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The effect of debt generating capital flow on the exchange rate regime

Theses of Doctoral (Ph.D) Dissertation

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1. The background of the work, purposes, hypotheses

The regulation of the capital flows and the money markets have already interested the writer during his university years, so he wrote his diploma and also his postgraduate thesis in a similar topic. Later also that helped the topic to become stable, that at the faculty of Economics of the University of West Hungary, he and his colleagues on the BA-s and MA-s have already dealt with the monetary and fiscal correlations, which are presented in the theoretical parts of the dissertation, in the topic of international finance. These provided a good basic to explain deep, detailed researches.

In the doctoral research the writer undertake to explain notions, which over the significance of the theoretical discussion, also in the practise are often contentious notions in the economical and social life: the indebtedness and the exchange rates. The Hungarian economy leans on the outer financial resources to a great extent, so the international capital flows directly take effect on the domestic financial stability. So the high level of the indebtedness in foreign currency makes the exchange rate of the domestic currency to the object of the interest. Therefore the topic could not be more actual, because the debt crisis, what appeared as the effect of the decline in the liquidity of money markets, and is still waiting for a solution, has drawn attention to the examination of the structure and the content of the public debt. With the growing of the outer indebtedness, the stability of the foreign exchange rates becomes one of the headstones

of the financial stability. In this case, the growth of the financial vulnerability and the process, what generated the indebtedness and lead to the crisis, can be analysed not only in the speciality of the debt-generating capital flows, but also in the changes of the foreign exchange rates, because the latter can mean the significant source of the culmination of the problems. The exchange rate regime according to the writer's survey means that mechanism, what causes the equilibrium exchange rate to evolve, independently from the form of the exchange rate regime. So the writer examine the capital flow's effect on exchange rate regime on the "outcome", namely on the effects on the exchange rate.

That provides the topic's suitability for the research, that the exchange rate of the forint weakened-swelled more intensively than that would be reasonable in the examined period. The basic aim of the dissertation is to perambulate and search in a recent approach the correspondences of the factors, what generate changes in the international currency's exchange rate, especially the capital flows, and within it, in the aspect of the co-movement of debt generating capital flow and exchange rate. The writer with his survey would like to demonstrate that, the exchange rate influential short time effects, what are described by the portfolio-model (the realignment in the foreign-owned government bond's portfolio, what is caused by the change of risks), are traceable in the exchange rate of the forint. As an operative project, the writer set out the examination of the debt, denominated in the internal currency and within it, the pressure on the exchange rate by the changes in the stock of the foreigner-owned

government bonds, expressed in the national currency. The writer looks for the answers for that question, that correspondence between the change of the foreign-owned governmental debt and the strengthening and (especially) the weakening of the national currency shows up or not as a cause and effect relationship. Besides this the writer makes up assumptions to analyse on the activity and the effects of debt generating capital flows in outer financing.

The writer set up the hypotheses of the dissertation by the national and international theories, and then he verified or threw out his previous statements by an adequate research model, after the elaboration of the secondary information specific to the Hungarian economy. The formulated hypotheses follow a kind of logical order in the process of the research:

H1. The effects of the outland's debt generating resource extraction on the forint government bond market determine and rearrange fundamentally the Hungarian economy's outer financial activity:

H1.1. The debt generating capital flow took out in the analysed period the most significant changes in the balance of payments financial account (both sides foreign currency outflow and foreign currency inflow)

H1.2. The most significant evocative of the changes in the volume of the outer debt financing is the government and within it, the government bond market denominated in forint

H2. The most active participant of the capital withdrawal from the government bond market denominated in forint is the outland, mainly on the sell side

H3. The rising volume of the foreigner's government bond market activity put the exchange rate of the forint under pressure on the foreign exchange market

H4. The forint's exchange rate, especially in the years of the crisis, traversed more, than that would be reasonable by the fundamental factors, and this is connected with the changes of the foreign-owned stock of the government's external debt

H5. The volatility of the forint's exchange rate in the analysed period moved together with the foreigner's government bond selling (purchasing) wave

H6. The significant foreign capital withdrawal from the forint government bond market in a short or medium term leads to the weakening of the forint's exchange rate against the leader foreign currency.

2. The content, the method and the justification of the dissertation

Nowadays following the forint's exchange rate is a common activity for the government, the companies and also for the households. From 2008, the intensifying exchange rate volatility made in foreign currency indebted internal economic sector's debt service unpredictable, which dramatically impact the economic growth prospects. Thereby grew the significance of the governmental devices, which could influence, soften the unwanted effects of the growth of the certain sectors risk positions. So the dissertation tried to connect the monetary devices, what would like to control the exchange rate's dynamics and the foreign capital flows fiscal management, what causes foreign indebtedness, and to deal with their effects. The dissertation might help awarding that, how could the theory set off in the practice: whether is the exchange rate effect ascribed to the capital flow shocks shows up or not in the Hungarian economy and could this effect be demonstrated also on a long period.

This dissertation approach to its object as follows: firstly it summarizes the required theoretical knowledge and the results of the relevant surveys. It presents the forms of the data's processing, what are used in the models of the dissertation, moreover the statistical, econometric methodology of the analysis. It reviews the process of the research, the results, and finally makes proposals to the continuation's ways f the inchoate analysis.

The writer set up the hypotheses of the dissertation by the national and international theories, and then by an adequate research model, after the elaboration of the secondary information specific to the Hungarian economy, could the previous statements be verified or threw out.

For induction, used the writer the public statistic data of the national institutions (MNB, ÁKK, KELER, KSH), the international institutions (BIS, IMF, Eurostat) and the professional informants (Reuters, Bloomberg). The writer processed the data from the more than 10 year long examination period in the most detailed breakdown, as that was possible; he had to make quarterly, monthly and daily time series, to structure the available data properly.

In each research item was the methodology different, according to the topic and the available data. The first part of the examinations confines oneself to the devices of the elemental descriptive statistic. So for example in the case of the H1.1.-H1.2.-H2.-H3. hypotheses, after processing the data it is possible to decide with easy ratio calculations whether the assumptions were right or not. The survey of the H4.-H5.-H6. hypotheses needs more sophisticated analysing methodologies, for example the writer examined the correctness of his statement with a time series analysis containing more than 2500 data.

The time series analysis analyse time series, what are serial numbers from the data corresponding to point in time. Several data series combined analysis is the multivariate time series analysis; its main object is to determine the dynamic or the temporal structure of the data series. The analysis of the time series stationary could be very

important, because if the time series in not stationary, the traditional connectivity test, the classic econometric methodologies (for example: linear regression) lead to faulty conclusions, supposition of "false correlation" connection, so the results would not be trusty, and perhaps could show connection between time series, what are really independent. If the time series show "random walk", so the variance of the time series increases with time, the dispersion of the time series is changing too, than it is not stationary. In this case, it is needed to use a model, which can treat the problems caused by the lack of stationary. For the designation of the analysis method of the connection between non-stationary time series can the unit root analysis be used, whereby the first differences of the time series will be stationary. However, all information will be lost from the long term behaviour of the model, to avoid this; there is the analysis of the time series cointegration. To take the short term dynamics more attention, the stationary connections are written down statistically by some kind of cointegration (or error correction) models. With the help of the cointegration, it is possible to explore the connections between the long term trends of time series. If the analyses are completed, both the short term and the long term coefficients will be estimable.

Methods used in the course of the examination

> *Executing the ADF unit root test in order to examine stationarity*

In the Augmented Dickey-Fuller test – which is used to execute the unit root test – lagged values of the dependent variable appear in

the regression. It is worth to test the unit root tests with alternative methods, too (for example with the Phillips-Perron (PP) unit root test), which can confirm the results of the examination of the hypothesis).

➢ *Cointegration analysis*

The conception of cointegration was defined to analise the common trends of non stationary time series. It can happen that the two non stationary time series have a linear combination which is already stationary. In this case, the two time series are cointegrated, this can prove the existence of dynamic balance connections, that link the examined variables.Since two cointegrated time series don't withdraw from each other in the long run, this means that a connection exists between the two time series. The two most commonly used cointegration tests are the Engle-Granger two step procedure method and the Johansen more variable technique. During his examination, the author draws his conclusions on the grounds of either technique.

➢ *Granger causality test*

The Granger causality test is suitable for deciding whether the behaviour of a variable in the past can give information about the future value of another variable, namely it can predict: the lagged values of a given variable significantly predict the value of another variable in a given period. In fact, the methodology refers to the time and not to the causality as used usually: one can decide whether the A or the B case happened earlier, or they happened in the same time.

For the stationary variable pairs, wich showed Granger causality, the author executed an estimation with two variable regression. In the case of the non stationary variable pairs, a cointegration examination was applied to show the existence of the connection.

> *The error correction model (ECM)*

Short-term analysis usually filter the trend of the variables out by differentiating, however this leads to losing information about the long-term relations. The error correction model, applying standard econometrical techniques, estimates the long-term (cointegrating) correspondence between the non-stationary variables and also the short-term dynamics, which restores balance. The main goal of the cointegration theory is to unite the question of the short-term fluctuation and the long-term balance. The author proved the dynamics of the exchange rate of the Forint and that of the goverment securities – possessed by foreigners - by setting up the error correction model.
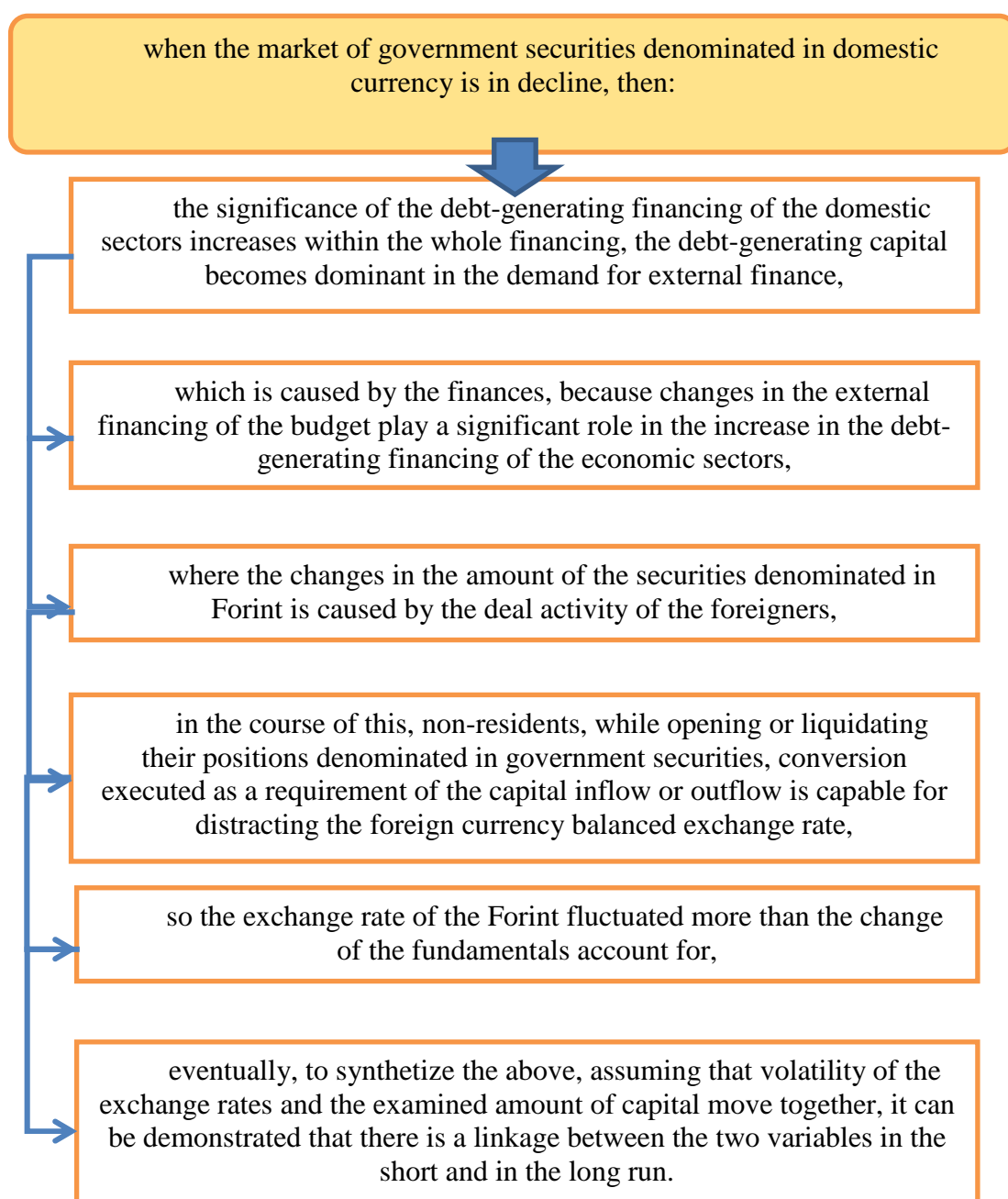
To process data and to set up models, the author used Microsoft Office Excel 2003 and 2010, the 1.9.7 version of GRETL[1] (Gnu Regression, Econometrics and Time-series Library) and the Eviews econometrical program[2].

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[1] GRETL is an open source-coded, userfriendly econometrical software, written in a C language, which can be downloaded free from: http://gretl.sourceforge.net/

[2] Eviews is a software, whereby econometrical, statistical calculations and prognosis can be made. To fulfil all these, the software visualizes the mathematical, graphic and programming elements

3. Research results, the new and the recent scientific results

The examination of the thesis of the dissertation is based on the following logic:

when the market of government securities denominated in domestic currency is in decline, then:

the significance of the debt-generating financing of the domestic sectors increases within the whole financing, the debt-generating capital becomes dominant in the demand for external finance,

which is caused by the finances, because changes in the external financing of the budget play a significant role in the increase in the debt-generating financing of the economic sectors,

where the changes in the amount of the securities denominated in Forint is caused by the deal activity of the foreigners,

in the course of this, non-residents, while opening or liquidating their positions denominated in government securities, conversion executed as a requirement of the capital inflow or outflow is capable for distracting the foreign currency balanced exchange rate,

so the exchange rate of the Forint fluctuated more than the change of the fundamentals account for,

eventually, to synthetize the above, assuming that volatility of the exchange rates and the examined amount of capital move together, it can be demonstrated that there is a linkage between the two variables in the short and in the long run.

On the grounds of the examination, the following thesis can be drawn up:

T.1. Because of the increasing sovereign risk of the state, the qualification of government securities deteriorates and also the risk premium, hereby the promised yield rises. This hazardously alters the composition of the investors' group: because of the higher risk, the institutional investors, following a „buy and hold" strategy and aspiring after safety, begin to sell their government securities to investors who seek after higher yields and want to invest in the short-run. These investors endanger the financial stability and generate sudden capital movements, which depend on the „carry trade" difference in the interests.

T2. Taking away the debt from the market of the government securities leads to more debt instead of debt. In the examinated periods, the debt-generating capital was dominant in the demand for external finance, in spite of the fact that in these quarters foreign debt-generating capital was taken away from the market of the government securities. The cause for this is that in these periods, the volume of the non debt-generating capital (mainly the direct investment) reduced its activity, so the non debt-generating capital doesn't compensate the missing financing forms. Hereby, the alternative debt-generating finance of the domestic sectors within the total amount of the financing had to rise. If there's no way to renew the debt in the market, alternative opportunities are needed – so instead of a

decreasing debt caused by the capital taken away, the debt of the economy rises. In this way, in the examinted quarters, the foreign currency flows were mainly composed of debt-generating financing, either the capital outflow or the capital called in - to make up for the capital which was taken away - is taken into consideration.

T.3. During the quarters, when the foreigners took away capital from the market of the government securities, in the case of the debt-generating financing of the economic sectors, the biggest foreign currency movement – contrary to the author's expectation – was not caused by the external financing of the budget. In the examined quarters, the banking sector had the highest operations in currency financing with foreigners – aside from a few exceptions. Moreover, the realignment of the market of government securities denominated in Forint, doesn't either generate the most significant money movement, regarding the financing of the budget, because the alternative financing channels – foreign currency bonds and later the pressure of the changeover to non-market financing: foreign currency credits from the international organizations - proved to have a more significant volume. As a consequence, those processes in the foreign currency markets, wich affect the exchange rate of the Forint were not primarily determined by the external financing of the budget (denominated in Forint), thus the caused exchange rate effect can also be softened by the foreign currency transactions of other sectors and this influences the latter thesis as well.

T.4. The non-residents - the most active participants of the trade on the secondary market of the Forint-based government securities – in the course of rearranging their investment portfolio, primarily the selling volume of foreigners causes the realignment of the governement securities denominated in Forint among certain sectors.

T.5. The size of the Hungarian foreign currency market and the volume of the examined capital take-away occurrences differ from each other notably, so the demand-supply pressure of the examined capital movement is observeable only in an extreme short-run - in a day. In order to examine the straight effect of the foreign currency selling (or Forint buying) – carried out as the requirement of the capital take-away, after the non-residents liquidate their position in government securities- on the exchange rate of the Forint, an order-flow analysis has to be run in a day.

T.6. Different shocks often cause that the short-run balanced exchange rate diverges from the fundamental balanced exchange rate indicated by the purchasing power parity. A proof of this is that the over/undershooting be detected in the exchange rate of the Forint. This prompts to further examinations. The over/undershooting - which is composed on the grounds of purchasing power parity which is calculated by right of the manufacturers index of prices (products of the tradable sector) – causes the change of the public debt in Forint, owned by the foreigners.

T7. The volatility of the government-securities investments made by foreigners in forint currency show that it's not speculative, fluctuating like „hot capital", but its volatility is higher than the rates'. The volatility raising of the rate is defined by the weakening and the following correction raising due to the turbulent market circumstances. Despite of the predictions, there are no parallel movements indicated in the two volatilities.

T8. There is a weak cointegrational connection between the nominal rate and the government-security stock denominated in forint, even analysing higher-frequency data, in which the currency rate and the level of stock capital moving together in longer period, while in short term there are strong disharmony which will be corrected slowly on the long-term equilibrium path. In long-time exchange rate and capital stock value correlating negatively with each other, this means, that the raising capital stock is lowering the nominal exchange rate (forint is strengthening) . In short period the information spreading direction is exchange rate → capital stock direction, so the foreigner investors are changing their position in the forint government-securities market according to the forint rate change against foreign currency. The government-security processes which starting because of the forint weakening after fundament degradation are weakening the national currency away which will result big government-security selling process to foreigners and as final effect: weakening the exchange rate.

Status of the hypothesis evidences (summary)

Hypothesis nr.	Hypothesis statement	Research result	Difference reason
H1.	The Hungarian economy's financing activity is defined and reshuffled fundamentally by the results of the foreign's debt-generating equity extraction on the forint-government-security market.	Partly evidenced	Based on H1.1. and H1.2.
H1.1.	*The debt-generating capital flow resulted in the examined period the significant changes in the payment balance financial balance part. (either foreign currency outgoing or incoming directions.*	Evidenced	
H1.2.	*The most significant cause in changes at volume of external debt-financing is the national budget, and inside it the government-security market denominated in forint.*	Not evidenced	The significant foreign currency financing activities in the bank sector. The state pushed the external financing to credit-channels.
H2.	The most active actor in the capital extraction from the government-security market denominated in forint is the foreign land, especially in the seller side.	Evidenced	
H3.	The volume-boom on the foreign activity in the currency market made under pressure the rate of forint.	Not evidenced	Microstructure-analysis because of missing data is not possible yet.
H4.	The rate of forint, especially during crisis years, has swayed in bigger extent than it was motivated by the fundamental factors' changes, and it is in connection with the state debt volume change owned by foreigners.	Evidenced	
H5.	The forint rate volatility is mowing together in the examined period with the foreigners' government security selling (buying) wave	Not evidenced	The common mowing was refused by the econometric analysis.
H6.	The forint government-security market foreigner capital volume change on short and long term supports the forint exchange rate movement against the leading foreign currency.	Evidenced	

New and novel scientific results

1. In the homeland literature the applied time-series analysis is considered as novel research method. It is rarely used in the Hungarian literature researches, especially rare in the connection analysis between exchange rates and capital flow, the cointegrational and error-correctional model's estimating model is implemented to Hungarian data analysis rather from the basis of international studies. With this the author can inspire other similar researches.

2. It is evidenced that the exchange rate overshot process can be indicated in the case of forint, and this can be in connection with the dynamics of the state debt in forint, which is in foreigners' hands. The effect analysis showed that the two variable is correlating with each other negatively: the growth (loss) of exchange rate overshot lowers (raises) the volume of capital stock change. From casual point of view exactly the opposite of the expected result is coming: the debt volume change do not results exchange rate overshot in short term, the overshot is evolving earlier, and the investors from abroad are reacting to this with raising their activity in the forint government security market.

3. With the analysis of the historic volatility value the author came to that the swing of forint exchange rate and the fluctuation of the foreigners' forint government security neither on short (as casual relation) nor on long term (as regressive connection) move together.

4. Despite of the expectations the author found that the exchange rate change takes over the debt-letter movement and not the debt extraction-incoming makes the national currency swinging So the rate expectancies are grounding the investing decisions, thus the swinging forint rate because of fundamental reasons inclining to portfolio allocation the capital owners, which makes stronger and shoot over the movement of the exchange rate.

4. Conclusions and proposals

Advices for using the conclusions of the dissertation:

➢ Harmonised the relevant questions and literature topics regarding rate mechanisms, which can be used in the future for international financial education

➢ The research is pointing the attention to the problem of the exchange rate effect caused by debt-generating capital flows, the conclusions can mean strongholds in the strategic direction creation for monetary strategies and state debt-management.

➢ Further researches can be started from the problem hypothesises delivered by the dissertation.

The weak explaining-like connection found during the analysis of the final hypothesis will inspire the author for further research to find exact reason. The models weak explanatory power which is dealing primarily with home country circumstances justified with the fact that the global components effects to regional foreign currencies can be indicated easily according to literature, and playing important role in exchange rate pendulation. So involving global components will strengthen the conclusions of the model. An explanation can be (as well as a new research direction) that the FDI income rate inside the aggregated capital flow is relatively high in the Middle-East Europe region, so the operating capital's micro-structural effect to the foreign currency market order-flow can neutralise the portfolio investments' exchange rate effect (concretely the state security change in stock).

Also the foreign currency market micro-structural effect analysis and the order-flow based connection model can involve the missing link to the research, which justifies the connection between the analysed capital flow and the exchange rates. Another possible research direction is the involvement of the foreign state security investors to the research. The foreigners' forint state security stock change will not take significant effect to the exchange rate because they rarely take the risk of exchange-rate change and buy the needed forint (on selling foreign currency) on the spot market. To reach this they use mostly FX-swap agrees to the money with investment goal. thus their exchange rate risk is covered, but the stock, which is financed with FX-swap will not occur as traded stock in the foreign currency spot market in the case of selling and buying state security.

Based on this it cannot be expected a connection between the exchange rate and foreigners' state security stock financed by FX-swap, thus not the whole effect will occur from the forint state security ownership change as exchange rate influencing factor, so the effect will be even smaller.

Interesting research topic will be involving MNB bonds to the dynamics of the foreigners' forint state security ownership. Despite of these bonds representing loan relationship as well, these are not classic state security category, because these are not used to finance state expenditures. Traditionally they sipping liquidity surplus from the money market, but from the end of year 2008, mostly from the middle of 2010 the relatively high yield (which is basically the base rate) can called the foreigner investors' attention, because the stock

raised. A future research can find out whether the foreigners used or not the MNB bonds to obligate temporally their liquidity from the state security market, so the capital extraction foreign currency market effect did not occurred. As summary we can say that the exchange rate is also influenced by several other variables, thus the weak effect which we have as result does not mean alone that the hypothesis for the existence of the connection has not satisfied. We can draw the consequence, that in long term the theoretically expectation which was formed in the objective is prevailing, which is saying that the foreigners' denominated capital stock change in forint can be in connection with the forint-euro exchange rate - sometimes not in the expected quantity and direction - and if we consider the error-correction short term effects can be also indicated. But we need to take care with interpreting the model's results carefully, because correction, expanding the influencing circumstances can modify and explain the results significantly. This makes available the comprehensive analysis of the connection which will be input for the above detailed future researches.

5. Publications connected with dissertation

Proffesional articles, studies connected with dissertation, published in foreign publications:

Kovács, R.-Lentner, Cs (2005): The financial strategies of the Hungarian transnational companies in East-Central Europe, in consideration of Romanian Relations. *Babes-Bolyai University of Cluj Napoca - Faculty of Economics and Business Administration, „The impact of European Integration on the National Economy",* Kolozsvár (ISBN: 973-751-097-6)

Kovács, R.-Tóthné Szabó, E.-Vajna Istvánné Tangl, A. (2009): A survey of the reliability of accounting and financial information based on the notes to the financial statements. *Bulletin of the Szent István University 2009.* (ISSN 1586-4502)

Conference studies, papers:

Kovács, R.-Lentner, Cs (2005): A magyar működőtőke-áramlás jellemzői a Kárpát-medencében. *„Regionális fejlődés a Kárpát-medencében és az Európai Unió transz-regionális politikája", a Magyar Regionális Tudományi Társaság III. Vándorgyűlése,* Sopron (ISBN: 978 963 9052 68 0)

Kovács, R.-Lentner, Cs-Szóka, K.-Vágyi, F. R. (2006): Az energiatakarékos gazdálkodás pénzügyi háttere az EU-s források tükrében. *Az Alternatív energiaforrások hasznosításának gazdasági*

kérdései nemzetközi konferencia, Poszterelőadás, (ISBN: 978-963-9364-82-0)

Kovács, R.-Pataki, L.-Vigh, Gy. Zs. (2009): Ügyfélkockázatok kezelése. Gazdaság és társadalom, *Nemzetközi konferencia a Magyar Tudomány Ünnepe alkalmából, NYME KTK,* Sopron (ISBN: 978-963-9871-30-4)

Kincses, Zs.-Kovács, R. (2010): Az állami adósságszolgálat fenntarthatóságának aktuális kérdései. „Hitel, Világ, Stádium", *Nemzetközi tudományos Konferencia a Magyar Tudomány Ünnepe alkalmából, NYME KTK*, Sopron (ISBN 978-963-9883-73-4)

Kovács, R. (2012): A forint árfolyam-dinamikája és az árfolyamtúllövés. Tehetség és kreativitás a tudományban, *Nemzetközi tudományos konferencia, NYME KTK,* Sopron (ISBN 978-963-9883-92-5)

Proffesional articles, studies connected with dissertation, published in hungarian:

Kovács, R.-Lentner, Cs (2005): A „magyar multik" pénzügyi stratégiái Kelet-Közép-Európában – különös tekintettel Romániában. *Gazdaság és Társadalom* 16. (1.) (ISSN: 0865 7823)

Kovács, R.-Pataki, L. (2008): A hatékonyság és a jövedelmezőség mérése. *Agrártámogatások és -pályázatok c. szakkönyv.* Budapest: RAABE Tanácsadó és Kiadó Kft. (ISBN: 963 9600 01 6)

Kovács, R. (2009): Az adózás rendjéről szóló törvény főbb változásai. A jövedéki adóról szóló törvény főbb változásai. Az illetékekről szóló törvényfontosabb változásai. A helyi adókról szóló 1990. évi C. törvény módosítása. *Agrártámogatások és -pályázatok c. szakkönyv.* Budapest: RAABE Tanácsadó és Kiadó Kft. (ISBN: 963 9600 01 6)

Tatay, T.-Vágyi F. R.-Varga, J (szerk.) (2011): A pénzügyi intézményrendszer Magyarországon. A jegybanki szabályozás (könyvfejezet). Sopron: A Soproni Felsőoktatásért Alapítvány Kiadásában (ISBN 978-963-89173-1-7)

Other publications:

Kincses, Zs.-Kovács, R.-Lentner, Cs (2004): A külföldi működőtőke-befektetések áramlásának tendenciái napjainkban. Az FDI világszinten és Magyarországon. PKE, Nagyvárad

Kovács, R-Kovács, T.-Lentner, Cs (2006): A működőtőke-beáramlás és a régiónkénti gazdasági fejlettség összefüggései. Fiatal regionalisták V. országos konferenciája, SZIE, Győr

Kovács, R. (2007): Új tag, új lehetőség – Hány nap alatt lehet Bulgáriában céget alapítani és mennyiért (a bolgár adórendszer). 2007. október 16. www.adozona.hu (a HVG tematikus oldala)