek residents**




*Note: The BIS data indicate the country of the bank depending on the head office of the ultimate shareholder. This way, the data contain the receivables of the Greek subsidiary banks from Greek residents (but not the receivables within the given bank group). The Figure only shows the foreign players with the largest receivables, therefore the sum of the shares does not add up to 100 per cent. The data for 2016 reflect the average of the first three quarters.*

*Source: Calculated based on the database of the Bank for International Settlements. "Consolidated positions on counterparties resident in Greece". http://stats.bis.org/statx/srs/table/b4?c=gr&p=20153. Downloaded on 09 April 2016 and 15 March 2017.*

[9] The time series of yields on 10-year government bonds of EU Member States can be found in: "*Long-term Interest Rate Statistics for EU Member States*", European Central Bank. https://www.ecb.europa.eu/stats/money/long/html/index.en.html. Downloaded: 12 April 2016

relationship illustrated in *Figure 1* reflects the conclusions of *Hale – Obstfeld (2014)*, according to which lending within the currency area shifts towards internal relations.

In *Figure 1*, we can clearly see the realignment of the structure of receivables of foreign banks from Greek residents: a decreasing share of creditors from outside the area between 1998 and 2008, and in parallel with this, an increased share of the volume of receivables of banks within the zone.

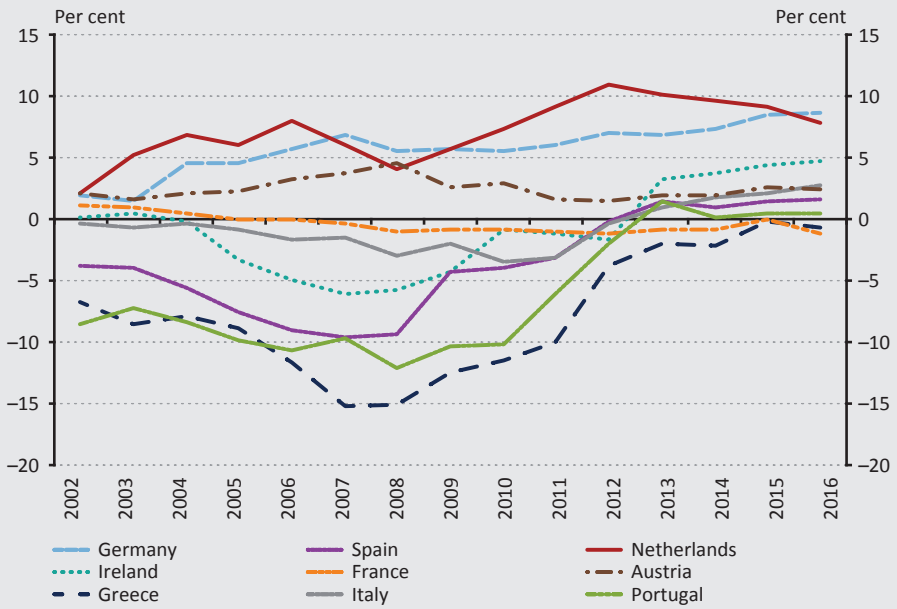
The mostly unilateral flow of credits primarily financed consumption and asset price bubbles on the periphery and not productivity and efficiency increasing investments. The boom in consumption primarily affected imported products and non-tradable goods (i.e. services). Thus, the utilisation of loans did not create the ability to repay external debt because it did not contribute to boosting future exports (*Giavazzi – Spaventa 2010*). During the initial years, it may have seemed that indebtedness is a natural consequence of economic convergence (*Blanchard – Giavazzi 2002*), but growth expectations proved to be exaggerated in view of the reasons mentioned in the foregoing.

In terms of the magnitude, the links among the players, the speculation related to the real estate bubbles and the not so prudent lending, capital flows can be approached from the perspective of the financial account, but the development of the crisis can also be clearly followed in the current account patterns. While the current accounts of the entire EMU remained in equilibrium vis-à-vis the global economy during the period under review, intra-euro area financing positions exhibited the proportions experienced between the USA and China (*Schmitz – von Hagen 2011*). Swings observable in Figure 2 represent the clearly unidirectional flows until 2008.[10] The single monetary policy was unable to prevent imbalances, what is more, it further aggravated them because excessive lending on the periphery, and just as importantly, inflation exceeding the euro area average, would have required a higher interest rate, which did not seem justified for the other regions of the zone.

In 2010, the sudden outbreak of the crisis was essentially related to the fact that the market considered outstanding debt to be unsustainable. This cast a shadow on every economy of the euro area due to the interconnections among the banks and the states of the area, creating some kind of symmetrical situation for monetary policy (interest rate cut) during the next period. At the same time, the revelation of the risks entailed the widening of credit default swap premia. The direct stakeholders in this issue, i.e. the periphery states became isolated from

[10] *Pasimeni* (*2016*) also has an illustrative Figure which shows the developments in Germany's current-account balance vis-à-vis the euro area. It also shows similarly robust current account surpluses, explicitly indicating that the surpluses and shortages shown in *Figure 2* "are matching".

**Figure 2**
**Developments in the current account balance of various euro area members as a percentage of GDP, 2002–2016**




*Source: Edited based on Eurostat, World Bank and Trading Economics data. 2016 data of the Netherlands and Austria only for the first three quarters. http://ec.europa.eu/eurostat/web/products-datasets/-/tipsbp20; http://data.worldbank.org/indicator/BN.CAB.XOKA.GD.ZS?year_high_desc=false, http://www.tradingeconomics.com. Downloaded: 18 September 2016 and 15 March 2017.*

financial markets (*Darvas 2013; De Grauwe 2013*).[11] The fragmentation of the financial market, the scaling down of internal market debtor-creditor relationships, and the stronger home bias can still be observed (*Acharya et al. 2014*). We can also see this in *Figure 1*. Despite the fact that we linked the crisis directly to excessive internal capital flows, fragmentation is also an issue. Because one of the channels of alternative adjustment is the mobility of capital, the low level of willingness to invest by non-residents compared to the past may also be the underlying reason for the protracted recovery in the area.[12] In addition to this, we must also analyse the other mechanisms of market adjustment: the question is to what extent they played a role, in that the imbalances within the current accounts have declined in number by now.

[11] This acute problem was finally resolved by the announcement of ECB's OMT program in the fall of 2012 as part of which the European Central Bank committed to the theoretically unlimited purchase of debt securities of the states in difficulty (*Pisani-Ferry 2012*; *De Grauwe 2013*).
[12] The euro crisis highlights that the capital mobility/financial market integration criteria of the OCA must mostly signify the flexibility of working capital (foreign direct investments).

## 3. Market adjustment mechanisms and real heterogeneity in the euro area

*Figure 2* shows that the current account position of the periphery economies closed by 2015–2016 or in certain cases changed to a surplus. The substantial volume of assets held by Germany and the Netherlands remained unchanged in the meantime; moreover, Germany's assets have even increased since 2010. This pattern only partially corresponds to what we expect when market adjustment works properly. As a reminder: if the downturn in one specific region is stronger than in the others, the adjustment mechanisms will cause the export of the weaker performing economy to become relatively more competitive within the euro area. This represents a shift towards financing capacity and, on macro level, it helps deleveraging. But the process corresponding to this also creates the reflection: once competitiveness shifts within the area, the other economies must show a decreasing balance all other things being equal (ceteris paribus). The "ceteris paribus" condition is essential because economic relations outside of the currency union may possibly influence the overall balance in another direction. But this is rather just a dummy obstacle in the perception of change directions. If the products of the originally recessive economy become more competitive than those of euro area members, this is reflected not only in the internal, but also concurrently in the external connections. For this very reason, *the contents shown in Figure 2 do not convince us that the EMU could rely on unimpaired adjustment mechanisms*. In addition, the closing of the current position at the periphery does not cause debt to contract materially, not even at a macro level for the time being. The balance sheets of the banks of peripheral countries, and lately especially those of Italian banks, continue to show outstandingly high volumes of non-performing loans (*Laurent 2017*). It seems likely that the mostly 5–15 per cent current account deficits until 2010 "melted away" not because of income generating export expansions, but due to the forced and rapid decrease of imports. We receive differing data about the economic performance of the members, which may once again face the single monetary policy with dilemma after the symmetrical position stemming from the contagion of the crisis (see *Eichengreen 2009*).

This article tests the observation suggesting the weakness of the adjustment based on several aspects, taking the OCA criteria as basis. The objective is not to discuss the conditions one by one in detail, but to identify the correlations among them so that we can obtain a picture of the resistance to the endogenous spiral.

### 3.1. Flexibility of prices and wages

Based on the analysis of the European Commission (*Dhyne et al. 2009*), the price level of the euro area was overall rather inflexible before the crisis. The authors

examined the frequency of consumer price changes in comparison with the USA.[13] According to the results, consumer prices changed on average annually in the EMU. In 2009, the share of *monthly* price changes was 15 per cent in the euro area, while in the USA, the same was materially higher: 25 per cent. Consumer markdowns were more frequent in the United States, while in the EMU the retail sector introduced significant inflexibility into price levels by comparison with producer prices. *Dhyne et al. (2009)* revealed more significant differences in the behaviour of prices among various product categories than among the Member States. Based on this, the relative inelasticity of the price level characterised members more or less to the same extent, with a symmetrical pattern among product categories. Services always showed negligible repricing frequency, while the prices of unprocessed food were the most volatile, apart from energy prices. As part of services, the share of monthly price changes in 2009 was only 5.6 per cent, but that of unprocessed food was 28.3 per cent. In the same year, services represented 47.5 per cent of the euro area's consumption expenditure based on Eurostat data.[14] Thus, the prices of goods consumed at the highest rate proved to be the most inflexible.

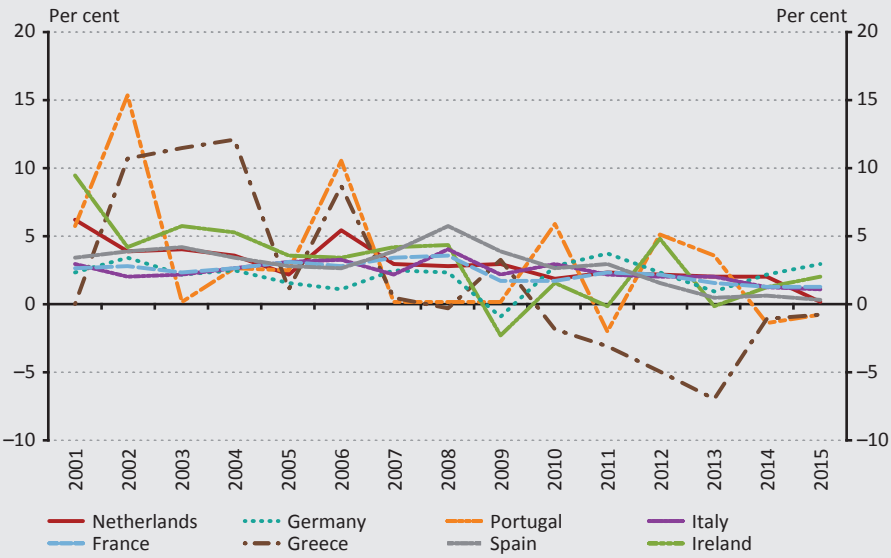
According to the survey, changes included the same proportion of downward price drifts and price increases. This bears significance because in the appropriate reflection adjustment both directions may become necessary. The same must be examined for wages. Prior to the crisis, notable asymmetrical wage developments happened in the euro area. In the periphery countries, the period of growth financed from loans coincided with a significant wage increase period. The growth rate of nominal wages exceeded productivity, while in Germany wages increased to a lesser extent than productivity (*Schmidt – Weigert 2013*; *Hankel et al. 2010*). In other words, wages proved to be flexible in the periphery countries, while less so in the centre (although wage growth could have been considered, which has fewer obstacles in principle compared to the reverse direction).

*Figure 3* shows wage dynamics, while *Figure 4* illustrates the developments in consumer price levels after April 2010 in the periphery countries and in the central countries. It can be concluded from the Figures that since 2010, Greece, Spain, Portugal and partly Ireland performed an overall substantial internal devaluation. The gross average wage was decreasing at least temporarily in each of the periphery states until 2015. A sustained, large-scale contraction only occurred in Greece,

[13] Comparison with the United States, a currency union also wide-spread and heterogeneous from many aspects, is rather obvious. We have already discussed in the foregoing the differences in terms of schemes and institutions to be considered when making the comparison. In the sections below, the comparison will be performed based on some real economics and market adjustment aspects.

[14] I performed the calculation based on the database of Eurostat titled "*Final consumption expenditure of households by consumption purpose*", http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_co3_c&lang=en. Downloaded: 22 February 2017.

**Figure 3**
**Developments in gross average wage in the central and periphery countries, 2001–2015, YoY, change expressed as a percentage**



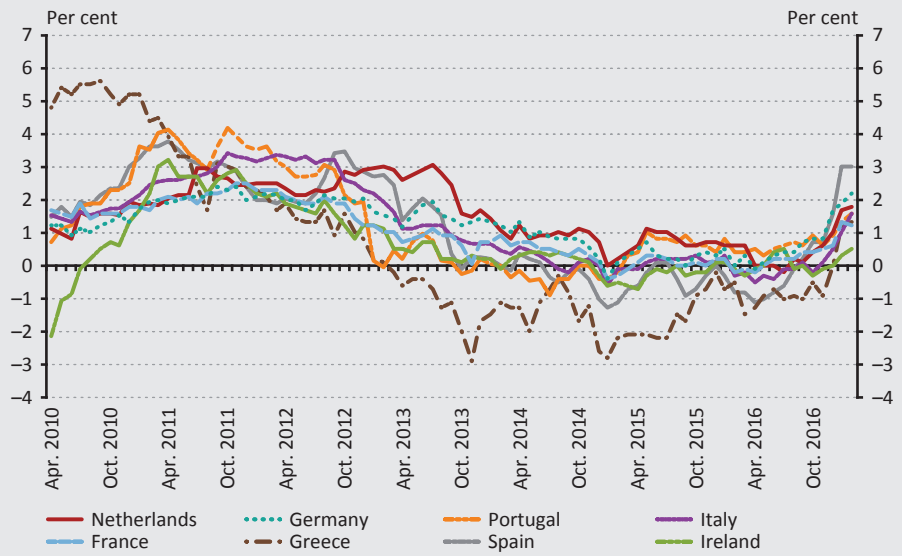

*Source: Calculated based on Eurostat data: "Annual net earnings [earn_nt_net] – gross earnings", http://appsso.eurostat.ec.europa.eu/nui/show.do?wai=true&dataset=earn_nt_net. Downloaded: 18 March 2017.*

where the gross average wage decreased by an average 3.16 per cent per year between 2009 and 2015, while the maximum annual decrease exceeded even 7 per cent. However, in the public sphere, every concerned state performed wage cuts, and in addition, the amount of pensions and various budgetary benefits also shrank (see i.e. *Krugman 2011*; *Skouras 2013; León – Pavolini – Guillén 2015*).

In the economies of the central countries, such as the Netherlands and Germany, we observed a change of a more moderate pace compared to the periphery countries since the outbreak of the crisis. Between 2009 and 2015, gross average wage increased by an average of 2.5 per cent per year in Germany and by 1.7 per cent in the Netherlands. This may partly indicate a less flexible wage level, since both economies had some expansion periods during the given period (see *Figure 9*). We observed wage adjustment in the data of the last two years for Germany entailed by economic growth.

Similarly, the change of price level primarily affected the periphery countries. According to *Figure 4*, prices decreased for an extended period in Greece, Spain and, to a lesser extent, in Ireland, Portugal and Italy. In the meantime, price levels evolved in a relatively stable manner in Germany and the Netherlands. The GDP growth of the past 2 to 3 years in excess of the euro area average started to bring

**Figure 4**
**Monthly average change of consumer prices in 2010 in the central countries and in the periphery countries**




*Source: Edited based on the data of Trading Economics. www.tradingeconomics.com. Downloaded: 16 March 2017.*

about a more substantial price increase in these economies from the second half of 2016. Meanwhile, the period of internal devaluation seems to be ending in the periphery countries: in the last months of 2016, price levels increased and the average wage remained at the same level also in Greece, Spain and Italy.

We can have only one conclusion and especially one question based on the foregoing. The conclusion is that internal price and wage adjustments unavoidable in single currency areas in the lack of other means are also achieved to a certain extent in the EMU. In the light of the preceding imbalances (excessive indebtedness), it is not surprising that in the periphery countries purchasing power, and in turn, prices and wages also declined due to diminishing borrowing opportunities and the burdens associated with balance adjustment. But the adjustment process is rather unilateral; the expenditures of central countries could not really support its efficiency because wages and prices in these countries shifted relatively to a lesser extent (they increased less). It is difficult to draw a stronger conclusion for the resilience of price and wage levels, because as a result of debtor-creditor inter-linkages the crisis also spilled over to the central countries; therefore, it is not possible to examine the proper reflection adjustment (positive and negative branch). *The upcoming period may be decisive in terms of whether prices and wages will evolve in a flexible way in Germany and the Netherlands, two countries about*

*to enter economic recovery,* enabling the complete unravelling of the effect of the southern internal devaluation. But here the question comes up: *can the internal devaluation of the periphery countries be really effective in the EMU?* We can give a definite answer based on the following OCA criteria.

### 3.2. Product market integration

Because *price and wage adjustment can only work properly in a closely integrated internal market and alongside the mutual competitiveness of products*, we must examine the likelihood of lower prices resulting in substantial export performance for the periphery countries that are making the adjustment sacrifice. We can directly ask the question as to what results did the internal devaluation discussed in the foregoing have so far.

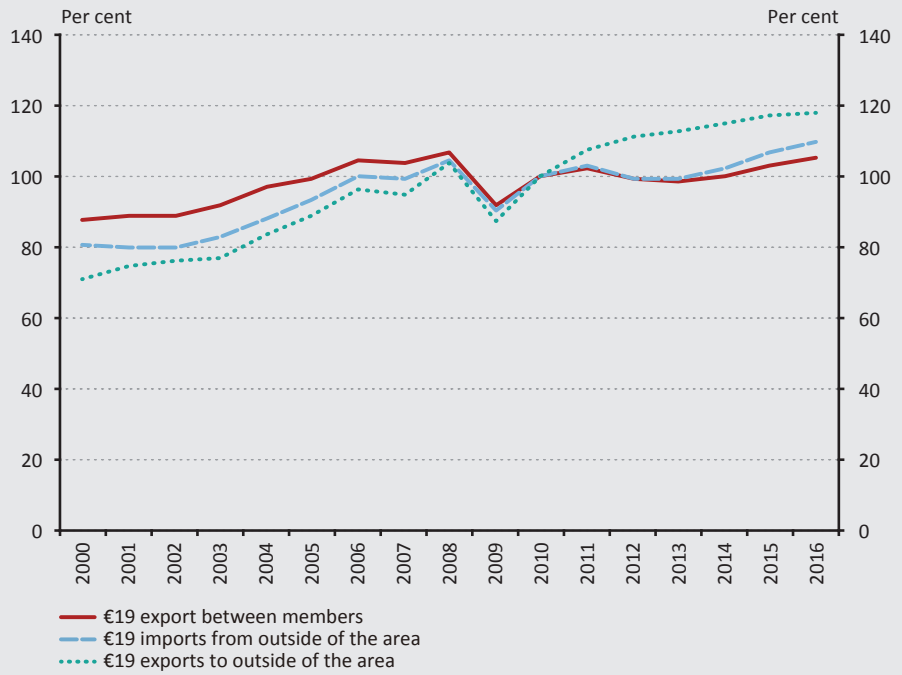
Starting from the period prior to 2010, we can conclude that the euro area is overall an integrated product market region in which trade among members has a long-standing history. The internal trade in goods and services amounted to 50 per cent of the total annual export of the €16 group on average between 1998 and 2008.[15] Thus, members were just as open towards one another as towards the rest of the world (from the perspective of export). Figure 5 shows that trade was continuously increasing among the €19 economies starting from the early 2000's.

However, there are material differences in the significance of trade in the euro area: some members were relatively more isolated. The value of external trade in the area as a percentage of GDP even in the case of Portugal, Spain, Italy and France was approximately 15 per cent lower than the German value, and was markedly below the values of the Benelux states and Austria in terms of the 1999–2011 average (*ECB 2013*). Moreover, a shift in emphasis took place towards "non-tradable" goods in the Mediterranean countries (*Schmidt – Weigert 2013*), as we have already discussed in connection with the housing loan boom (henceforth see *Part 3.3*).

Based on the experiences so far, the crisis seems to weaken the tightness of internal trade relations. According to Figure 5, the level of trade among members stagnated between 2010 and 2015 while the euro area started to rapidly expand its external exports. Even according to the latest data, extra-EMU exports are expanding: in 2016, they exceeded the level of 2010 by 18 per cent. By comparison: exports between members was 5.6 per cent higher at the same point in time. The level of internal exports showed a minor increase for the first time in 2015. This *does not corroborate that the price and wage cuts in the periphery countries would have generated internal export surplus (improvement in competitiveness).*

[15] Not including the three Baltic EMU Member States, calculated based on the data of *Hankel et al.* (*2010*).

**Figure 5**
**Changes in trade conducted by euro area Member States with internal and external partners. Export and import volume indices, 2010 = 100 per cent.**



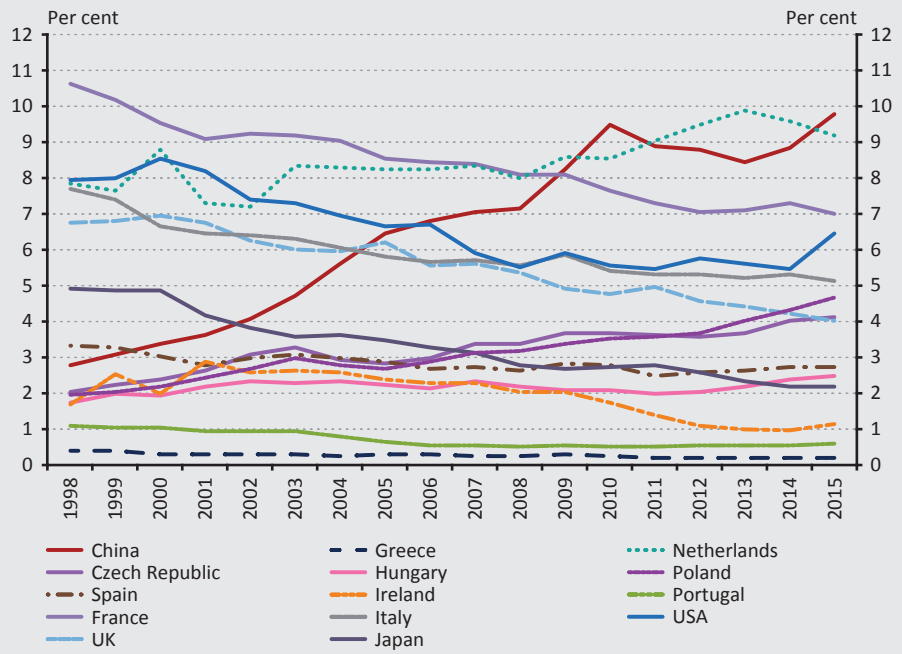

*Source: Calculated based on Eurostat data. Exports and imports between members must match apart from statistical errors, hence the Figure contains the exports. The €19 indication refers to the appropriate set of countries, irrespective of whether they already used the euro in the given year. "Euro area 19 trade by BEC product group since 1999 (ext_st_ea19bec)", http://ec.europa.eu/eurostat/web/international-trade/data/database. Downloaded: 14 April 2016 and 17 March 2017.*

*Figure 6* and the data series of the members' exports outside the monetary union is very telling. *Figure 6* illustrates the changes in the partner composition of German imports. *Since 1998, periphery countries have been selling products and services to Germany in an unchanged proportion.* For Italy and Ireland, a continuous slow contraction can be observed. Meanwhile, even economies that are not part of the currency area were able to increase their share on the German import market; thus, we cannot explain their advantage with the elimination of transaction costs and exchange rate risk. Certain Central and Eastern European states obtained an increasing share and China became a key import partner.

Because periphery states were unable to increase their share of exports to the largest economy of the euro area, despite the recent price reductions, the prospect of the expected competitiveness adjustment seems limited. According to the international trade database of Eurostat, the increase in the global exports of the

€19 countries cannot be linked to the Mediterranean countries, either. The 2010 level of exports to outside the EMU could not be reached by Spain and Portugal until 2014, by Greece until 2015 and by Italy until the end of 2016.[16] Of the Member States in the epicentre of the euro crisis only Ireland and most recently Spain and Portugal contributed in merit to the increase in external export. World market exports show a rather diverging pattern in the zone for the time being, underpinning the assumption that the crisis might have impaired the integrity of the product market in the zone.[17] Based on the data, *the current account balance of periphery countries was essentially driven by the drop in imports and not by the increase in exports*. If no change happens in that respect, we should expect a delay in the shedding of outstanding debt.[18]

**Figure 6**
**Changes in the composition of German imports by trading counterparties. Share of counterparties, %, 1998–2015.**




*Source: Edited based on the data of World Bank. http://wits.worldbank.org/. Downloaded: 16 March 2017.*

[16] Calculated based on Eurostat International Trade Database, "Euro area 19 international trade – monthly data (ei_etea19_m)" (export volume indices, 2010 = 100 per cent, seasonally and work day effect adjusted data). http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ei_etea19_m&lang=en Downloaded: 18 March 2017.

[17] Together with Germany, the Netherlands, Slovakia and Slovenia also boast of fast external export expansion compared to 2010.

[18] As set out above, based on its current position, Spain seems to be an exception, where the data already indicate substantial external export growth. But shedding liabilities is obviously not a simple task even when coupled with growing financing capacity, because – as discussed in *Part 1* – the export revenues of the various economic players are not directly available for the deleveraging of other players.

### 3.3. Similarities and diversification of economic structures

EMU economies can be essentially considered diversified, none of the members are characterised by an extreme exposure to partial shocks. This is suggested by the fact that trade within the zone is mainly conducted between industries, which was also facilitated by the rise in internal trade prior to the crisis, because most of the members were expanding the scope of their export goods at that time (*ECB 2013*).

However, some previously present differences preserved during the crisis can also be observed. These differences may cause problems in the operation of the adjustment mechanisms, and as such, in the degree of price elasticity and export competitiveness and also in labour mobility. In Germany, manufacturing has a relatively higher share than services, and according to the data publications of the Eurostat, its share within added value remained stable despite the decline in global demand. Between 2008 and 2013, this share exceeded the internal contribution of manufacturing in Mediterranean economies by 13 percentage points in each of these years. At the same time, in Greece, Portugal and Spain, trade, construction industry and services, that is, practically non-tradable goods were relatively dominant. Compared to the structural stability of the German economy, we can observe a more significant structural realignment between 2008 and 2013 in these countries, because, for example, the bursting of the real estate bubble in Spain setback the share of the construction industry's added value by 10 percentage points. But a radical structural change or a shift towards manufacturing failed to take place. So the most relevant structural differences are manifested in that *central countries primarily operate a knowledge and capital intensive economy, while the southern periphery countries' economies are more labour intensive.*

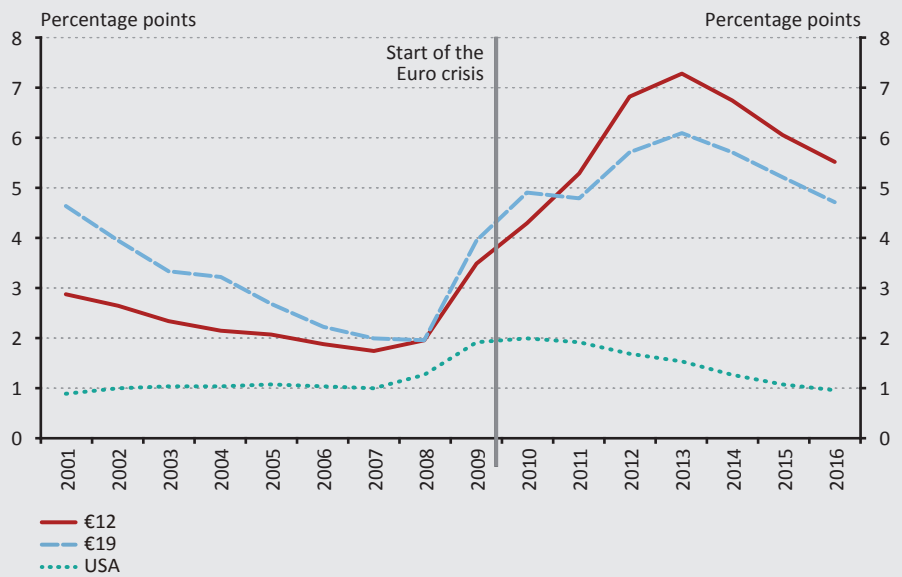
In terms of market adjustment, several possible obstacles can be identified here. On the one hand, as discussed in the foregoing, prices of the service sector are usually less flexible. During the 2010 crisis, this disadvantage was only partially present, because compared to other factors, the price adjustment of periphery countries was not negligible. On the other hand, it is also true for service sectors even in modern economies that the value generated by these sectors does not lend itself as much to export. These sectoral proportions may have played the role in that periphery countries were unable to increase their exports despite the price level reduction. Although the role of tourism-related export revenues is outstanding in these economies – as demonstrated by the third quarter surpluses shown in the quarterly current accounts statistics –, these are not necessarily sufficient to create a real effect for internal devaluation. At the same time, Germany's extensive manufacturer capacities are immanently prone to generate sustained surplus, which is due, inter alia, to the economic interest linked to uninterrupted production (see *EC 2016*). The different focus is also apparent in the labour force base of the two zones, so mobility is hindered by the differences in qualification and skills. Even

with adequate migration willingness, it remains uncertain whether a manufacturing entity on an upswing needs the same amount of additional labour as the number of workers left unemployed in an economy sinking into recession (or vice versa).

### 3.4. Labour mobility

Labour mobility can be efficiently captured through the analysis of the distribution of unemployment rates, since any sustained difference suggests that the shocks affecting the regions cannot disappear through the flow of labour force (see for example *Eichengreen et al. 1990*). Figure 7 shows developments in the deviation of unemployment rates between 2001–2016 for the €12 and €19 country groups and, by comparison, for the states of the USA.

**Figure 7**
**Deviation of unemployment rates in the euro area and the USA, 2001–2016**




*Note: The €12 and €19 indications refer to the appropriate set of countries, irrespective of whether they already used the euro in the given year.*
*Source: Calculated based on the data of Eurostat publication "Unemployment rate, annual average" and Bureau of Labour Statistics, "Unemployment Rates for States. Annual Average Rankings". http://www.bls.gov/lau/lastrk13.htm.*
*http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=une_rt_a&lang=en. Downloaded: 09 April 2016 and 17 March 2017.*

In the euro area, the unemployment rates of the Member States had been already significantly different for a sustained period before the crisis compared to the USA. This difference was gradually decreasing until 2008, but primarily within the broader group containing 19 countries, where the contraction on the deviation is mainly

attributable to the rapid decline in unemployment in the three Baltic states. The difference between the €12 countries started from a lower level, but dropped less steeply until 2008, i.e. the average value remained relatively more stable in this narrower circle.

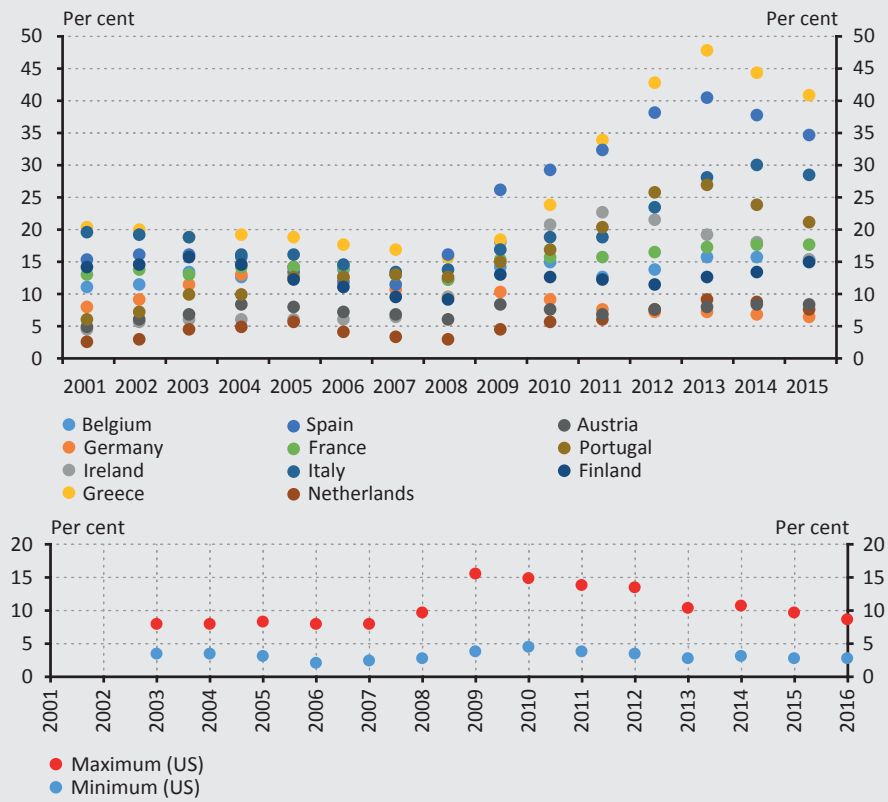
It is worthy of attention that the global crisis originating from the USA brought about only a slight divergence in the state-level unemployment data in the United States of America itself and any substantial increase in deviation was only observed for a period of two years. Thereafter, the increased deviation disappeared over a period of 5 years: In 2015–2016, a stable 1 percentage point average divergence, already seen prior to the crisis, can be observed. By contrast, from 2008 and from the time the crises reached the euro area, *these rates suddenly started to drift apart.* Divergence increased all the way until 2013. Over the past three years, these differences decreased by approximately 0.5 percentage points each year, but the €19 block is still approximately 3 percentage points away from the starting value.

The divergence was stronger within the €12 group compared with the group of the 19 member states. This phenomenon is in line with the above finding, according to which unemployment rates of the 12 countries were converging at a slower pace. This highlights the source of tension between the central and periphery countries since Greece, Spain, Italy, Ireland and Portugal, considered to be the centre of the crisis, are all part of the €12 group, together with Germany.

The decline in deviation over the past three years suggests a certain mobilisation of the labour force. The labour force statistics published by the Member States are unfortunately too narrow to form a dynamic picture of the distribution of migrant workers by place of birth. In the meantime, the issue of the labour shortage experienced in the German economy arises from time to time (*Eichhorst et al. 2013*; *BMWFW 2013*; *EP 2015*). This phenomenon is hardly consistent with the high unemployment rates of the periphery countries, especially with the outstandingly high youth unemployment analysed on a number of occasions, that is, it definitely implies some mobility issues. The young employee group must be highlighted because a greater geographic and occupational mobility is expected from them. *Klekowski von Koppenfels – Höhne* (2017) give accounts of the increasing employment in Germany of workers coming from Southern Europe, especially the young and skilled ones. This correlates with the MobilPro EU programme launched by the German government in 2013 which intended to connect the needs of young unemployed workers of Southern Europe with the need of the German economy for skilled workers. But according to the authors, the share of employment in Germany of Southern European workers cannot be accurately determined.

*Figure 8* illustrates developments in youth unemployment rates in the €12 countries and in the United States. The European data were available for the age group between 20 to 24 years while the US data were available for the age group between 25 to 34 years, measuring the share of unemployed persons against the active population of the appropriate age in both cases. The EMU values are shown by Member State, while for US states, the value of minimum and maximum rates is shown for each year. Based on this, we can compare the range of deviation and the dynamics occurred during the crisis. Our findings here are similar to those made for *Figure 7*. In the United States, we observe a smaller difference between the minimum and the maximum rates prior to the crisis, which is approximately 4–5 percentage points. This is one third of the 15 percentage points difference observed

**Figure 8**
**Developments in youth unemployment rates in the €12 countries and in the states of the USA**




*Source: Edited based on the data of Eurostat and the Bureau of Labour Statistics. €12 data pertain to the active population between the ages of 20–24, while US data refer to the active population between the ages of 25–34. "Youth unemployment by sex, age and educational attainment level [yth_empl_090]", https://www.bls.gov/lau/ex14tables.htm. Downloaded: 17 March 2017.*

in the €12. (It is interesting to note that regional differences are systematically higher in the unemployment data of the young age groups compared to the figures available for the total active population both in the USA and in the EU.) As a result of the crisis, we can observe a minor, short divergence in the United States while in the €12 block, deviation remained substantial even after 2008–2010. 2013 seems to be a turning point in that case as well. The range started to narrow since then, although it still remains expressly broad: it is over 30 percentage points. The same countries keep the minimum and maximum values with some slight changes since the start of the time series: the lowest rates are associated with the Netherlands, Germany and Austria (central countries) while the highest rates can be linked to Greece and Spain (periphery countries). This constancy suggests that *there are some inherent problems also in terms of labour force mobility in this group of countries.* But based on recent developments and government measures taken during the past few years, change is not impossible in the case of skilled employees. However, expectations regarding qualifications and expertise call attention to the fact that differences in the economic structure discussed in Part 3.3 represent a real obstacle and there are also some language and language knowledge related issues.

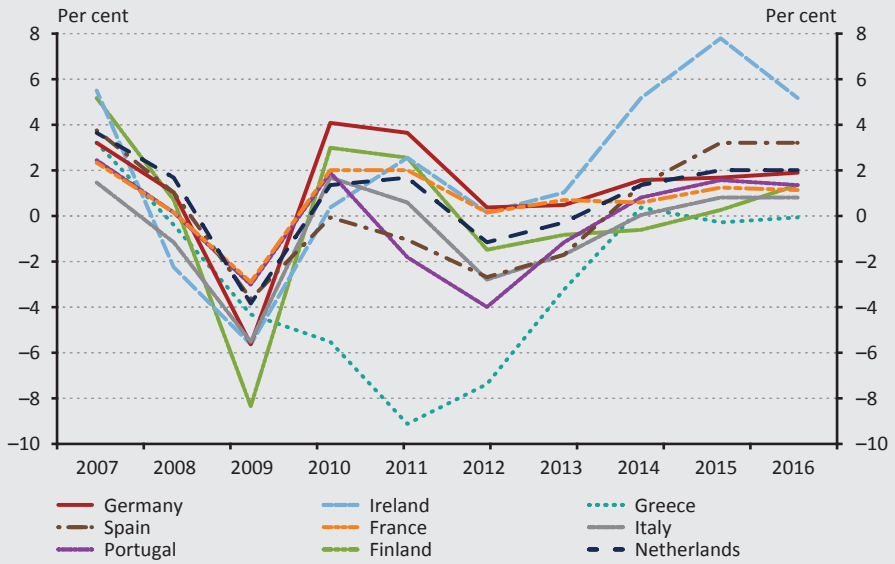
### 3.5. Business cycles

We have already talked about the diverging economic performance of EMU Member States. As a closure of the analysis, Figure 9 shows the developments in GDP between 2007 and 2016. This picture shows relatively similar patterns of booms and busts for the Member States which is the consequence of a general product market integrity and relative structural similarity in the real economy, while from the monetary aspect, it is the consequence of a close interlocking of financial markets. Thus, the members move more or less together in their directions, but the delays compared to one another and the differences in scale may face the monetary policy with some constant optimisation issues. *De Grauwe (2012a:175)* illustrates this with the example of the 2008 downturn: according to his estimation, at that point in time the zone as a whole did not differ from the potential output, “so there was nothing to adjust”. However, as we can see in the Figure, the current annual growth of specific countries varied in a range of 4 percentage points, producing both decline and growth in GDP, therefore the difference was substantial between the individual output gaps. Individual members certainly had different monetary policy needs.

At present, a situation is emerging where the economies may demonstrate heterogeneous growth over the medium term, and as a result, inflationary outcomes may also substantially differ. The most recent data as of the end of 2016 currently signal the end of the deflationary period, but the risk of inflation is uneven throughout the zone. From the perspective of the members showing more fragile economic performance and leaving deflation behind, the professional opinion

regarding the necessity of an interest rate increase may be completely different than in the case of those members that have a considerably more favourable outlook for economic activity. In that regard, the world market connections presented in Part 3.2 play a special role, because the economies that are (also) externally oriented may pick up momentum more easily from the expected growth of external partners (see *IMF 2017*).

**Figure 9**
**Developments in real GDP growth rate in countries of the euro area from 2007**
*[Previous year's GDP = 100%]*




*Source: Edited based on Eurostat data: http://ec.europa.eu/eurostat/web/products-datasets/-/tec00115. Downloaded: 16 April 2016 and 17 March 2017.*

## 4. Summary of conclusions

This article examined the endogenous disturbances of the single currency area and the background of the euro crisis as well as the prospects of market adjustment. Currency zones always carry the risk that the common (single) monetary policy is unable to meet the simultaneous needs of the regions. In that case, endogenous feedbacks are generated in the system that may entail inflationary, financial stability and real economy related problems. This mechanism played a role in the developments in the euro crisis because after the introduction of the single currency, interest rates evened out at a low level, which encouraged debt overhang

and asset price bubbles in the periphery countries. Deepening financial integration was accompanied by the "efficient" dissemination of vulnerabilities as these were increasingly shifted inward, creating unsustainable exposures for both the central and the periphery countries (both in gross and net terms). EMU's institutional system was unprepared for the early identification of private indebtedness and the mitigation of systemic risks and was also partly unprepared for the management of public debt. The lack of clarity of the crisis management and risk community framework resulted in a confidence crisis in the markets at the most critical moments.

But when we are missing risk monitoring, economic policy coordination and crisis management systems, we must also ask the question as to what fundamentally drives economic disturbances and/or what may prevent their self-adjustment. This is relevant irrespective of the degree to which we consider market efficiency as being valid, because there is no guarantee for the absolute power of institutions. Even a properly operating institutional system is not supposed to handle repeated severe tensions. From the perspective of real economy, EMU shows a mixed picture based on the experiences gained so far. Generally speaking, a region having an integrated product market and exhibiting interconnectivity in many areas has a rational need for a common currency. However, the centre-periphery fault-line may force the members over the medium term to draw the balance of belonging to the euro area. After the 2010 crisis, the relative internal price and wage adjustments entailed economic sacrifices for the periphery countries, but based on the foregoing, it proved to be less efficient as it failed to meet its essential objective to date, i.e., the expansion of exports. This can be explained by complex competitiveness issues. Moreover, no fast labour market adjustment took place either. The partial results primarily affect employees with a higher qualification, but youth unemployment remains overall an acute problem. To achieve the long-term functioning of the euro, and what is more, to actually realise the desired benefits, a comprehensive, targeted structural, competitiveness and regional policy framework and the harmonisation of initiatives are needed, which can ensure the improvement of internal adjustment mechanisms within the area.

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# A possible methodology for determining the initial margin

*Marcell Béli – Kata Váradi*

*Our article presents a methodology for determining the initial margin requirement that complies with the EMIR regulation in effect since 2012, while also taking into account market participants' demands and needs in connection with establishing the initial margin. The task of central counterparties that operate behind stock exchanges is to take over the counterparty risk from market participants. In order to manage the emerging risks, central counterparties operate a multilevel guarantee system, one key element of which is the initial margin. From the perspective of market participants, the main requirement is that the value of the margin reflect market developments and remain stable over time, if possible. Another requirement is that its value be determined objectively, so that market participants can easily reproduce it, i.e. it should contain as few expert decisions as possible and should be uniform with respect to all product types. We will show in the article through the example of some securities how a potential methodology is structured, and how the individual parameters can be determined in a way that satisfies the interests and the requirements of all stakeholders, i.e. regulators, market participants and the central counterparty.*

**Journal of Economic Literature (JEL) codes:** G15, G17, G18

**Keywords:** central counterparty, initial margin, EMIR, procyclicality

## 1. Introduction

The main task of central counterparties (hereinafter: CCPs) on a capital market is to ensure, in the case of potential non-performance, that the innocent party does not incur losses in the transaction as a result of the non-performance, i.e. to take over the counterparty risk from market participants. Accordingly, CCPs play a crucial role in ensuring the smooth operation of the markets. CCPs have in place a multilevel guarantee system in order to meet this requirement. For example, the

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The authors of the study are indebted to the KELER CCP for providing them with the data that form the basis for this analysis and to the staff of the Risk Management Department for their useful comments.

The manuscript was received on 25 October 2016.

DOI: http://doi.org/10.25201/FER.16.2.119147

CCP in Hungary, KELER KSZF Zrt. (KELER CCP) uses the following guarantee system (*KELER CCP 2016*):

- Basic financial collateral: this must be deposited once prior to trading in order to begin trading.
- Initial margin: the goal of this is to provide collateral for the change in the product's price.
- Variation margin: on the day when the position is opened, it is the difference between the closing price and the trading price, while later until the settlement day it is the difference between the closing price of the current day and that of the previous day.
- Supplementary collateral: this may be collected in two cases: if a Clearing Member does not meet the minimum capital requirements, or if the size of the guarantee fund on the spot market is insufficient, and then the shortage may be collected by KELER CCP from the entity responsible for the problem.
- Additional financial collateral: this is used as collateral for individual Clearing Member risks. It is usually imposed as a sanction.
- Collective guarantee fund contribution: this is an individual and a collective guarantee element as well, since KELER CCP primarily uses the guarantee fund contribution of the guilty member, and only draws on the guarantee fund contributions of the innocent parties within the whole guarantee system at a later time.

Of these guarantee system elements, this article concentrates solely on establishing the initial margin, which aims to ensure the smooth operation of the market under normal conditions. The CCPs use various risk management models to create an adequate margin for losses incurred under normal market conditions. These models need to be set up so that they comply with the EMIR regulation[1] which entered into force in 2012, and the so-called TS regulation[2] which contain its details. In the case of stock exchange transactions, the requirements for risk management models are the following with respect to the margin:[3]

[1] EMIR regulation: European Market Infrastructure Regulation (Regulation [EU] No 648/2012). Regulation (EU) No 648/2012 of the European Parliament and of the Council of 4 July 2012 on OTC derivatives, central counterparties and trade repositories**.** Available at: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012R0648, downloaded: 8 April 2016.

[2] Technical Standard (Regulation [EU] No 153/2013): Commission Delegated Regulation (EU) No 153/2013 of 19 December 2012 supplementing Regulation (EU) No 648/2012 of the European Parliament and of the Council with regard to regulatory technical standards on requirements for central counterparties. Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:052:0041:0074:EN:PDF, Downloaded: 8 April 2016.

[3] Article 41 of EMIR; Chapter VI of (EU) 153/2013.

- General assumptions: the CCP's full exposure should be covered by collaterals at least on a daily basis. In addition, the CCP should adopt models and parameters in setting its margin requirements that capture the risk characteristics of the products cleared and take into account the interval between margin collections, market liquidity and the possibility of changes over the duration of the transaction.
- Liquidation period: in the case of financial instruments other than OTC derivatives, this must be at least two working days.
- Significance level: in the case of financial instruments other than OTC derivatives, this is 99 per cent.
- Use of a portfolio-based margin requirement: the margin may only be calculated on a portfolio basis if the method used for this is prudent and robust.
- Lookback period: The margin must cover the exposures arising from the past volatility calculated on the basis of the data for the last 12 months, ensuring that the data used for calculating past volatility reflect the whole spectrum of market conditions, including stresses. Other time horizons may be used only if they entail at least as high a margin requirement as the one calculated for 12 months. If the past observation period cannot be applied, the margin parameters must be based on conservative assumptions.
- Consideration of procyclicality: The margin buffer or procyclicality buffer used must amount to at least 25 per cent of the calculated margins, and this buffer may be temporarily used in periods when the calculated margin requirements rise considerably.

However, CCPs must bear in mind not only compliance with the regulatory requirements, but also the fact that they should meet the requirements of market participants. This is because market participants expect the margin to be as stable over time as possible, while effectively reflecting market developments, and should also be easily reproduced, which means that CCPs should employ few expert decisions, i.e. the margin should be determined automatically and objectively. Another crucial factor is that CCPs use a methodology that can be applied uniformly to all products.

The margining procedure presented in this study takes into account these regulatory requirements and market demands.

The study is structured as follows: Chapter 2 presents the margin calculation methodology and the parameters, followed by an impact assessment, within the framework of which backtesting is performed in Chapter 3 and sensitivity analysis is conducted in Chapter 4, which help adequately calibrate the values of the

parameters used. Finally, in Chapter 5, we define stress in order to provide an objective method for establishing the lookback period in margin calculation. The article ends with a summary.

## 2. Margining methodology

Margin calculation is based on the appropriate choice of the degree of risk measure during the quantification of risk. In risk management systems, the most widespread measures are the Value at Risk (VaR) and the Expected Shortfall (ES) models. The choice between the two metrics can be made by weighing their advantages against each other. The advantage of the VaR over the ES is that it is easier to comprehend and backtest (*Acerbi – Székely 2014; Yamai – Yoshiba 2005*), elicitable[4] (*Ziegel 2016; Gneiting 2011*), fewer data are enough for reliably calibrating the model and it is not sensitive to outliers. The advantage of the ES over the VaR is that it is coherent (*Artzner et al. 1997, 1999; Pflug 2000; Frey – McNeil 2002; Acerbi – Tasche 2002*), results in a stricter initial margin requirement and can take into account fat tail risk[5] (*Yamai – Yoshiba 2005*).

Based on these advantages and drawbacks and in order to comply as fully as possible with the regulation, for CCPs it is adequate to choose the VaR methodology for determining the margin requirement, since:

- It provides a guarantee in the case of several illiquid securities for which the initial margin requirements could not be appropriately determined with the ES methodology due to the absence of data.
- It addresses the fat tail risk with other tools such as the use of expert buffers.
- Easy backtesting is important, since the regulatory authority stipulates that it should be carried out.[6]
- The model should not be sensitive to outliers, i.e. the initial margin requirement should be relatively stable over time.
- If the aim of the initial margin is actually to manage non-extraordinary market situations, per definition the VaR is better suited for this purpose than the ES.
- If the delta-normal method (*Jorion 2007*) is applied, the problem of coherency does not emerge (*Jorion 2007; Szűcs 2006*).

[4] Elicitability means whether the result derived from the degree of risk can be verified or confirmed with other estimations.
[5] Fat tail risk: the probabilities are greater than expected at the two sides of the distribution.
[6] Article 49 of EMIR.

Overall, the VaR model determined with the delta-normal method can provide an adequate basis for CCPs to establish the margin. When using the delta-normal method, the VaR model requires estimates for only two parameters, namely the expected value and standard deviation, the estimation of which will be presented in the next chapter.

### 2.1. Parameters of the Value at Risk model

The main goal when determining the parameters is to meet the margin requirements. Accordingly, the standard deviation parameter is determined in two ways: in an equal-weighted manner and using the exponentially weighted moving average (EWMA). Determining the equal-weighted standard deviation is insufficient because the EWMA weighting serves our above-mentioned purposes better. This is because the benefit of EWMA weighting is that it immediately jumps if a problem/stress occurs on the market, while it lets the VaR decrease under normal market conditions. The difference between the two methods of determining standard deviation is shown in the following two formulas, which also demonstrate how the EWMA fits our purposes:

The formula for equal-weighted standard deviation: $$\sigma^{equal}=\sqrt{\frac{1}{K}\sum_{t=1}^{K}\left(r_t-\overline{r}\right)^2} \quad (1)$$

The formula for the EWMA standard deviation: $$\sigma^{EWMA}=\sqrt{\left(1-\lambda\right)\sum_{t=1}^{K}\lambda^{t-1}\left(r_t-\overline{r}\right)^2} \quad (2)$$

where $r_t$ denotes the log return on day t, $\overline{r}$ is the expected value (average) of the daily log returns, $K$ denotes the number of days, from which the average and the standard deviation are calculated (lookback period), $t$ denotes a given day, while $\lambda$ is the parameter for exponential weighting.

The difference between the two formulas is that in the case of the equal-weighted standard deviation, the weight of each observation is 1/K, while in the case of EWMA, the older an observation, the less weight it has, thereby ensuring that new information has greater weight, i.e. its value rises in stresses, whereas if the market calms down, it lets the value of standard deviation drop more rapidly than in the case of the equal-weighted scenario. The weight of the individual observations depends on the parameter $\lambda$, called the decay factor, the value of which may be between 0 and 1. If its value is moving closer to 1, the value of the standard deviation established in this manner would converge towards the value of the equal-weighted standard deviation. The value of $\lambda$ depends on two other parameters: $K$, i.e. the length of the lookback period and the parameter $\gamma$, which determines a tolerance level. The tolerance level must be provided because in the case of exponential weighting, past data could be observed into infinity during the estimation, since even very distant values have some minor weight, which, however,

can be considered negligible from the perspective of the estimation. Therefore, the data series has to be cut somewhere, and we provide a tolerance level for this, saying that the other data can be considered irrelevant from the perspective of our model. The formula of the tolerance level is the following:

$$\gamma = \left(1-\lambda\right)\sum_{t=K}^{\infty}\lambda^{t} \tag{3}$$

The relationship between the lookback period, the decay factor and the tolerance factor is presented in Formula 4:[7]

$$K = \frac{\ln\left(\gamma\right)}{\ln\left(\lambda\right)} \tag{4}$$

It follows from the formula that the longer the lookback period, the smoother the standard deviation data series, i.e. the greater the parameter $\lambda$, thereby assigning less weight to recent data. The regulatory authority requires that the lookback period contain a stress and cover a period of at least 12 months. If both conditions are met, the VaR and thus also standard deviation are calculated based on the data for 250 trading days. In the case of a CCP, the lookback period is given, therefore the parameter that can be chosen is the tolerance level, from which the decay factor is automatically derived in Formula 4. The tolerance level was chosen to be 1 per cent, in line with EMIR's 99 per cent significance level requirement. If the lookback period is 250 days, the tolerance level is 1 per cent, it follows that $\lambda$ must be 98.17 per cent. Overall, we normally chose these parameter settings, but the lookback period may be chosen freely – since it has to be more than 250 days if there was no stress, and it cannot be applied in the case of newly introduced products either – just like the tolerance level, and therefore weighting, i.e. the value of the parameter $\lambda$, can be determined for each product/instrument.

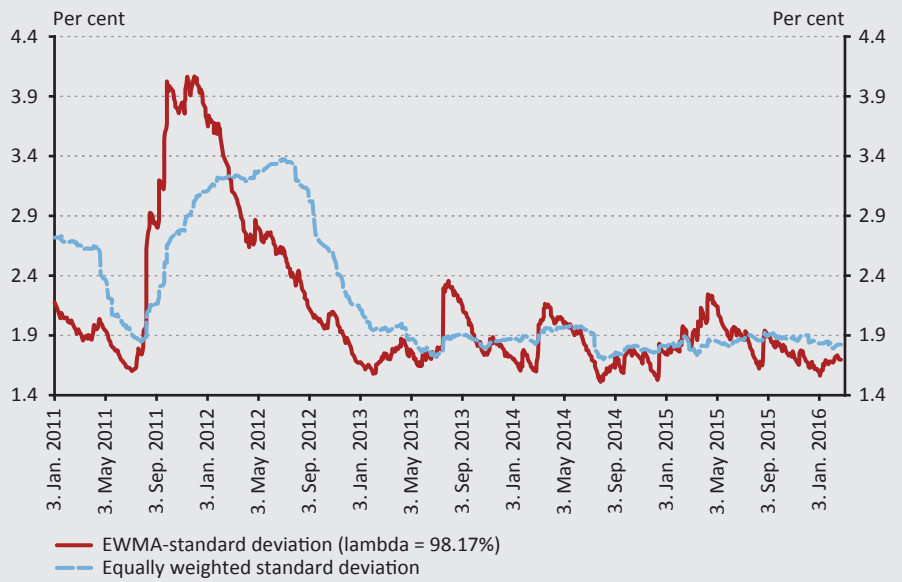
Another element of determining the value of standard deviation is that the average of the daily log returns should be set at 0 per cent, since it can be considered close to 0 per cent, which was examined on actual data, and thus it is deemed negligible, thereby considerably reducing the computer-intensive nature of the methodology. Furthermore, due to the fact that the expected value is not taken into account while determining the standard deviation, for the sake of consistency, it will also be considered 0 per cent when determining the VaR.

With an overall $\lambda$ parameter of 98.17 per cent, the standard deviation determined with the EWMA weighting and the equal-weighted standard deviation can be seen

[7] *RiskMetrics™ – Technical Document*. J.P. Morgan /Reuters New York, 17 December 1996.

in Figure 1 based on the log returns determined from OTP's past exchange rate data series.

***Figure 1***
**Standard deviation with various λ parameters**
*(OTP)*




In establishing the margin, we determine the VaR both with the equal-weighted and the exponentially weighted standard deviation. The basis for the margin calculation will be the VaR that is smaller. Of course, this will depend on the parameters of the standard deviation, i.e. the basis for calculating the VaR and thus also the margin will be the smaller standard deviation. This method ensures that the reduction of the VaR follows the market to the appropriate extent, since in this case the EWMA standard deviation is smaller than the equal-weighted standard deviation, i.e. the more subdued volatility of the market will be reflected in the VaR. On the other hand, the market is not punished too much when it moves upwards, since recent events have a substantial weight in the EWMA standard deviation, so the VaR would reflect unreasonably high volatility, which would considerably increase the margin. This would be against the principles of the regulatory authority, and therefore in the case of a rising EWMA standard deviation, we employ equal weighting, assuming that the former is greater than the equal-weighted standard deviation. Overall, the VaR is determined based on Formulas 5–8, and we present how the various buffers are based on the value of the VaR, where $\varphi$ denotes the liquidity buffer, $\theta$ is the

expert buffer, while $\pi$ is the procyclicality buffer, and these parameters would be known to market participants, for example through publicly available disclosures.

$$VaR_t^{return} = \min\left(\sigma^{equal} \cdot N^{-1}\left(99\%\right); \sigma^{EWMA} \cdot N^{-1}\left(99\%\right)\right) \tag{5}$$

$$VaR_t^{price} = -P_t + P_t \cdot e^{\sqrt{T} \cdot VaR_t^{return}} \tag{6}$$

$$KSzFmargin_t = VaR_t^{price} \cdot \left(1+\varphi\right) \cdot \left(1+\theta\right) \tag{7}$$

$$PROmargin_t = VaR_t^{price} \cdot \left(1+\varphi\right) \cdot \left(1+\theta\right) \cdot \left(1+\pi\right) \tag{8}$$

The aim of the liquidity buffer is to adequately manage products' risk arising from potential illiquidity, which is not quantified by the VaR. The aim of the expert buffer is to facilitate the management of further potential risks. Such risks may arise, for example, when one margin parameter is determined for a whole product group, and margining is not performed at the product level. This may be employed, for example, on the government bond market, where one margin can be determined for each maturity, irrespective of the conditions under which the securities were issued. The procyclicality buffer is required by the regulatory authority, and its value is 25 per cent. The point of the procyclicality buffer is to facilitate the management of the effects of economic cycles in the case of margin calculation, i.e. to prevent the margin from soaring if market developments, for example a panic, would warrant this. In such cases, the regulatory authority allows CCPs to eliminate the procyclicality buffer instead of raising the margin, which would be caused by the rise in the VaR, thereby offsetting the rise in the VaR. However, the focus on the automatism and objectivity requirement warrants clearly defined criteria for the exhaustion and build-back of the procyclicality buffer, which will be presented in the next two subchapters.

### 2.2. Exhaustion and build-back of the procyclicality buffer

The procyclicality buffer may be exhausted if the EWMA standard deviation is greater than the equal-weighted standard deviation. Thus all in all, the treatment of the buffer would depend on the current standard deviation parameters. We decided to do this, since we believe that it is important that the current market sentiment be reflected in the establishment of the margin and the exhaustion and build-back of the buffer, i.e. whether the current period is more volatile or calm than generally in the case of the given product. This characteristic can be easily deduced from the relationship between the equal-weighted standard deviation and the EWMA-weighted standard deviation. That is why we consider it appropriate to base the treatment of the procyclicality buffer on this.

The procyclicality buffer is not exhausted in one step, since in such a scenario the margin may plunge too much. Exhaustion of the procyclicality buffer is performed in the spirit of keeping the margin as stable as possible, even in highly volatile times. Therefore, the procyclicality buffer is exhausted by taking either the margin from the previous day ($margin_{t-1}$) or the value without the procyclicality buffer[8] ($KSzFmargin_t$), whichever is greater, and that will be the basis for establishing the margin:

$$margin_t^{pro-exhaustion} = max\left(margin_{t-1}; KSzFmargin_t\right) \quad (9)$$

However, this only gives us the basis for the margin if the buffer is exhausted. We have to be able to determine the build-back of the buffer, so that the procyclicality buffer is only exhausted if conditions warrant it.

The build-back of the procyclicality buffer also rests on the principle that the margin should be kept as stable as possible. If the buffer was built back in one step, the margin may move up substantially. Instead, the buffer is built back gradually, by taking either "$margin_t^{pro-exhaustion}$" or the margin with the procyclicality buffer ($PROmargin_t$), whichever is smaller:

$$margin_t^{pro-buildback} = min\left(margin_t^{pro-exhaustion}; PROmargin_t\right) \quad (10)$$

However, complete build-back of the procyclicality buffer must also be based on a criterion, since it may not be fully restored for a long time (for example if the VaR does not drop enough). Using the limit in reverse that we used for exhaustion – i.e. seeing when the EWMA standard deviation is smaller than the equal-weighted standard deviation – would not be practical. This could once again result in a huge spike in the margin. Therefore, the procyclicality buffer is built back gradually, in line with the EWMA standard deviation's gradual decline below the equal-weighted standard deviation. Thus, the gradual build-back of the procyclicality buffer should be applied instead of complete build-back as long as the following condition is met:

$$\sigma^{EWMA} \cdot max\left(\frac{margin_{t-1}}{KSzFmargin_t}; 1\right) > \sigma^{equal} \quad (11)$$

If this condition is no longer met, the margin once again contains the whole procyclicality buffer. This means that this condition and the fact that the procyclicality parameter is 25 per cent determine that the procyclicality buffer is built back completely if the EWMA standard deviation drops below the equal-weighted standard deviation by 25 per cent.

[8] It, however, includes other buffers, as can be seen in Formula 7.

### 2.3. Minimum margin

The precondition for restoring the procyclicality buffer can also be applied as the precondition for exhausting the buffer, since Formula 11 contains the case when the EWMA standard deviation exceeds the value of the equal-weighted standard deviation.

If we combine the formulas mentioned so far, we can determine the minimum for the margin. If we exhaust the procyclicality buffer, the minimum of the margin is "$KSzFmargin_t$", i.e. the VaR plus the liquidity and the expert buffer, while if the procyclicality buffer is not exhausted, it is "$PROmargin_t$", i.e. the value of "$KSzFmargin_t$" plus the procyclicality buffer. The choice between the two lower limits is determined by the values of the standard deviations compared to each other (*Formula 11*). The above can be incorporated into a single formula:

$$MINmargin_t = if\begin{pmatrix} \left(\sigma^{EWMA} \cdot max\left(\frac{margin_{t-1}}{KSzFmargin_t};1\right) > \sigma^{equal}\right); \\ min\left(max\left(margin_{t-1};KSzFmargin_t\right);PROmargin_t\right);PROmargin_t \end{pmatrix} \quad (12)$$

When determining the minimum margin, we may arrive at noninteger values. However, during this, we assume that if the margin is smaller than 1,000, we round up to whole forints, if the margin value is between HUF 1,000 and 10,000, we round up to 10, and above 10,000, we round up to 100, thereby increasing both the stability and the communicability of the margin.

### 2.4. Maximum margin and the margin band

However, if we set the margin to the two possible minimums each day, we would have to modify the actual margin as the minimum margin changes. The goal of the CCP, however, is to keep the margin as stable as possible, and therefore in addition to the basic expert buffer, we determine a variable expert buffer as well, aimed at providing a band ($\tau$), within which the value of the actual margin can move above the minimum required margin. That is why we refer to this as the variable expert buffer, since its value changes each day, depending on the difference between the minimum margin and the actually applied margin. The maximum margin value is determined based on Formula 13:

$$MAXmargin_t = MINmargin_t \cdot \left(1+\tau\right) \quad (13)$$

The maximum margin is established by the same rounding rules as in the case of the minimum margin.

### 2.5. Margin value

The narrower the band between the maximum and the minimum margin, the more often the margin is modified (and the smaller the variable expert buffer), since as soon as the actual margin would reach the maximum, this value, i.e. "$MAXmargin_t$" becomes the new margin, while if it reaches the minimum, the new margin value will be the "$MINmargin_t$". As long as it does not reach either limit, the margin's value is not modified, as shown in Formulas 14–16:

$$margin_t = if\left(margin_{t-1} > MAXmargin_t ; MAXmargin_t\right) \tag{14}$$

$$margin_t = if\left(margin_{t-1} < MINmargin_t ; MINmargin_t\right) \tag{15}$$

$$margin_t = if\left(MAXmargin_t > margin_{t-1} > MINmargin_t ; margin_{t-1}\right) \tag{16}$$

*Figures 2-6* show the potential margins of the various products (one liquid and a less liquid Hungarian equity, and a foreign currency) using this method and in the context of different parameters. *Figures 2–4* are based on historical OTP data: *Figure 2* shows the margin if the liquidity and the expert buffers are 15 per cent, while the margin band is 25 per cent; *Figure 3* shows the margin in this methodology if the margin band is 50 per cent, while *Figure 4* shows the margin in this methodology if both the liquidity and the expert buffers are changed to 25 per cent, and the margin band is left unchanged. *Figures 5–6* show the margin determined for Masterplast and CHF. The values for "standard deviation" and "EWMA standard deviation" can be seen on the secondary y-axis in all of the figures.

*Figures 2–3* demonstrate that the wider the margin band, the less the margin fluctuates. If we wish to keep the margin of a given product as stable as possible, we can adjust it through the width of the band. If we had changed the buffers, the shape of the margin would not have changed, only its level would have risen, as seen in *Figure 4*.

**Figure 2**
**OTP's margin I**

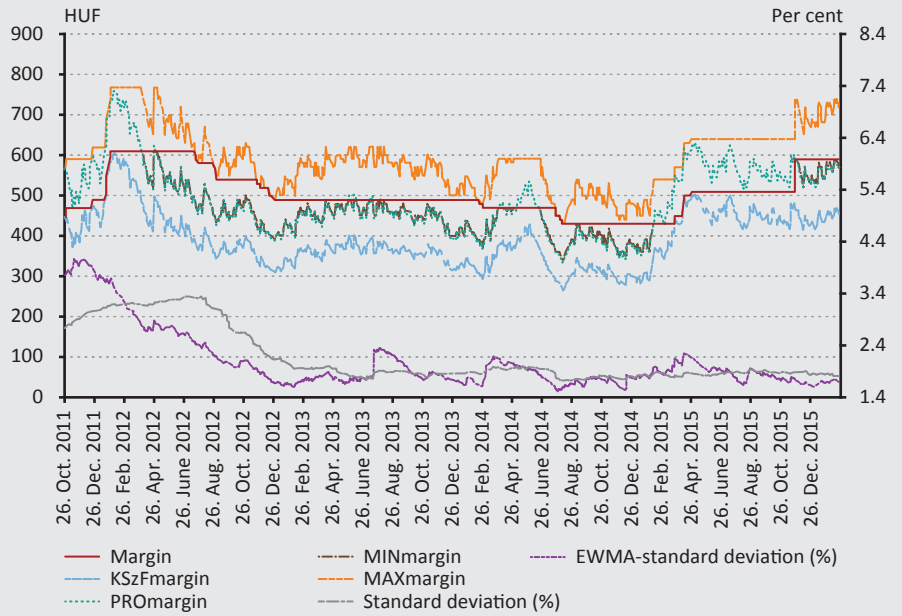



**Figure 3**
**OTP's margin II**

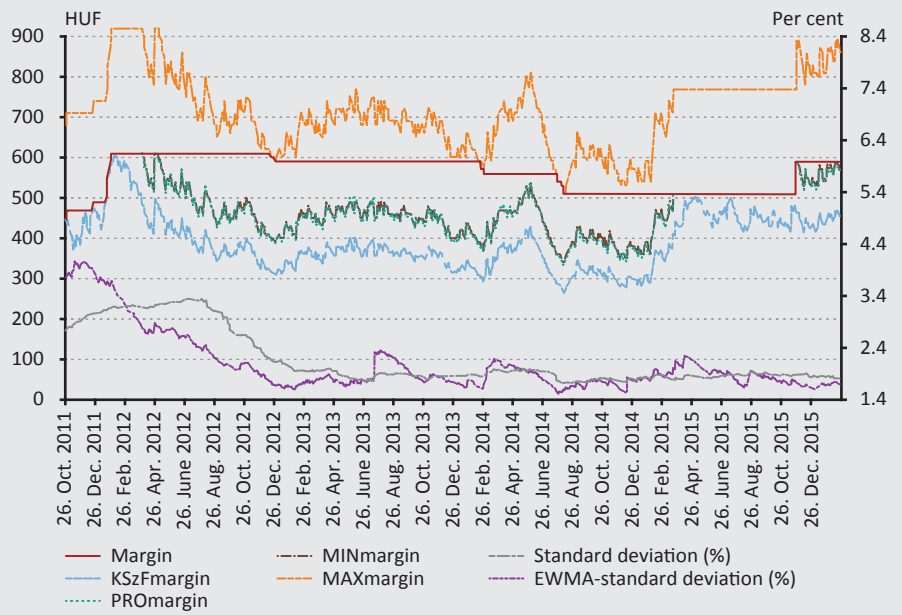


**Figure 4**
**OTP's margin III**

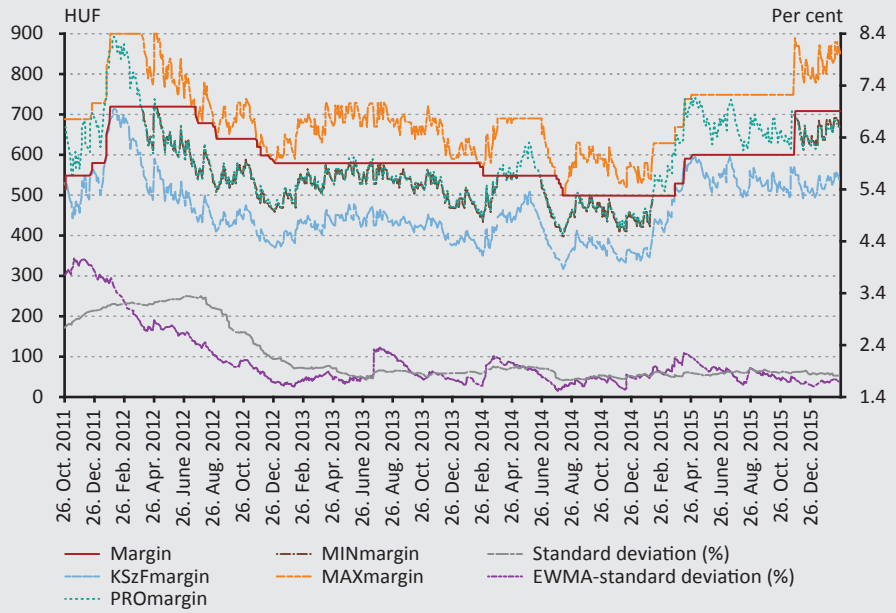



**Figure 5**
**Masterplast's margin**

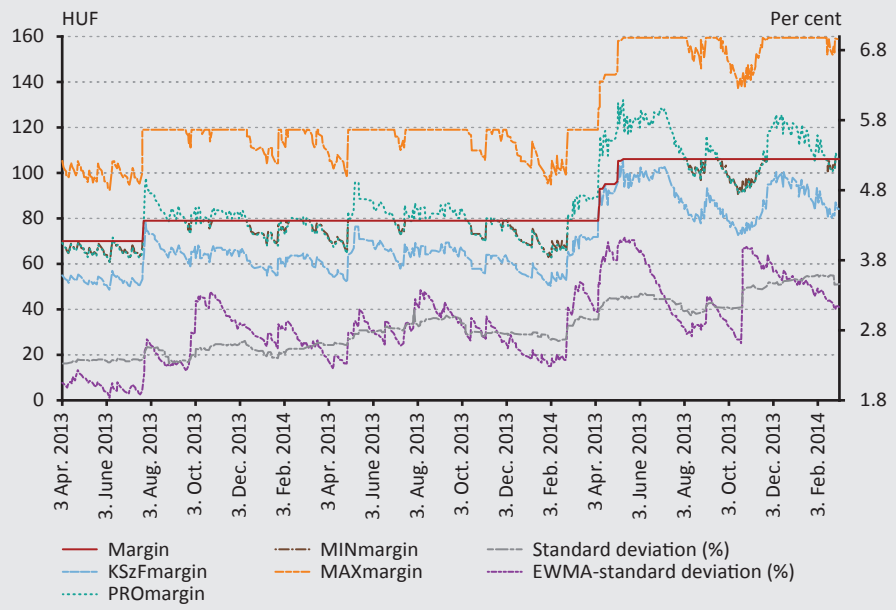
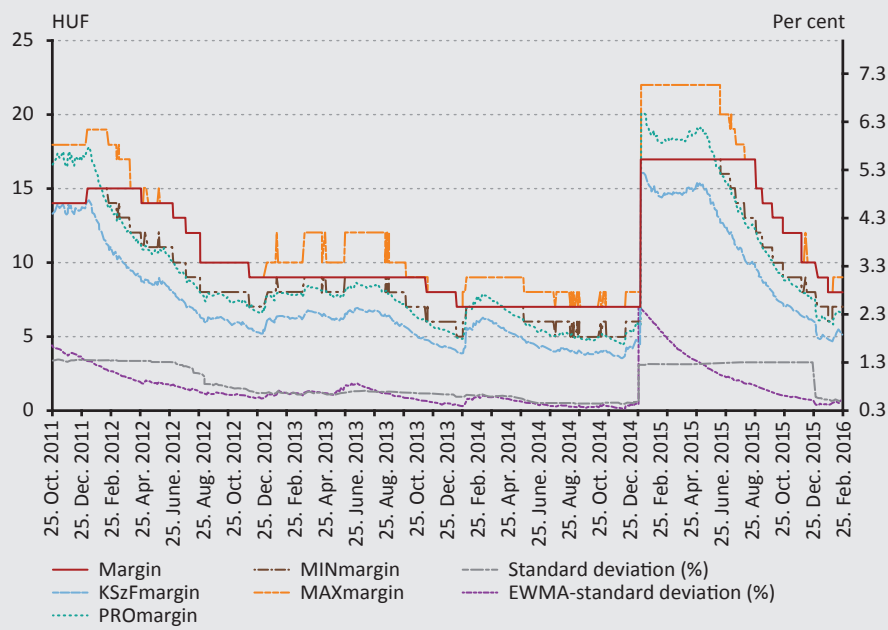


*Figure 5* contains the margin for a less liquid equity, Masterplast, which, however, cannot be deemed illiquid. In this case, both the liquidity and the expert buffer are set at 25 per cent, and the margin band is 50 per cent. Based on the figure we can say that the methodology presented in this article reflects the actual market developments at the level of the margin, thereby capturing the current risks. It is also evident in this case that if the margin band had been set narrower, the margin would have reflected the actual market developments even more.

We showed how the margin is determined in the case of shares representing a liquid and a less liquid product. However, this method works and can be used for other products as well. *Figure 6* shows how the margin would have developed in our methodology in the case of a foreign currency (liquidity buffer 10 per cent, expert buffer 10 per cent, margin band 25 per cent).

These figures clearly show that the margin was able to reflect the actual market developments, since the jump in the exchange rate of the Swiss franc in early 2015 was handled without unduly increasing the margin, only to the level that was necessary (based on the results of the backtesting presented later) to enable the CCP to manage the elevated risk.

**Figure 6**
**The CHF's margin**



Nonetheless, despite the fact that the methodology can be applied to other products as well, it must be noted that based on the unique features of other products such as their risk factor, the methodology may be modified by incorporating further parameters to take into account these special characteristics. However, this does not change the logic behind the methodology, it merely expands it. The description of these unique features and the modification of the methodology is beyond the scope of this article.

### 2.6. Methodology for objectively establishing the parameters – Margin groups

Based on the establishment of the margins in the previous chapter, it was demonstrated that the value of the margin depends largely on the parameters applied when establishing the buffers. These buffers are not determined on an ad-hoc basis: the products are divided into groups, and within those, the parameters are uniform by default. The buffer parameters can be determined through backtesting and sensitivity analysis. Obviously, if the backtesting results for the securities show that the values of the buffers applied to the margin group are incorrect, the parameters can be changed at the level of products/instruments in the direction of either tightening or relaxing them, i.e. the parameter settings can become unique. For example in the case of shares and foreign currencies, the classification may be as follows for KELER CCP:

**Table 1**
**Margin groups**

| Product group | Margingroups |
|---|---|
| Equity | leading; |
| | premium (non-leading); |
| | standard; |
| | T-category (non-illiquid); |
| | illiquid. |
| Currencies | leading HUF; |
| | leading cross; |
| | standard HUF; |
| | standard cross. |

In the case of equities, classification may be based for example on the classification used at the Budapest Stock Exchange (hereinafter: BSE).[9] The BSE classifies equities into premium, standard and T categories. CCPs should also use two additional categories, leading products and illiquid products, so that they can take into account risks to the appropriate extent. Highlighting leading products is also important because on the BSE, most of the trading is concentrated in a few products. Due

[9] https://www.bet.hu/Befektetok/Reszveny-szekcio, downloaded: 8 April 2016.

to this concentration risk, the group of equities in which most of the trading is concentrated should be set apart from the premium category. And classifying illiquid equities into a separate group is important because their risk arising from their illiquidity is substantial. This risk should be quantified using various liquidity measures; for a CCP, one potentially appropriate indicator may be a weighted spread measure such as the Budapest Liquidity Measure (BLM)[10] used by the BSE. The weighted spread measures can be determined based on the current order book in the context of various trade levels. Based on the weighted spread measure, those T category equities can be considered illiquid in the case of which the establishment of the weighted spread measure was not ensured at a specific trade level and for the given proportion of trading days. This is tantamount to the absence of a trading book for a given product on the given day that would have ensured the performance of the transactions to market participants, i.e. the market not being liquid enough.

Leading products based on trading should also be determined in the case of foreign currencies as well, in two separate groups: among forint crosses on the one hand, and among non-forint based foreign currencies on the other hand. The foreign currencies that are traded less could also be classified into the standard category in forint and non-forint groups.

Overall, in all product groups within the established margin groups, the parameters rise monotonically. For example, as we saw in the presentation of the margin methodology, the liquidity buffer was 15 per cent for OTP – assuming that it is a leading product – while the liquidity buffer for Masterplast, a standard equity, was 25 per cent.

Within most margin groups, margin calculation is performed in the manner we described in the presentation of the new methodology, only the applied parameters are different. However, in the illiquid category introduced above, the presented methodology cannot be used, since no appropriate past data series is available to the CCPs that would enable the new methodology to yield satisfactory results. Yet this problem does not only arise in the case of illiquid papers, but also during initial public offerings (IPOs). However, the discussion of this issue is also beyond the scope of this article, but it can be easily incorporated into the methodological framework using reference indices as risk factors.

[10] https://www.bet.hu/portal/Kereskedesi-adatok/Adatletoltes/Budapesti_likviditasi_mertek/Budapesti_likviditasi_mertek_linkelt_tartalom, downloaded: 8 April 2016.

## 3. Backtesting

Backtesting is performed in two ways for all products. First, we gauge how many times the actual daily exchange rate movements exceeded the applied margin over the past 250 trading days, and we also examine how many times the actual daily price changes exceeded the VaR value. In the case of the VaR, we do not look at VaR calculated with the equal-weighted standard deviation and the EWMA-weighted variety: we always use the smaller value in backtesting, since we also used that in establishing the margin. Accordingly, the 99 per cent requirement will probably be not met for the VaR, since we always employ the smaller value, but the figure has to be close to that if the models function well and the parameters are set correctly. In the case of the margin, the goal is to achieve an adequacy of close to 100 per cent, since the buffers used should ensure an adequacy of over 99 per cent for the margin. Based on the backtesting, the following results were obtained in the case of the products under review, over a 1-year time period:

**Table 2**
**Results of the backtesting**

| **Adequacy** | | | |
|---|---|---|---|
| **Product group** | **Security** | **Margin** | **VaR (min: equal-weighted, EWMA)** |
| Equities | OTP | 100.00% | 98.80% |
| | Masterplast | 100.00% | 99.20% |
| Foreign currency | CHF | 100.00% | 100.00% |
| | Average | 100.00% | 99.33% |

*Table 2* shows that on average, the margin was 100 per cent adequate for all the products under review, i.e. the price movement was never greater than the applied margin. And in the case of the VaR we can see that the knock-out was 0.67 per cent on average, i.e. the applied VaR calculation corresponded to 99 per cent. The results are represented graphically in *Figures 7–9*.

**Figure 7**
**Backtesting OTP**

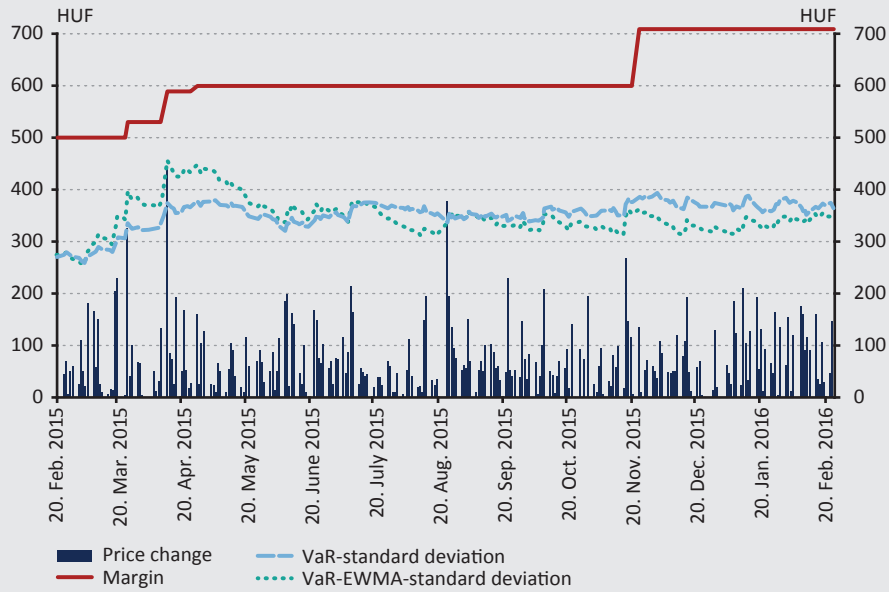



**Figure 8**
**Backtesting Masterplast**

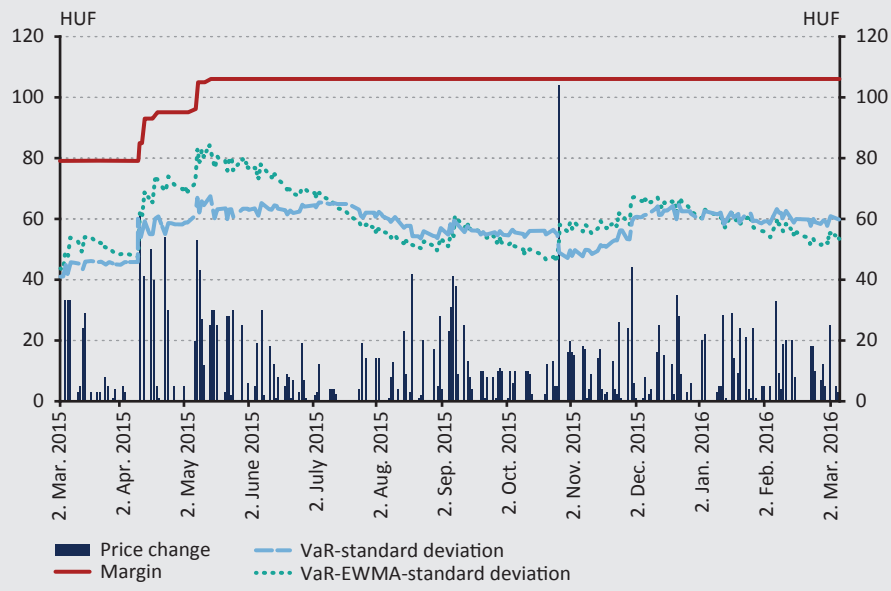
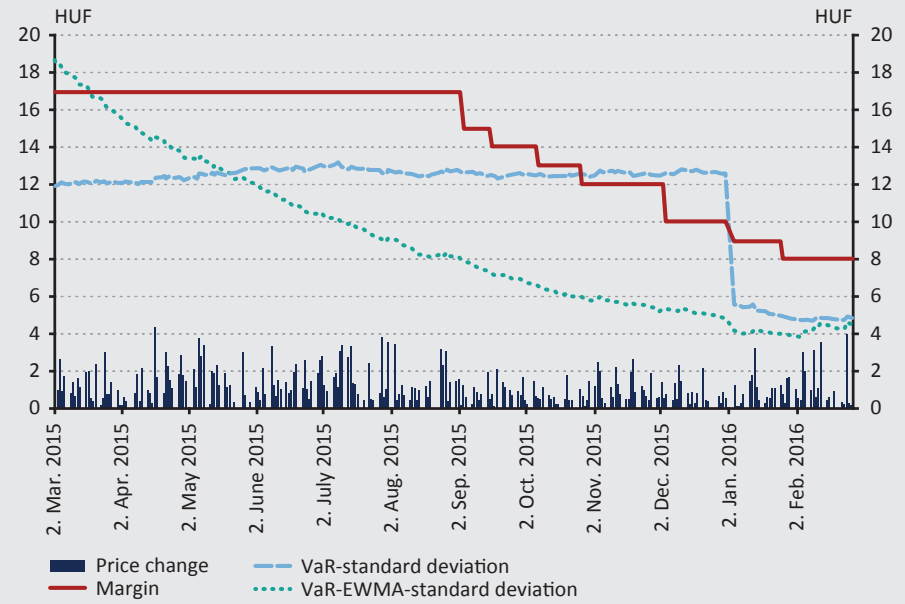


**Figure 9**
**Backtesting CHF**




## 4. Sensitivity analysis

In the course of sensitivity analysis, we examine how, *ceteris paribus*, a change in one parameter changes the margin to be applied, and how it influences the backtesting results. Based on this, we can analyse which parameter will have the greatest influence on the margin and the backtesting results if we change the parameters to the same extent (e.g. by 1 per cent). In order to ensure the comparability of the results, the analysis was performed for the margin applied on 30 December 2015 (the last trading day in 2015) in the case of all the products under review.

However, the established margin is path-dependent as a result of the margin band, since the first day when the methodology is applied is important, as is the value of the margin for this day. Different starting and end dates may reach the minimum and the maximum of the margin band, and therefore the margin may change at different times. In order to address this path-dependency, the lookback period in the sensitivity analysis is always 250 days from 30 December 2015, and the 250 days before that is the basis for estimating the parameters. In addition, the initial margin is established in a way that on the first day $MINmargin_1$ equals $PROmargin_1$, while $margin_1$ is the arithmetic mean of $MINmargin_1$and $MAXmargin_1$. On the other days, the margin calculation methodology described above is applied.

Overall, the parameters to be reviewed may be the following in the case of equities and foreign currencies:

1 VaR parameters:
• significance level
• liquidation period

2 Buffer parameters:
• liquidity buffer
• expert buffer
• procyclicality buffer
• margin band (variable expert buffer)

3 EWMA parameters
• tolerance level

Only those parameters were included in the analysis that can be changed in the models of the CCP freely and on an expert basis. The only parameter the CCP can influence that is nonetheless not included in the sensitivity analysis is the length of the lookback period. This is because in the case of all parameters, we examine the effect of a change of +/– 1–20 per cent (not percentage points), but in the case of the lookback period such an analysis would be pointless, as the EMIR stipulates that the lookback period must be at least 250 days, including a stress period. Consequently, the default for each product in the models is 250 days. If the data series does not contain a stress period, the lookback period is extended not by one day at a time, but by a longer period (e.g. half a year). This is because the robustness of the model (and its reproducibility by market participants) would be reduced if a basic parameter of the calculation of standard deviation was changed on a daily basis. If no stress event can be observed on the market in the next half year either, the lookback period is extended by another half a year. This continues until a stress is reached. Therefore, it is pointless to conduct sensitivity analysis in the case of the lookback period, as its result will never impact experts' decisions.

The sensitivity analysis of OTP yields the percentage changes in the margin as shown in *Table 3* (the initial parameters were the following: significance level: 99 per cent; liquidation period: 2 days; liquidity buffer: 15 per cent; expert buffer: 15 per cent; procyclicality buffer: 25 per cent; margin band: 25 per cent; tolerance level: 1 per cent), and *Table 4* reflects the results of the sensitivity analysis of the backtesting.

**Table 3**
**Margin sensitivity of OTP**

| Percentage change in the margin | | | | | | | |
|---|---|---|---|---|---|---|---|
| Original margin | VaR parameters | | buffers | | | | EWMA |
| 590.00 | $\alpha$ | T | liquidity | expert | pro-cyclicality | band | $\gamma$ |
| Change | 99% | 2 | 15% | 15% | 25% | 25% | 1% |
| –20% | *–69.49%* | *–8.47%* | 0.00% | 0.00% | *–3.39%* | 0.00% | 0.00% |
| –19% | *–62.71%* | *–10.17%* | 0.00% | 0.00% | *–3.39%* | 0.00% | 0.00% |
| –18% | *–61.02%* | *–6.78%* | –1.69% | –1.69% | *–3.39%* | 0.00% | 0.00% |
| –17% | *–61.02%* | *–6.78%* | –1.69% | –1.69% | *–3.39%* | 0.00% | 0.00% |
| –16% | *–59.32%* | *–6.78%* | –1.69% | –1.69% | *–3.39%* | 0.00% | 0.00% |
| –15% | *–62.71%* | *–6.78%* | –1.69% | –1.69% | *–1.69%* | 0.00% | 0.00% |
| –14% | *–61.02%* | *–5.08%* | 0.00% | 0.00% | *–1.69%* | 0.00% | 0.00% |
| –13% | *–59.32%* | *–5.08%* | 0.00% | 0.00% | *–1.69%* | 0.00% | 0.00% |
| –12% | *–57.63%* | *–6.78%* | 0.00% | 0.00% | *–1.69%* | 0.00% | 0.00% |
| –11% | *–55.93%* | *–5.08%* | 1.69% | 1.69% | *–1.69%* | 0.00% | 0.00% |
| –10% | *–47.46%* | *–3.39%* | 1.69% | 1.69% | *–1.69%* | 0.00% | 0.00% |
| –9% | *–45.76%* | *–1.69%* | 1.69% | 1.69% | *–1.69%* | 0.00% | 0.00% |
| –8% | *–40.68%* | *–3.39%* | 1.69% | 1.69% | *–1.69%* | 0.00% | 0.00% |
| –7% | *–40.68%* | *–1.69%* | 1.69% | 1.69% | *–1.69%* | 0.00% | 0.00% |
| –6% | *–35.59%* | *0.00%* | 1.69% | 1.69% | *0.00%* | 0.00% | 0.00% |
| –5% | *–32.20%* | *0.00%* | 1.69% | 1.69% | *0.00%* | 0.00% | 0.00% |
| –4% | *–30.51%* | *–1.69%* | 1.69% | 1.69% | *0.00%* | 0.00% | 0.00% |
| –3% | *–23.73%* | *1.69%* | 0.00% | 0.00% | *0.00%* | 0.00% | 0.00% |
| –2% | *–16.95%* | *1.69%* | 0.00% | 0.00% | *0.00%* | 0.00% | 0.00% |
| –1% | *–11.86%* | *1.69%* | 0.00% | 0.00% | *0.00%* | 0.00% | 0.00% |
| 0% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| 1% | 66.10% | 3.39% | 3.39% | 3.39% | 0.00% | 0.00% | 0.00% |
| 2% | | 3.39% | 3.39% | 3.39% | 1.69% | 0.00% | 0.00% |
| 3% | | 1.69% | 3.39% | 3.39% | 1.69% | 0.00% | 0.00% |
| 4% | | 1.69% | 3.39% | 3.39% | 1.69% | 0.00% | 0.00% |
| 5% | | 5.08% | 3.39% | 3.39% | 1.69% | 0.00% | 0.00% |
| 6% | | 5.08% | 3.39% | 3.39% | 1.69% | 0.00% | 0.00% |
| 7% | | 3.39% | 3.39% | 3.39% | 1.69% | 0.00% | 0.00% |
| 8% | | 6.78% | 3.39% | 3.39% | 1.69% | 0.00% | 0.00% |
| 9% | | 6.78% | 3.39% | 3.39% | 1.69% | 0.00% | 0.00% |
| 10% | | 6.78% | 3.39% | 3.39% | 1.69% | 0.00% | 0.00% |
| 11% | | 6.78% | 3.39% | 3.39% | 3.39% | 0.00% | 0.00% |
| 12% | | 8.47% | 1.69% | 1.69% | 3.39% | 0.00% | 0.00% |
| 13% | | 8.47% | 1.69% | 1.69% | 3.39% | 0.00% | 0.00% |
| 14% | | 10.17% | 1.69% | 1.69% | 3.39% | 0.00% | 0.00% |
| 15% | | 10.17% | 1.69% | 1.69% | 3.39% | 0.00% | 0.00% |
| 16% | | 10.17% | 5.08% | 5.08% | 3.39% | 0.00% | 0.00% |
| 17% | | 10.17% | 5.08% | 5.08% | 3.39% | 0.00% | 0.00% |
| 18% | | 11.86% | 5.08% | 5.08% | 3.39% | 0.00% | 0.00% |
| 19% | | 11.86% | 5.08% | 5.08% | 5.08% | 0.00% | 0.00% |
| 20% | | 10.17% | 5.08% | 5.08% | 5.08% | 0.00% | 0.00% |

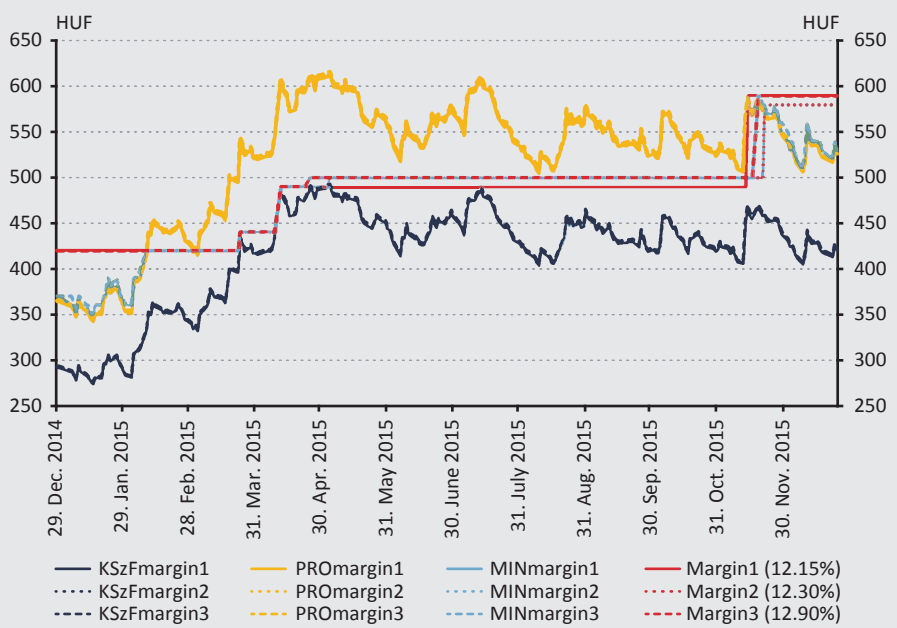
**Table 4**
**Backtesting sensitivity of OTP**

| OTP backtesting | | | | | | | |
|---|---|---|---|---|---|---|---|
| Original adequacy | VaR parameters | | buffers | | | | EWMA |
| 100.00% | $\alpha$ | T | liquidity | expert | procyclicality | band | $\gamma$ |
| Change | 99% | 2 | 15% | 15% | 25% | 25% | 1% |
| –20% | *91.60%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –19% | *92.00%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –18% | *92.40%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –17% | *94.80%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –16% | *95.60%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –15% | *96.00%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –14% | *97.60%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –13% | *98.00%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –12% | *98.00%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –11% | *98.00%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –10% | *98.80%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –9% | *98.80%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –8% | *98.80%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –7% | *98.80%* | *99.60%* | 99.60% | 99.60% | *100.00%* | 100.00% | 100.00% |
| –6% | *98.80%* | *99.60%* | 100.00% | 100.00% | *100.00%* | 100.00% | 100.00% |
| –5% | *98.80%* | *99.60%* | 100.00% | 100.00% | *100.00%* | 100.00% | 100.00% |
| –4% | *98.80%* | *99.60%* | 100.00% | 100.00% | *100.00%* | 100.00% | 100.00% |
| –3% | *99.20%* | *99.60%* | 100.00% | 100.00% | *100.00%* | 100.00% | 100.00% |
| –2% | *99.60%* | *99.60%* | 100.00% | 100.00% | *100.00%* | 100.00% | 100.00% |
| –1% | *99.60%* | *100.00%* | 100.00% | 100.00% | *100.00%* | 100.00% | 100.00% |
| 0% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 1% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 2% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 3% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 4% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 5% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 6% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 7% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 8% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 9% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 10% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 11% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 12% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 13% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 14% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 15% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 16% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 17% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 18% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 19% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |
| 20% | | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

It can be seen in both tables (3–4) that the significance level cannot be moved in the positive direction more than 1 per cent of the 99 per cent value, otherwise the value would exceed 100 per cent; and despite the fact that the negative change of the 99 per cent is mathematically interpretable, this result does not provide important information to the CCP (just like the reduction of the liquidation period or the procyclicality buffer), since the minimum of these parameters is set by the regulators. Thus, these values were represented in smaller print, since they cannot be used for making expert decisions. All in all, the significance level could only be modified by +1 per cent, since the result was both interpretable and applicable only in this case. We had greater leeway for analysing the change in all other parameters.

We can conclude from the results that the strongest impact is exerted by the change in the significance level, while changing the margin band and the tolerance level by +/– 20 per cent did not impact the value of the margin in the case of OTP. It is interesting to note that increasing/decreasing the other parameters does not monotonically increase/decrease the margin. This is because the process of restoring the procyclicality buffer is linked to *KSzFmargin*, the value of which is influenced by these parameters. Furthermore, the application of the margin band makes the value of the margin path-dependent. By way of illustration, *Figure 10* shows the development of the margin in the case of three different liquidity buffers. In the figure, the original 15 per cent liquidity buffer was reduced by 19 per cent, 18

**Figure 10**
**Development of the margin in the context of various liquidity buffer parameters**



per cent and 14 per cent, respectively, and as a result the margin stayed at HUF 590 in the case of the 19 per cent and the 14 per cent reduction, while it decreased to HUF 580 on account of the 18 per cent reduction, since it took a different path.

The sensitivity analysis of the backtesting shows that currently the positive changes in the parameters do not have any effect, since backtesting originally yielded 100 per cent adequacy at the margin level, and from the perspective of the CCP, the reduction of the margin in the case of OTP only produces interesting results for the expert and the liquidity buffer. In this case we can see that if the buffers were reduced, backtesting would not have 100 per cent adequacy, since as a result of a 7 per cent reduction of any buffer (i.e. from 15 per cent to 13.59 per cent), there may have been a price movement on the market that would have exceeded the applied margin.

## 5. Stress

During margin calculation, it is important to define stress, since the length of the lookback period depends on whether the past 250 days included a stress. If there is no stress, the lookback period must be extended in line with the EMIR's provisions to include a stress. As we noted in the chapter "Sensitivity analysis", the lookback period is not changed one day at a time, but if the past 250 days did not contain a stress, it is extended by half a year.

Stress is not treated at the product level, it is defined at the level of the products that are traded the most, i.e. when these products experience stress, this automatically applies to all the other products within their product group. Currently on the Hungarian market, the following products are examined for a stress period in the lookback period: the most traded equities were considered to be the blue-chip equities, i.e. OTP, MOL, MTELEKOM and RICHTER, while in the case of foreign currencies, the EUR/HUF, USD/HUF, EUR/USD and GBP/USD are traded the most.

Nevertheless, measuring stress is not straightforward, as there is no commonly accepted methodology for this. In the literature, there are some stress indicators containing several financial indicators, based on which stress is attempted to be condensed into a single indicator, for example:

- Kansas City Financial Stress Index (KCFSI) (*Hakkio – Keeton 2009*)
- Financial Stress Indicator of Canada (FSI) (*Illing – Liu 2006*)
- Composite Indicator of Systemic Stress (CISS) (*Holló et al 2012*)
- Cleveland Financial Stress Index (CFSI) (*Oet et al 2015*).

However, in the case of CCPs, the use of these indicators does not appropriately show the actual stress situations as in the case of other financial institutions, since for CCPs, absolute price changes matter, they usually have a monopoly on the market, they have balanced positions, their exposures are symmetrical, they have a guarantee fund and the margin is path-dependent (*Berlinger et al 2016*). Consequently, a "bespoke" stress indicator should be prepared based on *Berlinger et al* (*2016*). Therefore, we propose that CCPs use their own definition and methodology for quantifying stress, rather than using stress indices that can be found on the market.

We propose the following definition for stress, taking into account the EMIR's 99 per cent requirement for determining the margin and the steps of establishing the margin that we have presented so far: the expected shortfall (ES) at the 99 per cent significance level knocks out the initial margin. This is equivalent to looking at the VaR at 99.6 per cent (assuming that we use the delta-normal method) (*Yamai – Yoshiba 2002*). We use this method because the stress must refer to a rare and extreme period on the market. We believe that if the ES exceeds the margin, it may entail very significant price movements on the markets, which can be justifiably referred to as stress. In order to identify all stresses as accurately as possible, the ES calculation is not based on equal-weighted standard deviation but either the current equal-weighted or EWMA standard deviation, whichever is greater. Furthermore, the initial margin level is based on $MINmargin_t$ rather than the margin, since we do not wish to take into consideration the effect of the margin band. The latter primarily serves the purpose of keeping the margin as stable as possible, it has no actual buffer-increasing and thus margin-increasing effect.

*Figures 11–12* show the stresses in the individual products. In both figures, the points denote the days when stress occurred in the given product, while the coloured areas indicate the periods when the lookback period would have had to be extended, i.e. when no product from the product group experienced stress in the preceding 250 days.

**Figure 11**
**Stress in equities**

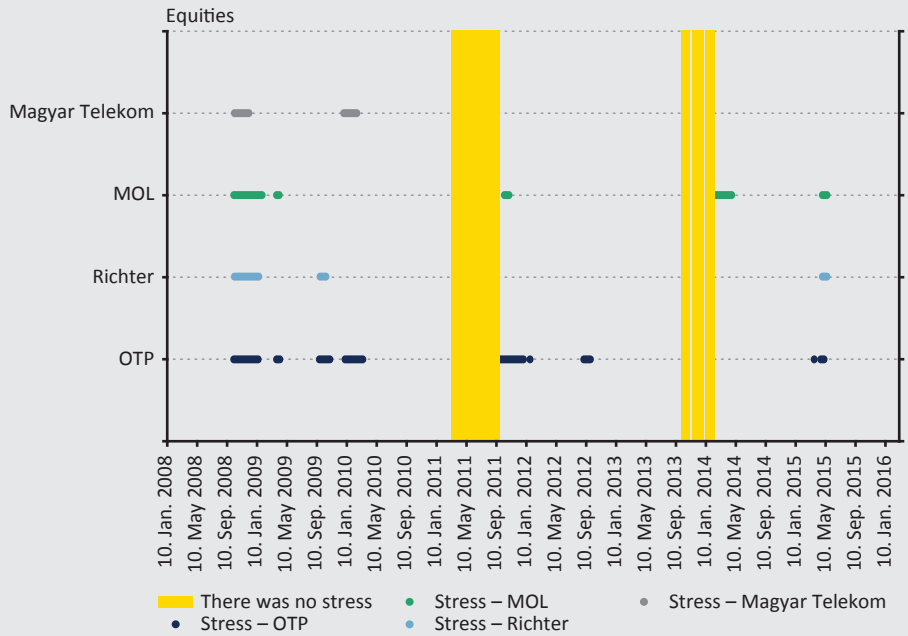
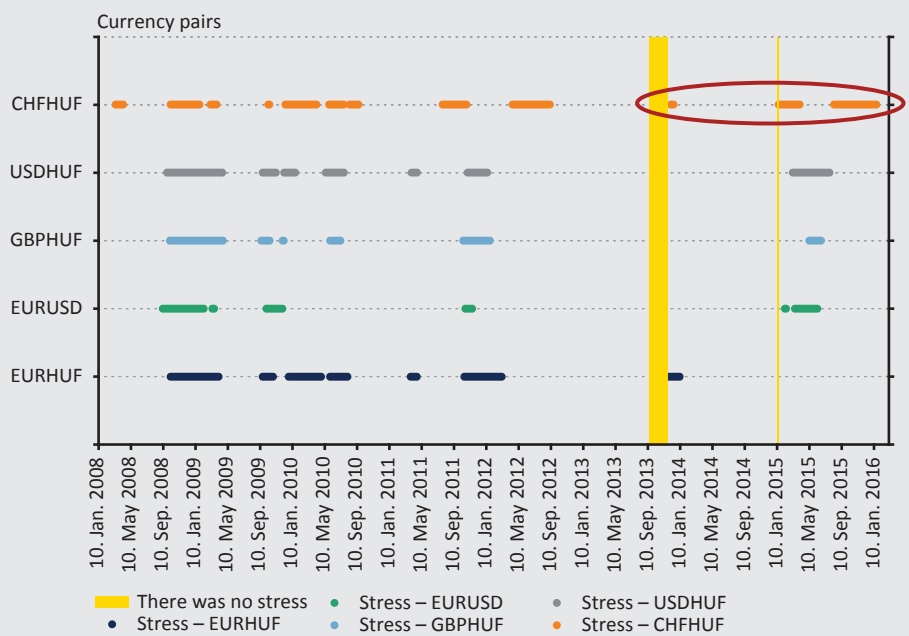



**Figure 12**
**Stress in foreign currencies**



In *Figure 12*, in the case of foreign currencies, the circled stresses do not matter from the perspective of stress in the case of CHF/HUF, because since the end of 2012, CHF/HUF was not among the most traded products.

## 6. Conclusions

In line with its objective, this study presents a new margining procedure, which satisfies the risk management requirements of regulators, the market and central counterparties. Our main results are the following:

a) Reflecting market developments: Determining EWMA-weighted standard deviation in addition to equal-weighted standard deviation while establishing the risk measure

b) Stable margin: The use of a margin band

c) Automatic and objective treatment of the procyclicality buffer: The exhaustion and build-back of the procyclicality buffer based on the relationship between the two standard deviation values that are weighted differently

d) Few expert decisions: A) The creation of margin groups, within which the parameters are uniform; B) Establishing the values of the liquidity and the expert buffers based on the results of the backtesting and the sensitivity analysis; C) The definition of stress for the appropriate establishment of the lookback period

Our model is based on a value-at-risk model with a 2-day liquidation period and 99 per cent significance level prepared with the delta-normal method, in which the lookback period is 250 days. Two parameters of this model, standard deviation and expected value, were determined in a way to ensure that market developments are reflected as effectively as possible, which was achieved through the establishment of the EWMA-weighted standard deviation parameter in addition to the equal-weighted standard deviation. The margin calculation was always based on the standard deviation that yields smaller values. Furthermore, the procyclicality buffer required by the regulatory authority was also exhausted and built back based on the relationship between the two different standard deviation parameters, thereby avoiding the need for hinging the treatment of the procyclicality buffer on external expert decisions. The establishment of the other buffers (the liquidity and expert buffers) was based on the results of backtesting and sensitivity analysis, also to ensure a quantifiable basis for the value of the buffers. The margin groups, within which the parameters are treated uniformly, were also set up in a way to minimise expert decisions. One parameter, the lookback period, could not be determined during backtesting and sensitivity analysis, since this would have required the definition of stress, for which we also provided a solution. Stress occurs on the market if the minimum margin is exceeded by the expected shortfall value at the

99 per cent significance level, where the standard deviation parameter is yielded by either the equal-weighted standard deviation or the EWMA-weighted variety, whichever is greater. The final requirement in connection with determining the margin was that – despite effectively reflecting market developments – it should be as stable as possible, which can be achieved through the use of a margin band in the methodology we have presented.

All in all, the use of this new methodology enables central counterparties to meet the legal, risk management and market participant requirements with respect to a methodology for determining the margin.

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# Thoughts about the Life Work of Kenneth Arrow

*Péter Medvegyev*

Kenneth Joseph Arrow is one of, and perhaps, the most important figures of modern economics. He was born on 23 August 1923 and died recently, on 21 February 2017. Perhaps it is interesting to note that although Arrow was born in the United States, his parents were Jewish immigrants from Romania, who devoted great attention to the education of their son and thought that the main tool of social progress is obtaining knowledge and holding his own in the schools.

In order to understand the intellectual legacy of Arrow and to exactly determine his place in economics, as always we must first briefly outline the precedents. Arrow's scientific achievements are based on three pillars or antecedents. The first is John von Neumann, the second is operations research, the third is the economic and political circumstances of the 1950s.

Let us start with John von Neumann. Neumann is a typical representative of the scientific generation appearing after the collapse of the Austro-Hungarian Monarchy, which fundamentally re-evaluated and transformed the world of science. Naturally, empires are not built from one day to the next nor do they disappear from one day to the next. Although the Austro-Hungarian Monarchy disappeared from the stage of history politically after World War I, it lived further for at least fifty years in schools, in scientific norms, in the world view on science and in philosophical systems. In the case of Neumann, unparalleled talent was coupled with unparalleled education. Hence, we can safely call John von Neumann the Beethoven of mathematics. His works are simultaneously characterised by elegance, universality and preciseness. Most thoughts stemming from Neumann are cited verbatim in the corresponding textbooks even after fifty years. I think that the economic works of Neumann are not among his most successful ideas, but the enormous prestige of his person opened the scientific world to the mathematical economists. Mathematical economics was born, so to speak, with the blessing and direction of Neumann. On the one hand, Neumann had raised a series of technical elements that would play a fundamental role later on, for example the transformation of equalities to inequality and complementarity, emphasising the duality of economic models, and the introduction of the minimax, the saddle point

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DOI: http://doi.org/10.25201/FER.16.2.148155

and economic equilibrium. On the other hand, however, and this is crucial, he accepted – and actually considered – the mathematical description and analysis of economic processes as especially important. It is often the case in mathematics that the counterexample better clarifies the statement than the statement itself. It is, therefore, worth citing the case of Louis Bachelier, who – in the course of the examination of stock exchange price movements – discovered continuous time random walk, a process and phenomenon of great importance. At the same time, the leading mathematicians in the age of Bachelier thought that stock exchange price movements are not an issue which a self-respecting mathematician has to examine, and thus the career of Bachelier cannot be called a success story, to put it mildly. Naturally, his works were re-discovered later on and became known thanks mainly to Kolmogorov. At the same time, the phenomenon discovered by him was first examined only because of its role played in physics and it became part of economic thinking much later.

The other important antecedent is the birth of the modern science of operations research. In the mathematical sense, operations research is an extension of the classic theory of optimisation. The essence of this extension is that inequalities are also allowed among the conditions, instead of just equality conditions. Naturally, the classic result, which attracted great attention at its time, was the theory and practical application of linear programming. The most important observation is the discovery of the importance of convex sets in optimisation. Previously, the necessary conditions building on differentiation had dominated in extreme value problems. Linear programming and its generalisations were built on a completely new approach. The main tool is not differentiation, but the separation theorems of convex sets and the duality theorems building on that. At that time, linear programming and its extensions were sort of an intellectual fashion, similar to mathematical finances and the pricing of derivative products forty years later. Many people thought that linear programming was a mathematical tool whose knowledge may lead to obtaining jobs and building a career easily, and thus students jostled for courses in this topic and countless textbooks on the subject were prepared, and the relevant theorems constituted the subject of discourse in the world of the academy and the corridors of universities.

Whereas the first two factors were elements appearing in the organic internal development of mathematics, the third element is a clearly political, economic and social philosophy factor. The world arising out of the bloodbath of World War I and then World War II faced a serious and historic dilemma: whether development continues in a sort of a centralised system, built on the cult of a leader, or whether a social picture building on market self-organisation will be the norm to follow. Looking back from the current vantage point, the gravity of this problem perhaps cannot be perceived, but this question had arisen as the fundamental problem

deciding everything, which permeates everything, which determined the fate of hundreds of millions of people in the strictest sense of the word. The entire life work of Arrow can be built around answering this dilemma. According to his first result, the Arrow paradox or Arrow's impossibility theorem, it can be shown mathematically in the case of relatively evident conditions that only one method of harmonisation of the various preferences exists if the preferences of a single person, the dictator, prevail. The analysis, extension and refutation of the Arrow paradox is an independent academic field. At the same time, the extensions and mainly the refutations follow largely incorrect paths and, in my opinion, their value is very small. Arrow did not want to solve or create a mathematical problem, instead he wanted to find an explanation for one of the saddest and most exasperating phenomena of historical development. The objective of science is not the creation of a technically attractive alternative reality, but the explanation of phenomena that can be observed in the real world. With respect to society and history, the most disappointing fact is that while systems and theories attempting to redeem the life of people have been made, are made and perhaps will be made as well, all of those have made bed for the terror of autocrats and dictators. For Arrow, the notion of a dictator is not an abstract mathematical construction or a jolly logical problem. He saw dictators grinning and waving on the front page of newspapers day by day. The main experience of his young days was how the preferences of one dictator affected the people of a country of great culture, and how that remained captive even under the pressure of enormous pincers closing in hundred metres from his bunker. Not to mention the fact that the two sides of the pincers were moved by the will of another dictator. The Arrow paradox indicates the road of further progress very clearly and its message is very simple: anybody who advocates a sort of social harmony in the name of social justice opens the door for the coming of evil. A society cannot be maintained without breach of interests. Everybody who promises the opposite of this brings war, dictatorship, destruction and the Apocalypse, irrespective of his/her intentions. And it has to be emphatically emphasised that this extremely pessimistic statement is true – or is incidentally not true – not because of a trickily formulated mathematical problem. This is a historical experience which was explored, explained, illustrated and modelled by Arrow very tangibly and elegantly.

The second fundamental result of Arrow is also partly related to dictators. It is an often mentioned argument in connection with dictators that they direct societies efficiently. The classic argument is that although thousands of people were killed, imprisoned or exiled in connection with the coming to power of Napoleon III, Paris became a splendid metropolis during his rule. But we can also refer to the notable remark of the classic age that Augustus inherited a Rome built from mud and he left a Rome built from marble. And we can also recall the roads built by Hitler, or that Stalin shot a country ploughing with wooden plough into the space age. Of course, the legitimate question is what does efficiency mean? Everything has its price, and

cost and benefit must be considered simultaneously in the case of efficiency. It is thus evident that we should identify the efficient statuses with Pareto efficiency, i.e. with such statuses in which the result cannot be increased further with the given level of costs, or in the case of which costs cannot be decreased further in the case of maintaining the results. According to the fundamental theorem of welfare economics, stemming from Arrow and bearing his name, equilibrium statuses are efficient, and in the case of certain conditions efficient statuses can be transformed to equilibrium status. It should be emphasised that in the Arrow theorem we can choose from the individual efficient statuses with the income distribution parameters. The key idea is the notion of the equilibrium, which is the intellectual counterweight of the "ideal" status prescribed and planned by the dictator. The notion and widespread use of equilibrium is questioned by many in economic theory, perhaps not even completely without foundation. Thus, it is worth talking about it a bit. First, it is worth noting that the notion of the equilibrium is used in several different senses. In most cases, it is customary to think of equilibrium in a dynamic sense, associating as example to the balls rolling down from a slope. However, the concept of equilibrium used by Arrow is not the result of a dynamic movement, and the equilibrium status does not represent an ideal status by any means. In fact, it is more like a trap, from which no escape is possible without external assistance. When dealing with social issues the first obvious question is why the losers of the social system come to terms with their situation, and why they do not attempt to do something for example against their poverty and unfavourable situation? The answer is very simple: because they are in an equilibrium situation, and thus they cannot escape from this status on their own, since their present status is the best status achievable for them, provided that their environment does not change their situation either. No matter that someone is unemployed and no matter that there are work opportunities at another place, moving from one place to another place is impossible because of high real estate prices. In the Arrow model everybody optimises, but they obviously do this with the specific distribution of wealth and incomes. People are not happy in the equilibrium, it is only that they cannot change their situation. Arrow's fundamental theorem of welfare economics can be considered as a key theorem in two senses. On the one hand, the mathematical tools and conditions necessary for the verification of the existence of the equilibrium, his later main work, appear here; on the other hand, this result records the sphere of possible social movements, since it connects the notions of the equilibrium and efficient statuses. It is worth indicating in terms of mathematics that it is again a very simple theorem. Indeed, the proof includes the apparent application of the theorem about the separation of convex sets. The researchers of the age routinely applied such types of considerations in the literature of linear programming. What makes the theorem important is the fundamental description of the operation of the society and not the mathematical contents or the exact discussion of the conditions. On the one hand, efficiency is perceived not only in

dictatorial systems, market competition also results in the efficient distribution of resources, but on the other hand, it sheds light on another important factor, namely that not only the individual is responsible for the destiny of the individual. Poverty and distress are the responsibility of the entire society, since the destitute have no other choice in an equilibrium. Moreover, which of the efficient statutes is realised essentially depends on the other parameters of the society, mainly on the distribution of wealth and incomes. The fundamental theorem of welfare economics is not simply a mathematical model, but a framework for thinking, in which the social problems can be formulated and discussed. If the set of efficient and equilibrium statuses is identical, it is sufficient to leave the market statuses on their own and concentrate on the indirect handling of environmental conditions in the course of state intervention. The separation of economic participants aiming for equilibrium and economic policy influencing the exact parameters of the equilibrium is the main starting point of modern economic thinking. But the opposite reasoning is possible, too. If economic policy influences prices and market relations not indirectly, it inevitably results in an inefficient status. In other words, fixing prices restricts equilibrium mechanisms and entails only negative consequences, and these methods do not assist the destitute, whose situation we would like to improve in the given case.

With this, we have reached the main result of his life's work, the proof of existence of economic equilibrium. According to a legend known at all the universities of the world, a professor not much liked by the students discussed the fascinating properties of a mathematical structure in hundreds of papers, until eventually a first-year student of an end-of-the-world university proved that the structure is either empty or it only includes some trivial elements. Hence, the mathematical proof of the existence of economic (general) equilibrium had been an old wish of economic thinking. The problem had been stated in a more or less exact mathematical language by French economist Léon Walras as early as the 1870s. The life work of Walras caught on in the English-speaking countries relatively slowly, but in the 1950s the model and the related mathematical problem was already known by everyone. Naturally, it was not Arrow and his co-author Gerard Debreu who were the first to prove the existence of equilibrium in a mathematical model motivated in terms of economics. The line of predecessors goes back to John von Neumann, who introduced the notion of the saddle point in the framework of game theory, which was later generalised by Nash to the notion of the Nash equilibrium, bearing his name today. Actually, Nash's theorem, which verifies the existence of the Nash equilibrium, already includes in an extremely abstract form the conditions providing the existence of the equilibrium of the model of Arrow and Debreu. Building on the article of Nash, Arrow and Debreu described a schematic economic model and showed that in the model described by them the existence of the equilibrium defined by them follows from the existence of the Nash equilibrium

of the Nash abstract game theory model. The mathematical key of the solution is the Brouwer fixed-point theorem and the generalisation of that. The most famous generalisation of the theorem is known as the Kakutani fixed-point theorem. It is worth emphasising that Kakutani proved his theorem to simplify the proof of the Neumann fixed-point theorem. On the other hand, Neumann verified the existence theorem of the growth model bearing his name with his fixed-point theorem. The Arrow-Debreu model divides economic participants into two groups. On the one hand, there are consumers, who maximise the utility that can be achieved by them given their income. In other words, they solve an extreme value problem with parametric conditions. The most important parameter of the problem is income, which stems partly from selling their wealth, and partly from the part they receive from the profit produced by the producers, the other group of the participants. Producers and consumers concurrently create demand and supply for the products appearing in the model. It is customary to refer to this model as the model of general equilibrium since equilibrium exists concurrently on all the markets, i.e. generally. The equilibrium factor which settles the two sides of demand and supply is the movement of prices. In other words, according to the model, only prices are capable of settling demand and supply and create the market equilibrium.

It is not an exaggeration to state that the proof of the existence of the general equilibrium was the most significant achievement in economic theory in the 1950s. The fact and method of the proof provided extreme self-confidence to contemporary economic researchers. After eighty years, a mathematical problem motivated economically was proven elegantly and clearly. At the same time, it also turned out that the pioneering contribution of leading mathematicians was necessary for the solution. Not without foundation, mathematics has always been the sample science for scientific researchers, with a glorious pedigree of thousands of years with its axiomatic method. There is some fuzzy element if something cannot be captured mathematically. Naturally, there are important areas of knowledge and there are the sciences. And although economics had always been a storehouse of useful knowledge (who would dare deny this), with the proof of the Arrow-Debreu model, it entered the Valhalla of scientific theories, or at least many people thought so.

For my part I, prefer to concentrate on the shortcomings of the model and analyse with what conditions the verification of the existence of the equilibrium was successful. The most important conditions are the various convexity conditions. All of the sets and functions appearing in the model are in some way convex or concave. According to the interpretation of the convexity conditions, this means that there are decreasing returns to scale. In addition to decreasing returns to scale, the other deficiency of the model is that the representation of time and randomness is extremely schematic in the model. Despite all of these, not much success has been achieved – during the sixty years passed since then – in modifying the conditions

of the model, and in exceeding that either mathematically or economically. Tens of thousands of dynamic and stochastic generalisations have been born, but the basic construction can be perceived in all the generalisations in a way that cannot be surpassed. Everyone who was alive and active received a Nobel prize in economics for the development of the Arrow-Debreu model and the precedent of that, and, without doubt, it provides an example for every economist until today with respect to how an economic problem has to be stated and solved mathematically.

After the verification of the existence of the Walras economic (general) equilibrium, investigation of the uniqueness and stability of the equilibrium has arisen evidently. However, the examinations in this direction have essentially produced only negative results. The reason for this is that the so-called Walras Law, which plays a key role in the Arrow-Debreu model, does not sufficiently restrict the dynamic properties of market systems. According to the statement of the Walras Law, in the case of each price system, irrespective of whether the price system is an equilibrium price system or not, the amount of value of demand and supply is always identical, since each economic participant represents such demand which is identical to its income, and income is generated in such a way that the economic participants offer some resource. In the language of mathematics, this means that the excess demand function, defined as the difference of demand and supply, is always perpendicular to the price system belonging to it. In terms of mathematics, the problem stems from the fact that it can be shown that each function that has the property that the argument of the function is perpendicular to the value of the function is an excess demand function of a suitable Arrow-Debreu model. But this is only one of the countless mathematical considerations that have been inspired by the model. It is difficult to find a result of modern economics that is not directly related to the Arrow-Debreu model. In addition to the direct connections, the style and approach followed by the authors decisively modified the science of economics.

Naturally, the life work of Arrow was not restricted to the development of the general equilibrium theory, but it is indisputable that this is his most famous work and these results are cornerstones of thinking about the economy that have not been worn by the extensive examination of the last decades which has been steadfast and extremely detailed. Kenneth Arrow was undoubtedly an unparalleled thinker, whose greatness in the history of science can only be measured with John von Neumann, his great predecessor. I think that this comparison is an honour with respect to both giants of science. Similarly to Neumann, Arrow has left his mark on countless areas. His wide-ranging interest and exceptional mathematical talent made it possible to create enduring results not only in economics, but in the area of pure mathematics as well. I will not undertake to enumerate his achievements, as the number of these is too great and too wide-ranging for me. But I think that I can undertake to outline and evaluate the method of approach followed by him

and demonstrated as an example. It is a scientific principle of the methodology permeating the works of Arrow that he thought that economics was mature enough to state its questions in the form of mathematical models. Moreover, he examined the mathematical theories belonging to the models with great joy and devotion. He had the unrivalled ability that he could see the mathematics in economics problems and the economics in mathematics. Mathematical talent is a common ability that can be developed in most people with good upbringing and appropriate education. The main problem of mathematics is that it is essential for its development that it should not separate in some way from the external impulses and it should be motivated sufficiently by other sciences. The generation of economists whose best known and most important figure was Arrow has had an enormous effect on the development of mathematics, since it opened the sphere of applications of mathematics and broke the connection of mathematics and the natural sciences in a good sense. In terms of modern mathematics, economics is a legitimate area of application to exactly the same extent as physics or any other natural scientific problem. Moreover, several natural scientists observed that the mathematical exactness of modern economists and their commitment to mathematical precision is much greater than that of their natural scientific colleagues. I also often hear the remark that students with an economics degree are not behind students majoring in other areas in terms of their preparedness in mathematics, computer science and statistics. If this is true, one of the reasons for this is the model which was received by the society of economists from the predecessors. From those predecessors who had learnt it mostly from Kenneth Arrow how a problem of economics has to be stated and analysed. At the same time, let me make a last remark. Style is often more important than the result itself. Modern economics is undoubtedly written in the language of mathematics. Yet language often restricts the message. In the case of Arrow, the classic philosophical notions of content and form were balanced and neither side repressed the other. The key of his greatness lies exactly in this equilibrium.

# Behavioural Finance and Consumer Loan Contracts

*Barna Fömötör – Anett Parádi-Dolgos – Zoltán Sipiczki*

*Due to the situation that has emerged in the wake of retail lending, particularly foreign currency lending, every circumstance that leads to excessive systemic risks must be taken into consideration, namely the absence of consumer self-control, under- and overreactions and the risks stemming from intertemporal retail consumer decisions. The authors attempt to make consumer decisions understandable by analysing biased intertemporal models. Based on the relevant literature, the authors use a behavioural science approach to shed light using on the underlying factors of action or passivity, the factors that introduce bias into consumer rationality and their potential management, in particular asset regulation and the fair bank acts, deeper and more comprehensive regulation of legal relationships, keeping in mind not only the key interest of consumer protection, but also the predictable and sustainable long-term functioning of financial institutions.*

**Journal of Economic Literature (JEL) codes:** D18, D90, L15

**Keywords:** retail indebtedness, intertemporal decisions, systemic risk, regulation

## 1. Introduction

Consumers' consumption-related decisions are often made not on a rational basis but in a manner describable using intertemporal choice models, accompanied by under- and overreactions. The organisations offering products and services are often familiar with and even exploit these decision asymmetries. They develop products and offer services for consumers using this acquired knowledge. The protagonists of the system of financial intermediation play a particularly important role. These protagonists play a key role in making available the funding needed for consumption, thereby determining future consumption. This lends particular relevance to the investigation of this topic.

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The manuscript was received on 15 August 2016.

DOI: http://doi.org/10.25201/FER.16.2.156169

Corporations, but particularly and specifically financial institutions, enhance and catalyse the decision-making process based on their knowledge of the key drivers and motives of consumer behaviour in an effort to maximise profits in a shorter amount of time. This behaviour necessarily fosters a biased, non-rational decision-making process that focuses on short-term benefits and ignores the medium- and long-term drawbacks and negative consequences. (Paradoxically, the characteristics of such behaviour exhibited by the management and shareholders of financial institutions are identical to those of irrational consumer conduct.) This process is further reinforced by information asymmetry and consumer impatience. Thus from the perspective of our topic, it is necessary to first analyse biased intertemporal models which give us an understanding of consumer decisions. Understanding the identified causes and motives can bring us closer to resolving the issue. Using a behavioural science approach, we can gain an understanding of the underlying factors of action or passivity.

## 2. A history of intertemporal decisions and the discounted utility model

Intertemporal decisions were first modelled by *Fischer* (*1930*) in 1930, who found that a comparison of the current perceived utility at various points in time depends on the marginal rate of substitution for the various points in time. The marginal rate of substitution is determined by the time preference and declining marginal utility. The discounted utility model created by Paul Anthony Samuelson was a major step forward in this area; it spread quickly and became highly popular mainly thanks to its simplicity, which resides in its capacity to condense numerous heterogeneous and diverse (psychological) factors into a single parameter, the discount rate, and regarding this discount rate as constant. On this basis, the utilities emerging at different points in time became easily comparable. *Samuelson* (*1937:156*) wrote that "during any specified period of time, the individual behaves so as to maximize the sum of all future utilities, they being reduced to comparable magnitudes by suitable time discounting. The individual discounts future utilities and some simple regular fashion which is known to us." Therefore, the model must be associated with positive time discount rates, i.e. a more distant point in the future will always have a lower perceived utility and will therefore reinforce consumption that is closer to the present. The discounted utility model treats the discount factor exponentially, in other words the ratio of perceived utility linked to current and future consumption will change constantly per unit (of time). The discounted utility model is therefore characterised by a constant discount rate and a time-consistent preference (*Bölcskei 2009*).

### 2.1. Hyperbolic and quasi-hyperbolic models describing present-biased preferences

It is no coincidence that the set of criteria presented above was increasingly questioned and contested. The constant discount rate and the consistent preference over time appeared unrealistically regular, even norm-like, with respect to which empirical studies yielded results that called the model into question. However, numerous experiments conducted in the context of behavioural economics refuted the discounted utility model. As a result of these, it also became clear that the behaviour of participants can be better described using a different discounting model. Hyperbolic and quasi hyperbolic models that describe present-biased preferences emerged from further research.

The model was amended several times before in *1992 Loewenstein and Prelec* finally created generalised hyperbolic discounting, which was capable of addressing numerous earlier anomalies and offering a more general description of human behaviour. However, it was more difficult to apply in more complex models (*Neszveda – Dezső 2012*).

The main tenet of quasi hyperbolic discounting is associated with *Phelps and Pollak* (*1968*) In essence, the discount rate that can be assigned to periods is inconsistent when choosing between periods and associates a higher discount rate to short-term time preferences. In comparison, quasi hyperbolic discounting also describes behaviour that is inconsistent over time similarly to hyperbolic discounting, but the model is simpler and easier to manage compared to hyperbolic discounting models (*Nagy 2011*).

### 2.2. Significance and applicability of hyperbolic and quasi hyperbolic models

"The significance of hyperbolic and quasi hyperbolic models lies primarily in the fact that they allow us to describe and explain human behaviours that were formerly indescribable" (*Bölcskei 2009:1027*). As a result of present-biased preferences, perceived utility associated with current consumption is assigned a greater weight than perceived utility associated with future consumption. Exponential discounting applied in a neoclassical context results in greater utility of current consumption compared to the utility of consumption at any later point in time. However, delaying future consumption as much as possible decreases the associated utility not just exponentially, but to an even greater degree. With regard to this, the individual becomes interested in consuming comprehensively, even in excess of his current financial means, or more precisely, to maximise the associated perceived utility. However, the latter depends on numerous other factors, and thus developments in the marginal utility of consumption, the size of discount rates, the expected developments in future income and interest on credit jointly determine whether the individual borrows or not.

The hyperbolic discounted model has become a popular area of application for studies of self-control issues. Why are hyperbolic models well-suited for describing issues of self-control? Self-control is fundamentally assumed of consumers by traditional neoclassical economics based on rationality. Rational consumers are, for instance, capable of ranking things based on utility according to the *Neumann and Morgenstern* (1953) rationality system. The consumer therefore has adequate self-control, in other words, he will not make irrational decisions precisely because he can control himself. The problem with this is that in reality, consumers often make irrational decisions that traditional economics are unable to adequately explain.

The matter of self-control issues provides a tool for giving an approximation of reality. In the case of an individual with self-control issues, divergence from rationality can be explained with this factor. Several authors modelled this, for instance *Camerer et al. (1997)*, who concluded in their paper on New York taxi drivers that drivers often defined their operation and the duration of their work time based on heuristic decisions. The authors argue that adaptive models rooted in psychology have better forecasting capacities in cases where the area under review is shaped by human decisions. Accordingly, hyperbolic models are able to adequately handle the situation: if we are unable to keep the desires embodying preferences under control, preferences automatically shift in time towards the present, we want to fulfil them as soon as possible and live out our desires. The mathematical formalisation of behavioural finance, which we will not address here for the sake of brevity, is further hindered by the fact that decisions are not single-periodic, but rather multi-periodic and are strongly shaped by risk and uncertainty (*Merton 1969*).

Broadly speaking, present welfare utility based on hyperbolic models is always far higher than future utility and therefore sudden profit in the present is much more attractive and likewise, immediate expense is always more painful than future expense.

## 3. Application of behavioural economic findings and intertemporal models in the financial sector

Consumer loans in a “legally regulated” framework – including a legal framework for enforceability – originated in the early 20th century. As their national economic significance increased in the wake of their effect on consumption, their widespread dissemination became inevitable. This process entailed the emergence and excessive growth of inadequate lending practices that triggered adverse social consequences that far exceeded the earlier periods.

It should be taken into account that the present-future exchange also works “backwards”, in other words an individual can take out a loan to be able to consume

in excess of his current financial means by giving up future consumption as a result of an inconsistent present-biased time preference. Consumers' time inconsistent behaviour presented above is not a novelty in the realm of bank lending.

Credit cards, which are becoming increasingly popular and are being used by more and more consumers in Hungary, are a typical form of consumer credit and their emergence has been the subject of widespread research. The following section presents the main findings of this research.

*Laibson – Repetto – Tobacman* (*2003*) reported that the ratio of credit card debt in the United States is salient, suggesting that consumers borrow a lot at a high cost. This process already includes irrational elements in and of itself, as the cost of credit card debt is far higher than money market interest rates. The paper also highlighted that the ratio of long-term de facto illiquid savings is also high, which assumes a hyperbolic discounting preference and fundamentally calls into question the possibility of exponential discounting. Consumer naïveté is identified as a possible explanation in the paper. The case presented in the *Ausubel* (*1999*) paper, considered a novelty at the time, is now considered a classical example of consumer overreaction. According to the study, credit card applicants are unable to estimate the future balance of their credit card with any measure of accuracy and expect to borrow lower or far lower amounts. This is due to the fact that they are unable to accurately recognise credit offered at very low interest during the introductory period and by the time this preferential period expires, the consumer is faced with an excessive repayment at far higher interest. In this scenario, consumers underestimate the loan amount actually taken out in the future and simultaneously overreact to the preferential low interest rate intended as an introductory tool. Besides under and overreaction, *Ausubel* (*1999*) also emphasised the phenomenon of adverse selection whereby if the consumer took advantage of the credit conditions offered with the introductory period instalment, you will have greater propensity to take out a larger credit amount. This finding simultaneously signals the risk of such behaviour to the creditor, as these customers are far riskier. By and large, the findings of the study may indirectly point to the emergence of moral hazard. The lending financial corporation is aware that with preferential offers, they can attract a customer base comprising increasingly more and increasingly riskier consumers. This process may therefore result in the creation of a stock of bad quality debt.

In their study of classic purchase loans, *Stango and Zinman* (*2009*) identified as a fundamental issue the fact that consumers are unable to adequately evaluate the actual cost of offers due to their illiteracy. As they are unable to do this, lacking the intellectual faculties and financial literacy, they are more likely to accept offers that are more disadvantageous for them. The paper also revealed that adequate information of consumers did not change the situation, nor did market competition

resolve the issue. Although a stock comprising consumers who seek out a more expensive service is more profitable in the short run, it leads to the emergence of credit risk in the medium and long run.

*Koltay and Vincze* (*2009*) summed up the essence of this as follows: "The most common causes identified are usually non-exponential discounting, naïveté and excessive self-confidence, alongside cognitive flaws such as the incapacity to perform mathematical and financial calculations and errors in objectively defining the decision-making situation. Evidence of hyperbolic (non-exponential) discounting, naïveté and excessive self-confidence tend to be indirect, and these hypotheses taken together seem better suited for characterising behaviour than exponential discounting and the assumption of total rationality." (*Koltay – Vincze 2009:513*). Banks offer numerous products to their retail clientele that specifically take advantage of this present-biased time preference. The *Sebestyén et al (2011)* paper contests that dynamically time inconsistent preferences played a critical role in the emergence of the issue, but the authors concede that waived upfront fees and preferential initial period interests are common methods in Hungarian lending today. Today, consumer loans that do not have to be repaid during an initial grace period have also become widely familiar to and accepted by consumers. Such offers are particularly attractive during busy periods of buying, for example before holidays. Bank offers that propose the soonest possible utilisation of the loan amount instead or alongside preferential repayment or a grace period are also based on the characteristics of a present-biased time inconsistent positive time preference. Pre-paid deposit interest schemes, where the credit institution credited the interest on the deposit made by the customer at the time the deposit was made also took advantage of intertemporal decision-making bias, allowing the customer to get the interest at the beginning of deposit maturity, to use or consume it immediately, with the bank essentially having lent the deposit interest to the consumer.

Bank lending can easily lead (and has led) to consumer borrowing where the debtor's inconsistent time preference, optimistic and excessively self-confident estimation of his future financial situation spur him to borrow credit that he is later unable to repay. The information advantage of financial intermediaries also contributed to the emergence of this lending practice. It is actually more accurate and professional to refer to information asymmetry rather than an information advantage, as bank products and services almost always require special know-how that most customers fully lack or only partially possess. The latter scenario may unfortunately result in even more severe consequences in the absence of the right professional background knowledge and general professional know-how than a total lack of professional know-how.

In order to gain more comprehensive insight on the topic, the matter of consumer impatience should also be addressed. Consumer impatience emerges when consumers are compelled to forgo consumer goods and delay their purchases for a given period of time. "Once the reason for temporarily forgoing consumer goods is resolved, deferred consumption is compensated for, due to consumer impatience. In such scenarios, the marginal propensity to consume is much higher" (*Tóth – Árvai 2001:1024*).

Although these behavioural patterns are detrimental in and of themselves, they may cause substantial macroeconomic harm if they affect a large portion of society. "There is such a severe lack of financial literacy within society that it impedes recovery and consolidation during cyclical economic crises" (*Kovács 2015:87*).

In line with the one-off examples and the findings of the literature, the affected consumer decisions are shaped by behavioural economic drivers. In other words, the irrational causes of consumer decisions identified by behavioural economics are: present-biased positive (time) preference, excessive optimism, excessive self-confidence, information asymmetry and information processing shortcomings. The increasingly severe problem that emerges from this calls for an examination of the optimal potential solutions. Among the potential solutions, regulation is the one we consider most effective.

## 4. Emergence and escalation of the issue

Understanding the issue and the regulatory solution to it calls for an overview of the main features of foreign currency lending that emerged in Hungary and of the situation that preceded the introduction of the 2015 regulation which ultimately led to the adoption of the regulation.

"As a result of the excessive race for growth, the Hungarian banking system mobilised significant external funding, primarily through parent banks. The Hungarian banking system consequently became very reliant on short-term foreign currency liabilities even by international standards, the loan-to-deposit ratio spiked even by regional standards and departed from the 100% figure considered sound. This is how cheap external funding increased risk-taking and fuelled procyclical lending." (*Bethlendi 2015:21*)

In the context of foreign currency lending, a financial institution disburses the loan in the currency of its own country[1] and the debtor repays both the principal and interest to the bank in this same currency, but the loan amount is kept on record in a foreign currency, or is disbursed in a foreign currency (the disbursement currency

[1] I.e. where the branch office is located.

is the foreign currency) but is repaid in forint (the repayment currency is forint). Conversion is performed at the interest rate valid at the time of disbursement and repayment, as defined in the contract.

There were several fundamental issues with foreign currency lending, as loans were disbursed and repaid in forint but the loan was kept on record in a foreign currency, so the consumer in fact assumed the entire exchange rate risk. "Consumers who took out foreign currency loans assumed any potential exchange rate gain or loss. They obtained a right and an obligation on the foreign currency market, even if this was not their intention. Every forint by which the Swiss franc appreciated was their gain and every depreciation of the forint their loss. The latter could have been avoided with some sort of exchange rate insurance, but they did not buy foreign currency purchase rights or currency futures. If they had done the latter, they would precisely have lost the interest rate difference" (*Száz 2015:82*). In the majority of cases, this occurred for the long term; needless to say, it is impossible to model the exchange rate of currency pairs for this time horizon, in other words, foreign currency lending was in fact a product that could not be measured and as such, was extremely high risk.

The rational consumer expectation of Hungary joining the euro area and the adaptive exchange rate expectation that understandably developed in the population in the wake of the stable forint exchange rate when viewed from the time of contracting the loan, before the crisis, may have contributed to a portion of this borrowing (*Kolozsi – Banai – Vonnák 2015*). Oftentimes, customers who were not creditworthy for forint loans became creditworthy for lower-interest foreign currency loans, ignoring the exchange rate risk (*Bánfi 2013*). "A significant portion of Hungarian households contracting foreign currency loans was (would have been) uncreditworthy in the domestic currency, which is why they were not granted forint loans. Add to this the fact that there is of course no long-term banking solution that can make an uncreditworthy customer creditworthy, especially not by changing the currency of the loan" (*Lentner 2015:311*). Foreign currency lending spread because it could be accessed with lower repayment instalments compared to forint loans, but was also associated with an unmeasurable risk for the consumer as described above, which consumers most likely ignored, were unaware of and were incapable of understanding the root of the risk. This despite the fact that "contrary to households, the banking sector has a far bigger toolset for managing risks stemming from retail foreign currency loans" (*Kolozsi – Banai – Vonnák 2015:61*).

Unfortunately, no better example than foreign currency lending could be found to illustrate the behavioural economic issues, biased intertemporal decisions and undervaluation and overvaluation addressed in the previous section.

## 5. The Fair Bank Act

Act LXXVIII of 2014 on the amendment of Act CLXII of 2009 on Loans to Consumers and certain related acts (hereinafter: Fair Bank Act) created what was known as the fair banking system, which introduced transparent and understandable developments in consumer loan contract interest rates. The relevant stipulations defined in the statutes came into effect on 1 February 2015. "Legislators have extended the tasks of central banks worldwide. Central bank decision-makers themselves have reassessed the economic role of their institutions. In light of these changes, the economic responsibility of central banks can be interpreted as an obligation for central banks to be more attuned to the social impacts of economic processes." (*Lentner – Szegedi – Tatay 2015:39*)

According to the data of the Magyar Nemzeti Bank, "the volume of consumer loans peaked on 30 June 2010, representing an aggregate value in excess of HUF 8,647.9 billion. This figure then decreased continuously until 2014, but the volume of consumer loans still exceeded HUF 6,802 billion on 30 June 2014. Of this amount, forint consumer loans account for HUF 3,139.1 billion and foreign currency loans account for HUF 3,662.9 billion. Based on the foregoing, the legislator drafted a bill for the amendment of the Fair Bank Act in an effort to increase the level of consumer protection in the context of loan contract law."[2]

### 5.1. The main amendments

Act LXXVIII of 2014 on the amendment of Act CLXII of 2009 on Loans to Consumers and certain related acts addresses the following main issues:

#### *5.1.1. Enhancing the efficiency of the information obligation before contract conclusion*

The rational consumer framework not only means correctly interpreting information, but also requires having sufficient information for drawing correct conclusions (*Barberis – Thaler 2003*).

It is therefore paramount that customers be given accurate and sufficient information prior to concluding a loan contract. It is even a necessary condition that the contract text be disclosed earlier. The Nobel prize-winning work of *Daniel Kahneman and Amos Tversky* (*1974*) showed that in complex and risky decision situations, consumers often simplify the issue and make decisions based on earlier partial information, their subjective feelings, prejudices and rules of thumb instead of rational analysis.

[2] Statutory reasoning: Act LXXVIII of 2014 on the amendment of Act CLXII of 2009 on Loans to Consumers and certain related acts.

Thus, in order to allow consumers to make more effective and rational decisions, the act states that the creditor and the lending intermediary are required to provide information to consumers prior to contract conclusion. The should enable the consumer to assess whether the prospective loan is a good fit for his needs and financial ability. For instance, the publication online of loan contract templates by creditors is aimed at helping prospective borrowers make an informed decision.

This provision was badly needed because although there had been prior regulation against misleading consumers, the new regulation not only restricted misinformation but also addressed the conscious exploitation of the decision-making flaws and non-rational preferences of prospective borrowers.

*5.1.2. Other regulations*

The debt cap regulation came into effect on 1 January 2015 based on two main pillars. "The payment-to-income ratio (PTI) will limit the maximum initial debt-servicing burden as a percentage of customers' regular legal income, thereby moderating the accumulation of household debt. The loan-to-value ratio (LTV) will cap the maximum amount of secured household lending (e.g. mortgage loans) as a percentage of the value of collateral."[3]

For instance, the payment-to-income ratio can be calculated as follows:

Payment-to-income ratio = monthly debt service/certified net monthly income

This may clearly foster a reduction of the shadow economy, as borrowing in the future will only be possible taking into account declared legal income. In addition, short-term profitability may override long-term profitability on the creditor side in lending practice. In this scenario, competition emerges for the largest market share, which can be achieved amongst others by reaching increasingly risky borrowers. Internal bank debt cap rules may be loosened during this effort, which may warrant an externally defined debt cap that halts risk-increasing competition. Therefore, systemic regulation aimed at restricting excessive borrower indebtedness is capable of mitigating the emergence of systemic risks.

*5.1.3. Annual percentage rate cap*

The "Loan contract terms and changes therein" subheading of Act LXXVIII of 2014 on the amendment of Act CLXII of 2009 on consumer credit and certain related acts was supplemented with the following passage: "The creditor (…) cannot extend credit to consumers with an annual percentage rate that exceeds the central bank base rate increased by 24 percentage points. In the case of credit card contracts, payment account credits, or pledged collateral credits, the annual percentage rate

[3] The payment-to-income ratio limitation acts as a debt cap to protect consumers. Magyar Nemzeti Bank press release, 27 August 2014.

may not exceed the central bank base rate increased by 39 percentage points." Borrowers often fail to rationally assess their future repayment capacity. The annual percentage rate cap is necessary if a portion of consumers overestimate their future income and would accept irrational credit fees given their current situation due to the behavioural asymmetries presented in the previous chapters. *Fischhoff – Slovic – Lichtenstein* (*1977*) confirmed this excessive self-confidence, concluding that consumer expectations in which they feel fully confident only materialise with an 80 per cent likelihood in reality. From the perspective of our topic, the excessive optimism linked to future increases in income prevailing in behavioural finance may lead to excessive indebtedness if the consumer takes on debt that is too high in reality.

## 6. Conclusions

The legislative intervention that aims to disrupt the basic principle of contractual freedom in the realm of private law in exceptional cases may offer a solution to the asymmetries presented in the models describing present-biased preferences. In such scenarios, the consumer has a high likelihood of finding himself in a situation where the contractual balance shifts to his detriment due to the inconsistent time preference, excessive self-confidence and optimistic estimates of the future. Although the reasoning of the regulation and the guiding legal practice primarily cite information asymmetry, it can legitimately be assumed that the identified causes can in and of themselves lead to contractual inequality. Our view is that the information asymmetry between the contracting parties further undermines the consumer's contractual position and the adequate information, professional know-how and experience cannot unequivocally neutralise a decision triggered by a biased time preference, as the latter is primarily psychologically-based and significantly decreases the likelihood of a more rational decision based on objective information.

For the sake of comprehensiveness, it should also be added that if banks offer products to retail customers that specifically take advantage of this present-biased time preference, it may further deteriorate the contractual balance. In our view, the present-biased time preference can even be regarded in and of itself as a circumstance that warrants legislative intervention in contractual freedom. We believe that the legislator offered adequate responses to the issues identified in the realm of behavioural economics, particularly the avoidance and prevention of intertemporal biased decision situations, the eradication of self-control issues, the management of information asymmetry, overreactions and consumer impatience. The statutory limitation of the rights of financial institutions in the interest of consumers (information obligation, the guaranteeing of broader contractual rights), the protection of consumers from themselves (debt cap regulations), the reduction

of information asymmetry (enhanced information obligation, the introduction of interest and interest margin indicators, the preliminary definition of the interest methodology of loans) are all steps that are geared towards reducing or remedying flawed (irrational) consumer decisions made as a result of the anomalies identified by behavioural economics.

In order to effectively address the identified issues, however, in addition to successful regulation, smoothly functioning supervision is also necessary to enforce the statutory requirements adopted in the interest of consumers. Significant trend-like changes have recently emerged in this domain. The fair bank legislative package, as it is commonly referred to, introduces a new regulatory framework that may be capable of managing the biased intertemporal decisions, consumer self-control issues and underreactions and overreactions that reflect consumer irrationality. The legislator recognised the social need that stems from the underlying inequalities and information asymmetry residing in consumer decisions. However, it is uncertain to what extent the legislator intends to intervene in the private law relationships of parties from a regulatory perspective. Too little intervention is incapable of curbing the potential adverse consequences of inequality between parties, while too much intervention could change the behaviour of economic agents to such an extent that it could distort market competition and excessively and unwarrantedly restrict economic development. But even well-crafted regulation and the effective enforcement of the law are unable to fully address the issue because as we have seen, the underlying factors of flawed irrational decisions are behavioural in nature, in other words consumer behaviour needs to be changed, or more specifically its motives and drivers. This underlying motivation and mentality can be shaped not with legal tools, but with education, training and information. Consequently, education and training tools must be adopted alongside the legal toolset, and only their concurrent application can yield a truly effective and comprehensive solution.

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# A Compass and Map for Changes

*Júlia Gutpintér*

*Norbert Csizmadia*:
*Geomoment – Map of the exploration of the 21st century*
*L'Harmattan Publisher, Budapest 2016, p. 407*
*ISBN: 978-963-414-147-1*

As much as it sounds like a cliché, it can be hardly disputed that we are currently seeing a transformation taking place in the world. Changes are happening faster than ever in the economy, society, technology and the environment. Political fundamentals are being questioned, and global centres of power are shifting. We face several demographic and environmental challenges never seen before. This busy and eventful period is called by the author – somewhat contrary to the time horizon of the actual processes – a geomoment. It might seem misleading at first sight, but if we consider the popular comparison, which is also presented by the author, where the Earth's 4.5-billion year history is compared to 24 hours, during which humankind appeared in a little shorter time than the last one and half minutes, this name is justified, because at this time horizon changes of a decade seem like just a moment.

With his informative scientific work the author intends to provide a kind of map and compass for getting oriented in the processes of this geomoment in an unusual form. With powerful visual contents, primarily through novel maps and infographics, he describes the processes that determine and shape our world, because – as he himself stresses– getting oriented, exploring and understanding the social, economic, environmental and geopolitical processes are essential for achieving success at the individual, organisational and national levels as well. It is especially important to present these in an accessible, attractive and modern form in a country such as Hungary, where surveys show that the interest of the general population in foreign countries and foreign policy developments is quite negligible on average (*NMHH 2011*). The book satisfies most of these expectations, as its contents and form are both appropriately trendy to capture the attention of the everyday reader, although the structure of the book's logic and its sometimes very free-flying contents (and editing) make it more difficult to comprehend.

In the book the author first defines the tool that we need to get oriented, which is nothing but geography itself. Accordingly, for the author geography is not primarily

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a science or an area of expertise, but rather one of the most efficient means to explore today's world. In the first chapter he explains the significance of geography, and in the second and third chapters he presents an exciting selection of interesting points about geography that provide a good run-up to the subsequent sections.

Urging the rediscovery of geography, the volume is closely related to the presumably global tendency in social sciences, which declares the inevitable appreciation of the geographical approach, even in international relations and policy (*e.g. Kaplan 2012*), in the role of cities in growth (*Glaeser 2014*), or in international trade (*Khanna 2016*). Considering the professional literature in Hungary, this work which goes beyond the framework of geography and regional science can also be associated with the efforts aimed at creating awareness of the spatiality and territoriality of the processes that had not been interpreted geographically earlier, and make this approach an operating logic. From this aspect, in Europe the paradigm of territorial cohesion can be considered a point of connection (see *Péti et al. 2009; Ricz – Salamin 2010*).

Owing to the spread of infocommunication technologies and the deepening of globalisation, in the 1990s several researchers envisaged a process which would render geography and territoriality completely insignificant. However, approximately one decade later spatiality became more important once again, and as a result of the works of Paul Krugman, it even became part of mainstream economics. Several significant thinkers deal with spatiality, and within that with the key role of cities in global socio-economic processes. These researchers have recognised that although in many cases it is possible to use infocommunication technologies to overcome the obstacles imposed by physical space, and the deregulation of world trade has made possible the spread of economic activities globally, there are still powerful spatial processes of concentration occurring in the economy, and the agglomeration effect and the role of cities are becoming more and more important. Actually, transnational companies plan their activities in terms of country groups in respect of sales and product markets, and at the same time, they implement production in sub-national regions, usually at the level of cities and their agglomeration. These companies have also recognised that their competitive advantages are concentrated in space. An appropriate level of concentration can be established only on highlighted points of space, in cities and their agglomeration, in certain regions; therefore, the economic role of these territorial levels has grown even more through the deepening of globalisation, which in turn has also resulted in competition of these territorial levels among each other. In the presentation of these thoughts in Hungary, the works of Imre Lengyel should be highlighted (*Lengyel 2010*).

The decrease in the significance of geographical space is also refuted by researches that emphasise the importance of personal encounters and interactions enabled by geographical proximity, compared to connections created and maintained electronically, both in general terms and in the context of innovation, productivity and other economic factors (*Glaeser 2014*).

At the same time, spatial features do not only determine the operation of the globalised world economy, as recent geopolitical developments – such as the annexation of the Crimean Peninsula by Russia – have also underlined the significance of territoriality and that we cannot disregard the spatial aspects of socio-economic features and geographical location itself.

Therefore, on the one hand, geography and spatiality are factors that shape global socio-economic processes and are also one of the keys of understanding them, since owing to their synthesising, interdisciplinary approach they enable the analysis and understanding of complex multi-dimensional social, economic and environmental processes. This capability and the interdisciplinary approach are especially important for the understanding of the ongoing multi-dimensional and multi-factorial processes.

In the second and third parts and, to a smaller extent, even in the last, fourth chapter of the first part, the author presents these macro-processes and their anticipated future courses by presenting selections from analyses of renowned strategic thinkers (Noah Raford, Parag Khanna, etc.) and organisations, think tanks (Stratfor, World Economic Forum, Economist Intelligence Unit, Roland Berger Institute etc.), without taking a critical approach.

Based on the synthesis of these analyses and visions, the author highlights three key areas that enable the best capturing of the processes of our time and also ensure the success of a particular country, region or city. These are fusions and creativity (part four), knowledge and technology (part five) and the cities themselves as the entities that actually concentrate these factors in space (part six).

Owing to their high population density, cities enable dense social and economic interactions that are the driving forces behind innovation, creativity and the emergence of new thoughts. Cities can ensure a favourable constellation of social, economic and physical environmental conditions, which enables the fast flow of new information, knowledge transfer and the interconnection of their residents by various modalities, through various networks and different platforms (public spaces, transport networks, digital networks).

In accordance with the major aims of the book, in the last section titled “Geomanifesto” the author also formulates proposals and gives advices on how we can be successful in the age of the geomoment at the individual, organisational or even at the country level. These include proposals aimed at improving the life of the individual, as well as elements that fundamentally determine a country strategy. Each of these proposals reflects on one of the processes that currently determine the world and is described in the book. The individual proposals are substantially distinct, but creativity could be explicitly or implicitly identified in each of them, and this also means the relationship between proposals applying to the individual and

higher levels of social/territorial organisation. Our creativity is the key to shaping and transforming our world, which means that we must shape our own lives in such a manner that we can exploit this creativity as best as possible. Creativity and the ability and willingness to innovate are a growth factor that can be demonstrated to exist at each territorial level in today's economy. At the same time, owing to automation – which is expected to fundamentally disrupt the socio-economic conditions of the next and coming decades – these factors can be expected to be appreciated even more. In fact, one of the most efficient ways to defend ourselves against the negative effects of automation (especially on the labour market) and to become resilient to the changes is to use our creativity, networks of relationships and knowledge and our local individuality to create unique products or to provide such services that differentiate us in the crowd at the individual, city, regional and national levels.

To sum up the messages of the author: we need geography to get oriented and to understand the complex processes happening in the world, while in order to achieve success at an individual and higher social/territorial level creativity is required in the changing age of the geomoment.

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# The Great Divide

*Katalin Botos*

*Joseph E. Stiglitz:*
*The Great Divide: Unequal Societies and What We Can Do About Them*
*W. W. Norton & Company, New York, 2015, p. 448*
*ISBN-13: 978-0393248579*

Recipient of the Nobel prize in economics, *Joseph Stiglitz,* has dealt with the phenomenon of increasing income differences for years. His work entitled "*The Price of Inequality*" was published in 2013 by Norton & Norton Co. and according to the New York Times it was the best-seller of that year. In 2015, he published another book on this subject (*"The Great Divide"*), partially repeating and further developing the ideas of his 2013 work.

Indeed, *The Great Divide* can perhaps more aptly be described a volume of essays, since he publishes his articles presented in various papers and Internet forums, arranged into topics. He essentially addresses two subjects: What is the explanation for the increasing gap between poor and rich people in America and throughout the world? Can solutions be found for this phenomenon whereby liberal capitalism retains its advantages, yet it eliminates its effects which hinder growth?

As an economist, Stiglitz approaches the issue of poverty versus wealth not from the aspect of moral theology. He is not only bothered by the fact that the distribution of incomes between capital and labour, among the people already possessing wealth and those living only from their wages and salaries, is unfair – although naturally this bothers him as well. He states it in the most precise way that this "great divide" is – and will be – detrimental to the growth of the economy. I.e. *in the long run this is not advantageous to anyone!*

He does not agree with the standpoint of Piketty that the so-called period of Ford growth after World War II was *only a deviation*, since the differentiation of incomes and the concentration of wealth is *in the nature of* capitalism. After all, this would mean that the economic-social system must be rejected if we intend to terminate this phenomenon! According to Stiglitz, however, in the 1930s *capitalism was capable of self-correcting itself*, and this made such further development

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possible for capitalism which increased the performance of the developed world to an amazingly high level. Only Reaganomics, the return to the fundamentalism, the radical decrease in taxes and the resulting indebtedness of the state and the population can be considered as deviations from the line of development.

*He denies the essence of neo-liberal philosophy*, according to which *it is good if the differences in incomes are great*. According to this view, the profit of the rich "trickles down" to the poor. "It creates jobs and employment and increases salaries". This is the ideology. That is, capital owners becoming rich is in the interest of the workers… According to the data, however, *this is not true at all!* Over the last almost four decades, the income of the poorest *has increased by almost zero*, whereas that of the upper decile, especially the richest 1 per cent, *has increased like a rocket!* Where is "trickle down" here?

He already pointed this out in detail in his work published in 2013. (Hence the title: "*Price of inequality*". According to Stiglitz, this fact has and will have a serious economic price.) He launches his work on the Great Divide by highlighting the contrast between the 1 per cent vs. 99 per cent. He presents that the American belief *in the equality of chances* is *only a myth*. No doubt, this is not verified in today's USA. Poor people cannot break out from their hopeless situation. These days only education can provide an opportunity for this, but even this is less and less affordable for the average American. Thus, it is only a fairy tale that the small shoeshine boy will become a millionaire. Young people who understand this challenge and attempt to find money for further education are trapped by student loans. According to Stiglitz, young people in America are tragically indebted and the labour market opportunities are far below their expectations. Moreover, the handling of the collapse of student loans is even more difficult than that of mortgages. This would only be improved if state education financing (and health care) became much more extensive! He is not alone with this idea. Of the financial economists, R. Rajan, professor at the University of Chicago, ex-chief economist at the IMF, and ex-governor of the Bank of India, also emphasised this (already in his book "Fault Lines" published in 2010).

One of the basic messages of Stiglitz is that even the so-called social expenditures of the state do not only serve social purposes. Ultimately, conservative, fundamentalist capitalists must understand that solidarity with the poor *is in their interests* as well, because *there is no market of appropriate size without these people!* Moreover, poorly educated and paid labour is less efficient both as a consumer and as a producer. There is no appropriate labour supply if we finance education and health care based on the residual principle and we do not raise talented people from all parts of society. Hence, we essentially *waste human capital* and thus reduce the market potentials of our own national economy. It has always been the *profitable co-operation of the market and the state* that *has made the US big*! There is no

enterprise or enterprise empire of large success in America whose foundations were created not by state infrastructure developments and state-financed research.

Yet, incomes are also necessary for expenditures!

Stiglitz deals with the issue of taxes intensively. He states that the decrease in tax rates in the US clearly favoured richer people. However, it is not possible to stimulate the economy endlessly by decreasing taxes, since the state would then have no sufficient tools for assisting the economy. He mentions that the current American taxation is extremely *unfair*, as already noted in his earlier work in 2013. The rich *pay a much smaller proportion* of their declared income as tax than less rich people, and their declared income is often just a fraction of their real income. He disputes that it is not worth taxing the rich more than the middle class, since this supposedly "does not result in a lot of money"… He writes that this is no longer so today. Indeed, the progressive tax income from the rich can be significant, exactly as a result of the large differentiation of incomes that has occurred up until now. However, he sees that the reforms planned up to now are more and more aimed at terminating the benefits assisting the middle class, for example the deductibility of mortgage interests and health care provided by employers. Stiglitz acknowledges that these indeed decrease the tax base and their gradual elimination could in fact be justified, all the more so because the deductibility of mortgage interest rates assists the rich more than the middle class… However, now that the real estate market is on the ground after the crisis, he does not deem it practical to eliminate the benefit in one step. Although this tool is essentially condemned in the hand of the state, since this also contributed to the previous, overly brisk construction industry demand (the housing boom).

Stiglitz says that a well-organised tax system is not only capable of raising the necessary amounts for the government, but it is also capable of *economic policy orientation*. It is better to tax harmful activities than useful activities. It is more practical to impose taxes on environmental pollution and speculation than on human labour and savings. It is more rational to tax things that cannot be taken away (such as land, oil and other natural resources), in contrast to profits, whose realisation can be cleverly relocated to tax havens. And yes: the stimulating effect of taxes does also matter. He considers it correct if the state encourages domestic investments that create jobs. According to him, it would be good if multinational companies were taxed on the basis of how much they produce and sell in the US. This is because the possibility of reorganising incomes to countries with low taxation is currently very popular… He also says that the additional taxation of the banking sector is justified, since as a result of its "innovations", it indeed realised additional incomes in the period leading to the crisis (pp. 123–124).

According to the author, the main objective of tax reforms cannot primarily be the realisation of higher budget income. Their effect on steering the economy is more

important. Therefore, he favours "tiered" taxes. As regards the so-called carbon tax, the punitive tax on emissions, he thinks that it is clearly justifiable in terms of economics, since the damage caused has to be compensated to society. As the environment is indeed our scarcest resource, which we have to guard to a greater extent!

The author puts great emphasis on the importance of the war against corruption and the links between the private sphere and the state. The privatisation of benefits and the nationalisation of losses is an extensive practice in the US. There is a "revolving door system", whereby certain people find themselves in well paying positions of large companies at the end of an election cycle in return for their services in the state administration. Moreover, as a result of the elections, the leaders of companies may obtain positions of power, where they can again assist business sector enormously by establishing through regulation, monopolist benefits, and with state orders. In his 2015 work (similarly in 2013), Stiglitz emphasised that the problem of the established system is primarily not of economic, but *of political nature*. Namely, it is the *distortion of democracy* that it is not the "one man – one vote" principle, that prevails in reality, but the "one dollar – one vote" principle, *because of the campaign support system*… (The US Supreme Court has rejected the upper limit of campaign funds transferred by corporations.) This also means that those with the opportunity of establishing statutory regulation can spend larger amounts on the campaign, including buying the media empires as well. As we already pointed out, these influence the average voter to such an extent that he/she is inclined to not see his/her own interests… But both main parties in the US are the hostages of enormous business conglomerates, and thus it is not expected that there will be a major difference in the programmes regarding the equalisation of incomes.

The author emphasises that the future is not predetermined, we have the power to change it, but *political will* is necessary for this. More democracy, more transparency, more civil activity. All of this has to be accompanied with assisting actions of the state, since the poorest people are unable to rise solely on the basis of market rules of the game, and a downward spiral can develop in society.

Stiglitz has confidence in the strength of the civil sector and the viability of liberal capitalism. The future will answer the question to what extent this can be implemented during the term of the new US Administration.

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# A Multidisciplinary Approach to Financial Culture

*Erzsébet Németh*

*Levente Kovács – Elemér Terták:*
*Financial Literacy*
*Panacea or placebo? A Central European Perspective*
*Verlag Dashöfer, Bratislava, Slovakia, pp. 112*
*ISBN: 978-80-8178-016-5*

Having read the recently published book of Levente Kovács and Elemér Terték cover to cover, it was my first impression that economics, especially its subdivision on financial culture, affects an extremely large number of different disciplines, and is thus a really multi-disciplinary topic. When exploring the perspective of financial culture, the two authors deal not only with economics, but also with history, jurisprudence, sociology, social psychology and pedagogy. All this diversity is certainly not unjustified, and gives a special value to the book.

The authors point it out that the global interconnection of the financial markets, the constant appearance of increasingly sophisticated financial products and the resultant risks pose new challenges all the time for every participant, at individual, institutional, social and even at global level. Making optimal individual and family financial decisions requires appropriate financial skills and motivation. Those who have adequate financial knowledge are expected to respond better to financial shocks. It is one of the features of this work that it analyses its subject matter from several aspects, and so the global financial markets and actors, the relations between banks and their customers, the media as the main driving force of social attitudes and education and research, as areas of intervention, are given an important role. This does not come as a surprise, since the authors are not only scientific researchers and instructors, but also important persons in the domestic financial sector: Levente Kovács is Secretary-General of the Hungarian Banking Association, a university lecturer with habilitation, while Elemér Terták is an economist, author of several works, chief executive officer of Hitelgarancia Zrt. and former administrative state secretary of the Ministry of Finance.

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The introduction to this volume is a kind of exposition of the problem, which calls attention to the exposure of the "man of the street", influenced by messages of the media and their own – often unsubstantiated – desires and fears. The authors demonstrate that average citizens without appropriate skills usually make their financial decisions not at the appropriate pace, which means that they benefit too little from an upturn and take more than their share of the disadvantages of a decline. The authors make it clear that it is necessary to develop financial culture, in order to enable the general public to become connected to financial services in the appropriate manner and to the appropriate extent, and in the introduction already they take a stand for the inclusion of the education of financial culture in school curricula.

In the following chapter the authors review the concept of financial culture and the opportunities for its dissemination. The presentation contains both an historical and an international outlook. In Hungary, the distinction of the level of financial culture is an entirely novel approach by nation, culture and even subculture: "*it is impossible to make an international comparison of financial culture and skills, since different types of skills are necessary for the management of financial challenges based on the level of development of the economy and the traditions of the financial intermediary system*". At the same time, they treat as an axiom the statement that the higher the financial culture in a society, the higher the level of available savings is in the country, since the financial culture of the general public also contributes to the stability of the financial system. When writing this review, it is raised on several points that the statements formulated in the book deserve being explored by research (this applies to the above statement as well).

The authors treat the perception of the banking sector as one of the most delicate issues. They provide an historical overview on the role of money and on how the perception of interest-taking has changed in various eras and by various religions. This is one of the most exciting, most interesting parts of the book. The authors claim that the negative perception of banks is rooted in cultural history and religion, which is only further compounded by the distorting effect of the media. The impact of social level communication (the media, advertisements and political communication) on financial culture, and within that, financial skills, attitudes and behaviour is a matter worthy of research.

The next chapter of the book presents the range of financial skills the lack of which could generate – in the opinion of the authors – social exclusion, consumer dissatisfaction or financial losses. The book presents a case for the education of financial skills at such a level that is capable of adapting to the constantly changing technical environment. At the same time, it is quite stringent when it claims that *"… the faculty and the educational administration are not prepared for this challenge, and even their relevant motivation is quite low*". In respect of financial attitudes, we

see quite an emotional approach to prejudices against banks, which is explained, in addition to the deficiencies in financial skills and the effects of the media, by stating (and rightly so) that self-justification is a natural human reaction. We can observe this behaviour, for example, when the general public blame their sustained losses on the banks, as an external justification. This applies even more when the political sector holds the banks accountable for losses sustained at the level of society (which is only partially justified). The authors point out sharply that this phenomenon disrupts the assumption of responsibility for financial decisions, the propensity to repay loans and contractual discipline. All of this causes severe economic and moral damages, both at social and individual level.

The part that presents the specific nature and behaviour of banks is especially interesting. The authors emphasise that banks have an inherent inclination to operate in such a manner that they fill up the space available for them so to say, and without appropriate regulation this reinforces cyclical impacts that can be only and exclusively mitigated by regulatory and supervisory means. This is followed by an analysis of the issue of the state as a regulatory authority and a market actor, which could be important study material for every decision-maker. Considering the professional history and experiences of the authors, the following statements should be taken seriously: "*…although the sector of credit institutions is not fond of regulations, it does need them as a limiting activity, and also requires them as a potential, legitimate means of enforcement of contractual discipline*".

In the following part, the book presents research findings of determining significance concerning financial culture. The reviewer feels honoured that in four of the eight scientific research projects highlighted and presented in detail in the book he was the leader of the working group performing the research. These were the international longitudinal research conducted with the support of the Financial Compass Foundation and based on the OECD methodology, and research conducted based on a financial personality test, which is unique in Hungary. The State Audit Court is also included in the selection with two research projects. One study analyses the financial culture of students of higher education, the other the financial culture developments introduced in extra-curricular education in Hungary. Research by Econvencio spanning several years affects a wide group of secondary school students. The survey of the Student Loan Centre was focused on the vision of the future of career starters, while the researchers of the University of Miskolc compared the financial skills of students of economy to those of other students. Deloitte prepared a scientific analysis on the financial habits of Hungarian households. The description of the surveys complies with the scientific standards, but its style is still highly accessible and easy to follow. In summary, the results of the research imply that in Hungary the level of financial skills can be considered average in international comparison, however, the practical application of the skills

in the area of financial attitudes still shows a significant backlog. This measure of financial awareness is related to income and life position, social and economic relations, personal attitudes and personality. In addition, socialisation also plays an important role. However, the role of education-training is still not implemented properly or at all in several cases. It follows from the above that the authors stress the role of training and education, highlighting the need to develop the skills and competencies of our time in a practice-oriented manner.

Related to the development of financial culture, the volume presents the events and significance of Money7 in more detail. On the initiative of the Hungarian Banking Association, for the first time our country joined in 2015 this event happening simultaneously in some 30 countries all over Europe. Today the number of cooperating partners has increased to five, and thus in addition to the founder Banking Association and the Financial Compass Foundation, the Ministry of Human Capacities, the Ministry of National Economy and Junior Achievement Hungary Foundation also take their share of the financial education of the generation of the future. This initiative, which is extremely popular in Hungary, offers several professional programmes for schools. In 2017, a huge level of interest was shown all over the country for this series of events which was renewed in several respects: over 1,000 schools registered, and the number of students who participated in over 10,000 school lessons exceeded 150,000. As a result of the successes of the initiative, financial awareness and management were incorporated in the regime of the academic year as a thematic week.

Finally, the volume warns that the modern technical environment and the rapid spread of digitalisation impose a constant challenge both for the individuals and for financial education.

This book is downloadable for free from the website of the Hungarian Banking Association.

# Accounting in a Nutshell

*András Kómár*

*Christopher Nobes:*
*Accounting – A Very Short Introduction*
*Oxford University Press, 2014, pp. 137*
*ISBN: 978-0-19-968431-1*

The British author Christopher Nobes is a professor of accounting at several universities (London, Oslo, Sydney), who has participated in the development of international accounting standards and is a member of the editorial board of several accounting journals. His book ("*Accounting – A Very Short Introduction*") was published in 2014 as part of the educational book series (*Very Short Introduction Series*) of the Oxford University Press, started decades ago, covering hundreds of subjects.

Accounting is a very large special subject, and its history is almost of the same age as writing. Companies in the private sector and public institutions use accounting statements for internal purposes at a daily level, whereas tens of thousands of public limited companies are obliged to publish accounting statements several times a year. At the time of writing the book, the IFRS[1] (containing the international standards of accounting) is more than 3,600 pages long (and continuously increasing), whereas the American equivalent of this, US GAAP,[2] is much longer. Thus, the objective of the author, i.e. to introduce the history and framework of accounting and present in clear language its main concepts and notions and their practical applications in a relatively short book, is rather ambitious. The targeted audience is not accounting experts, but intelligent non-specialists who wish to obtain a better understanding of accounting.

The historical antecedents of accounting date back very far. When archaeologists excavate remains from ancient times and find writing or numbers, they are usually part of the accounting records of that age. Incomes, i.e. taxes, are necessary for the establishment and maintenance of the government power maintaining social order. Taxation requires accounting records. Thus, modern civilisation does not operate efficiently without accounting records.

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[1] IFRS: International Financial Reporting Standard
[2] US GAAP: United States Generally Accepted Accounting Principles

The economic decisions of the modern world are also based on basic accounting information (e.g. How should Tesco or Walmart price a product? In which country should General Motors build a new factory? Can the stocks of Citibank or HSBC be considered as better investment? How much tax has to be paid in the given year? What level of dividends per share can be paid?). If we make good decisions on the basis of high quality accounting information, it may lead to economic prosperity with better opportunities. By contrast, in the case of bad decisions, less money can be spent on important things such as health care, transport infrastructure and culture.

Within accounting, the author presents the essence of bookkeeping, financial accounting, auditing and management accounting. We also learn that accounting experts also establish organisations in order to protect their interests and enforce their objectives. The first professional organisations were established by the state, e.g. the Collegio dei Rasonati in Venice in 1581, so that the accounting experts could exercise control over the budgets of building warships. The first professional accounting organisation established on a private basis was founded in the United Kingdom in the 19th century.

There are vast national differences as regards accounting experts. Accounting has greater prestige and plays a larger cultural role in Anglo-Saxon countries (Great Britain, Australia, New Zealand) than in other countries.[3] Whereas among the senior executives of American companies one finds a significant ratio with an accounting degree, in the case of the German companies BMW and Lufthansa even the head of accounting is not a trained accountant, and they have a business or engineering degree instead.

Some accounting experts work alone and specialise on certain areas, whereas others provide a wider area of services by organising themselves into larger units. In terms of the latter, the author underlines and examines the four large global auditing firms (the so-called Big4: Deloitte, Ernst & Young, KPMG, PwC). The main profile of the larger companies dealing with accounting is auditing, but several related areas have been developed as well, e.g. in the United Kingdom many accounting experts work on insolvency procedures (*corporate recovery*). In many countries, accounting experts handle taxation issues as well (e.g. in Germany and Italy), whereas elsewhere (e.g. in the US) taxation is typically the domain of lawyers. After some time, the large auditing companies have also launched other, related business lines (e.g. consulting).

The author starts the presentation of the development and evolution of accounting with historical precedents. Ancient Romans already developed accounting

[3] Almost 1 per cent of the population of New Zealand has an accounting degree, whereas this ratio is much lower in the non-Anglo-Saxon countries.

statements for measuring the effectiveness of farm management, whereas in India and in the Arab world they used more sophisticated accounting records. At the beginning of the 13th century, the traders of Venice already kept rudimentary records (still using Roman numerals!), preparing an entry for each transaction, with *single-entry bookkeeping*. After some time, however, business relations became more complex (e.g. foreign branches, trading in multiple currencies, projects of several merchants performed in partnership), which required more detailed records. This was done in *double-entry bookkeeping* which appeared in Italy. This system prepares two entries for each transaction (debit and credit) and the debit and credit sides are always in balance.

Thanks to its advantages, double-entry bookkeeping spread quickly among Italian traders and then among the traders of other cities as well (e.g. in Provence from 1299 and in London from 1305). By the 1340s, some cities (e.g. Genoa) also switched to double-entry bookkeeping. Two systems of double-entry bookkeeping caught on: the Tuscan and the Venetian. Today's double-entry bookkeeping is based on the latter. A great role in the spread of double-entry bookkeeping was played by the publication of the textbook (*Summa De Arithmetica, Geometria, Proportioni et Proportionalita*) of Franciscan friar and professor of mathematics Luca Pacioli, published in 1494 in Venice, which he wrote not in Latin, but in Italian, and thus it quickly became popular among merchants, and it was soon translated into Flemish, French and English. The French started to regulate accounting with legal tools in the 17th century. The formation of the rich trader layer and colonisation led to the development that funds had to be collected publicly for the major projects in 17th century Amsterdam, and public companies with separate legal entity were developed. Later, the industrial revolution further increased the need for the collection of funds and the foundation of such companies.

After the industrial revolution and the victories of Admiral Nelson and General Wellington, Great Britain became the 'top nation' in terms of military and trade. In 1844, the regulation related to public limited companies was eased in order to facilitate the collection of funds for companies. In parallel with this, the publicity of the accounting data of such companies was introduced, thereby also decreasing the likelihood of abuses and promoting the control of owners. Despite this, the enormous collapse of some companies (e.g. that of the City of Glasgow Bank in 1878) resulted in the tightening of regulation: the application of external auditors was prescribed for banks and, from 1900, for other companies as well. Thus, with the gradual separation of the role of owners and management in 19th century Great Britain, the demand for auditing appeared in order to exercise external control over management in the interest of the (often layman) owners. Scotland played an outstanding role in the development of the auditing profession.

In the beginning, there were no bookkeeping and auditing provisions whatsoever in the US for publicly traded companies: the 1929 stock exchange crisis clearly underlined that this was an untenable situation. The Federal Securities and Exchange Commission (SEC) was established in 1934. The American accounting profession started the development of accounting standards, and for this activity the Financial Accounting Standards Board (FASB) was established in 1973. Currently, the Generally Accepted Accounting Principles (US GAAP) are constituted by the accounting standards submitted by the FASB and accepted by the SEC. Germany standardised financial reports at the beginning of the 20th century, the US developed the system of consolidated financial reports, and the United Kingdom introduced the requirement of "*true and fair view*" for financial reports, which is a basic requirement of today's accounting in several countries. Japan introduced significant innovations in the area of management accounting and accounting controls.

Accounting remained in national frameworks until the 1970s, but with the development of large international companies, globalisation spread to the area of accounting as well. The accounting framework systems operating within national boundaries could no longer ensure the ability to compare various companies globally. Thus, the harmonisation of the national systems became necessary. First, attempts were made for the harmonisation of rules within the European Community. But British accounting experts lobbied against this, as they did not want other (e.g. German and French) governments to have a major influence on their accounting system. And so, in 1973, when the United Kingdom joined the European Community, the London-based International Accounting Standards Committee (IASC) was established with the professional organisations of nine countries. In the first 20 years only a few companies followed the International Accounting Standards (IAS) of the IASC, and then German companies started to use it from 1994. In 2001, the IASC was succeeded by the International Accounting Standards Board (IASB), which issues standards as the International Financial Reporting Standards (IFRS). Upon its establishment, the IASB assumed all previous IAS's, therefore the IFRS and IAS standards exist in parallel in the current system, until the IFRS prepared for the given subject replaces the IAS dealing with the same subject. At the time of writing the book, the use of IFRS was already a requirement in the majority of the countries of the world (e.g. EU, Australia, Canada, Brazil), and it was allowed in other countries (e.g. Japan, Switzerland).

The IFRS is built on basic principles (*principle-based system*) and it often provides several possible options for users. By contrast, US GAAP establishes very detailed rules (*rule-based system*) and provides only few options for companies in relation to a given issue.

After the historical part, the book presents the foundations of *financial accounting* via the presentation of the balance sheet, the profit and loss statement and the cash flow statement. Moreover, a separate chapter is devoted to the financial statements of listed companies prepared on the basis of IFRS and US GAAP, and the accounting indicators related to profitability, liquidity and leverage calculated on the basis of the financial statements. According to the author, financial statements and accounting indicators must be handled with care, since their producers are interested in giving a better impression about themselves and they often 'manipulate' the numbers to this end. In the case of the 2001 Enron scandal, the main problem was the fraudulent evaluation of financial contracts and hiding losses in off-balance-sheet structures; whereas in the 2003 Parmalat scandal, EUR 4 billion of stated deposits were not on the accounts and the debt of EUR 14 billion was eight times the amount that the company stated in the financial statements.

The main task and responsibility of the auditor is to provide an *opinion* in its report about the contents of the annual report prepared by the board of directors that the financial report is reliable and provides a realistic picture about the financial situation and economic processes of the company. The development of global standards can be observed in the area of auditing as well, in the form of the International Standards of Auditing (ISAs). The independence of the auditor provides authenticity to its opinion on the financial report, and therefore both the external rules and the internal provisions of auditors include requirements related to achieving and maintaining independence. The breach of independence of the auditor may have serious consequences, e.g. the 2001 fall of Enron also resulted in the termination of the audit activity of its auditor, Arthur Andersen, which belonged to the five largest global (Big5) auditing firms at that time.

The book presents in detail the phases of the auditor's activity and the topics related to the audit (e.g. the role of accounting systems, estimates and internal control processes in auditing; the IT support of the audit; and to what extent the exploration of accounting abuses is the task and responsibility of the auditor). In the beginning the work of the auditors was very seasonal and adjusted to the preparation of the annual report. Later, auditors' work also related to the semi-annual and quarterly reports of listed companies, and thus for example the auditors of Shell have work continuously throughout the year. Nowadays, special examinations are also entrusted to auditors (e.g. in the United Kingdom it is customary to order both a prominent auditor and a prominent lawyer for the examination of corporate scandals, with respect to their complementary expertise), and in the case of legal disputes they also perform expert activity for any of the parties or for decision-makers.

Separate chapters present management accounting and the control function of accounting. This part of the book presents how managers can use accounting to

increase the efficiency and profitability of control over the institution they manage (e.g. budget planning, cash flow forecast, rate of return analyses, calculation of standard cost for work and production processes and monitoring the deviations from these).

In the epilogue, the author mentions several issues in connection with accounting, arising in the literature and in public life: e.g. how exact a science is accounting; are financial reports nearly as good as they could be; why is the modernisation of management accounting necessary; and what was the role of accounting and auditors in the global financial crisis?

# Lectures of the Lamfalussy Conference: Presentation of the Book 'Alexandre Lamfalussy – Selected Essays'

*Ivo Maes*

Alexandre Lamfalussy (1929–2015) was a highly influential person in the process of European monetary and financial integration, especially as the Founding President of the European Monetary Institute, the predecessor of the European Central Bank. However, he was also a brilliant intellectual and an eminent academic who published widely. This made for an abundant number of beautiful essays, a selection of which is presented in the book '*Alexandre Lamfalussy – Selected Essays'* (*Maes – Szapáry 2017*).

Belgium and Hungary were the two countries close to the heart of Alexandre Lamfalussy. Lamfalussy was born on April 26, 1929 in Kapuvar, Hungary. He started his economics studies at the József Nádor University of Technology and Economics in Budapest. In January 1949, he left Hungary and came to Belgium where he continued his studies and where his career took off.

The volume, 'Alexandre Lamfalussy – Selected Essays', is a compilation of selected articles and speeches by Alexandre Lamfalussy, starting with his first article in 1953 on 'The Steel Industry and the European Coal and Steel Community' and ending with his last lecture, his 'Concluding Remarks' delivered at the conference commemorating the 20th anniversary of the European Monetary Institute in February 2014. The volume is divided into four broad parts.

(1) 'The Young Lamfalussy', covering the period from 1929 to 1975, encompassing his initial work on industrial economics and growth as well as his early writings on monetary and financial issues.

In his early research, Lamfalussy focused on the weak investment and growth performance of Belgian industry (*Maes 2009*). In the subsequent years, Lamfalussy broadened his research, exploring the topic of why the countries of the European Economic Community had been growing much more strongly than the United Kingdom. It led to a short article in Lloyds Bank Review (*Chapter III*) and a book, "The United Kingdom and the Six. An Essay on Economic Growth in Western Europe"

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*The author would like to thank everybody who contributed to this project, especially György Szapáry.*

(*Lamfalussy 1963*). In these publications, Lamfalussy emphasised virtuous (or vicious) circles, in which stronger export growth promotes higher investment, which in turn strengthens productivity and investment, further reinforcing exports. Broadly speaking, Lamfalussy's analyses fit into the Keynesian tradition. His emphasis on vicious and virtuous circles clearly showed that the free market economy was not stable and self-adjusting.

In 1955, Lamfalussy started working at the Banque de Bruxelles, Belgium's second commercial bank, becoming Chairman of the Executive Board in 1971. In the 1960s, he was involved in the creation of mutual funds and played a role in international investment banking (*Chapter V*). In 1961, under the influence of Robert Triffin, he went to Yale for a year. He also met James Tobin there, who was already critical of the functioning of the financial system. Whilst at the Banque de Bruxelles, Lamfalussy's research interests shifted to monetary and financial issues, both national and international. He was very close to the thinking of the Radcliffe Report, emphasising the importance of money substitutes (*Chapter IV*). In the 1960s, Alexandre Lamfalussy was also a member of several committees which investigated the financial system, such as the Segré Committee, which investigated the integration of the capital markets in the EEC. Moreover, he took part in meetings on the reform of the international monetary system, one of the most famous being the Bellagio group together with Sir Roy Harrod, Harry Johnson, Peter Kenen, Fritz Machlup, Robert Mundell, Jacques Rueff and Robert Triffin, among others. In 1969, at the age of forty, he delivered the prestigious Per Jacobsson lecture (*Chapter VII*).

(2) 'At the Bank for International Settlements' covering the period from 1976 to 1993 He joined the BIS as its Economic Advisor, becoming General Manager in 1985. During Lamfalussy's time at the BIS, three topics were predominant: exchange rate instability, inflation and the Latin American debt crisis.

The strong appreciation of the US dollar, resulting from differences in the policy mix between Europe and the US in the early 1980s, would mark Lamfalussy profoundly. He felt this was a clear indication that flexible exchange rates could not be relied on to avoid serious exchange rate misalignments. Moreover, the period showed the dangers of exchange rate misalignments, especially strong protectionist threats (see *Chapter XIX*).

The mid-1970s were the time of the great inflation. Among central bankers, monetary targets were a major issue of discussion. Lamfalussy (*1985, reprinted as Chapter XVI*) took a balanced approach. He emphasised that policy-makers had to avoid succumbing to two opposite temptations. One temptation was to return to complete "ad hoc-ry". Lamfalussy argued that rules were needed, "to provide some anchor for the wildly fluctuating expectations of market participants; to make monetary policy-makers accountable for their action… and to give them leverage

in their dealings with governments and parliaments" (*Lamfalussy 1985*). However, he also argued against the temptation of retreating into a world of rigid rules. "It is difficult to define such rules; it is sometimes impossible to apply them; and it would often be irresponsible to stick to them. The road to follow is somewhere in between: rules applied with a pragmatic sense of discretion". For Lamfalussy, monetary policy, notwithstanding thorough research, remained an art, not a science.

Financial stability was always an important topic for Lamfalussy. As early as the mid 1970s, he was warning about the debt build-up in Latin America (*Maes 2010*). He also pointed out the interrelationship with loose US monetary policies and the US balance of payments deficit. In 1976, he proposed to set up a "risk office" at the BIS in order to collect crucial information on a limited number of systemic banks. In 1979-1980, a Working Party which he chaired advanced a "macro-prudential" approach. Later, in the 1980s, Lamfalussy played a significant role in the management of the Latin American debt crisis.

Lamfalussy very quickly took a cautious attitude towards financial innovations. In a certain sense, he always kept a "Keynesian" *Weltanschauung*, with a certain scepticism about the functioning of financial markets. Similar to Tobin, Lamfalussy had questions regarding the efficiency of the financial system and argued in favour of a research programme in the field of "normative financial economics".

In his (aforementioned) presentation, *Lamfalussy* (*1985*) focused closely on the accelerating speed of financial innovation. This was leading to a flow of new financial instruments and techniques, as well as the blurring of dividing lines between institutions and between markets, an old concern of Lamfalussy who was steeped in the Radcliffe tradition. After discussing the monetary policy implications, Lamfalussy turned to prudential issues. His fundamental question concerned the effects on financial stability of the redistribution of risk by these new instruments: "You may argue that when risk-averse market participants shift risks associated with unexpected interest and exchange rate developments onto willing risk takers, everybody is going to be better off. This may well be the case, but increased collective happiness does not necessarily mean greater systemic stability. Or does it?" (*Lamfalussy 1985*).

Lamfalussy greatly contributed to the creation of a "BIS atmosphere", namely that one should be attentive to imbalances, debt build-ups and bubbles, which may sow the seeds of financial crises. Lamfalussy thus became the main architect of the BIS "macro-prudential" approach to financial stability with a focus of the financial system as a whole.

During his time at the BIS, Lamfalussy was also involved in European issues. The highlight was his participation in the Delors Committee a crucial phase in the

EMU process. Lamfalussy played an intellectually stimulating role (*Maes 2016*). In his view, the coordination of budgetary policy was a crucial issue. Marked by his experience of the Latin American debt build-up, he questioned whether market forces were enough to ensure fiscal discipline. Lamfalussy advocated an EMU with a significant economic pillar. In his view, fiscal policy coordination "appears to be a vital component of a European EMU" (*Lamfalussy 1989*). He advanced two main reasons. The first one very much reflected his preoccupations with the policy mix on the international monetary scene: "the determination of a global fiscal policy in a way that is sufficiently responsive to evolving domestic and international requirements". The second reason foreshadowed the "binding rules on budgetary policy" in the Delors Report itself, namely, the need "to avoid tensions arising from excessive differences between public sector borrowing requirements of individual member countries".

(3) 'Founding President of the European Monetary Institute', the period from 1994 to 1997. The main task of Lamfalussy and the EMI was preparing the final stage of European Monetary Union, especially the single monetary policy and the introduction of the euro.

In several speeches and articles, Lamfalussy also discussed the implications of EMU. Here, he was responding to an explicit request from Chancellor Helmut Kohl. As Lamfalussy wrote, Kohl told him: "I know that you have a lot to do, but please go and speak to the Germans. Explain the facts in different places, and especially in Bavaria". So, Lamfalussy went to Bavaria and, the next day, he got a phone call from Helmut Kohl who said, "You really won over those Bavarians, and they are a difficult lot" (*Lamfalussy, Maes and Péters 2014:147*).

In Lamfalussy's view, EMU would lead to major benefits. He emphasised that, in order to reap these benefits, countries had to enter EMU in a state of sustainable macroeconomic convergence. Lamfalussy argued that significant policy adjustments were still necessary for EMU to function. One area was budgetary policy. But for Lamfalussy, the greatest challenge concerned the labour market, "I have already noted that wage and price flexibility is essential to facilitate economic adjustment to various kinds of shocks ... With or without EMU, employment policies have to be in the forefront of attention of European policy-makers" (*Lamfalussy 1997*).

Wim Duisenberg, in his address at the occasion of the farewell of Alexandre Lamfalussy as President of the EMI, beautifully summarised Lamfalussy's contribution: "Things have not always been easy for you when chairing the meetings of the EMI Council. But being a central banker, heart and soul, you have always managed to find compromises. I vividly remember a few meetings of the EMI Council which you eventually managed to conclude successfully, although they started off as a babel of tongues. … One of your greatest assets is that you have

managed to combine this typical conservative and cautious nature of a central banker, always focused on substance, with your firm belief in European monetary integration. … You have never believed that a true single market is in the long run compatible with a quasi-floating exchange rate system" (*Duisenberg 1997*).

Very fundamentally, Lamfalussy's advocacy of European monetary integration had its origin in two main sources: a profound European conviction, marked by the devastation of the Second World War and by the Iron Curtain, and a fundamental distrust of systems of floating exchange rates, in line with his general views on the functioning of financial markets. Moreover, he was a strong defender of a symmetric EMU, with a strong economic pillar, and an early advocate of a banking union.

(4) 'Lamfalussy the Elder' covering the final period of his life, from 1997 to 2015, focusing strongly on financial stability.

In his Pierre Werner Lecture in Luxembourg in 2004 (see *Chapter XXXII*), Lamfalussy focused on the organisation of prudential supervision in the European Union, which he described as a "mind-boggling patchwork". Lamfalussy stressed that central banks had a crucial role in the management of financial crises, especially in "preventing a potential crisis from turning into a real one... In such a situation, they should provide liquidity to the system, so as to avoid liquidity shortages pushing otherwise solvent banks into bankruptcy. They also have to care about the smooth functioning of the payments system". Lamfalussy further argued that the timely provision of liquidity was very much a matter of judgment, which implied that central banks had to be intimately familiar with financial institutions. "They must possess direct information on banks' risk-assessment methods and capabilities, on their decision-making processes and control mechanisms and, not least, on their expertise and skills in using innovative financial instruments. Such information cannot be acquired by reading second-hand reports, however lucid and transparent such reports may be." (*Lamfalussy 2004*).

For Lamfalussy the crucial issue was whether one should give some responsibility to the ECB for supervision of the large, systemically important, banks: "I would start from the assumption that the group of financial intermediaries whose regulation and supervision deserves to be reconsidered are a limited number of very large banks which have become actors at the global level and are key players in the European interbank market. Their problems could have directly systemic consequences ... Should one not consider exploring the desirability and the feasibility of entrusting the ECB with an operational responsibility in the supervision of this limited number of banks"? (*Lamfalussy 2004*). An early anticipation of the 2014 establishment of the Banking Union with the Single Supervisory Mechanism under the European Central Bank.

The financial crisis further induced Lamfalussy to adjust his opinions. In his "Dinner Address" to the Sixth ECB Central Banking Conference (see *Chapter XXXIII*), he "meditated" on his 1997 EMI farewell speech, in which he had warned not to "overburden monetary policy" and to focus on price stability. He now argued that the financial crisis had "confirmed something that was (or should have been) expected: that whether they like it or not, central banks are in the front line when it comes to keeping crisis manifestations under control" (*Lamfalussy 2011*). He then emphasised the severity of the crisis, "What is *new* in the current experience is that central banks have had to carry out their liquidity-boosting operations in an environment where the liquidity shortage turned rather quickly into solvency problems of frightening dimensions – for which there has been no precedent since the 1930's. Nor has there been any precedent for the speed of contamination at the global level" (*Lamfalussy 2011*).

Given the severity of the crisis, central banks reacted with a variety of "non-standard" measures. This led not only to a spectacular expansion of their balance sheets, but also to a change in the composition of their assets, with more risky assets. "As a result central banks have started navigating in uncharted waters, in terms of both operational techniques and their relations with governments". Lamfalussy did not expect a quick end to the crisis. Consequently, financial stability should remain an objective for central banks, just as price stability, making life more complex for central bankers.

In 1999, Lamfalussy became the President of the Triffin International Foundation, now called Robert Triffin International, which seeks to enhance the debate on a necessary reform of the international monetary system. Together with Michel Camdessus and Tommaso Padoa-Schioppa, he was also co-chair of the Palais-Royal Initiative, which produced a report "Reform of the International Monetary System: A cooperative approach for the twenty first century", which was submitted to the French G20 Presidency on 8 February 2011.

Alexandre Lamfalussy died in Ottignies, Belgium, on 9 May 2015, aged 86.

In these times of financial instability and doubts over the European project, it is worth reading, or rereading, Alexandre Lamfalussy's work. As Jacques de Larosière pointed out, '*Alexandre Lamfalussy expressed himself with lucidity and often adopted controversial positions. In the light of subsequent events, we are compelled to acknowledge that his assessments were generally correct and far-sighted.*'

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# Report on the Budapest Renminbi Initiative Conference 2017

*Zsanett Sütő*

The Magyar Nemzeti Bank launched the Budapest Renminbi Initiative in 2015, within the framework of which an international conference is held annually, where domestic and foreign decision-makers, financial and economic leaders and professionals discuss the current situation and further development of Hungarian-Chinese economic-financial relations. The conference, which was being held for the third time already, occurred on 5 April 2017 and was attended by 110 participants from Hungary as well as from several Chinese cities and the United Kingdom.

The conference was opened by *Márton Nagy*, Deputy Governor of the central bank, who emphasised in his speech that the conference provides a good opportunity for the sharing of knowledge and experiences and for the development of new cooperation schemes. Márton Nagy called attention to the results of Chinese-Hungarian relations so far, and recalled that the central bank has encouraged the development of Chinese-Hungarian economic-financial relations with the launch of the Budapest Renminbi Initiative. Moreover, with its Renminbi Programme the MNB itself has spearheaded the development of the initiative, mentioning the renminbi bond investments of the central bank as a case in point. Furthermore, Márton Nagy noted that the "One belt, one road" and the 16+1 initiatives and the activity of the MNB support the further development of Chinese-Hungarian relations.

In the first lecture of the morning panel discussion, *Dániel Palotai,* Chief Economist and Executive Director of the Magyar Nemzeti Bank, presented the steps taken up to now by the MNB to develop Chinese-Hungarian relations and the accomplishments, as well as the potential for further development. At the beginning of his lecture he highlighted the points of connection between the New Silk Road ("One belt, one road") concept, the Renminbi Programme of the central bank and the Renminbi Initiative of Budapest, which is manifest in the financial relations. He then pointed out that opportunities for new investments and financing sources are available in the constantly developing Chinese-Hungarian economic and financial relations. He emphasised that since the launch of the Initiative the settlement infrastructure for renminbi (RMB) has been developing, in which Bank of China plays a significant role, and more and more types of banking services are available related to the Chinese currency. Of the latter, he stressed the opportunity of direct conversion between the

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renminbi and the forint, which is already available in the onshore market. Among the directions of development, he identified the increase of the use of the renminbi in trade relations, development of the related financial markets, the opportunity of exploiting the RQFII quota (onshore share and bond investment opportunity for financial investors) and the opportunities of cooperation in research.

*Zsolt Csutora*, Deputy State Secretary for the policy of Opening to the East at the Ministry of Foreign Affairs and Trade, gave a welcome speech and shared his thoughts on the current points of Hungarian-Chinese cooperation. The closing lecture in the morning discussion panel was presented by *Chi Lo*, senior economist at BNP Paribas, who gave an overview of the developments in the internationalisation of the renminbi so far and then outlined further potential steps towards renminbi internationalisation. The first step was the dissemination of the currency in trade settlements. As the second step, he identified the increased use of renminbi in the capital markets. The latter refers to the use of RMB-denominated financial instruments, securities and other financial products (e.g. hedging transactions). In his opinion, in order to accomplish a shift in this direction, on the one hand the offshore RMB market needs to grow, for which it is necessary that the largest possible portion of exports to China should be settled in RMB, while on the other hand, further deregulation of the onshore market is also necessary. Finally, he highlighted that recently and probably in the future as well, the international financial system has been transforming in a direction that is favourable for the renminbi, and if we assess the future demand for traditional SDR currencies, the renminbi may be the currency for which demand could increase in the upcoming period.

The second session was organised around the real economy and related financial areas. In the opening lecture of this panel, *Mariann Gecse*, Director of Corporate Communication of Huawei presented the achievements of the company in the field of corporate social responsibility, highlighting environmental protection and programmes supporting future generations. Of the latter, since 2011 the company has worked with almost 500 students in Hungary in the secondary and tertiary educational sectors through its 'Seeds for the Future' programme and the agreement concluded with Széchenyi István University. *Zoltán Urbán*, Chief Executive Officer of EXIM, provided comprehensive information on the opportunities for export and import subsidies, giving an overview of the available options and the already completed and successful projects by the example of specific projects. He emphasised that financing is available in the form of equity as well, through various funds for companies involved in Chinese-Hungarian relations. *Xi Jingjing* gave a lecture on behalf of Bank of China. In her presentation, she gave an overview of the development of Chinese-Hungarian relations, the current issues related to the internationalisation of the renminbi and the future role of the renminbi in

the international financial system. After that she presented the banking services that could serve the continued development of Chinese-Hungarian economic and commercial relations. In addition to trade financing, they also offer corporate financing and cash management solutions, and risk management and investment products. The closing lecture of the panel was given by *Wu Wei,* representative of the China Foreign Exchange Trade System, who presented the general features of the onshore Chinese bond markets and the opportunities for market entry.

The participants discussed capital market issues in the afternoon panel. In the introductory lecture, Professor *Chen Xin* presented the results of the Chinese economy and the internationalisation of the RMB, and outlined how the process of RMB internationalisation is connected to investment opportunities in the securities market. *Richárd Végh*, chairman of the board and chief executive officer of the Budapest Stock Exchange, presented the plans of the Stock Exchange for RMB products, which covers a broad range in accordance with international practice: in addition to the traditional equity and currency products, plans call for bonds, ETFs and structured products to become available on the market. The stock exchange also maintains active relations with institutional investors and based on the experiences of the negotiations conducted with them he also reported that in certain cases some actors are already considering direct entry into the Chinese capital markets. At the same time, several challenges have been identified concerning market entry (e.g. language barriers, technical challenges). In his lecture *György Barcza,* Chief Executive Officer of the Government Debt Management Agency outlined the major milestones in the development of the Chinese bond market and recalled the success of the Hungarian dim sum bond issuance in 2016. He talked about the role of the Chinese currency in financing public debt and the plans for the future related to onshore bond issuance (panda bonds). In addition to giving a brief comparison of panda and dim sum bonds, he also presented the considerations regarding panda bonds. The closing lecture was held by *Miklós Endreffy*, senior portfolio manager of BIS, who gave a presentation about the features of the Chinese bond market, spoke about the market of derivative instruments available for the management of the bond portfolio, and presented the available yields in international comparison.

Through the examples and experiences of recognised experts in the field of Chinese-Hungarian relations and financial markets the participants learned about the opportunities available for the real economy and for investment and financing related to the New Silk Road, and promoted by the Renminbi Programme of the Central Bank and the Budapest Renminbi Initiative.

# Report on the Bank of Korea International Conference 2017

*Gábor Meizer*

The South Korea's central bank held its annual international conference on 1–2 June 2017 for the 13th time, with this meeting focusing the subject of *Global Economic and Financial Challenges: The Decade Ahead*. The professional event aims at discussing current topics related to economic stability, growth and monetary policy with the participation of distinguished economic experts, academics and policymakers, while at the same time providing a high-level platform for discussing new economic theories and initiatives as well.

The objective of this year's conference was to identify structural changes in the world economy, and to examine the challenges of the future and the possible economic policy responses to these challenges. Thus, the reforms necessary for ensuring inclusive and sustainable growth were also discussed.

In the opening address to the conference, *Lee Juyeol*, Governor of the Bank of Korea, called attention to the fact that the world economy stands at a turning point, but despite the unprecedented accommodative fiscal and monetary policies, economic growth remains fragile. Many challenges can be identified in the world, and some of these are of structural nature, such as the ageing population, income inequalities or financial imbalances. Increasing the intensity of structural reforms is necessary, but it must also be taken into account that an appropriate (macroeconomic) environment is a fundamental condition for successful execution. Thus, the conference can make a significant contribution to generating constructive policy approaches.

*Thomas J. Sargent*, Nobel prize laureate economist (2011) and professor at New York University was one of the keynote speakers of the conference. In his speech, Sargent discussed the different assessment of labour supply elasticity in the micro and macro approaches. The value of elasticity is a key issue from the point of view of economic models, but different values are derived stemming from the characteristics of the two approaches.[1] A better understanding of this group of

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[1] Remark: in the micro approach the labour supply elasticity is typically low, whereas the macro related estimates show a (sometimes substantially) higher value.

issues is crucially important, because it can help in comprehending the challenges and finding answers.

The second keynote speech at the conference was given by *John C. Williams*, President and Chief Executive Officer of the Federal Reserve Bank of San Francisco. Among other things, it was noted that the neutral rate of interest, according to the different estimates, have declined over the past several decades. Other topics included the slowdown in productivity growth since the crisis and anticipated demographic trends. As a general economic policy outlook, unconventional policies may become a new norm, while at the same time a revaluation of the policy framework is necessary in order to manage the challenges caused by the new environment, to ensure price stability, to anchor inflation expectations, and to ensure the achievement of macroeconomic objectives.

After the keynote speeches of the conference[2] there were several sessions in which well-known central bankers, professors and renowned economists of international organisations presented the results of their studies, with the moderation of experts, after which these results were discussed and appraised by discussants.

(1) *Population ageing.* The ageing population represents a challenge in both the developed and the emerging countries as well, and this has an effect on both the supply and demand sides as well. *Sagiri Kitao*, professor at Keio University, mentioned in her presentation, *inter alia*, that delaying the necessary reform of the social security systems results in a significant cost for the young generations, while the uncertainty related to the structure and timing of the reforms affects individual generations differently. *Eric French*, professor at the University College London, talked about how the US health care reform package, the so-called "Affordable Care Act", affects labour supply and savings. In terms of the subject of labour supply elasticity, the relevance of the labour supply decision along extensive and intensive margin was also mentioned.

(2) *Inclusive growth and employment*. As a result of the changes in economic structures and technological development, uncertainties have arisen regarding the future of the labour market, and handling these uncertainties is of key importance in terms of inclusive growth. *Steven J. Davis*, professor at the University of Chicago, mentioned that the young firm employment share has fallen significantly in recent decades in the United States and also talked about the connection of price changes in the local housing markets and the trends in the discussed rate. *Nir Jaimovich*, professor at the University of Southern California, said in his lecture that after the

[2] The presenters of the conference typically expressed their own views in the individual subjects and did not represent the views of the sending institutions. At the conference, the audience was able to learn about the standpoints of more than 30 presenters about the processes selected as the subject of the conference, and thus, the next part of this report essentially focuses on presenting the main messages of the presentations of the studies.

crisis the quality of the goods consumed has become lower, and the less labour intensive and lower quality goods have affected employment to a significantly negative degree.

(3) *Structural reforms and macroeconomic policies*. Monetary and fiscal policies can advance structural reforms, while successful structural reforms can expand the macroeconomic manoeuvring room. Recognition of these approaches and maximizing synergies are essential for addressing the challenges. In this session, *Mikhail Golosov*, professor at Princeton University, gave a presentation on the optimal fiscal and monetary policy with redistribution. Subsequently, *Davide Furceri*, senior economist at the IMF, talked about how fiscal policy can contribute to increasing growth in the medium term. It was emphasised that fiscal stabilisation can positively influence the R&D and the information and communication technology (ICT) sector, especially during times of recession.

(4) *Sustainable growth*. Sustainable growth includes important elements such as efficiency and productivity, but in the recent period the examination of the distribution effect of growth has also become more and more important. *Yongsung Chang*, professor at the University of Rochester and at Yonsei University, presented the evaluation of the redistribution policies of the OECD countries, mentioning how important the support of the optimal tax reform by the population is in terms of the implementation of the reform. After this, *Rémy Lecat* presented the trends in total factor productivity (TFP) in a long-term, historical and cross-country perspective, including the recent decrease in the indicator. Regarding the expected changes in productivity, the assessment of the so-called secular stagnation and technological shocks can be critical.

(5) *Panel discussion on policy challenges*. The panel discussion was aimed at the further evaluation of the subjects discussed in the previous sessions and the consequences of those, with the participation of the following guests: *Jan Marc Berk*, director at De Nederlandsche Bank; *Era Dabla-Norris*, division chief at the IMF; *Eric French*, professor at the University College London; *Soyoung Kim*, professor at Seoul National University; and *Andrea Tambalotti*, assistant vice president and function head at the Federal Reserve Bank of New York. Amongst other things, it was noted that in terms of the efficient implementation of monetary policy, significant attention must be paid to undesirable redistribution mechanisms and the prevention of those as well. Moreover, on the side of monetary policy it was highlighted that, as a result of the decline in the neutral rate of interest, the flexibility of the inflation targeting framework has become more important. In terms of narrowing the productivity gap across firms, structural reforms have arisen that partly affect the labour and product markets (e.g. with respect to reducing barriers to entry). Furthermore, it was highlighted that the global financial crisis sent a strong message in the sense that ensuring financial stability is essential in terms

of macroeconomic stability, and in response the application of macroprudential policies has expanded as well.

(6) *Monetary policy and financial stability (special session with the participation of the Federal Reserve Bank of New York and the Bank of Korea).* In this session *Joao Santos*, vice president at the Federal Reserve Bank of New York, said that monetary easing had an effect on the risk-taking channel in a verifiable way, which is identifiable, amongst other things, in the trends of the loan spreads of riskier companies. After this, *Dong Beom Choi*, financial economist at the Federal Reserve Bank of New York, examined the effectiveness of monetary easing in a heterogeneous risk taking environment. Subsequently, *Fernando Duarte*, financial economist at the Federal Reserve Bank of New York, held the last presentation of the conference on how optimal monetary policy should take into account the aspects of financial vulnerability as well.

The last ten years have resulted in profound changes in the world economy, including challenges such as the financial crisis, imbalances and structural problems, while the growth path and potential growth have eroded widely compared to the period before the crisis. In several regards, it has been proven that new approaches are necessary in the world, including a revaluation of past economic policy framework. A further increase in productivity may represent a solution to the challenges, especially via innovation and the development of education. The participants of the conference organised by the Bank of Korea also agreed that ensuring strong, balanced, inclusive and sustainable growth is necessary, while the economies must be rendered more dynamic using appropriate instruments. A new norm is emerging in the world economy, but adaptation to this indicates an area in question: where this takes place successfully, the next decade will also offer a path full of success.

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Manuscripts should be submitted in accordance with the following rules.

- The length of the manuscripts should be limited to 40 000 characters (including spaces) but a ± 50 per cent deviation is accepted. Manuscripts should be written in Hungarian and/or English.
- Papers always begin with an abstract which should not exceed 800–1000 characters. In the abstract a brief summary is to be given in which the main hypotheses and points are highlighted.
- At the bottom of the title page a footnote is to be given. The footnote contains every necessary information related to the paper (acknowledgement, relevant information etc.). This is followed by the name of the institution and position the author works at, e-mail address in Hungarian and English.
- Journal of Economic Literature (JEL) classification numbers should be given (three at least).
- Manuscripts should be written in clear, concise and grammatically correct Hungarian and/or English. Chapters and subchapters should be bold.
- Manuscripts should contain the list of references with the first and surname of the authors (in case of non-Hungarians the initials of the first name is required), the year of publication, the exact title of the book, the publisher, the place of publication. In case of papers, the exact title of the journal, the year, the volume, and the pages should be indicated. References in the text should contain the surname and the year separated by comma. When citing, the exact page be indicated.
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