

Kaposvár University  
Faculty of Economic Science

Head of Doctors' School:  
**DR. GÁBOR UDOVECZ**  
Doctor of the Hungarian Academy of Sciences

Supervisor:  
**DR. CSABA SARUDI**  
CSc in Economic Sciences

Co-supervisor:  
**DR. JÁNOS SZÁZ**  
CSc in Economic Sciences

CURRENCY DEMAND AND SHADOW ECONOMY IN  
HUNGARY

Author:  
**BALÁZS SISAK**

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## **1. AIMS, AND ANTECEDENT OF THE RESEARCH**

The euro changeover is late. In the begining of the century it was considered to be quite realistic that we are going to use euro by the end of the decade, but it did not happen until now. The reasons are referred back to the problems of the state's interference. The reason, which is mostly claimed, that the public redistribution is not effective enough: wasting and absence of sources is present at the same time. This became more serious when the budget deficit got very high because of short-term economic political decisions. This enlarged our indebtedness and according to this, the interest rate got higher because of the growing risk. This course became accelerating, and the credit crunch was making the situation all worse.

The most significant problems are brought by the expansion of the shadow economy. On the one hand the underground economy is deforming the nominal economic indicators and because of this, the Maastricht criterias are not showing the concrete status of the economy, on the other hand the great level of the underground economy is leading to tax evasion and this also causes the delay of euro introduction.

In the first part of my dissertation I am reviewing the convergence. I will analyse why the shadow economy is obstructing the close up of the economy. My most significant aim is to show that there exists a connection between the underground economy and the currency

demand, and after proving this I will show why the euro changeover can not lead to the decrease of the activities of the shadow economy.

To reach my aims, I will check the Hungarian and international bibliographies in euro introduction, cash demand and in shadow economy. Furthermore I was also analysing papers in cash demand of the underground economy.

In the essay I will use the tools of modern econometrics. In the methodology part, I will shortly dissert in the most significant, methodological questions of the dissertation.

## **2. THE METHODOLOGICAL BACKGROUND**

The Hungarian data is from the MNB's and KSH's thesaurus. These can be found on the websites: [www.mnb.hu](http://www.mnb.hu) and [www.ksh.hu](http://www.ksh.hu). The international database is from the public sources of the Eurostat<sup>1</sup> and the European Central Bank (EKB, [www.ecb.int](http://www.ecb.int))<sup>3</sup>. I use only public information. When it was necessary, I was using the TRAMO/SEATS method for the seasonal adjustment with the help of the Demetra package, recommended by the Eurostat. The ratings shown in the essay, are results of own calculation.

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<sup>1</sup> [http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search\\_database](http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database) date of download: 08.2009-03.2010

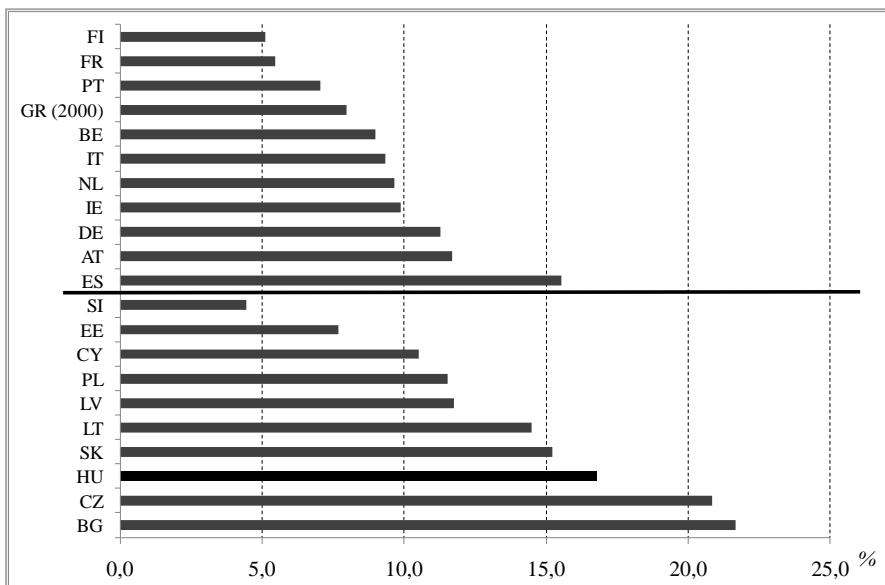
<sup>2</sup> <http://sdw.ecb.europa.eu/browse.do?node=3447413> date of download 08.2009-03.2010

<sup>3</sup> <http://sdw.ecb.europa.eu/browse.do?node=3447413> date of download 08.2009-03.2010

### **3. RESULTS AND THEIR EVALUATION**

Taking in consideration other countries, in the same economical status as Hungary, our country has intensive cash usage. Only in the Czech Republic and in Bulgaria was this rate higher in the end of 2008, and we are at the same level as Slovakia and Lithuania.

*1. graph Currency in circulation as portion of final consumption of households*



Source: European Central Bank (ECB), Eurostat

Beside from the state of development, cultural issues and economic political decisions have also a great effect on currency stock. The less developed central-European countries' cash intensiveness is showing a more complex picture then the eurozone's. It is visible in

the picture that Slovenia's cash intensiveness is the lowest, and Hungary's, the Czech Republic's and Bulgaria's exceeds the average of the European countries'. What is causing the significant differences? Later I will try to prove that also another segment, the shadow economy has effect on the cash demand.

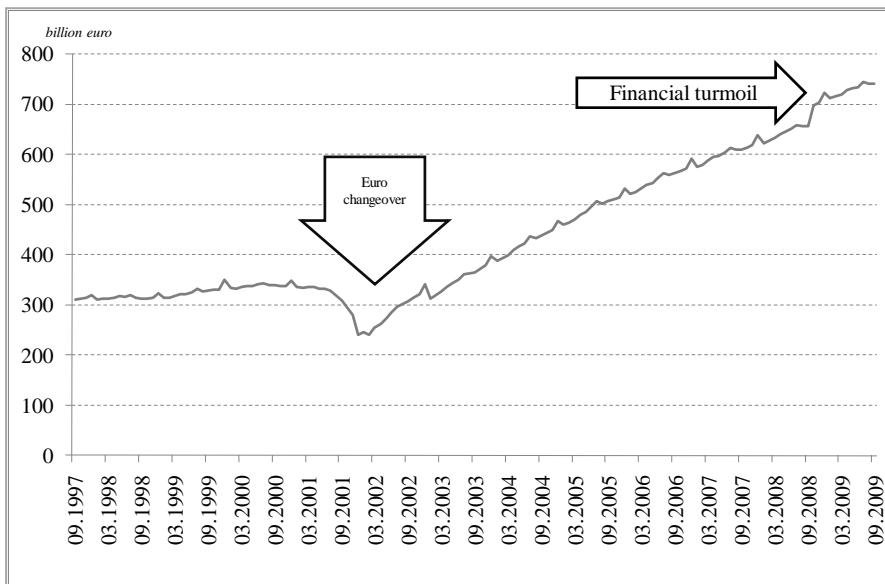
### **3.1Cash demand and euro introduction**

The euro introduction has an ambiguous effect on the cash demand. Just before the euro changeover the currency stock starts to reduce, because the economic actors are changing the currency of their transaction stock. After the introduction of euro, this process of changing old national currency banknotes to new euro banknotes is managed by the financial system. According to this, we could await that the euro changeover is going to have a permanent negative effect on the cash demand.

As a matter of fact, if we watch the times of the introduction of the euro in 2002, we are not going to observe this process (EKBb 2002). However, the currency stock reduced significantly before the introduction it reached very quickly the level before. So we could draw the conclusion, that if in the developed countries the euro was not able to influence the cash demand, it is unlikely that it is going to be an important issue in the Central-European countries.

Furthermore, as the 2. graph shows below, the currency stock has reached historic peek in 2008. In case of euro this boost is considered to be unlikely that it is caused by the increasing cash demand of the shadow economy. It is more likely that it has connection with the international demand for the euro as a currency.

## *2. graph Effect of euro changeover on currency stock*



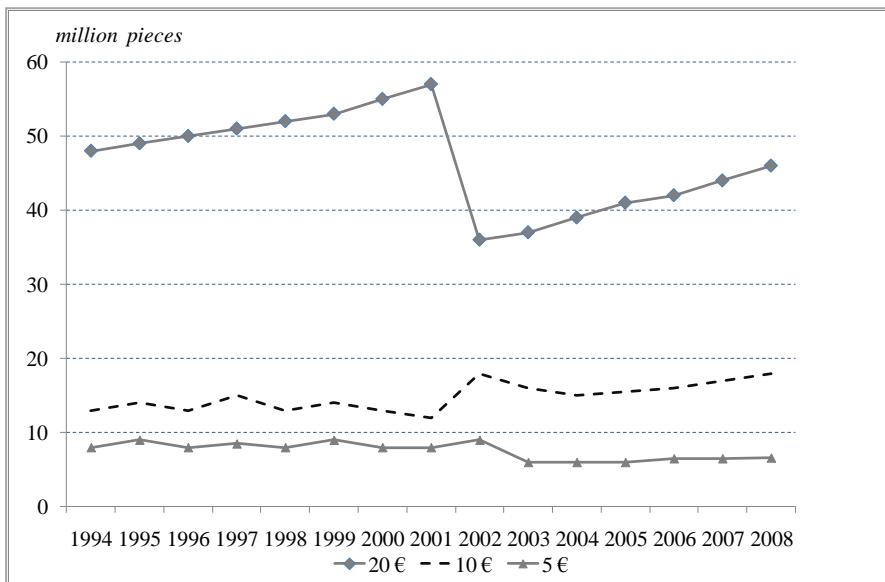
The stock before 2002 is estimated by the ECB

Source: ECB

The euro value of the national currencies was estimated by the ECB, based on the countries joined in 2002. Because they are estimations and not concrete data, the graphics are holding uncertainty. At the same time they are adequate to regard further examinations. (EKBb 2002; EKBC 2003).

As it is visible on the 3. graph, the amount of transaction banknotes reduced slightly after 2002. On the one hand the reason for this can be that the economic actors preferred electronic payment. On the other hand the popularity of the 50 euro note could have affected the demand for the 20 euro note negatively.

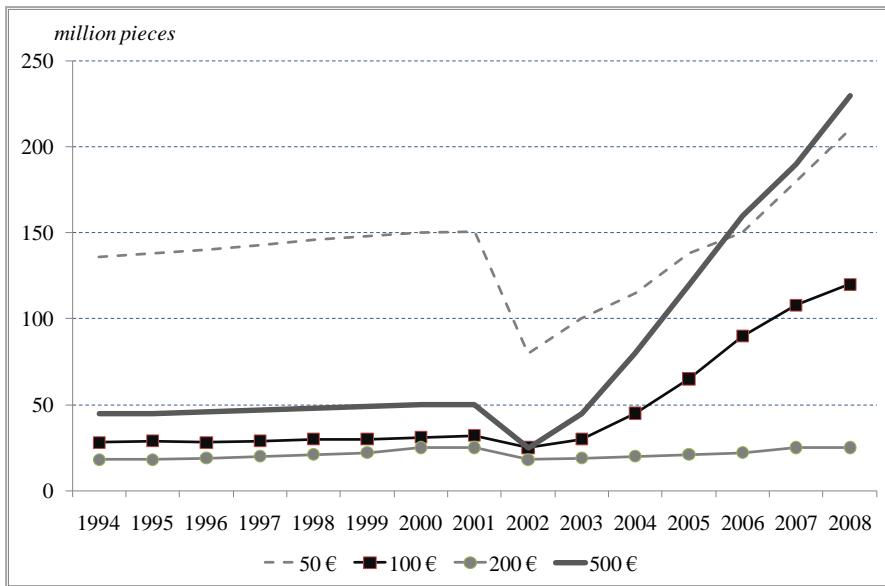
### *3. graph Transaction notes and euro introduction*



Source: ECB

In the case of the large bills, the situation has changed heavily. (4. graph). The most outstanding is the quick increase of the 500 note, but the 100 euro note increased significantly as well.

#### 4. graph Large notes and euro introduction



Source: ECB

So the euro introduction can slightly affect negatively the transactional currency stock, but it can affect positively (through the foreigners) the currency stock for hoarding purposes.

### 3.2 The connection between the shadow economy and the currency stock

In an effective economy, there is no underground economy. Only, as a side-effect of governmental actions, like taxing and regulation, non-official economic actions are appearing.

### *3.2.1 Direct approach*

The cash demand of the shadow economy can be modeled from cash demand function directly. The idea behind the method is very simple: however, the individual cash transactions are not leaving hints they can be observed at aggregated level. The transactions in the shadow economy are increasing the cash demand, so the currency stock is reaching a higher leve compared to the status without shadow economy. So those independent variables should be pointed out, which are affecting the cash demand of the underground economy. Picking out the effect of these, we can get to the currency stock, which should be reasonable without shadow economy.

To estimate the cash demand of the shadow economy, we should define the amount of money, which can be in connection with the transactions (or hoarding) made in shadow economy. So we should take from the actual amount of money the amount of money which is estimated by the model assuming minimal tax burden. There are several problematic points with this argument, which can be summarized as follows.

- Not only cash transactions are settled in the shadow economy, so the method can underestimate the transactions made in shadow economy.
- Beside of the tax burden, there are other factors, which can affect the shadow economy. For example tax moral, the complexity of regulation and tax system. But unfortunately there are no reliable

datas in most of the countries about these items. [Aastveit, K. A. (2006)]

In the dissertation I was modeling the shadow economy's cash demand, with a structural vector correction model (SVCM), with the help of variables, recommended by Tanzi.

The estimated equations are the followings:

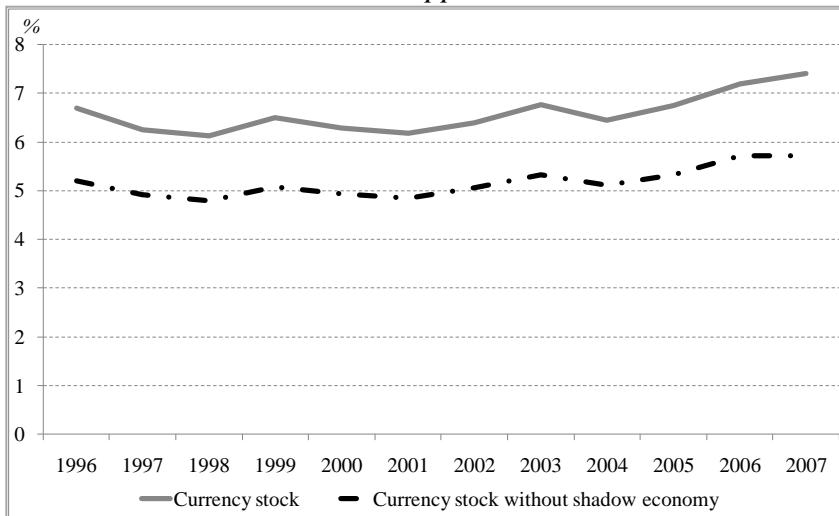
$$\ln \frac{CURR_t}{M2_t} = -2,1 + 1,46 \times \ln(1 + r_t) + 0,52 \times \ln \frac{Y_t}{P_t} + \varepsilon_{1t} \quad (17.1)$$

$$\begin{aligned} \ln \frac{Y_t}{P_t} = & 2,7 + 1,03 \times \ln \frac{CURR_t}{M2_t} + (-27,175) \times \ln \left(1 + \frac{T_t}{Y_t}\right) + \\ & + 27,24 \times \ln(\pi_t) + \varepsilon_{2t} \end{aligned} \quad (18.1)$$

The signs of parameters, except the signs of the interest rate, are parallel to theoretical considerations.

According to the model, I was estimating the cash demand of the underground economy the way that I was calibrating the tax variable gripping it, to 0. The difference between the actual and counted by zero tax burden cash demand is the shadow economy's cash demand. This can be explained theoretically that without the state there would not be shadow economy. The result of the model is shown by the 5 graph.

*5. graph The currency stock with and without shadow economy  
as proportion of GDP  
Direct approach*



Source: own estimates

The model simplifies the real world, that's why there are several problems with it.

- The shadow economy is not only depending on high taxes, but on illegal activities and mostly on bureaucratic circumstances.
- If we can accept the fact that the shadow economy is mostly influenced by the tax rate, it is not even sure than that with 0 zero tax incomes the cash demand of the shadow economy would be less.

So the model is only giving answer to the case that how big part of the cash amount is explained by the fact that the state imposes taxes.

However, the model does not say anything about the informal demand for cash.

### *3.2.2 Indirect approach*

A part of the currency stock is transactional, another part is motivated by hoarding but the residuum can be connected to the shadow economy. We can get indirectly to the cash demand of the informal economy, if first we determine the transactional cash demand. In the second place, from the remaining stock, which is also including the currency stock with the aim of hoarding, we may conclude to the cash demand needed by the shadow transactions. So we are not modeling the cash demand in connection with the underground economy, but the part which can be explained by transactional and may be with hoarding motives. Accordingly, there is no use of introducing an explanatory variable that is claimed to be the main determinant in the cash demand of the shadow economy. That is why this approach can have a better answer to theoretical requirements.

The model was elaborated on the basis of theoretical demonstration in my essay, and of empiric considerations showed above. The equation was estimated by the method of fixed effect panel regression.

$$\begin{aligned} \frac{\Delta CARD_{it}}{C_{it}} = & \alpha_0 + \beta_{it} \frac{\Delta CURR_{it}}{C_{it}} + \gamma_{it} \frac{\Delta GNI_{it}}{C_{it}} - \alpha_2 \beta_{it} \Delta r_{it} + \\ & + \theta_{it} ATMPOP + \varepsilon_{it} \quad i=1, \dots, 13 \quad (19.7) \end{aligned}$$

$$\beta_{it} = \gamma_0 + \gamma_1 POSPOP_{it}$$

I normalized the dependant variable, the currency stock and nominal GDP with the final consumption of the households. This was necessary because I needed the result that in a concrete country how is consuming influence the cash transaction, and how other ways of paying. It would be more appropriate to normalize the equation with the already purchased consuming, because the country's consuming also includes the imputed consumption. But on international level a data like this is not available.

And in the end, the ATMPOP is an explanatory variable of the dependant variable. Its influence on cash transactions is depending on the level of development of the given country. With low ATM penetration, growing of the terminals is helping to obtain cash, so their numbers can have a positive relation with the currency stock. At a technically higher level with easier ATM availability, people can reduce buffer cash holding, which can reduce the currency stock.

From the estimated parameters it is possible to approximate the changes of the cash transactions (19.7). Where the  $\beta_{it}$  has a country specific, changing value and it is depending on the estimated parameters and also on POS terminals per capita (POSPOP).

$$\Delta CASH_{it} = -\beta_{it} \times \Delta CURR_{it} + \alpha_2 \beta_{it} \Delta r_{it} \quad (19.6)$$

We have a view on the currency stock used for the transactions, which equals to the cash volume of the population and the enterprises, and also on currency stock included in the books of other sectors' economic actors. From the financial accounts, the currency stock kept by the state and banks is available. (I was considering the currency stock kept by enterprises as a part of the consumption cash demand, because the household budget is the offset of the goods consumed by the population and the goods represented.) The process of counting is shown by the 1. table.

### *1. table Decomposition of currency stock*

**A** Cash transactions for consumption

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**B** Cash withdrawal (volume)

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**C** Cards with cash functions (volume)

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**D** Frequency of circulation(B/C)

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**E** Transactions currency stock (A/D)

**F** Currency held by state

**G** Currency held by banks

**H Explained currency stock (E+F+G)**

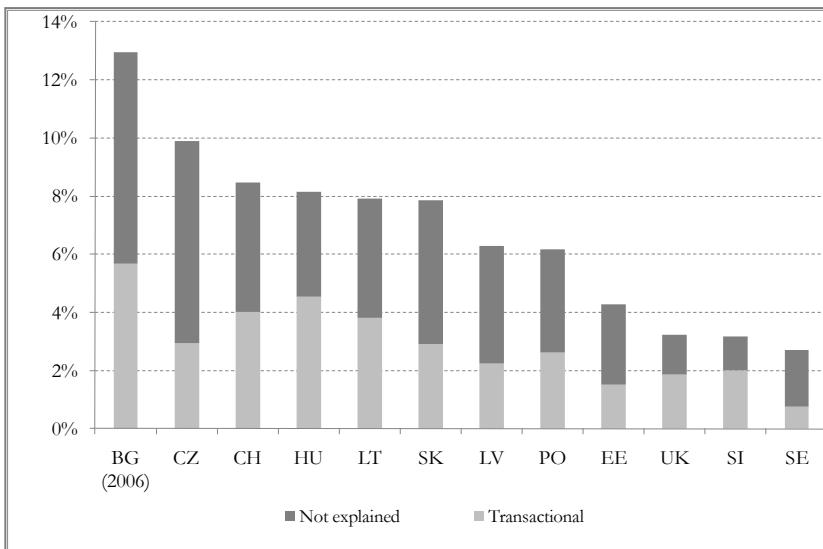
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*Source: Gabriela Guibourg and Björn Segendorf*

(Sveriges Riksbank): The Use of Cash and the Size of  
the Shadow Economy in Sweden, march 2008

The total of these is regarded as the explained currency stock. On the 6. graph I was comparing the consumption cash demand based on the results obtained from the model explained above.

## *6. graph Transactional currency stock as portion of GNI*

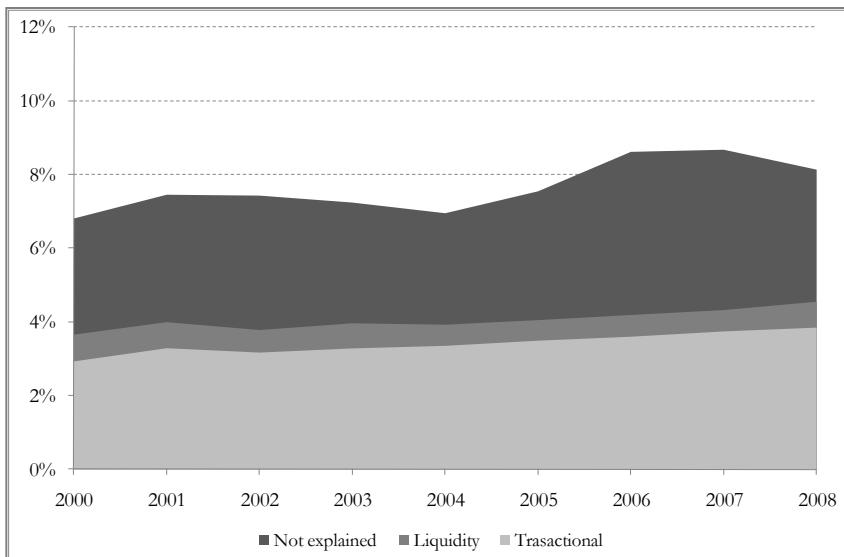


Source: own estimates

The 6. graph shows the total and the transaction currency stock in the percentage of GNI on cross-section data, based on the calculations in 2008. Hungary is estimated to possess high transactional currency stock; Switzerland and Latvia in considered being at the same level. Only Bulgaria needs more cash to transact their buying. The high transactional currency stock of Switzerland can primarily be referred back to cultural circumstances.

Until this point it have been shown that what portion of currency stock is reasoned by the everyday purchases and services, given in a country. If we complete this data with the financial sector and government sectors liquidity hoarding, then we are getting the result how we can explain directly the conformation of currency stock.

### *7. graph Transactional and explained currency stock in Hungary as portion of GNI*



Source: own estimates

The Hungarian processes can be followed on the 7. graph. The explained currency stock follows the path of transactional quantit and has been grown in the last 8 years. The boost observed in the middle of the decade can not be explained by the transactional cash demand. As a result of this, the increase can be reasoned only with hoarding motives. However, it can not be stated definitely that the shadow economy's cash demand caused the expanding between

2004 and 2007. As mentioned in the dissertation, hoarding can be rational in itself. But it can be clearly stated that this period was characterized by high real interest rate age and stable financial system. So the sudden increase of cash demand can not be clearly explained with the change of financial circumstances. According to this, it is highly suspected that cash intensiveness of the shadow economy could have played a great role. It is very important to assert that this did not meant the expanding of informal economy, only that the shadow economy might have needed more cash. But it can not be stated with confidence from the presented model. So from micro aspect, the question should be analyzed with quantitative tools. The study made in the MNB in 2010 [Schubert (2010)] got to the results with these tools that the informal economy's cash demand increased in the last times. It is all reasoning the evaluation of the model showed in the article.

### *3.2.3 The cash demand of shadow economy and the euro changeover*

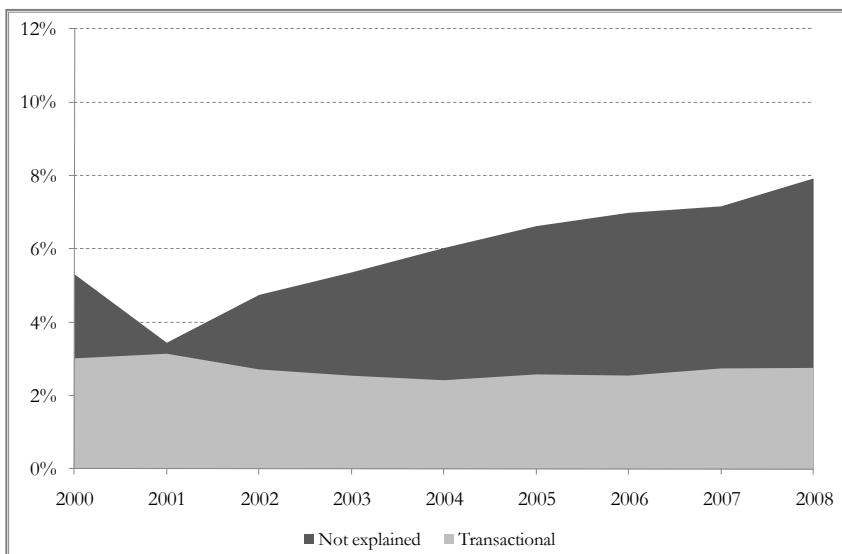
Before I got to the main conclusions of the thesis, I will make short evasive into the theme of the euro introduction. The method presented in the study gives the opportunity to think through what effect will have the euro introduction on the eastern European countries' cash demand. It can be assumed that by process of changing of cash denominations, the authorities will get to pieces of

relevant information about the income acquired illegally and kept in national currency what they can use in wealth investigations.

So first we have to analyze how the euro changeover affected the cash demand, related to the shadow economy of the countries that joined eurozone in 2002. Using the parameters of the model, we calculated the transactional cash demand of the eurozone.

The 8. graph shows the result of the calculation. The currency stock of the eurozone mitigated to the level of transactional stock until the end of 2001.

*8. graph Transactional and explained currency stock in the eurozone as portion of GNI*



Source: own estimates

According to model calculations, the growing can not be referred back to transactional cash demand because its intensity stagnated and the whole stock's intensity broadened. The whole stock reached the level before the euro introduction until 2004, and it has been increasing since.

The reason for the large broadening, in the case of euro, is not only the extended cash demand of the shadow economy but the significant and growing need for the currency of euro. The already mentioned ECB study [Fischer et al (2004)] and the report of the ECB from 2007 is claiming that the currency stock, possessed by the non-residents, is 15-20 percent of the whole stock. Deducting this from the whole stock we are arriving to the conclusion that resident hoarding in cash evaded significantly in mid-period. It is all confirming our consideration that high value notes (200-500 euro) are easing saving in cash and they are increasing the latitude of informal economy [Rogoff (1998)].

So the changeover was not equivalent in itself to efface the motives of hoarding. Moreover high value notes presumably helped in using them in the underground economy. So as a result of this the intensity of euro stock reached record.

The join of central eastern European countries can cause the same processes. The falling of currency stock in the beginning, will be followed by a rising in a very short period and the previously acquired illegal wealth can be converted into euro very quickly. So

presumably the changeover will not have a bad influence on shadow economy

#### **4. CONCLUSIONS AND RECOMMENDATIONS**

In the chapters where I presented the results of the study I was estimating the cash demand of the shadow economy with two methods. The results of the direct calculation should be handled reservedly. The reasons are the followings.

- The shadow economy can not be explained only by avoiding taxes, the reasons can be also the overgrown buerocracy, complicated regulations, and delinquency.
- The cash demand of the shadow economy is cointegrated with the whole currency stock. As the currency demand of the shadow economy is influenced by other circumstances as well, this path should not be relevant.

These facts were asserting my supposal that the model is only showing a part of the shadow economy's cash demand.

We can have a picture of the proportion of currency stock that can be explained by avoiding of taxes. To estimate on international data, is another research opportunity. The results can show the given country's cash demand, induced by the tax system. So we can have a picture of the efficiency of a given country's tax system.

The indirect estimations are more relevant on the level of the cash demand of the shadow economy. The level of this should be handled very carefully; however, its dynamics can be accepted by theoretical correspondences. The specification of the model and significant parameters prove the relevance of the model. According to the levels of cash demand of the shadow economy, the estimations are quite unsure. The reasons are the followings:

- To calculate the starting value, the 1.table is giving a nearly punctuate result. As we should have taken in consideration other payment tools either (paying with cheque, transfers, paying via the internet etc.). Unfortunately we do not have any information about how many transactions were handled by these tools.
- In the model, which is estimating the cash transactions, I normalized the equation with the total consumption of the country, instead of the purchased consumption. This does not change the dynamics of the results, only the levels.

So the strict understanding of the indirect model is acceptable, as it says that the growing of the cash demand of the shadow economy exceeded the growing of the whole economy's cash demand in between 2005-2007.

The growing of cash demand of the shadow economy could have been caused by other factors, like the tax system's change, or the more severe investigations of tax agency [Odorán-Sisak (2008)]. So the result of the model serves our first expectations.

I have also found an unambiguous correspondence in the study as the cash demand is influenced by non-cash paying facilities' infrastructural development. Moreover if we are promoting the spreading of non-cash facilities, strengthening the infrastructure (POS, ATM terminals), we may reduce the economy's cash demand. As the non-cash paying facilities are preferential in a lot of places; the transactions will be made mostly in electronic way, decreasing the latitude of underground activities. I am not stating that the shadow economy can be constricted to an optimal size; this needs active economic policy measures. However, favouring non-cash paying can strengthen the efficiency of economic political actions.

I tried to make conclusions based on the results of the indirect model: how the euro changeover is influencing the shadow economy's cash demand. According to stylized facts, it is visible that after the changeover the currency stock got back to the same level as before the introduction, in the current eurozone's countries. We can make the conclusion that the euro introduction had only temporary effect.

Only a little continuous part of the eurozone's currency stock can be reasoned with the cash demand, in connection with consumption. According to the estimation, the non-transactional part increased constantly, and only a quiet constant part (15-20 % of the whole stock) can be explained with foreign demand.

When the new countries will join the euro will be an existing currency. So the conversion of the secret incomes can start before the introduction of euro. So the euro introduction can only be a technical factor also in the case of the closing up states It is not influencing structurally the shadow economy's cash demand.

## **5. NEW SCIENTIFIC RESULTS**

1. I analyzed the relationship between electronic and cash payments and the tools affecting these with statistical and econometric tools. I showed that the intensity of non-cash transactions is very low in the central European countries, because the infrastructure is underdeveloped. I proved that the penetration of POS terminals is in negative connection with the cash demand.
2. I estimated the transaction cash demand with an econometric model in central European countries. The transactional cash demand is depending on the volume of non-cash transactions, on income level and the interest rate. Endogeneity was handled by instrumental variables. I analyzed the Hungarian processed separated. I proved that the transactional cash demand is cointegrated with the income. So the intensity of currency stock was not depreciating, though, non-cash transactions increased significantly.

3. I estimated the currency stock related to shadow economy with two different approaches: the direct and indirect approach. The latter was more relevant. I showed that the increase of the currency stock between 2005 and 2007 may have been caused by the informal economy.
4. With the analyses of stylized facts and econometric tools I proved that the euro introduction did not affect the latitude of shadow economy in 2002. This can be considered a technical factor, but the shadow economy can be diminished only by structural changes.

#### **LIST OF PUBLICATIONS RELATED TO THE PHD RESEARCH**

Odorán, R., Sisak, B. (2008) A magyar gazdaság készpénzigénye – továbbra is olajozottan működhet a rejtett gazdaság? MNB szemle MNB, Budapest  
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Sisak, B. (2006) A háztartások pénzügyi megtakarításainak előrejelzése Széchenyi István Egyetem Doktori Iskola, Kutatási Füzetek Győr (pp.36-57)

Sisak, B (2005) How do income expectations influence consumption? - Econometric analysis of income and consumption V. European Doctoral Seminar Seminar Volume BERG Verlag Bamberg (pp. 161-182)

Sisak, B. (2004) Development of savings in Hungary IV. European Doctoral Seminar Seminar Volume BERG Verlag Bamberg (pp. 51-76)

*Sisak B.;* (2007) Az adójárvány hatása a fogyasztásra és a megtakarításra Musgrave Szeminárium Budapest 2007. Előadás magyar nyelven

*Sisak B.;* (2007) Was geschah mit den Ersparnissen in Ungarn? Was ist zu erwarten? DSG Seminar Lakitelek 2007. Előadás német nyelven

*Sisak B.;* (2006) Die Einkommen Erwartungen und das Konsum von Haushälte DSG Seminar Lakitelek 2006. Előadás német nyelven

#### **LIST OF PUBLICATIONS NOT RELATED TO THE PHD RESEARCH**

*Sisak, B.:* Devisenkurs mit Bandbreite Modellierung mit Optionen, Mehrere Bewertung (Előadás) 2005 május 6-án Lakitelek Seminar in Finanzwissenschaften Universität Passau Corvinus Egyetem DSG (Deutschsprachiger Studiengang) Szervezésében

*Dr. Sarudi, Cs. (Cs.C) – Dr. Geszti, Sz. (Ph.D) – Sisak, B.* Entwicklungsmöglichkeiten von Kleinräumen in Süd-Transdanubien (Poszter) 2. Sächsische Mittel und Osteuropatag Deutschland am 20. mai 2005 Technische Universität Chemnits

*Sisak, B.:* A piaci verseny intenzitása (Elemzés) Nemzeti Fejlesztési Hivatal Fundamentum Projekt. 2004. december Megjelent: [www.fejlesztespolitika.gov.hu](http://www.fejlesztespolitika.gov.hu)

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