APPLICATION OF MUNDELL-FLEMMING MODEL IN CONDITIONS OF EUROZONE COUNTRIES FROM FISCAL PERSPECTIVE[1]

VOJTKOVA, MARIA
PHD STUDENT, UNIVERSITY OF ECONOMICS IN BRATISLAVA; FACULTY OF NATIONAL ECONOMY, BRATISLAVA, SLOVAK REPUBLIC
maria.vojtkova.nhf@euba.sk

ĎURECH, RICHARD
PHD STUDENT, UNIVERSITY OF ECONOMICS IN BRATISLAVA; FACULTY OF NATIONAL ECONOMY, BRATISLAVA, THE SLOVAK REPUBLIC
richard.durech@gmail.com

ABSTRACT

The main goal of this paper is to test applicability of the Mundell-Flemming model on one of the newest members of common currency union in Europe, the Slovak republic. Basic structure of IS-LM-BP model is adjusted for specific conditions of the Eurozone, especially presence of fixed exchange rate due to common currency euro. Additionally, we model fiscal sector in more detailed way due to the fact that in case of common currency union the fiscal policy is able to positively or negatively affect final output of the economy. Contrary to the standard model, we use short-term interest rate as a tool of monetary policy while we distinguish between exogenous part of money stock - domestic credit, and an endogenous part represented by a foreign credit.

KEYWORDS: Mundell-Flemming model, fiscal policy, monetary policy, Eurozone

1. INTRODUCTION

In the recent years the new open economy macro models (NOEM) have spread in the economic literature and have been widely used not only by academic researchers but also by policy makers. The traditional Mundell-Flemming model (referred as the MF model) has been used mostly in the economic theory for teaching purposes. Yet, as argued in Huang (2010): "up to now, the main conclusions obtained from NOEM shows no radical difference from those of the Mundell-Flemming model or Dornubsch model." Furthermore, so far it has been considered to be a traditional approach to apply basic MF model on conditions of the Slovak economy (Luptáčik et al., 2005; Luptáčik et al., 2006; Ivaničová, 2006).

We would like to contribute to this branch of economic literature by taking the standard model used in Luptáčik et al. (2005) and Huang (2010) and adjust it for conditions of a common monetary union. As the Slovakia has become a member of the Eurozone in 2009 the process of upgrading the traditional models on specific conditions of the common monetary union is a necessary step to be taken by economic researches. Our new version of the MF model resembles some features of the model proposed and tested by Páleník et al. (2011) but we decided to go deeper into problems of fiscal and monetary policy as done before.

In particular, the main focus of this paper is to assess the empirical predictions of MF model in explaining economic development of new member countries of the Eurozone, in our case the Slovakia.

2. THEORETICAL BACKGROUND

The MF model is an extension of the basic IS-LM model suitable for small open economies with inclusion of international financial capital flows accounted in the balance of payment statistics. The model used in this paper is designed for the analysis of macroeconomic policy, in particular fiscal and monetary policy, in a small open economy that is a price taker in import markets and in specific cases as well as in export prices.

Contrary to the standard model we assume that the domestic price is a tool that enables economy to achieve its equilibrium, not the short-term interest rate. Thus we place ourselves into the environment of fully flexible domestic prices.[2] The short-term interest rate is fully under control of the monetary authority as well as the domestic credit. Transmission mechanism between short-term interest rate and the long-term interest rate that affects investment decisions in the IS curve is modelled as a single equation.

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[2] This assumption results from the reasoning related to the theory of the optimal currency area. In the environment of fixed nominal exchange rate adjustment processes in the external sector depends on the relative prices of tradable goods between domestic and foreign economy. From this reason we would like to analyze the impact of changes in monetary and fiscal policy on the required change of the domestic price level. Clearly, the slow price adjustment process creates imbalances in this environment.

2.1. Extended Mundell-Fleming model

The basic setup of the MF model used in our analysis is described by a system of three following equations:

IS curve:

$$0 = C(Y,T) + I(IR^{S}, IR^{L*}, P, Y) + G(Y, T) + X(Y^{*}, P, P^{*}) - M(Y, P, P^{*}) - Y \quad [1]$$

LM curve:

$$0 = MD(Y,IR^{S}) - m(DC + FC) \quad [2]$$

BP curve:

$$0 = X(Y^{*},P, P^{*}) - M(Y, P, P^{*}) + CFA\ IRD(IR^{S}, IR^{S*}) \quad [3]$$

where $C(Y,T)$ stands for consumption, $I(IR^{S}, IR^{L*}, P, Y)$ for investments, $G(Y, T)$ for government expenditures, $X(Y^{*}, P, P^{*})$ for domestic export, $M(Y, P, P^{*})$ for domestic import, Y for domestic output, $MD(Y,IR)$ for domestic demand for real money balances, $m(DC + FC)$ for domestic money supply, $CFA\ IRD(IR^{S}, IR^{S*})$ for capital and financial account of the domestic balance of payments.

The IS curve represents set of equilibriums in the market for goods and services depending on different combinations of interest rate and output. The LM curve represents set of equilibriums in the money market depending again on different combinations of interest rate and output. The standard IS-LM model for closed economy is extended by BP curve that represents set of equilibriums in the foreign trade and capital markets and is modeled by basic domestic balance of payments equation.

Contrary to the standard model that takes government spending as an exogenous variable we would like to take a closer look on the impact of the changes in fiscal policy on different economic variables. Therefore we model government expenditure as a function of taxes, exogenous government expenditure and total domestic product. We assume that there is a positive relationship between taxes and total domestic product, thus in case of higher product the total amount of taxes collected from the economic agents should rise.

Additionally, the level of taxes should have an influence on the level of private consumption, thus the total domestic consumption depends negatively on the taxes and positively on the level of domestic product. The higher domestic tax rate decreases real income of domestic households, thus the total consumption goes down.

Based on the reasoning above, the concrete form of the equations included into the IS-LM-BP model is described as follows:

IS curve:

$$C = c_0 + c_0 Y + c_2 T$$
$$C = g_0 + g_1 T + g_2 Y$$
$$I = i_0 + i_1 IR^{S} + i_2 Y$$
$$Q = q_0 + q_1 Y + q_2 P^{*} + q_3 P$$
$$X = x_0 + x_1 Y^{*} + x_2 P^{*} + x_3 P$$

LM curve:

$$MD = md_0 + \phi Y + \lambda IR^{S}$$
$$MS = m(DC + FC)$$
$$MS = MD$$

BP curve:

$$Q = q_0 + q_1 Y + q_2 P^{*} + q_3 P$$
$$X = x_0 + x_1 Y^{*} + x_2 P^{*} + x_3 P$$
$$CFA = cf_0 + cf_1 \Big[\underbrace{IR^{S} - IR^{S*}}_{IRD} \Big]$$

[4]

where c_0 stands for autonomous consumption, Y for domestic product, T for taxes, g_0 for autonomous government expenditure, i_0 for autonomous investments, IR^{S} for short-term nominal interest rate, Q for import, X for export, P for price level, md_0 for autonomous real money demand, CFA for capital and financial account of the balance of payments, RP for risk premium. Asterisks indicate foreign variables.

The coefficients associated with the variables included into the model may be interpreted as elasticity of those economic variables with respect to the change in the other specific variables. For example, the coefficients c_1 and c_2 thus represent elasticity of consumption with respect to the domestic product or taxes, respectively. All of the coefficients may turn out to be of positive or negative values. However, according to the economic theory we generally assume the following:

$$c_1 > 0, c_2 < 0, g_1 < 0, g_2 > 0, i_1 < 0, i_2 > 0, q_1 > 0, q_2 < 0, q_3 > 0,$$
$$x_1 > 0, x_2 > 0, x_3 < 0, \phi > 0, \lambda < 0, m > 0, cf > 0_1 \quad [5]$$

In accordance with the standard economic theory we should use long-term interest rate as a variable that influences investment decisions of the companies. Yet, we would like to analyze impact of changes in the monetary policy not only from the perspective of changes in money supply (as done in the standard models) but also from the perspective of changes in the nominal interest rate as it currently serves as the main monetary tool in the environment of inflation targeting.

From this reason the use of the short-term nominal interest rate in the LM curve seems to us to be more appropriate. At this point we explicitly assume that there exists a strong link between the short-term and long-term interest rate that may be formulated as in equation for long-term interest rate.[3] Moreover we assume that the international capital flows are mostly determined by interest rate differential in the short-term, thus the short-term domestic and world interest rate enters the balance of payments equation.

The LM curve in our model has its specific characteristics. As we would like to examine the impact of changes in monetary policy on the domestic economy in the open economy environment we model domestic money supply as a product of domestic and foreign credit. While the total amount of the domestic credit may be influenced by the monetary policy decisions the amount of the foreign credit is determined by the interaction of the domestic economic agents with foreign environment. From this reason the domestic credit will serve as a tool for monetary policy in case of the monetarist transmission mechanism.

For the specification of the real exchange rate we use standard purchasing power parity theory that states the following:

$$RER = ER\frac{P^*}{P} \qquad [6]$$

where ER stands for nominal exchange rate which is defined as amount of units of domestic currency in exchange for one unit of foreign currency.

In case of countries that are not members of the common currency area the Eurozone the real exchange rate will be computed as stated in [6]. Yet, since the accession of the domestic country to the Eurozone the evolution of the common currency euro will not affect the evolution of the foreign trade or international capital flows in the full scale. For our purposes we assume that by adoption of the euro the domestic country does not face exchange rate risk and the nominal exchange rate, thus ER is fixed to unity for all time periods.[4] The evolution of the external trade is therefore affected by the changes in relative prices of the tradable goods. The influence of domestic and foreign price level on the export and import is modeled separately without loss of generality.

The flows of capital recorded in the capital and financial account are not any more under the influence of the changes in nominal exchange rate. Moreover we assume that the relative prices of domestic and foreign goods do not influence the evolution of the capital and financial account. Only the interest rate differentials in short term interest rates may have an influence on the capital flows between domestic and foreign country.

In the system of equations described in [1], [2] and [3] we work with the set of dependent, independent and policy variables. As there are three basic equations that describe the full system of linear equations in order to achieve full identification of the system we specify three dependent variables: Y as the domestic output, P as the price of domestic tradable goods and FC as the foreign credit. In addition to this we have set of policy variables that serve as an economic tool of fiscal or monetary policy: T as the taxes, DC as the domestic credit and IR^S as the short-term interest rate. All other variables represent independent variables and are exogenously specified.
In the theoretical part of this paper we briefly discuss implications of IS-LM-BP model. For this part the basic concepts of the derivation of the implicit function are used.

[4] Based on the data on international bilateral trade published by the Eurostat, the majority of export and import of goods from or to Slovakia, Slovenia and Estonia flows comes from the member states of the Eurozone. As the bilateral data on capital and financial account are not available we are not able to confirm or reject the hypothesis that the majority of international capital flows for countries such as Slovakia, Slovenia or Estonia also comes from the member states of the Eurozone. For our purposes we will assume that this is the case. rate, foreign long-term interest rate, changes in government deficit and inflation rate. The equation for the long-term interest rate is used instead of the LM curve. According to the authors: "The standard Mundell-Fleming model contains an LM-curve which is replaced by a long-term interest rate equation in our model, since during the 1980s the major monetary policy pursued in the various countries was an interest rate policy." As in our model we would like to investigate the effect of using the monetary transmission mechanism as well as interest rate policy we do keep LM curve in the model and we do not use the link between short term and long term interest rate described in the model of Douven and Plasmans (1996). The one possible extension of the model would be to consider long-term interest rate in the IS curve which is specified by the equation used in Douven and Plasmans (1996).

2.2. Implicit function theorem

Let us assume that there is vector of dependent variables y and vector of independent variables x where $y = y_1, y_2, \dots y_m$ and $x = x_1, x_2, \dots x_n$. If is an implicit function of many variables then may be written in the following form:

$$g(x_1, x_2, \dots x_n, y) = 0 \qquad [7]$$

Let us first examine the case when there is only *one dependent variable* y and n *independent variables* $x = x_1, x_2, \dots x_n$. In this case we may write differential form of the implicit function in the form of $g(x_1, x_2, \dots x_n, y) = 0$ as following:

$$\frac{\partial g}{\partial x_1} dx_1 + \frac{\partial g}{\partial x_2} dx_2 + \dots + \frac{\partial g}{\partial x_n} dx_n + \frac{\partial g}{\partial y} dy = 0 \qquad [8]$$

In case we would like to examine change in y for specific x_i, where $i = 1, 2, \dots, n$ we set $dx_j = 0$ for $j = 1, 2, \dots, n$ where $i \neq j$. Thus the partial derivative with respect to the x_i is expressed as following:

$$\frac{\partial g}{\partial y}\frac{dy}{dx_i} = -\frac{\partial g}{\partial x_i} \quad \rightarrow \quad \frac{dy}{dx_i} = -\frac{\partial g/\partial x_i}{\partial g/\partial y} \qquad [9]$$

Let us now proceed to the case when there are m *dependent variables* $y = y_1, y_2, \dots y_m$ and n *independent variables* $x = x_1, x_2, \dots x_n$. In order to be able to solve for a unique solution for dependent variables $y = y_1, y_2, \dots y_m$ it will take m equations to describe system of y variables:

$$\begin{aligned} &g_1 (x_1, x_2, \dots x_n, y_1, y_2, \dots y_m) = 0 \\ &g_2 (x_1, x_2, \dots x_n, y_1, y_2, \dots y_m) = 0 \\ &\dots \\ &g_m (x_1, x_2, \dots x_n, y_1, y_2, \dots y_m) = 0 \end{aligned} \qquad [10]$$

If we write this system of m equations in differential form in matrix notation, we get that:

$$D_x g(x, y)_{m\times n}\, dx_{n\times 1} + [\, D_y g(x, y)\,]_{m\times n}\, dy_{m\times 1} = 0 \qquad [11]$$

The system of m equations in matrix form may be further elaborated as following:

$$\begin{aligned} &[\, D_y g(x, y)\,]_{m\times m}\, dy_{m\times 1} = D_x g(x, y)_{m\times n}\, dx_{n\times 1} \\ &dy_{m\times 1} = -\,[\, D_y g(x, y)\,]^{-1}_{m\times m}\; D_x g(x, y)_{m\times n}\, dx_{n\times 1} \end{aligned} \qquad [12]$$

Let us assume that we would like to investigate effect of changes in x on y, thus finding the partial derivatives of x with respect to y. To find this out, we reformulate [] as following:

$$\left[\frac{dy_1}{dx_i}, \frac{dy_2}{dx_i}, \dots, \frac{dy_m}{dx_i}\right]^T_{1\times m} = -\left[D_y g(x,y)\right]^{-1}_{m\times m} \left[D_{x_i} g(x,y)\right]_{m\times 1} \qquad [13]$$

In order to be able to solve for a unique solution of the system of m equations the matrix of first derivatives $D_y g(x, y)$ must be invertible.[5]

Matrix filled with derivations of first order as in [] is called Jacobian, thus $D_y g(x, y) = J$. We may rewrite the solution to the system as described in [] in the following way:

$$\left[\frac{dy}{dx_i}\right]_{m\times 1} = -\, J^{-1}_{m\times m} \left[\frac{dg(x,y)}{dx_i}\right]_{m\times 1} \quad \text{for } i = 1, 2, \dots, n. \qquad [14]$$

[4] As the data for the money market rate were not available for France we used data on short-term government bond yields published by International Monetary Fund.

[5] There are two basic conditions that must be satisfied in order to $D_y g(x, y)$ to be invertible: (1) matrix $D_y g(x, y)$ is a square matrix and (2) $\det D_y g(x, y) \neq 0$. The first condition in always satisfied in a case when there are exactly m equations for m dependent variables. For the second condition to be satisfied we need to check the value of the determinant analytically.

In order to find inverse of the Jacobian matrix we may proceed in different ways. Based on the basic mathematical algebra the inverse of the Jacobian matrix may be expressed in following way:

$$J^{-1} = \frac{1}{\det(J)} adj(J) \quad \text{where} \quad adj(J)J = \det(J)I \qquad [15]$$

In order to be able to compute adjugate matrix in general form we firstly compute matrix C_{ij} called cofactor $C_{ij} = (-1)^{i+j} M_{ij}$, where $M_{ij} = \det(M)_{(n-1)\times(-1)}$ while M is created from J by deleting $i-th$ row and $j=th$ column. Then $adj(A) = C^T \iff adj(A)_{ij} = C_{ji}$.

As we will mostly deal with a system of $m = 3$ equations we describe algorithm for computing adjugate matrix 3×3 Jacobian matrix.

$$J^{-1} = \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & k \end{bmatrix}^{-1} = \frac{1}{\det(J)} \underbrace{\begin{bmatrix} \mathrm{A} & \mathrm{B} & \mathrm{C} \\ \mathrm{D} & \mathrm{E} & \mathrm{F} \\ \mathrm{G} & \mathrm{H} & \mathrm{K} \end{bmatrix}^T}_{adj(J)} = \frac{1}{\det(J)} \underbrace{\begin{bmatrix} \mathrm{A} & \mathrm{D} & \mathrm{G} \\ \mathrm{B} & \mathrm{E} & \mathrm{H} \\ \mathrm{C} & \mathrm{F} & \mathrm{K} \end{bmatrix}}_{adj(J)} \qquad [16]$$

$$\text{where} \quad \begin{array}{lll} A = (ek - fh) & D = (ch - bk) & G = (bf - ce) \\ B = (fg - dk) & E = (ak - cg) & H = (cd - af) \\ C = (dh - eg) & F = (gb - ah) & K = (ac - bd) \end{array} \qquad [17]$$

The final solution to the system of implicit functions for dependent variables is presented in the following form:

$$v - \left[\frac{dy}{dx_i}\right]_{3\times1} = -\frac{1}{\det(J)} \underbrace{\begin{bmatrix} \mathrm{A} & \mathrm{D} & \mathrm{G} \\ \mathrm{B} & \mathrm{E} & \mathrm{H} \\ \mathrm{C} & \mathrm{F} & \mathrm{K} \end{bmatrix}_{3\times3}}_{adj(J)} \left[\frac{dg(x,y)}{dx_i}\right]_{3\times1} \qquad [18]$$

2.3. Application of the implicit function theorem on the Mundell-Fleming model

In order to be able to analyze impact of changes in policy variables on endogenous variables in our model we use concept of derivation of the implicit function as described in the previous section. The first step is to compute determinant of the matrix of the first derivation or of, more precisely, Jacobian matrix.

The system of equation as described in the [1], [2] and [3] may be rewritten in the following form by using the concept of total derivation.

$$\begin{bmatrix} C_T + G_T & I_{IR^S} & X_{Y^*} & 0 & X_{P^*} - M_{P^*} & 0 \\ 0 & MD_{IR^S} & 0 & -m & 0 & 0 \\ 0 & cf_1 CFA_{IR^S} & X_{Y^*} & 0 & X_{P^*} - M_{P^*} & cf_1 CFA_{IR^{S*}} \end{bmatrix}_{3x6} \begin{bmatrix} dT \\ dIR^S \\ dY^* \\ dDC \\ dP^* \\ dIR^{S*} \end{bmatrix}_{6\ 1} + \begin{bmatrix} (C_Y + I_Y + G_Y - M_Y - 1) & (X_P - M_P) & 0 \\ MD_Y & 0 & -m \\ -M_Y & (X_P - M_P) & 0 \end{bmatrix}_{3x3} \begin{bmatrix} dY \\ dP \\ dFC \end{bmatrix}_{3x1} = 0 \qquad [19]$$

Determinant of the Jacobian that is used later on in the [] is of the following form:

$$D_J = m \underbrace{X_P - M_P}_{-} \underset{+}{M_Y} - \left[-m \underbrace{X_P - M_P}_{-} \underbrace{\left(\underset{+}{C_Y} + \underset{+}{I_Y} + \underset{+}{G_Y} - \underset{+}{M_Y} - 1 \right)}_{-} \right] = m_Y \underbrace{X_P - M_P}_{-} \left(\underset{+}{C_Y} + \underset{+}{I_Y} + \underset{+}{G_Y} - 1 \right) \overset{?}{<} 0 \qquad [20]$$

Finally, the adjugate matrix to the Jacobian matrix is of the following form:

$$adj(J) = \begin{bmatrix} m\ X_P - M_P & 0 & m\ X_P - M_P \\ mM_Y & 0 & -m(C_Y + I_Y + G_Y - M_Y - 1) \\ MD_Y\ X_P - M_P & -(X_P - M_P)(C_Y + I_Y + G_Y - 1) & -(X_P - M_P)MD_Y \end{bmatrix}_{3\times1} \qquad [21]$$

In the following section we would like to analyze impact of changes in policy variables on the endogenous variables in domestic economy, such as domestic product, price level or foreign credit.

2.3.1. Change in taxes as a fiscal policy tool

In order to describe how the changes in fiscal policy affect endogenous variables in our model we will proceed as described in the previous section. Firstly, we use relationship between Jacobian matrix as in [15] and adjugate matrix to Jacobian matrix as in [16] in order to specify signs of the vector v described in [18].

In the following theoretical analysis while we do not compute exact values of the elements of the vector v we are interested in the direction of the change, thus in the signs of the elements of the vector v. For our purposes the subscript of the vector v represent exogenous variable which is subject to the derivation. Thus, vector v_t consists of the elements that describe the impact of changes in taxes on our endogenous variables.

$$\begin{bmatrix} \frac{\partial Y}{\partial T} \\ \frac{\partial P}{\partial T} \\ \frac{\partial FC}{\partial T} \end{bmatrix} = \frac{-1}{m\left[\underbrace{X_P - M_P}_{-}\left(\underset{+}{C_Y} + \underset{+}{I_Y} + \underset{+}{G_Y} - 1\right)\right]} \begin{bmatrix} m\ X_P - M_P & 0 & -m\ X_P - M_P \\ mM_Y & 0 & -m(C_Y + I_Y + G_Y - M_Y - 1) \\ MD_Y\ (X_P - M_P) & -(X_P - M_P)(C_Y + I_Y + G_Y - 1) & -(X_P - M_P)MD_Y \end{bmatrix} \begin{bmatrix} (C_T + G_T) \\ 0 \\ 0 \end{bmatrix} \qquad [22]$$

$$\begin{bmatrix} \frac{\partial Y}{\partial T} \\ \frac{\partial P}{\partial T} \\ \frac{\partial FC}{\partial T} \end{bmatrix} = \frac{-1}{m\left[\underbrace{(X_P - M_P)}_{-}\left(\underset{+}{C_Y} + \underset{+}{I_Y} + \underset{+}{G_Y} - 1\right)\right]} \begin{bmatrix} (C_T + G_T)m\,(X_P - M_P) \\ (C_T + G_T)mM_Y \\ (C_T + G_T)MD_Y\,(X_P - M_P) \end{bmatrix} = \begin{bmatrix} -(C_T + G_T)/[(C_Y + I_Y + G_Y - 1)] \\ -(C_T + G_T)M_Y/[(X_P - M_P)\,(C_Y + I_Y + G_Y - 1)] \\ (-(C_T + G_T)MD_Y)/\,m\,[(C_Y + I_Y + G_Y - 1)] \end{bmatrix}$$

We analyze impact of changes in taxes on exogenous variable separately in each case. As a first case we consider change in domestic product due to the changes in tax policy.

Ad case 1 $(\partial Y/\partial T)$:

As there are many variables that may have a significant influence on the final result we need to distinguish between four different cases. Which one is able to describe what will happen in real economy depends on the empirical estimations of each single economy.

	$C_Y + I_Y + G_Y - 1 > 0$	$C_Y + I_Y + G_Y - 1 < 0$
$\lvert C_T\rvert > \lvert G_T\rvert$	$dY/dT > 0$	$dY/dT < 0$
$\lvert C_T\rvert < \lvert G_T\rvert$	$dY/dT < 0$	$dY/dT > 0$

In case that the elasticity of consumption with respect to the taxes is higher than the elasticity of government spending, increase in taxes should decrease total product if we assume that total multiplicative effect of increase in product is lower than one (standard case). In other cases the change in fiscal policy may have even positive effect on the total product if specific conditions are satisfied.

Ad case 2 $(\partial P/\partial T)$:

As there are many variables that may have a significant influence on the final result we need to distinguish between four different cases. Which one is able to describe what will happen in real economy depends on the empirical estimations of each single economy.

	$C_Y + I_Y + G_Y - 1 > 0$	$C_Y + I_Y + G_Y - 1 < 0$
$\lvert C_T \rvert > \lvert G_T \rvert$	${}^{dP}/_{dT} > 0$	${}^{dP}/_{dT} < 0$
$\lvert C_T \rvert < \lvert G_T \rvert$	${}^{dP}/_{dT} < 0$	${}^{dP}/_{dT} > 0$

In the case that the elasticity of consumption with respect to taxes is higher than the elasticity of government spending, increase in taxes should lead to decrease of relative price levels due to increasing domestic prices (we do not distinguish between different types of taxes). In other words, increase in taxes causes relative loss of competitiveness in international environment, thus decrease in real exchange rate (standard case).

Ad case 3 *$(\partial FC/\partial T)$*:

As there are many variables that may have a significant influence on the final result we need to distinguish between four different cases. Which one is able to describe what will happen in real economy depends on the empirical estimations of each single economy.

	$C_Y + I_Y + G_Y - 1 > 0$	$C_Y + I_Y + G_Y - 1 < 0$
$\lvert C_T \rvert > \lvert G_T \rvert$	${}^{dFC}/_{dT} > 0$	${}^{dFC}/_{dT} < 0$
$\lvert C_T \rvert < \lvert G_T \rvert$	${}^{dFC}/_{dT} < 0$	${}^{dFC}/_{dT} > 0$

In the case that the elasticity of consumption with respect to taxes is higher than the elasticity of government spending, increase in taxes should decrease foreign credit – more money are needed to be spent home not abroad (standard case).

2.3.1. Change in taxes as a fiscal policy tool

Again as in the previous section while we do not compute exact values of the elements of the vector we are interested in the direction of the change, thus in the signs of the elements of the vector v. Thus, vector v_{DC} consists of the elements that describe the impact of changes in domestic credit (money expansion or contraction) on our endogenous variables.

$$\begin{bmatrix} \frac{\partial Y}{\partial DC} \\ \frac{\partial P}{\partial DC} \\ \frac{\partial FC}{\partial DC} \end{bmatrix} = \frac{-1}{m\left[\underbrace{X_P - M_P}_{-}\left(\underset{+}{C_Y} + \underset{+}{I_Y} + \underset{+}{G_Y} - 1\right)\right]} \begin{bmatrix} m\ X_P - M_P & 0 & -m\ X_P - M_P \\ mM_Y & 0 & -m(C_Y + I_Y + G_Y - M_Y - 1) \\ MD_Y\ (X_P - M_P) & -(X_P - M_P)(C_Y + I_Y + G_Y - 1) & -(X_P - M_P)MD_Y \end{bmatrix} \begin{bmatrix} 0 \\ -m \\ 0 \end{bmatrix} \quad [23]$$

$$\begin{bmatrix} \frac{\partial Y}{\partial DC} \\ \frac{\partial P}{\partial DC} \\ \frac{\partial FC}{\partial DC} \end{bmatrix} = \frac{-1}{m\left[\underbrace{(X_P - M_P)}_{-}\left(\underset{+}{C_Y} + \underset{+}{I_Y} + \underset{+}{G_Y} - 1\right)\right]} \begin{bmatrix} 0 \\ 0 \\ m\,(X_P - M_P)(C_Y + I_Y + G_Y - 1) \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ -1 \end{bmatrix}$$

There is no impact of changes in domestic monetary policy through increase in domestic credit (monetary transmission mechanism) except on foreign demand. This is a direct consequence of the model setup when there is one to one relationship between domestic and foreign credit in order to achieve equilibrium.

This feature of the model may be considered as a problematic due to ineffectiveness of the monetary transmission mechanism and should be further analyzed when using the model in the field of monetary policy. Contrary to the standard IS-LM-BP model where the interest rate is not used as a policy variable, in our model the role of the money supply as a monetary used is replaced by the short-term interest rate. Thus, the money supply in this model is almost fully neutral.

2.3.2. Change in short-term interest rate as a monetary policy tool

Again as in the previous section while we do not compute exact values of the elements of the vector we are interested in the direction of the change, thus in the signs of the elements of the vector . Thus, vector consists of the elements that describe the impact of changes in domestic interest rate (monetary expansion or contraction) on our endogenous variables.

$$\begin{bmatrix} \frac{\partial Y}{\partial IR} \\ \frac{\partial P}{\partial IR} \\ \frac{\partial FC}{\partial IR} \end{bmatrix} = \frac{-1}{m\left[\underbrace{X_P - M_P}_{-}\left(\underset{+}{C_Y} + \underset{+}{I_Y} + \underset{+}{G_Y} - 1\right)\right]} \begin{bmatrix} m\ X_P - M_P & 0 & -m\ X_P - M_P \\ mM_Y & 0 & -m(C_Y + I_Y + G_Y - M_Y - 1) \\ MD_Y\ (X_P - M_P) & -(X_P - M_P\ )(C_Y + I_Y + G_Y - 1) & -(X_P - M_P\ )MD_Y \end{bmatrix} \begin{bmatrix} I_{IR^s} \\ MD_{IR^s} \\ cf_1 CFA_{IR^s} \end{bmatrix} \qquad [24]$$

$$\begin{bmatrix} \frac{\partial Y}{\partial IR} \\ \frac{\partial P}{\partial IR} \\ \frac{\partial FC}{\partial IR} \end{bmatrix} = \frac{-1}{m\left[\underbrace{(X_P - M_P)}_{-}\left(\underset{+}{C_Y} + \underset{+}{I_Y} + \underset{+}{G_Y} - 1\right)\right]} \begin{bmatrix} m\ (X_P - M_P)\ (I_{IR^s} - cf_1 CFA_{IR^s}) \\ m(M_Y I_{IR^s} - cf_1 CFA_{IR^s}\ (C_Y + I_Y + G_Y - M_Y - 1)) \\ (X_P - M_P)\ (MD_Y I_{IR^s} - MD_{IR^s}\ (C_Y + I_Y + G_Y - 1) - cf_1\, MD_Y CFA_{IR^s}) \end{bmatrix} =$$

$$= \begin{bmatrix} -(cf_1 CFA_{IR^s} + I_{IR^s})/(C_Y + I_Y + G_Y - 1) \\ -(M_Y I_{IR^s} - cf_1 CFA_{IR^s}\ (C_Y + I_Y + G_Y - M_Y - 1))/\ (X_P - M_P)\ (C_Y + I_Y + G_Y - 1) \\ -(MD_Y I_{IR^s} - MD_{IR^s}\ (C_Y + I_Y + G_Y - 1) - cf_1\, MD_Y CFA_{IR^s})/\ m\ (C_Y + I_Y + G_Y - 1) \end{bmatrix} = \begin{bmatrix} (cf_1 CFA_{IR^s} + I_{IR^s})/(C_Y + I_Y + G_Y - 1) \\ (/(X_P - M_P))[cf_1 CFA_{IR^s}] + (M_Y(I_{IR^s} + cf_1 CFA_{IR^s})/(C_Y + I_Y + G_Y - 1) \\ -1/m[(MD_Y(I_{IR^s} + cf_1 CFA_{IR^s})/\ (C_Y + I_Y + G_Y - 1)) - MD_{IR^s}] \end{bmatrix}$$

We analyze impact of changes in domestic interest rate on exogenous variable separately in each case. As the first case we consider change in domestic product due to the changes in interest rate.

Ad case 1 $(\partial Y/\partial IR)$**:**

As there are many variables that may have a significant influence on the final result we need to distinguish between two different cases. Which one is able to describe what will happen in real economy depends on the empirical estimations of each single economy.

	$C_Y + I_Y + G_Y - 1 > 0$	$C_Y + I_Y + G_Y - 1 < 0$
$cf_1 CFA_{IR^s} - I_{IR^s} > 0$	$dY/dIR > 0$	$dY/dIR < 0$

The impact of increase of interest rate depends on the value of total multiplicative effect in the economy. If there is total multiplicative effect lower than one the increase of interest rate leads to decrease of total domestic product (which is in line with the basic macroeconomic theory). Yet, in case of higher multiplicative effect increase in interest rate may lead to increase of total product due to inflow of capital through financial account.

Ad case 2 $(\partial P/\partial IR)$**:**

Direct effect of the change in nominal interest rate is ambiguous. We need to distinguish among many possible combinations of values of total multiplicative effect in economy in relationship to other variables. Hence, there are following eight combinations possible:

		$C_Y + I_Y + G_Y - 1 > 0$	$C_Y + I_Y + G_Y - 1 < 0$
$\left\lvert \frac{M_Y\ I_{IR^s} + cf_1 CFA_{IR^s}}{C_Y + I_Y + G_Y - 1} \right\rvert > cf_1 CFA_{IR^s}$	$\lvert I_{IR^s} \rvert > \lvert cf_1 CFA_{IR^s} \rvert$	$dP/dIR < 0$	$dP/dIR > 0$
	$\lvert I_{IR^s} \rvert < \lvert cf_1 CFA_{IR^s} \rvert$	$dP/dIR > 0$	$dP/dIR < 0$
$\left\lvert \frac{M_Y\ I_{IR^s} + cf_1 CFA_{IR^s}}{C_Y + I_Y + G_Y - 1} \right\rvert < cf_1 CFA_{IR^s}$	$\lvert I_{IR^s} \rvert > \lvert cf_1 CFA_{IR^s} \rvert$	$dP/dIR > 0$	$dP/dIR > 0$
	$\lvert I_{IR^s} \rvert < \lvert cf_1 CFA_{IR^s} \rvert$	$dP/dIR > 0$	$dP/dIR > 0$

In most of the cases increase in interest rate should be compensated with higher domestic price level in order the domestic economy to achieve equilibrium. Increase in domestic interest rate is transmitted into higher domestic price level and loss of competitiveness. However, there are specific cases where increase in interest rate should be accompanied with lowering domestic prices (with increasing real exchange rate, respectively).

Unfortunately, there is no simple rule available when first or second case can be applied. Once again, the result of change in short-term interest rate not only strongly depends on the value of total multiplicative effect, the relationship between elasticity of capital flows to the interest rates and elasticity of investments to interest rates is equally important. According to this analysis, the openness of the economy measured by the elasticity of capital and financial flows with respect to changes in short-term interest rate may be a key factor thanks to which the economy will converge to the equilibrium.

Ad case 3 $(\partial FC/\partial IR)$**:**

As in the previous case the direct effect of the change in nominal interest rate is ambiguous. We need to distinguish among many possible combinations of values of total multiplicative effect in economy in relationship to other variables. Hence, there are following four combinations possible:

	$C_Y + I_Y + G_Y - 1 > 0$	$C_Y + I_Y + G_Y - 1 < 0$
$\left\lvert \frac{MD_Y\ I_{IR^S} - cf_1 CFA_{IR^S}}{C_Y + I_Y + G_Y - 1} \right\rvert > MD_{IR^S}$	$dFC/dIR < 0$	$dFC/dIR > 0$
$\left\lvert \frac{MD_Y\ I_{IR^S} - cf_1 CFA_{IR^S}}{C_Y + I_Y + G_Y - 1} \right\rvert < MD_{IR^S}$	$dFC/dIR < 0$	$dFC/dIR < 0$

In most of the cases increase in interest rate should be compensated with lower level of foreign credit in order to economy stay in equilibrium. However, in one specific case when total multiplicative effect in domestic economic is higher than one and high income elasticity in money demand along with high interest rate elasticity in CFA and investments makes total impact of change in interest rate on foreign credit positive.

The economic logic behind the analytical analysis of the model is not so straightforward. Increase in domestic interest rate should trigger increase in capital flow which will be apparent in positive change of capital and financial account. As the domestic assets become more attractive and bought by foreign investors, net foreign stock should decrease due to increase of foreign liabilities.

3. DATA DESCRIPTION AND METHODOLOGY

For the econometric estimation of parameters entering the system of equations described in [2], [3] and [4] we use a three stage least square method (later 3SLS). As the instrumental variables entering the estimation procedure we use all exogenous variables as defined in the section 2 of this paper ($T, IR^S, Y^*, DC, P^*, IR^{S*}$). Three endogenous variables (Y, P, FC) are later used in the process of estimation.

The 3SLS appears to be more efficient to use than the 2SLS if the correlations between residuals of single equations are high. In this case the estimation results provided by 3SLS are asymptotically efficient in the entire system of equations not only in the single equation as in the 2SLS (Cipra, 2008, p. 218). We decided to use 3SLS as some of the correlations in the correlation table appears to be high, thus the 3SLS should provide us with asymptotically efficient results (Table 1). The residuals were computed by using OLS method on each of the eight equations as in [4] separately.

Table 1 Correlation table of residuals from single equations estimated by the OLS

	RESIDUAL1	RESIDUAL2	RESIDUAL3	RESIDUAL4	RESIDUAL5	RESIDUAL6	RESIDUAL7	RESIDUAL8
RESIDUAL1	1.0000	0.3372	-0.3783	-0.3344	-0.1943	0.4074	0.1654	-0.0963
RESIDUAL2	0.3372	1.0000	-0.4990	-0.1471	0.1154	-0.0337	-0.1688	0.2252
RESIDUAL3	-0.3783	-0.4990	1.0000	-0.1977	-0.2211	-0.4213	-0.1652	0.3848
RESIDUAL4	-0.3344	-0.1471	-0.1977	1.0000	0.3179	0.2085	0.0356	0.0022
RESIDUAL5	-0.1943	0.1154	-0.2211	0.3179	1.0000	0.0477	0.4999	0.3061
RESIDUAL6	0.4074	-0.0337	-0.4213	0.2085	0.0477	1.0000	0.4201	-0.1776
RESIDUAL7	0.1654	-0.1688	-0.1652	0.0356	0.4999	0.4201	1.0000	0.3104
RESIDUAL8	-0.0963	0.2252	0.3848	0.0022	0.3061	-0.1776	0.3104	1.0000

There were various sources used for collecting the necessary data. All data were calculated on a quarterly basis and used in nominal terms if not stated otherwise. Data for nominal GDP and its components and balance of financial and capital account were expressed in nominal terms, in millions of EUR and not seasonally adjusted. Those data were taken from the Eurostat database.

Data for M3 money supply were taken from the database of the National Bank of Slovakia, expressed in nominal terms and in millions of EUR. As a proxy variable for the domestic price level of tradable goods the consumer price index was used with year 2005 as a base year available in the Eurostat database.

Data related to tax income were downloaded from the official database of the Ministry of Finance of Slovak republic and were expressed in mil. of EUR in nominal terms. Short-term interest rates were downloaded from the OECD database for Slovak republic as well as main foreign trade partners of the Slovakia.

World short-term interest rate was computed as a weighted average of short-term interest rates of ten main foreign trade partners and their respective weights on total foreign import and export. The data for the structure of export and import on bilateral basis for the Slovakia were available up to year 2009, thus the data for the year 2009 were used for all other consecutive years.

The same principle as in case of world short-term interest rate was used for the calculation of the foreign demand Y^* of the Slovakia. We used data on total import of top 10 trade partners of Slovakia and weighted them by share of export and import of each single trade partner on total export and import from and to Slovakia. Data on total import of each trade partner were taken from the GDP statistics available in the Eurostat database. In case of the USA the data on total import of goods and services available in balance of payments statistics in the Eurostat database were taken. As in the previous case, the index of foreign prices was computed as a weighted average of consumer price indices of top 10 trade partners of Slovakia and their weights on total export and import of those trade partners. Data on domestic credit and foreign credit were taken from the balance sheet of the National Bank of Slovakia.

4. ESTIMATION AND RESULTS

All the results from the 3SLS estimation of the model as described in [4] are provided in the Appendix II. Let us discuss results for the Slovak economy.

Firstly we would like to test statistical significance of the results for the coefficients in each single equation. We consider variable to be statistically significant if the p-value associated with it is higher than 0.05, or 0.10 in specific cases. Contrary to our assumption we observe that the taxes do not affect domestic consumption, only the government expenditures are affected. According to our results, increase in taxes in times of the current crisis should have a negative influence on the consumption, thus the direction of change is correct but the statistical significance is not present in the data. The increase in taxes does go along with increase of government expenditure, thus, positive change in taxes does not bring negative change in government expenditure, however, the statistical significance is again a little questionable.

As the possible explanation of this phenomenon we consider two factors: (1) burst of the current crisis in the 2008, (2) reign of the left-wing party during the period of 2006-2010. While the tax income has been decreasing since the last quarter of the 2008, the government expenditures have risen up to their peak in the second quarter of the 2010. Thus the increasing government expenditures had been accompanied by the decreasing tax income during the some specific time that has been included into our observations.

Second interesting observation may be attributed to the fact that the role of prices, either domestic or foreign, contradicts our economic assumptions. Both of the variables are statistically significant, yet the results suggest that *increase (decrease) in domestic* prices and *decrease (increase) of foreign* prices triggers *increase (decrease)* in total value of import (export). Our results may suggest that the role of the nominal exchange rate was likely to be more influential during the analyzed period. The contradictory behavior of import and export with respect to foreign and domestic prices could be neutralized by a opposite behavior of the nominal exchange rates.

From this perspective our model should be applied on the conditions of the Slovak economy since its adoption of euro, thus for the period of 2009-2012. Unfortunately, the lack of data does not make this kind of analysis possible. On top of that, the use of consumer price indices as a proxy variable for the price of tradable goods in domestic and foreign economy is likely not to be sufficient. Interestingly, world interest rates as well as the domestic short-term interest rates do not play a significant role in determining the capital flows in or out of the Slovak economy. Again, this result may point out to the important role of nominal exchange rate in financial flows which was not accounted for in our model. Other plausible explanation would point out to the structure of the capital and financial account. The more the capital flows are of a long-term character with a strong focus on the direct foreign investments the less likely are those investment decisions affected by the short-term interest rate that has been used in our case.

Let us now analyze possible effects of fiscal and monetary policy on our three endogenous variables as stated in [4].

4.1. Fiscal policy

The coefficients in the Appendix I provide us with exact values of the partial derivations with respect to taxes and total product needed to estimate direct effect of change in taxes on the domestic product, domestic price level and foreign credit. We used them to estimate full effect of changes in fiscal and monetary policy on endogenous variables. Numbers in equations are adjusted for statistically non-significant variables.

$$\frac{\partial Y}{\partial T} = - C_T + G_T \big/ [\, C_Y + I_Y + G_Y - 1 \,] = -12.3571 \qquad (-25.2112^{*})$$

$$\frac{\partial P}{\partial T} = - C_T + G_T \;\; M_Y \big/ [\, X_P - M_P \quad C_Y + I_Y + G_Y - 1 \,] = -0.0095 \qquad (-0.0194^{*})$$

$$\frac{\partial FC}{\partial T} = - C_T + G_T \;\; MD_Y \,\big/\, m\, [\, C_Y + I_Y + G_Y - 1 \,] = -2.6694 \qquad (-5.4462^{*})$$

According to estimations for the Slovak republic, positive change in taxes goes hand with hand with decrease in domestic product, domestic price level and foreign credit.

When we eliminate coefficients that are not statistically significant we see that the impact of positive changes in tax income on domestic product is still negative. Thus, even though the domestic consumption seems not to be affected by the change in taxes the total domestic product will be affected negatively.

The impact of changes in taxes on domestic price level is very ambiguous. Before adjustment for the non-significant coefficients increase in taxes should be accompanied with decreasing domestic price level. After the reduction we observe that the domestic price level should again decrease due to higher tax income. However, from economic perspective, the change in taxes does not represent an important factor that influences behavior of prices, based on the results of our analysis.

Lastly, the increasing tax income causes negative change in foreign credit. As more money is spend in domestic economy covering the increase in tax income the foreign credit declines.

4.2. Monetary policy

Empirical results for the effect of monetary policy are mostly in line with our assumptions. Increase in short-term interest rate triggers decrease in domestic product. However, as apparent from the Appendix I, there is strong positive relationship between domestic investments and short term interest rate in Slovakia which may be seen as a contradiction to the standard economic theory.

$$\frac{\partial Y}{\partial T} = cf_1 CFA_{IR^s} - I_{IR^s} \,\big/\, C_Y + I_Y + G_Y - 1 \; = -14055.62 \qquad (-20793.17^{*})$$

$$\frac{\partial P}{\partial T} = -1 \big/ X_P - M_P \;\; [\, cf_1 CFA_{IR^s} + M_Y (I_{IR^s} + cf_1 CFA_{IR^s}) \big/ C_Y + I_Y + G_Y - 1 \;\,] \sim -0.0000 \qquad (-0.0000^{*})$$

$$\frac{\partial FC}{\partial T} = -1 \big/ m\, [\, MD_Y \;\; I_{IR^s} - cf_1 CFA_{IR^s} \big/ (C_Y + I_Y + G_Y - 1) - MD_{IR^s}] = -3036.31 \qquad (-4491.76^{*})$$

Yet, looking at the evolution of investments and short-term interest rates in Slovakia we see strong co-movement in both series. Again, this causes of this phenomenon links back to the current economic crisis. With burst of the economic crisis in third quarter of the 2008 we observe decline in both investments and short-term interest rate as the latter one has been used as a tool for fighting against the crisis. After the second quarter of 2010 the very slow recovery of domestic economy in terms of increase in investment stock has been and has been accompanied by increasing short-term interest rates. Thus, our model correctly predicts that increase in short-term interest rates should lead to rise in investment stocks.

Secondly, restrictive monetary policy in terms of increasing short-term interest rate does only have a minor influence over the domestic prices. From this perspective, the monetary policy is neutral with respect to the domestic price level. Finally and not surprisingly, increase in short-term interest rate should be mirrored in decreasing level of foreign assets. As the domestic financial assets become more attractive the investors change their preferences and switch from foreign to domestic assets.

5. CONCLUSION

This paper proposes a new extension of the traditional Mundell-Flemming model for conditions of the common monetary union. Contrary to the standard MF model we use short-term interest rate as main policy tool for expansionary or restrictive monetary policy. Secondly, we incorporate taxes as a main tool for the fiscal policy that may have an influence on the total domestic product. The new version of the MF model is analyzed firstly analytically providing a general solution to the model. Afterwards, we test predictions of the MF model in economic conditions of the Slovak republic during the period of 2006-2011.

With respect to the structure of our model we show that in the presence of the inflation targeting where short-term interest rate serves as a tool of monetary policy the monetary transmission mechanism is ineffective. Secondly, the change in short-term interest rate leads to decreasing total domestic product, increasing price level and decreasing foreign credit. The restrictive fiscal policy resulting in increasing tax income leads to decreasing total domestic product, increasing domestic prices and decreasing foreign credit.

Empirical results for Slovak republic suggest that increase in tax revenues goes hand in hand with decrease of total domestic product. According to the model, the monetary policy as well as the fiscal policy should both leave the domestic price level unchanged. Finally, the effect of the changes in short-term interest rate on the total domestic product is in line with a standard economic theory, where increase in domestic interest rates should lead to decrease in total product.

As the model is calibrated on the data that incorporates birth of the current crisis and its slow vanishing the results only resembles this fact. Furthermore, as a suggestion for a future research we would recommend testing the model on the countries that have been involved in the common monetary union for a longer time than a Slovakia has been.

LITERATURE

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Appendix I

System: UNTITLED
Estimation Method: Three-Stage Least Squares
Date: 09/10/12 Time: 08:35
Sample: 2006Q1 2011Q4
Included observations: 24
Total system (balanced) observations 192
Linear estimation after one-step weighting matrix

Determinant residual covariance 4.76E+44

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	91.7048	675.0453	0.1359	0.8921
C(2)	0.5966	0.0370	16.1306	0.0000
C(3)	-0.1414	0.2429	-0.5823	0.5611
C(4)	-936.0372	543.5883	-1.7220	0.0869
C(5)	0.2774	0.1461	1.8982	0.0594
C(6)	0.2021	0.0320	6.3102	0.0000
C(7)	-93.0510	722.4137	-0.1288	0.8977
C(8)	228.7872	52.4495	4.3620	0.0000
C(9)	0.2123	0.0434	4.8965	0.0000
C(10)	-120457.5000	57535.9400	-2.0936	0.0378
C(11)	1.9342	0.4312	4.4857	0.0000
C(12)	2512.1860	908.3518	2.7657	0.0063
C(13)	-1322.6120	366.3617	-3.6101	0.0004

c_sk=c(1)+c(2)*y_sk+c(3)*t_sk
g_sk=c(4)+c(5)*t_sk+c(6)*y_sk
i_sk=c(7)+c(8)*irs_sk+c(9)*y_sk
m_sk=c(10)+c(11)*y_sk+c(12)*cpif_sk+c(13)*cpi_sk
x_sk=c(14)+c(15)*y_star_sk+c(16)*cpif_sk+c(17)*cpi_sk
m3_sk=c(18)+c(19)*y_sk+c(20)*irs_sk
m3_sk=c(21)*dc_sk+c(22)*fc_sk
cfa_sk=c(23)+c(24)*irs_sk+c(25)*ir_w

INST t_sk irs_sk y_star_sk dc_sk cpif_sk ir_w

	Coefficient	Std. Error	t-Statistic	Prob.
C(14)	45017.4200	51180.8600	0.8796	0.3804
C(15)	0.1532	0.0221	6.9400	0.0000
C(16)	-1209.9030	822.9629	-1.4702	0.1434
C(17)	656.3265	270.4074	2.4272	0.0163
C(18)	15061.2400	2473.9660	6.0879	0.0000
C(19)	1.5208	0.1437	10.5825	0.0000
C(20)	-641.6754	185.5987	-3.4573	0.0007
C(21)	2.9703	0.4068	7.3017	0.0000
C(22)	4.0698	0.5135	7.9259	0.0000
C(23)	-591.4551	426.5939	-1.3865	0.1675
C(24)	74.1332	74.2550	0.9984	0.3195
C(25)	286.2582	149.7882	1.9111	0.0577

Equation: C_SK=C(1)+C(2)*Y_SK+C(3)*T_SK
Instruments: T_SK IRS_SK Y_STAR_SK DC_SK CPIF_SK IR_W C
Observations: 24

R-squared	0.924371	Mean dependent var	8737.737
Adjusted R-squared	0.917169	S.D. dependent var	1356.131
S.E. of regression	390.3005	Sum squared resid	3199024
Durbin-Watson stat	1.184965		

Equation: G_SK=C(4)+C(5)*T_SK+C(6)*Y_SK
Instruments: T_SK IRS_SK Y_STAR_SK DC_SK CPIF_SK IR_W C
Observations: 24

R-squared	0.66018	Mean dependent var	2786.208
Adjusted R-squared	0.627817	S.D. dependent var	584.8889
S.E. of regression	356.8222	Sum squared resid	2673764
Durbin-Watson stat	2.24153		

Equation: I_SK=C(7)+C(8)*IRS_SK+C(9)*Y_SK
Instruments: T_SK IRS_SK Y_STAR_SK DC_SK CPIF_SK IR_W C
Observations: 24

R-squared	0.571302	Mean dependent var	3689.488
Adjusted R-squared	0.530473	S.D. dependent var	726.1317
S.E. of regression	497.5601	Sum squared resid	5198886
Durbin-Watson stat	1.784262		

Equation: M_SK=C(10)+C(11)*Y_SK+C(12)*CPIF_SK+C(13)*CPI_SK
Instruments: T_SK IRS_SK Y_STAR_SK DC_SK CPIF_SK IR_W C
Observations: 24

R-squared	0.324131	Mean dependent var	12585.21
Adjusted R-squared	0.222751	S.D. dependent var	1974.961
S.E. of regression	1741.159	Sum squared resid	60632720
Durbin-Watson stat	1.420375		

Equation: X_SK=C(14)+C(15)*Y_STAR_SK+C(16)*CPIF_SK+C(17) *CPI_SK
Instruments: T_SK IRS_SK Y_STAR_SK DC_SK CPIF_SK IR_W C
Observations: 24

R-squared	0.855335	Mean dependent var	12437.35
Adjusted R-squared	0.8336	S.D. dependent var	2137.5180
S.E. of regression	871.8474	Sum squared resid	15202357.0000
Durbin-Watson stat	1.2393		

Equation: M3_SK=C(18)+C(19)*Y_SK+C(20)*IRS_SK
Instruments: T_SK IRS_SK Y_STAR_SK DC_SK CPIF_SK IR_W C
Observations: 24

R-squared	0.8957	Mean dependent var	36353.0400
Adjusted R-squared	0.885713	S.D. dependent var	4121.171
S.E. of regression	1393.219	Sum squared resid	40762248
Durbin-Watson stat	1.719257		

Equation: M3_SK=C(21)*DC_SK+C(22)*FC_SK
Instruments: T_SK IRS_SK Y_STAR_SK DC_SK CPIF_SK IR_W C
Observations: 24

R-squared	-1.07242	Mean dependent var	36353.04
Adjusted R-squared	-1.166621	S.D. dependent var	4121.171
S.E. of regression	6066.135	Sum squared resid	810000000
Durbin-Watson stat	0.381688		

Equation: CFA_SK=C(23)+C(24)*IRS_SK+C(25)*IR_W
Instruments: T_SK IRS_SK Y_STAR_SK DC_SK CPIF_SK IR_W C
Observations: 24

R-squared	0.237726	Mean dependent var	590.0833
Adjusted R-squared	0.165128	S.D. dependent var	527.806
S.E. of regression	482.2633	Sum squared resid	4884136
Durbin-Watson stat	2.032115		