

## Feldstein-Horioka puzzle – a myth or reality: case of Serbia<sup>2</sup>

*Article history*

Received: 25 March 2013

Sent for revision: 29 March 2013

Received in revised form: 29 April 2013

Accepted: 12 June 2013

Available online: 11 July 2013

**Abstract:** *In this paper we have presented the results of a research of the Feldstein-Horioka puzzle presence in Serbia for the period 1997 - 2010. By applying the technique of time series cointegration (Johansen and Engle-Granger test) we did not manage to estimate any cointegration relation between the gross domestic savings rate and gross domestic investments rate, as well as between their absolute real values. Based on such findings, we rejected the hypothesis that empirical data in Serbia indicate the presence of Feldstein – Horioka puzzle. Descriptive-statistical analysis has shown that almost everything produced in Serbia is consumed, which results in a very modest gross domestic savings, we would say negligible ones compared to gross domestic investments. This fact clearly shows that gross domestic investments are not limited by domestic savings, which is consistent with relatively free flow of capital that Serbia generates with foreign countries.*

**Key words:** *aggregate shocks, cointegration, Feldstein - Horioka puzzle, investments, general equilibrium concept.*

### Feldstein-Horiokina zagonetka – mit ili stvarnost: slučaj Srbije

**Apstrakt:** *U ovom radu smo prikazali rezultate istraživanja prisustva Feldštajn - Horioka zagonetke u Srbiji za vremenski period 1997-2010. godine. Primenom tehnika kointegracije vremenskih serija (Johansen i Engl-Grejndžer test) nismo uspeli da ocenimo nijednu kointegracionu relaciju između stope bruto*

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<sup>2</sup> The paper presents the results of a study conducted as part of the project III47010: *Social Transformation in the process of European integration - a multidisciplinary approach*, funded by the Ministry of Education, Science and Tehnological Development of the Republic of Serbia, 2011-2014.

*domaće štednje i bruto domaćih investicija, kao ni između njihovih apsolutnih realnih vrednosti. Na osnovu ovakvih nalaza odbacili smo hipotezu da empirijski podaci u Srbiji ukazuju na prisustvo Feldštajn - Horioka zagonetke. Deskriptivna statistička analiza pokazala je da se u Srbiji troši skoro sve što se proizvede, što rezultira veoma skromnom bruto domaćom štednjom, rekli bismo zanemarivom u odnosu na bruto domaće investicije. Ova činjenica jasno pokazuje da bruto domaće investicije nisu limitirane domaćom štednjom, što je konzistentno sa relativno slobodnim protokom kapitala koji Srbija ima sa inostranstvom.*

**Ključne reči:** *agregatni šokovi, investicije, Feldštajn - Horioka zagonetka, koncept opšte ravnoteže, kointegracija.*

## 1. Introduction

In their pioneer study, Feldstein and Horioka (1980) compared two types of relations between domestic savings and world's capital mobility. In case of perfect capital mobility, the relation between domestic savings and domestic investments should be very weak or even non-existent (Feldstein & Horioka, 1980, p. 317). Contrary to that, in case that preference portfolio and institutional inflexibility disturb the flow of long-term capital between the countries, domestic savings and domestic investments should be highly correlated (Feldstein & Horioka, 1980, p. 328). In other words, limited capital mobility should lead to the effectuation of every growth in domestic savings into the growth of domestic investments.

The research results presented in the mentioned study provide empirical basis for second type of relations. Namely, differences in savings rates between OECD countries correspond to almost the same differences in their investment rates (Feldstein & Horioka, 1980, p. 321, 328). Such conclusion is not opposite to obvious international mobility of short-term capital. While small part of the world's capital stocks is held in the form of short-term liquid capital, suitable for elimination of short-term interest differentials, larger part of capital is actually not available for such arbitrage type. In addition, the result regarding high degree of correlation between domestic savings and investments is not in confrontation with significant international flows of long-term portfolio and direct investments (Feldstein & Horioka, 1980, p. 328). Large portion of direct investments is realised in foreign countries in order to improve trade position and to gain advantage based on special knowledge. Such investments are not sensitive to differences in savings rates and relative capital intensity (Feldstein & Horioka, 1980, p. 328). Although some portfolio and direct investments are prevalingly realised searching for higher yields, the scope of

such investments is obviously limited by institutional barriers and portfolio preferences.

Feldstein – Horioka puzzle belongs to a group of six major puzzles in international macroeconomics (Obstfeld & Rogoff, 2001). Namely, in the period 1960-1974, using a sample of 21 OECD countries, Feldstein and Horioka (1980) discovered a strong cause and effect of relation between long-term averages of gross domestic savings rate and gross domestic investments rate. In other words, regressing of gross domestic investments rate with respect to gross domestic savings rate resulted in estimation of regression parameter, value of which was very close to one. This regression coefficient, taken as a measure of influence of savings rates to investment rates, i.e. as "savings retention" coefficient, had been decreasing over time, but it still remained high and significant (Obstfeld & Rogoff, 2001, pp. 349-350).

High correlation between savings rate and investments rate is contrary to Intertemporal Theory of the Current Account which, assuming perfect capital mobility, stipulates different determinants for savings and investments (Giannone & Lenza, 2008, p. 7). In other words, countries can get indebted and approve loans abroad whenever they have the need to invest or disinvest, at the same time not being limited by domestic savings in any way (Giannone & Lenza, 2008, p. 7). High correlation between savings and investments was explained by Feldstein and Horioka (1980) as low degree of capital mobility between OECD countries. Feldstein and Horioka (1980) attributed incompatibility with the hypothesis of perfect international capital mobility to the existence of institutional barriers and portfolio preferences, whereby large portion of additional savings is retained in order to be invested into the country of origin. In decades following the publication of this pioneer study, capital mobility between OECD countries increased, but "savings retention" coefficient was insignificantly reduced (Giannone & Lenza, 2008, p. 7; for exception see Coakley, Kulasi, & Smith, 1998 and Blanchard & Giavazzi, 2002). Obstfeld and Rogoff (2001, pp. 349-350) showed that "savings retention" for OECD countries was 0.60 in the period 1990-1997, which is significantly lower compared to the value of 0.89 estimated by Feldstein and Horioka (1980, p. 321). Yet, its value is still unexpectedly high taking into account almost completely integrated capital market at global level.

The literature contains considerable number of explanations for Feldstein – Horioka "savings-investment" puzzle. The key issue is that none of the offered explanations is persuasive enough. Despite the fact that majority of explanations often at first sight looks smart and elegant, they are mainly empirically unsustainable and quite commonly generate completely new puzzles (Obstfeld & Rogoff, 2001, p. 349). Obstfeld and Rogoff (2001, p. 349) notice that Feldstein – Horioka puzzle does not characterise intra-national regional data,

thus indicating a possibility that inner factors, attached to international trade, are the main cause of this phenomenon.

Review of somewhat older literature leads us to a conclusion that there are at least five-six leading explanations of Feldstein – Horioka puzzle. All these explanations are empirically unconvincing, both due to specific assumptions about the nature of exogenous shocks (Obstfeld, 1985; Mendoza, 1991), and due to the fact that they generate new empirical contradictions (Obstfeld & Rogoff, 2001, p. 350). For example, model with asymmetric information (Gordon & Bovenberg, 1996) can explain why foreigners finance such few domestic investments, whereas in order to get any inflow of foreign capital, deflection from the covered interest rate parity must be assumed. In addition, explanations tending to retain the assumption of perfect capital mobility often imply high correlation of savings and investments between the countries or regions within the same country (Obstfeld & Rogoff, 2001, p. 351). Yet, partial evidence for certain regions do not indicate the presence of Feldstein – Horioka puzzle.

Recent attempts to explain Feldstein – Horioka puzzle rely on the mechanism of influence of general equilibrium at capital market which is not covered by Intertemporal Theory of the Current Account (Ventura, 2003). The mechanism is very simple and is based on the fact that world is a closed economy to which equality of savings and investments must apply. For example, aggregate shock, which would be an incentive for savings in majority of countries, would generate disequilibrium at global capital market, which would influence fall of interest rates, investment growth and positive savings-investments correlation (Giannone & Lenza, 2008, p. 7). Taking this into account, it is clear that the effect of general equilibrium could reconcile theory and empirical proofs. Yet, this explanation does not have proper empirical support, bearing in mind that modelling of aggregate shocks has not led to reduction of “savings retention” coefficient (Glick & Rogoff, 1995; Ventura, 2003). Such empirical results have provoked some economists to take the standpoint that Feldstein – Horioka puzzle can be explained only by introduction of certain barriers at international goods and financial markets (Ventura, 2003; Obstfeld & Rogoff, 2001).

In this paper we have tested two key and inter-connected hypotheses. The first and conditional refers to the fact that empirical data in Serbia indicate the presence of Feldstein – Horioka puzzle. If the first hypothesis is accepted, this will be followed by testing of the second one stating that Feldstein – Horioka puzzle can be explained by general equilibrium concept – controlling aggregate shocks with heterogenous transmission mechanism.

The paper consist of six parts. Introduction explains theoretical core of Feldstein – Horioka puzzle and we referred to some existing attempts to find appropriate explanation for this phenomenon. In the second and third part re-

spectively, we have showed methodological framework for our research and basic information about data we used during the analysis. Fourth part includes the results of the empirical research, fifth one the most important conclusions. Finally, we provided the reference list in the sixth part.

## **2. Theoretical Methodology**

Analytical framework we used in this paper is based on classical method of gross domestic investments rate regressing on gross domestic savings rate, which is subsequently extended by introducing the concept of general equilibrium at global capital market with heterogenous transmission mechanism of aggregate shocks (Giannone & Lenza, 2008). All previous methodological frameworks which relied on the general equilibrium concept, assumed homogenous transmission mechanisms of aggregate shocks to savings and investments in various countries, although there is not a single proper theoretical reason for this to be correct. Aggregate shocks with heterogenous transmission mechanisms can also generate disequilibrium at global capital market if the pattern of heterogeneity is not such that the effects of global shocks in one group of countries are completely and perfectly annulled by opposite effects in the rest of the world. Methodological framework suggested by Giannone and Lenza (2008) enables different nature and intensity of aggregate shocks influence on different countries.

Such analytical framework, which by the means of aggregate shocks and disequilibrium at global capital market, through the global interest rate mechanism, explains the high correlation of savings and investments is not in contradiction with the Intertemporal Theory of the Current Account. Namely, this theory, focusing on the partial equilibrium at individual country (region) level, pertains to those components of savings and investments which are under the influence of idiosyncratic shocks. In other words, idiosyncratic components of savings and investments will not be highly correlated in the conditions of perfect capital mobility, since they are under the influence of idiosyncratic shocks which are not able to create disbalance at global capital market. If any idiosyncratic shock influenced growth of savings in a country (or region), such shock would not have the effect on global offer of capital and global interest rate, which anyway would not result in high correlation of savings and investments. In this case, perfect capital mobility, equalling interest rates at global level, would enable placement of savings abroad. In short, Intertemporal Theory of the Current Account stipulates low degree of correlation between idiosyncratic components of saving rates and investments rates in the presence of perfect international capital mobility. The rest of the savings rate and investments could be under the influence of aggregate shocks with hetero-

genous transmission mechanism, which would suggest use of global equilibrium concept to try to explain the Feldstein – Horioka puzzle.

Formally, we start from the following model (Giannone & Lenza, 2008, p. 9):

$$S_{jt} = \lambda_{1j}^S f_{1t} + \dots + \lambda_{rj}^S f_{rt} + S_{jt}^{id}, \quad (1)$$

$$I_{jt} = \lambda_{1j}^I f_{1t} + \dots + \lambda_{rj}^I f_{rt} + I_{jt}^{id}, \quad (2)$$

where  $S_{jt}$  and  $I_{jt}$  respectively represent saving rates and investment rates in country  $j$  in time period  $t$ , while  $f_{it}$  ( $i=1,2,\dots,r$ ;  $t=1,2,\dots,T$ ) stands for aggregate shocks which influence almost all countries and generate disbalance at global capital market. In addition,  $\lambda_{ij}$ ,  $S_{jt}^{id}$  and  $I_{jt}^{id}$  denote heterogenous influences of aggregate shocks and idiosyncratic components of saving rates and investment rates, respectively. Dynamics of idiosyncratic components of saving rates and investment rates is shaped by the influence of idiosyncratic shocks.

Our mission is first to test the presence of Feldstein – Horioka puzzle in Serbia, and after that, provided that results indicate its presence, to try to explain it through general equilibrium concept with controlled aggregate shocks. In other words, our need is to conceptualise such a model in which the influence of aggregate shocks would be separately modelled and detached from mutual influence (correlation) of idiosyncratic components of savings and investments. If we showed that inclusion of global shocks into the model significantly reduced correlation between idiosyncratic components of savings and investments, we would have a proper empirical proof for the claim that general equilibrium concept can explain the Feldstein – Horioka puzzle, i.e. that empirical data is not in collision with the Intertemporal Theory of the Current Account. Taking into account that the Intertemporal Theory of the Current Account refers to idiosyncratic components of saving rates and investment rates, the equation that is very important for derivation of the desired model can be formulated as (Giannone & Lenza, 2008, p. 10):

$$I_{jt}^{id} = \alpha_j + \beta S_{jt}^{id} + \varepsilon_{jt}, \quad (3)$$

where  $\beta$  stands for the so-called “savings retention” coefficient which pertains to idiosyncratic components of saving rates and investments. If from the equations (1) and (2) we express idiosyncratic components and replace them in equation (3), we obtain (Giannone & Lenza, 2008, p. 10):

$$I_{jt} = \alpha_j + \beta S_{jt} + \delta_{1j} f_{1t} + \dots + \delta_{rj} f_{rt} + \varepsilon_{jt}, \quad (4)$$

where coefficient  $\delta_{ij} = (\lambda_{ij}^I - \beta\lambda_{ij}^S)$  is variable as per countries. Let us notice that derivation of equation (4) included coefficient  $\beta$  which reflects the relation (correlation) between the idiosyncratic components of saving rates and investments. In order to enable the concept of global equilibrium to explain the Feldstein – Horioka puzzle, estimation of model (4) should lead to reduction of  $\beta$  value, which would be consistent with the Intertemporal Theory of the Current Account. Bearing in mind that there are no generally accepted variables which quantify aggregate shocks, their modelling can be carried out through inclusion of certain variables which are under the influence of global shocks. Therefore, different global variables can be used as a replacement for aggregate shocks, so that model (4) can be reformulated in the following way (Giannone & Lenza, 2008, p. 13):

$$I_{jt} = \alpha_j + \beta S_{jt} + \delta_{1j} \hat{f}_{1t} + \dots + \delta_{rj} \hat{f}_{rt} + \varepsilon_{jt}. \quad (5)$$

In researches of Feldstein – Horioka puzzle, usually used equations were specifications of regression equations which result in inconsistent estimation of “savings retention” coefficient. Namely, in their original paper, Feldstein and Horioka (1980, p. 318) relied on the following long-term regression equation:

$$\frac{1}{T} \sum_{t=1}^T I_{jt} = \alpha + \beta \frac{1}{T} \sum_{t=1}^T S_{jt} + \bar{\varepsilon}_j. \quad (6)$$

Calculation of time averages eliminates short-term and medium-term fluctuations from empirical data, which means that this specification of regression equation cannot control long-term influences of aggregate shocks. Whenever the effects of aggregate shocks are heterogenous, their long-term effects to savings rate and investments will not be adequately covered by constant  $\alpha$ , but one part will be included in error term  $\varepsilon$ . Since aggregate shocks influence the savings rate (equation 1), this would doubtlessly indicate the presence of correlation of explanatory variable and error term, i.e. the problem of endogeneity, which as a consequence has the inconsistent estimation of “savings retention” coefficient. In addition, alternative ways for the assessment of dependence of investment rate on the savings rate faced similar problems, as a rule of thumb. If we try to estimate this relation through a basic regression equation (Giannone & Lenza, 2008, p. 11):

$$I_{jt} = \alpha_j + \beta S_{jt} + \varepsilon_{jt}, \quad (7)$$

we would see, based on comparison with equation (5), that influences of global shocks are included in error term, which doubtlessly indicate the problem of inconsistent estimation of parameter  $\beta$ . The method proposed as a solution for this problem is based on the inclusion of dummy variables which are invariant in cross-section dimension, i.e. the so-called time effects (Ventura, 2003):

$$I_{jt} = \alpha_j + \gamma_t + \beta S_{jt} + \varepsilon_{jt} . \quad (8)$$

Yet, such modeling of aggregate shocks is proper only if their effect to savings and investments is homogenous. Otherwise, the estimation of parameter  $\beta$  will be inconsistent.

Our research should be based on a maximum of two equations. Firstly, it is necessary to estimate equation (7) in order to test the presence of Feldstein – Horioka puzzle in Serbia. In case of the acceptance of the first hypothesis, our next step would be to estimate model (5), intending to try to explain this puzzle applying the concept of general equilibrium. In short, equations (7) and (5) are methodological framework for our research.

### 3. Data

During the empirical research we used two sets of data. The first one includes relative values of certain variables (savings rate, investments rate and net export of goods and services rate) which are anyway used to analyse the Feldstein – Horioka puzzle. Time series of gross domestic savings was obtained as discrepancy between the series of gross domestic product (GDP) and series of final consumption (sum of individual and collective consumption). Time series of gross domestic investments includes gross fixed capital formation, changes in inventories and changes in valuables. Rates of all mentioned variables stand for the quotient of a certain variable and GDP. Original series are expressed in RSD million, at current prices, with annual frequency for the period 1997 - 2010.

The second set of data is composed on absolute real values of the observed variables we included into the analysis in order to test robustness of the results obtained based on rates. Real values of variables were calculated by applying retail price index (RPI) in January 1999 as a base period. We did not use the consumer price index as it was only introduced in 2007. Taking into account that RPI is available for the period 1999-2010, the second set of data, compared to the first one, covers somewhat shorter time series.



We derive monthly interest series from annual data using the multivariate Rossi method and Ecotrim program package. The list of variables and sources of data are shown in the table below, and all detailed information about the way of their construction are available at request.

**Table 1** *Variables we used during the empirical research*

<b>Variable</b>	<b>Label</b>	<b>Source</b>
Real gross domestic savings	S	Author's calculation based on data downloaded from <a href="http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx">http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx</a>
Real gross domestic investment	I	Author's calculation based on data downloaded from <a href="http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx">http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx</a>
Real net exports	NX	Author's calculation based on data downloaded from <a href="http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx">http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx</a>
Gross domestic savings rate	SS	Author's calculation based on data downloaded from <a href="http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx">http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx</a>
Gross domestic investment rate	SI	Author's calculation based on data downloaded from <a href="http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx">http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx</a>
Net exports rate	SNX	Author's calculation based on data downloaded from <a href="http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx">http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx</a>
Real gross domestic product	Y	Author's calculation based on data downloaded from <a href="http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx">http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx</a>
Real final consumption	C	Author's calculation based on data downloaded from <a href="http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx">http://webzrs.stat.gov.rs/WebSite/public/ReportView.aspx</a>

*Source: Author*

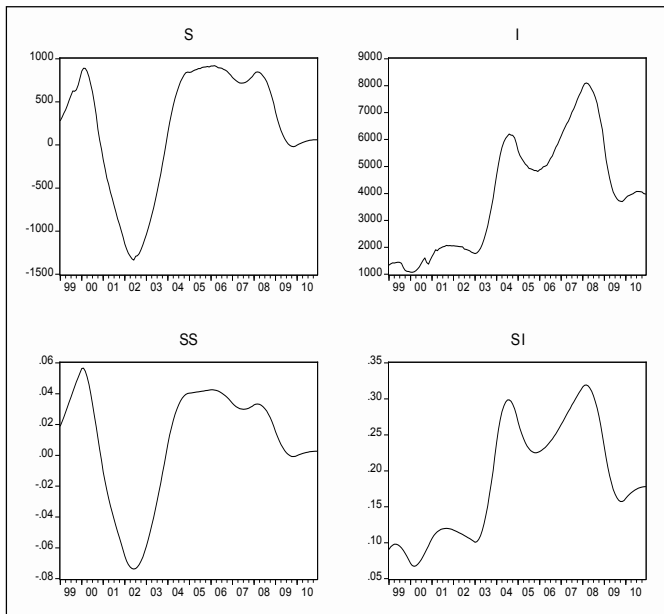
## **4. Results Of Empirical Research**

Testing of the first hypothesis about the presence of Feldstein – Horioka puzzle in Serbia is based on the attempt to estimate the relation between the savings rate and investments rate (equation 7), i.e. on the attempt to examine the range within which higher savings rate is related to higher investment rate and vice versa. Analogously to what we have already stated, if we assume perfect capital mobility between Serbia and the rest of the world, this relation would be very weak or would not even exist. Growing savings in any time period could be placed in any country in the world, as well as potentially growing investments could be financed by savings from any other country. Otherwise, very weak capital mobility would result in stable and strong relation between

the savings rate and investments, which means that every additional currency unit of savings would remain in Serbia, i.e. it would be effectuated in the investments growth.

Visual review of time series (Fig. 1) which are relevant for estimation of the relation (7) reveals that these are nonstationary stochastic processes, which was confirmed through formal testing by the means of *Augmented Dickey-Fuller* (ADF), *Phillips-Perron* (PP) and *Kwiatkowski-Phillips-Schmidt-Shin* (KPSS) unit root tests.

Figure 1. Real gross domestic savings, real gross domestic investments and their rates



Source: Author

Nonstationarity of time series leads us to application of time series cointegration concept. Estimation of the first cointegration equation, applying the ordinary least squares method (OLS), resulted in the following regression:

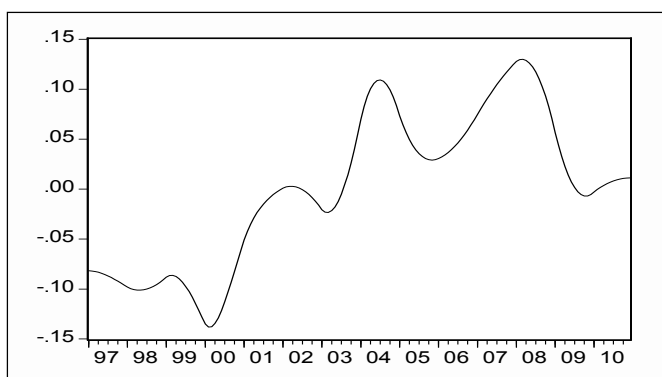
$$SI = 0,16 + 0,74SS . \quad (9)$$

(0,006) (0,16)

(EG= -1,54; CV<sub>10%</sub>= -3,07)

Yet, application of *Engle-Granger* (EG) cointegration test (values given in brackets below standard errors) shows that we cannot reject null hypothesis about residuals nonstationarity even at the significance level of 10%, which is confirmed by visual appearance of residual series from equation (9) (Fig. 2).

Figure 2. Residual from cointegration equation (9)



Source: Author

Alternative specification of cointegration equation implies addition of linear time trend into equation (9) (MacKinnon, 2010, p. 3-4), which gives:

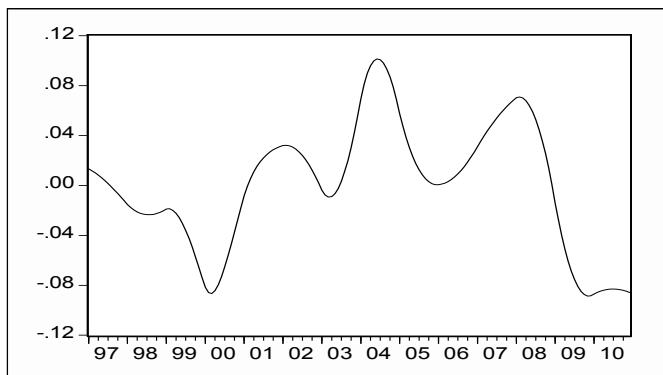
$$SI = 0,07 + 0,001t + 0,78SS, \quad (10)$$

(0,008) (0,00008) (0,11)

(EG= -1,64; CV<sub>10%</sub>= -3,54)

indicating again the fact that savings rate and investments rate are not cointegrated, i.e. that there is no long-run equilibrium relation (influence) between them. The same conclusion is indicated by the appearance of residual series from equation (10) (Fig. 3) which doubtlessly reveals that this is a nonstationary series.

Figure 3. Residual from cointegration equation (10)



Source: Author

Although the original Feldstein – Horioka puzzle (Feldstein & Horioka, 1980, p. 318) relies on the testing of gross domestic savings rates influence to the gross domestic investments rate, the second part of research we based on absolute real values of savings and investments. Namely, the intention is to test robustness of previous results by applying alternative approach, which is actually reflected in the attempt to estimate cointegration equation between real gross domestic savings and real gross domestic investments. Application of the OLS method resulted in the following cointegration relation:

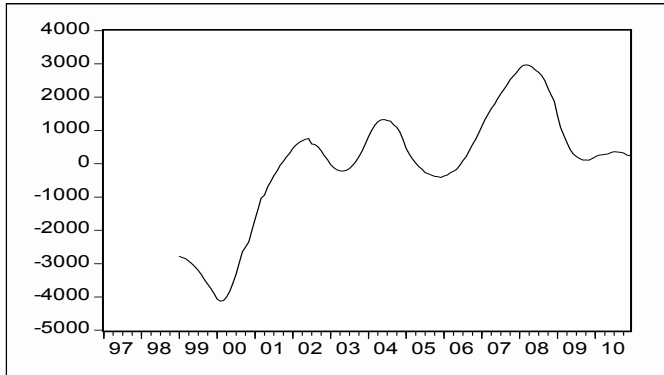
$$I = 3628,41 + 1,77S, \quad (11)$$

(153,03)    (0,21)

(EG= -3,15; CV<sub>5%</sub>= -3,38)

where EG test statistics still shows that the observed series are not cointegrated at the significance level of 5%, which is also indicated by the appearance of residuals (Fig. 4).

Figure 4. Residual from cointegration equation (11)



Source: Author

Inclusion of linear time trend in regression equation (11) provides:

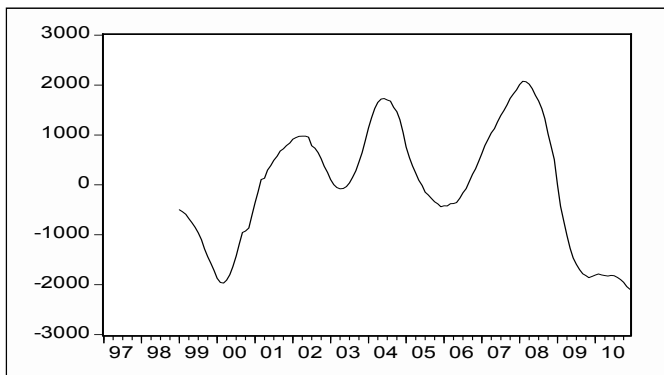
$$I = 723,45 + 31,54t + 1,28S, \quad (12)$$

(253.25)
(2.50)
(0.15)

(EG= -3,27; CV<sub>10%</sub>= -3,55)

which again leads to the conclusion that time series are not cointegrated, specifically taking into account the residual from this regression (Fig. 5).

Figure 5. Residual from cointegration equation (12)



Source: Author

Absence of cointegration of real savings and investments is confirmed by Johansen's test. Namely, application of this procedure implies the following cointegration relation:

$$I = 5456,76 + 0,83S, \quad (13)$$

(980.77)    (1.35)

(Trace= 7,76; CV<sub>5%</sub>= 20,26)  
(Max-Eigen= 6,86; CV<sub>5%</sub>= 15,89)

while both test statistics (*Max- Eigenvalue Statistic and Trace Statistic*) show that real savings and investments are not cointegrated at the significance level of 5%, which is confirmed by residual from the estimated cointegration equation (Fig. 6).

Figure 6. Residual from cointegration equation (13)



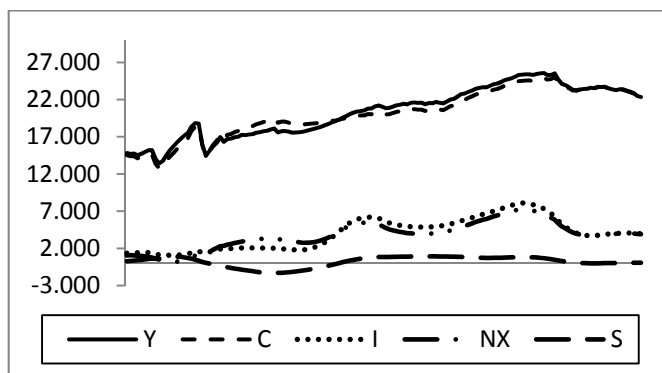
Source: Author

Summing up all the results of our research, we notice that cointegration analysis applied to two data sets does not reveal cause and effect relation, i.e. long-run equilibrium between savings and investments. Such results are in favour of the fact that gross domestic savings rate is not a significant determinant of gross domestic investments rate, i.e. these two GDP components have different determinants, which is greatly coincidental with the hypothesis of perfect capital mobility. Therefore, great capital mobility should result in zero value of "savings retention" coefficient, while its high value could be in favour of the country closedness. In addition, high value of "savings retention" coefficient could be a consequence of influence of some other joint factors which at the same time shape variations of both variables. This mechanism coincides with the general equilibrium concept and influence of aggregate shocks which we intended to use alternatively in order to explain possibly ex-

isting Feldstein – Horioka puzzle in Serbia. The fact that savings and investments are not cointegrated is equivalent to zero value of  $\beta$  parameter, i.e. absence of cause and effect relation between savings and investments.

Such result is quite logical if we bear in mind dynamics of basic GDP components (Fig. 7). It is obvious that final consumption immediately follows the dynamics of real GDP (correlation of 0.98), i.e. that these two series almost coincide, which indicates already well known fact that in Serbia, in terms of value, everything produced is almost entirely consumed. Such dynamics reveals one, to us even more important fact, that savings in Serbia are very small, and as shown in Fig. 7, always somewhere around zero, but in 2001, 2002 and 2003 was even negative. Taking into account that gross domestic savings on average cover somewhat 6% of gross domestic investments, it is clear that the remaining 94% of gross domestic investment are financed by the foreign trade deficit, due to which investments and foreign trade deficit greatly coincide, and their correlation amounts to 0.95.

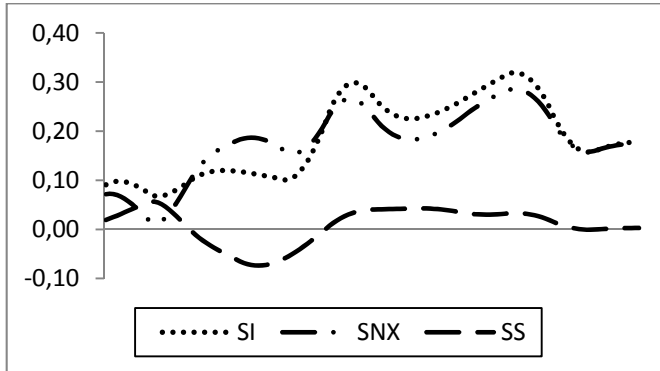
Figure 7. GDP and its components (real values, 1999-2010)



Source: Statistical Office of the Republic of Serbia

The situation is very similar if we observe rates of savings, investments and foreign trade deficit (Fig. 8). Savings rate is quite smaller compared to gross domestic investments rate, and their correlation is 0.47 only. At the same time, rates of investment and deficit greatly coincide and are highly correlated (0.89).

Figure 8. Savings, investments and foreign trade deficit (rates, 1999-2010)



Source: Statistical Office of the Republic of Serbia

Taking into account all the facts, we conclude that almost everything that is produced in Serbia is also consumed, i.e. that value of gross domestic savings is very low, we would say negligible compared to value of gross domestic investments. This fact clearly states that the amount of gross domestic savings is not imposed as a limiting factor for the investment consumption, which is in accordance with relatively free flow of capital Serbia has with other countries. Logical consequence of the stated is high coincidence between gross domestic investments and foreign trade deficit, as well as the absence of cointegration (long-run cause and effect relation) between savings rate and investments rate. High coincidence between gross domestic investments and net export, i.e. stressed correlation of these two time series is inevitable in accordance with basic macroeconomic identity of GDP use, if final consumption is too high compared to GDP, i.e. if savings are negligible. The conclusion about the absence of Feldstein – Horioka puzzle in Serbia is coincidental to a great extent with findings of the only research known to us dealing with this phenomenon, which pertains to Serbia among others (Josheski & Lazarov, 2012).

## 5. Conclusion

Based on our analysis results, we reject the first conditional hypothesis about the presence of Feldstein – Horioka puzzle in Serbia. This conclusion was reached by applying the time series cointegration concept, based on Engle-Granger and Johansen test, actually two data sets – rates of gross domestic savings and investments and their real absolute values. By applying the mentioned cointegration tests we did not succeed in locating any long-run equilib-



rium (cointegration) relation, by which we proved that gross domestic savings rate (real savings) in Serbia does not influence significantly gross domestic investments rate (real investments). Descriptive statistical analysis shows that consumption in Serbia is very high compared to GDP value, i.e. that gross domestic savings are almost negligible, even negative in the period 2001-2003. Such low savings manage to finance about 6% of gross domestic investments, while the rest is covered from deficit of goods and services balance. Such macroeconomic picture of Serbia completely clarifies why investments are not determined by domestic savings, but obviously by various forms of foreign accumulation inflow. In addition, analysis of rates of savings, investments and foreign trade deficit confirms the aforementioned. There are very similar, coinciding and highly correlated rates of gross domestic investments and net export, while gross domestic savings rate is almost negligible. The obvious fact that dynamics of savings in Serbia does not determine the investment dynamics is completely harmonised with hypothesis of perfect capital mobility and Intertemporal Theory of the Current Accounts, due to which we reject the first conditional hypothesis. Therefore, Serbia is in a situation to face excessively high consumption compared to current GDP level. High consumption compared to GDP implies very low, sometimes even negative, gross domestic savings, which doubtlessly is not a factor to determine gross domestic investments. According to basic macroeconomic identity, low savings imply high degree of coincidence between gross domestic investments and net export; or, looking from the other perspective, with the given GDP level, final consumption and gross domestic investments, it is not possible to reduce foreign trade deficit. It is possible to increase net export mathematically by: (a) reducing consumption by the given GDP level and investments, (b) reducing investments by the given GDP level and consumption, (c) increasing GDP by the given level of consumption and investments, or (d) combining the aforementioned ways. Taking into account that investments should be far higher, it is obvious that proponents of economic policy should primarily focus on reduction of final consumption, particularly the part related to the state, in order to reduce pressure to import through increased savings. A fall in domestic demand caused by the reduction of final consumption would have negative impact on import, and not only to import, but also to domestic production. The solution should be sought in the increase in export and investments. In other words, testing of the Feldstein – Horioka puzzle presence reveals that low savings definitely cannot determine multiply higher investments, and that, in the given or higher level of investments, it would be necessary to make efforts to reduce final consumption and increase export if we want to mitigate foreign trade deficit. Therefore, key question is how to draft policies to encourage export and reduced consumption, which goes far beyond the framework of this paper. This research could be the introduction into future analyses to cover the whole region of former Yugoslav republics, and whole European Union later, with which Serbia has intensive economic rela-

tions. Such extension of Feldstein – Horioka puzzle testing requires changes in methodological framework, i.e. application of econometric analysis techniques of panel data.

## 6. References

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