Michał Rubaszek

National Bank of Poland
Research Department

Modeling Fundamentals for Forecasting Portfolio Inflows to Poland

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Introduction

The influence of portfolio flows on the Polish balance of payment has become of vital importance during the last decade. As can be seen in Chart 1, Poland experienced a considerable increase of foreign capital inflow then. Financial institutions were eagerly purchasing treasury papers due to the high real interest rates differentials and increased Polish creditworthiness. According to the Institutional Investor survey, Poland's credit rating among all countries shifted from 51st to 38rd position[1] within the last five years (see. Table 1). Moreover, the economic growth, the reduction of inflation and approaching EU membership were further factors influencing the capital inflows. As a consequence, many foreign companies have decided to invest in various ventures such as greenfield projects, privatization of the state assets or debt securities.

During the studied period, a large amount of capital inflows was significantly contributing to the strong inflationary pressure and, consequently, posed a serious problem to the monetary authorities (for more details see Sławiński [1999]). In order to avoid mismanagement and to choose an appropriate policy mix that would provide stable growth in the future, modeling fundamentals of capital inflows seems to be necessary.

This paper presents two econometric models that will be utilized in order to forecast net portfolio inflows to Poland. The key factors, which continuously affect foreign capital inflow, are discussed in the first section. Section 2 contains econometric fundamentals, or more specifically, the error correction specification. In section 3 the model is applied to the observed data of capital inflows to Poland over the period

[1] The country-by-country credit ratings developed by Institutional Investor are based on information provided by chief economists at leading global banks and securities firms. They have graded each of the countries on a scale of zero to 100, with 100 representing these countries that have the least chance of default. The names of respondents to the survey are kept strictly confidential. Participants are not permitted to rate their home countries. The individual responses are weighted using an Institutional Investor formula that gives more importance to responses from institutions with greater worldwide exposure and more-sophisticated country analysis systems.

January 1997 – September 2001. Finally, the forecast for the year 2002 is the focus of section 4. In conclusions a short summary and the direction of further topics is given.

Table 1.

Poland's credit rating

Date	Rating Value	Position
Sept-96	44,0	51
Mar-97	47,9	46
Sept-97	50,2	45
Mar-98	51,9	44
Sep-98	54,0	38
Mar-99	56,7	33
Sept-99	57,5	34
Mar-00	58,5	36
Sept-00	62,2	36
Mar-01	59,3	38
Sept-01	59,2	38

Source: Institutional Investor monthly

1. The determinants of capital inflows

Two economic quantities determine the value of capital flows: demand for and supply of foreign borrowing. The first one depends on the difference between savings and investments in the domestic country. The latter is determined by country-specific and global factors, so called pull and push factors. The study of the panel data for 1988-1992 conducted by Chuhan, Claessens and Mamingi [1993] proves that the capital flows to Latin American and Asian countries were almost equally sensitive to push and pull factors.

Let us focus now on the demand for foreign borrowing. The fiscal surplus can be viewed as a proxy for the difference between saving and investment. The influence of budget deficit on capital account was discussed by Manzocchi [1997]. He focused his

attention on ten countries: Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovenia, Slovak Republic, Estonia, Latvia and Lithuania, over the period 1990-1995. The results indicated that about 70% of budget deficit was financed from abroad. However, permanent fiscal deficit leads to the growing stock of foreign debt and thus decreases the willingness of foreign agents to make another capital investments. For instance, a rise of the ratio of foreign debt stock to GDP by 10% lowers the borrowing/GDP ratio by 1,5% (see Rybiński [1998]).

Let us now concentrate on the pull factors. The county specific (pull) factors reflect both the domestic opportunity and the risk involved. According to Fernandez-Arias and Montiel (1996b) domestic factors are affected by the following events:

- Policies that increase the long run expected rate of return or reduce the perceived risk of real domestic investment, such as major domestic and institutional reforms. Improved domestic macroeconomic policies, namely successful inflation stabilization accompanied by sustainable fiscal adjustment, would also have this effect.
- Short-run macroeconomic policies, such as tight monetary policy, that increase the expected rate of return on domestic financial instruments, resulting in ex ante positive interest rate differentials.
- Policies that increase the openness of the domestic financial market to foreign investors as is the case with the removal of capital controls and liberalization of restrictions imposed on foreign investment.
- Structural or macroeconomic policies that, because of their lack of credibility, distort intertemporal relative prices. That could be incredible trade liberalization and price stabilization programs. Tariff cuts under domestic price rigidities, for example, may create expectations that the relative price of imports will rise over time when tariff's levels are restored.
- Credit ratings and secondary-market prices of sovereign debt, reflecting the opportunities and risks of investing in the country.
- Debt service reduction agreements, take Brady operations for example

The case of Poland is the clear evidence of the importance of these events. In 1994 the Polish creditworthiness was restored due to Brady's debt reduction plan. As a

result, the risk of investing in Poland significantly decreased. Moreover, tight monetary policy and structural reforms (see Sławiński [1999]) have considerably contributed to the attractiveness of investing in Poland. Unfortunately, it seems to be very difficult to test the influence of the mentioned events on the capital flows, as most of them are not measurable in quantitative sense. However, it is possible to select the set of measurable variables that would represent pull factors. Take the study of capital flows to 32 developing countries, conducted by Mody, Taylor and Sarno [2001] for example: the proxies of country-specific factors included Consumer Price Index, the level of domestic credit, short-term debt to reserves ratio, the level of industrial production, domestic short-term interest rate, the credit rating, the reserves to import ratio, and the domestic stock market index.

Let us now pay more attention to the second set of determinants of the supply of foreign capital that is to the global (push) factors. A good illustration of this type of factors is the decrease of U.S. interest rates that may induce the sharp increase in U.S. capital flows, which represent a significant share of the portfolio flows received by emerging markets. Mody, Taylor and Sarno [2001] have taken into consideration several global factors: that is to say the strength of the U.S. output growth, the U.S. short-term and long-term interest rates, the Emerging Markets Bond Index (EMBI), the U.S. swap rate and the US high-yield spread (as proxy for a measure of risk aversion).

2. Theoretical background.

Fernando-Arias and Montiel [1996a] have developed a useful analytical model that incorporates the influence of domestic and global factors on capital flows. The model assumes the existence of an equilibrium level of capital stock:

$$F^* = F^*(d, c, w), \qquad (1)$$

where F^* denotes long term equilibrium level of net foreign capital stock. Quantities d ,c and w are associated, respectively, with the domestic economic climate, country

creditworthiness and the external environment. Differentiating equation (1) and approximating total derivatives by first differences yields:

$$\Delta F^* = f_d \Delta d + f_c \Delta c + f_w \Delta w, \tag{2}$$

where f_d, f_c and f_w denote partial derivatives. According to equation (2), variations in d, c (standing for the pull factors) and w (corresponding to the push factors) result in the change in the equilibrium level of capital stock. Taylor and Sarno [1997] have modified this approach by introducing a dynamic cost-of-adjustment model. According to this theory, the creditors are to bear costs while adjusting their portfolios to the desired level. It is possible due to such phenomena as informational asymmetries (see Stiglitz and Weiss [1981]) and costs of entry to or exit from emerging capital markets (see Daveri [1995]).

Investors, who optimize the difference between desired and actual capital level subject to the adjustment costs, are assumed to apply the quadratic loss function. It means that one minimizes the expression (see. Taylor, Sarno [1997]):

$$L = (F - F^*)' \mathbf{M}_1 (F - F^*) + (F - F_{-1})' \mathbf{M}_2 (F - F_{-1}), \tag{3}$$

where $\mathbf{M}_1$, $\mathbf{M}_2$ are arbitrary chosen positive define matrices, and F, F_{-1} denote, respectively, current and one-period lagged net capital stock. The first-order conditions for minimizing L gives the formula:

$$\Delta F = (\mathbf{M}_1 + \mathbf{M}_2)^{-1} \mathbf{M}_1 (F^* - F_{-1}). \tag{4}$$

Equations (2) and (4) lead to the error correction specification (see.Engle, Granger [1987]) of net capital flows:

$$\Delta F = A_0 (F^* - F)_{-1} + A_1 \Delta d + A_2 \Delta c + A_3 \Delta w + \varepsilon_t, \tag{5}$$

where A_0, A_1, A_2, A_3 stands for the parameters, which are to be estimated and ε_t is a random variable.

The interpretation of the equation (5) is as follows: the change in stock of foreign capital (i.e. net capital flows) depends on both the deviation of capital stock from the long run equilibrium, and on the shifts in pull and push factors.

3. The model

The case of the net portfolio investments to Poland is studied here. The data set comprises two types of portfolio flows: equity securities and debt securities. In Polish practice, net portfolio investment in equity security is understood as an acquisition/sale of the company's shares, which do not exceed 10% of the base capital of the acquired/sold company. Respectively, net portfolio investment in debt securities contains an acquisition/sale of the long-term and short-term debt securities (i.e. bonds, eurobonds, Brady's bonds, T-bills, commercial papers). The parameter estimation is based on 57 monthly observations over the period January 1997-September 2001.

A/ Exogenous variables

Three sets of independent variables are taken into account. The first variable (G_t) stands for the cumulated budget surplus from January 1997 till period t. It is perceived as a proxy of the saving-investment imbalance and may be understood as the value of the demand for foreign borrowing.

The second group of variables represents the following pull factors:

- the exchange rates EUR/PLN and USD/PLN
- the domestic interest rate WIBOR 1M (i_t)
- the ratio of official reserves to imports (importcover), which can be related to Polish solvency.
- the value of the Warsaw Stock Index WIG, which may be interpreted as a proxy of the investment climate in Poland
- the time structure of interest rates (ts_t) which denotes market expectations concerning the interest rate changeability ($ts_t = WIBOR\ 3M_t - WIBOR\ 1M_t$).

- the level of industrial production
- the prices indices CPI and PPI
- the Polish value of the Institutional Investor rating (cr_t) (see Table 1), which is used to measure the creditworthiness.

The third group of variables, i.e. push factors, consists of the LIBOR 1M (i_t*) interest rate, the level of EMBI+ (Emerging Markets Bond Index) and the value of Standard&Poor's 500 index (representing the investment climate in the world).

Finally, the dummy variables are taken into account. Let us mention a few of them that occured in the studied period: shocks derived from Eurobond emissions, Brady's buyback (see. Table 2) and significant public offer of privatized companies (July 1998 – PeKaO S.A., Nov 1998 – TP S.A. and Nov 1999 – PKN Orlen), which occurred in the studied period. In order to catch these events in the model, three additional auxiliary variables are introduced:

- $$U_{1t} = \begin{cases} 1 & for \quad t \in < March\,2000, Sept\,2000 > \\ 0 & \text{otherwise} \end{cases} \tag{6}$$

- $$U_{2t} = \begin{cases} 1 & for \quad t \geq July\,1998 \\ 0 & or \quad t < July\,1998 \end{cases} \tag{7}$$

- $$U_{3t} = \begin{cases} 2 & for \quad t \geq Nov\,1999 \\ 1 & for \quad t \in < Nov\,1998, Oct\,1999 > . \\ 0 & for \quad t < Nov\,1998 \end{cases} \tag{8}$$

As can be seen in Table 2, U_{1t} corresponds to two shocks that have an equal but opposite effect on net portfolio flows in debt security, and it can be understood as a transitory shock, that does not change the long-term equilibrium. On the contrary, U_{2t} and U_{3t}, which represent significant public offers, are permanent shocks, and they have strong impact on the long-term equilibrium.

Table 2.

Eurobond issues and Brady's bond buyback

Date of Issue	Issuer	Amount	Maturity	Notes
May 1997	Bank Handlowy	200 mln USD	3 years	
June 1997	Polish Treasury	400 mln USD	7 years	
June 1997	Elektrim	219 mln DEM	7 years	Convertible bonds
July 1997	ERA GSM	253 mln USD	10 years	
Nov 1997	Netia	325 mln USD	10 years	
Nov 1997	Netia	135 mln DEM	10 years	
June 1988	PLL LOT	100 mln USD	5 years	
July 1998	Huta Sendzimira	50 mln USD	5 years	
Aug 1998	Polish Treasury	-700mln USD		Brady's bonds buyback
Oct 1998	PTO	130 mln USD	5 years	
Nov 1998	Kraków	66 mln DEM	2 years	
Dec 1998	TP S.A.	800 mln USD	10 years	
Dec 1998	TP S.A.	200 mln USD	5 years	
June 1999	Netia	100 mln EUR	10 years	
June 1999	Netia	100 mln USD	10 years	
July 1999	Elektrim	440 mln EUR	2,5 years	Convertible bonds
Oct 1999	TP S.A.	400 mln EUR	5 years	
Nov 1999	ERA GSM	300 mln EUR	10 years	
Nov 1999	ERA GSM	100 mln USD	10 years	
Dec 1999	TP S.A.	100 mln EUR	5 years	
Mar 2000	TP S.A.	475 mln EUR	7 years	
Mar 2000	Polish Treasury	600 mln EUR	10 years	
June 2000	BRE	200 mln EUR	5 years	
June 2000	Netia	200 mln EUR	10 years	
Oct 2000	Polish Treasury	-937 mln USD		Brady's bonds buyback
Jan 2001	Polish Treasury	750 mln EUR	10 years	
Feb 2001	TP S.A.	500 mln EUR	7 years	
Mar 2001	Elektrownia Turów	270 mln EUR	10 years	
Mar 2001	Kredyt Bank	150 mln EUR	3 years	
May 2001	Polish Treasury	-290 mln USD		Brady's bonds buyback
Oct 2001	PGNiG	800 mln EUR	5 years	

Source: „Rating & Rynek" and Polish Treasury Papers. Annual Report..

B/ Long term relationship

Let us now study the long-term relationship. Let F_{1t} and F_{2t} stand for, respectively, the cumulated net portfolio investment in debt and equity securities. In order to test the influence of exogenous variables on F_{1t} and F_{2t}, we apply the modeling procedure 'from general to specific' (see Hendry [1983]). Here, the influence of the variables G_t, i_t, i_t*, ts_t and cr_t occurs to be statistically significant. Therefore the further analysis is carried out for these variables and dummies defined in equations (6)-(8).

At the first stage, the level of integration of each of the variables was under study. The augmented Dickey-Fuller unit root test (see Dickey, Fuller [1981]) was used to verify hypotheses:

$$H_0: \delta=0 \tag{9a}$$

$$H_1: \delta<0, \tag{9b}$$

where δ is the parameter of the model

$$\Delta y_t = \delta y_{t-1} + \alpha_0 + \alpha_1 \Delta y_{t-1} + \varsigma_t . \tag{10}$$

The results presented in Table 3 indicate that all (dependent and independent) variables, except from ts_t are integrated *I(1).* The absence of the unit root in the time series $\{ts_t\}$ is not surprising, as economic theory suggests that arbitrage prevents nominal interest rates from getting too far away from each other. As a result WIBOR 3M and WIBOR 1M occur to be cointegrated, thus ts_t is *I(0)*. Stock and Watson [1988], who found out that the nominal Federal funds, the three-month Treasury bill and one-year Treasury bill rates are cointegrated, came to similar conclusions.

Table 3.

ADF statistics test for levels and 1st difference integration

Variable	Levels	1st difference	Conclusion
F_{1t}	-0.50	-4.83***	I(1)
F_{2t}	-0.65	-6.25***	I(1)
G_t	-0.52	-4.13***	I(1)
i_t*	0.36	-3.68***	I(1)
i_t	-1.02	-3.70***	I(1)
cr_t	-2.77*	-6.51***	I(1)
ts_t	-3.54**	-8.17***	I(0)

*,**,*** 10%, 5% and 1% significance level according to MacKinnon [1991]critical values for rejection of null unit root hypothesis

Source: Author's calculations

At the second stage of our study, the long-term cointegrating relations were tested. The SURE procedure (see Zellner [1962]) was utilized to estimate two-equation model. The results are as follows:

- the equation of net portfolio investment in debt securities[2]

$$\hat{F}_{1t} = \underset{(-10,9)}{-5935,5} \underset{(-33,3)}{-0,30G_t} \underset{(-2,2)}{-166,04i_T}\,^{*} \underset{(14,6)}{+301,44i_t} \qquad (11)$$
$$R^2 = 95,7\% \quad \text{D-W} = 0,80 \quad \text{t-ADF} = -3,72$$

- the equation of net portfolio investment in equity securities

$$\hat{F}_{2t} = \underset{(-5,7)}{-2167,5} \underset{(-3,7)}{-0,06G_t} \underset{(-1,92)}{-63,3i_T}\,^{*} \underset{(7,2)}{+121,4i_t} \underset{(2,2)}{+0,094F_{1t}} \underset{(8,2)}{+763,5U_{2t}} \underset{(5,4)}{+426,6U_{3t}}, \qquad (12)$$
$$R^2 = 98,7\% \quad \text{D-W} = 1,22 \quad \text{t-ADF} = -5,19$$

[2] F_1,F_2, G, i and i* stand for, respectively, cumulative net portfolio inflows in debt and equity securities, cumulative budget surplus, WIBOR 1M and LIBOR 1M levels.

Once again, the augmented Dickey-Fuller unit root test was applied to verify the hypothesis that (11) and (12) are cointegrating relations. According to MacKinnon tables [1991], the calculated values of t-ADF statistics indicate that the residuals of models (11) and (12) are stationary at the 1% significance level. Consequently, it can be accepted that equations (11) and (12) describe the long-term equilibrium level of F_{1t} and F_{2t}. The actual and fitted values are shown in the chart 2 and 3.

The conclusions seem to be consistent with the economic theory, i.e.:

- 30% and 6% of budget deficit is financed by portfolio inflow in debt and equity security.
- An increase of Polish interest rate by 100bp (pull factor) attracts, respectively, $301mln and $121mln of portfolio investments.
- An increase of the U.S. interest rate by 100bp (push factor) cause, respectively, $166mln and $63mln outflow of the capital from Polish capital market.

C/ Short-term relation

Processes F_{1t} and F_{2t} tend to oscillate around their long-term trajectories $\hat{F}_{1t}$ and $\hat{F}_{2t}$ given by equations (11) and (12). As a result, their deviation from the equilibrium level in period t should influence the portfolio flows in period $t+1$. For this reason two error correction models (see. Engle, Granger [1987]) were estimated:

$$\begin{cases} \Delta Y_{1t} = \alpha_{1,0} + \delta_1 (Y_1 - Y_1^*)_{t-1} + \sum_{i=1}^{n} \sum_{p=0}^{P} \alpha_{1,ip} \Delta x_{i,t-p} + v_{1t} \\ \Delta Y_{2t} = \alpha_{2,0} + \delta_2 (Y_2 - Y_2^*)_{t-1} + \sum_{i=1}^{n} \sum_{p=0}^{P} \alpha_{2,ip} \Delta x_{i,t-p} + v_{2t} \end{cases} \quad (13)$$

The results are presented in tables 4 and 5, for the sake of portfolio investments in debt and equity securities.

Table 4.

Short term model of portfolio investment in debt securities:

Dependent Variable: ΔF_{1t}				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-38,07	31,31	-1,21	0,23
$\Delta F_{1,t-1}$	0,178	0,071	2,52	0,01
$(F_1 - \hat{F}_1)_{t-1}$	-0,315	0,070	-4,48	0,00
ΔG_t	-0,251	0,040	-6,21	0,00
ΔU_{1t}	942,0	156,4	6,02	0,00
Δi_t	64,16	32,12	2,00	0,05
Δi_{t-3}	63,35	36,66	1,73	0,09
Δi_{t-2}*	-291,1	105,5	-2,76	0,01
Δcr_{t-1}	73,64	31,73	2,32	0,02
ts_t	138,36	64,38	2,15	0,03
R^2	0,75	Adjusted R^2		0,70
S.E. of regression	202,78	Jaque-Bera normality test		0,45
Durbin-Watson	1,91	J-B probability		0,80

Source: Author's calculations

Table 5.

Short term model of portfolio investment in equity securities:

Dependent Variable: ΔF_{2t}				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	13,03	10,06	1,30	0,199
$(F_2 - \hat{F}_2)_{t-1}$	-0,347	0,077	-4,46	0,000
ΔG_t	-0,037	0,013	-2,80	0,006
ΔU_{2t}	419,1	65,2	6,43	0,000
ΔU_{3t}	672,5	47,7	14,10	0,000
Δi_{t-3}	54,68	10,2	5,35	0,000
Δi_{t-2}*	106,8	32,9	3,25	0,002
R^2	0,865	Adjusted R^2		0,847
S.E. of regression	65,3	Jaque-Bera normality test		1,22
Durbin-Watson	2,10	J-B probability		0,59

Source: Author's calculations

Present results indicate that budget deficit has an immediate impact on foreign borrowing. The portfolio flows adjustment to changes in interest rates appears after 2-3 months. This delay should not be surprising if only the time needed to prepare the bond issue is taken into account. Moreover, an increase of the institutional investor's credit rating stimulates capital inflow to Poland as well.

What seems to be worth pointing out is that the influence of the remaining variables on the portfolio flows to Poland was tested, too. However, these variables appeared to be statistically insignificant. The above results have led the author to the conclusion, that the main systematic determinants of portfolio flows to Poland are domestic and world interest rates and the scale of budget deficit.

4.The ex-ante forecast of portfolio flows to Poland in the year 2002.

The presented model gives the opportunity to establish the influence of both: fiscal and monetary policy on the balance of payment. In order to predict the level of portfolio inflows to Poland in 2002, the estimation of exogenous variables was performed:

- WIBOR and LIBOR rates were predicted using Nelson-Siegel[3] [1987] procedure.
- The values of credit rating and budget deficit were calibrated.

According to the results of the forecast presented in tables 6 and 7, the portfolio inflows in the year 2002 will amount to, respectively, $1212mln and $247mln in debt and equity securities. The main contributors to these numbers are the extent of fiscal deficit and the expected decrease of foreign interest rates. However, the decrease of domestic rates will surely discourage foreign investors to locate their funds in Poland.

[3] The Nelson-Siegel procedure is based on the analysis of the current yield curve. The future interest rate in the time interval $<t_1,t_2>$ is equal to: $F(t_1,t_2)=\left[\frac{(1+i(t_0,t_2))^{t_2-t_0}}{(1+i(t_0,t_1))^{t_1-t_0}}\right]^{1/t_2-t_1}-1$, where $i(t_0,t_i)$ is the current interest rate of maturity in t_i. The detailed description of the procedure can be found in Stamirowski [1999].

Nevertheless, it should be stressed here that the quoted forecasted values are based on the two assumptions:

- No shock will take place in the year 2002
- The observed values of the exogenous variables will not differ considerably from the values used to the forecast

These assumptions may be not fulfilled. The possible factors behind it might be a large unexpected eurobond issue or terrorist attacks.

Table 6

Ex-ante forecast of portfolio investment in debt security[4]

		Contributors				
month	**Forecast**	$(Y-Y^*)_{t-1}$	ΔG_t	Δi_t	Δi_t^*	ts_t
Oct-01	**33,74**	-3,35	281,74	-102,13	52,40	-106,93
Nov-01	**305,20**	91,10	282,42	-39,42	140,03	-136,86
Dec-01	**405,50**	104,38	283,09	-52,85	196,53	-141,92
Jan-02	**277,46**	83,91	243,71	-94,03	122,17	-112,44
Feb-02	**100,51**	-12,18	224,29	-67,88	31,71	-86,76
Mar-02	**-86,58**	-40,50	204,87	-47,52	11,20	-69,27
Apr-02	**-27,70**	-2,52	187,32	-103,50	-0,48	-55,02
May-02	**5,10**	22,22	161,95	-82,06	-10,14	-43,87
Jun-02	**18,00**	36,38	136,59	-65,38	-18,02	-34,40
Jul-02	**55,94**	44,39	150,62	-52,00	-24,41	-27,79
Aug-02	**88,66**	51,67	158,11	-41,42	-29,44	-22,16
Sep-02	**115,60**	56,26	165,61	-32,95	-33,41	-17,63
Oct-02	**216,57**	59,04	192,82	-26,27	-36,36	-14,08
Nov-02	**203,89**	43,38	230,49	-20,92	-38,50	-11,06
Dec-02	**249,00**	48,48	268,16	-16,67	-40,00	-9,21

Source: Author's calculations

[4] The small size of the sample makes ex-post forecast almost unavailable. The shortening of the studied period leads to the decrease in the number of the degrees of freedom and thus to the loss in the effectiveness of the estimators. However, as the data for October and November are already available, it is possible to compare them with figures presented in the tables 6 and 7. Net portfolio inflows in debt securities amounted to 370 mln USD and 252 mln USD in October and November, respectively. The forecast for October is underestimated by about 337 mln USD, and this for November overestimated by 53 mln USD. Much better forecasts are those of portfolio inflow in equity securities: the observed data (-102 mln USD and –30 mln USD) are almost equal to the forecasted values.

Table 7

Ex-ante forecast of portfolio investment in equity security

		Contributors			
Date	**Forecast**	$(Y-Y^*)_{t-1}$	ΔG_t	Δi_t	Δi_t^*
Oct-01	-84,02	-52,9	41,8	-66,7	-19,24
Nov-01	-21,45	-2,3	41,9	-22,8	-51,40
Dec-01	-17,35	42,1	42,0	-42,4	-72,14
Jan-02	71,48	49,9	36,2	-21,1	-44,84
Feb-02	73,47	10,1	33,3	-11,1	-11,64
Mar-02	46,26	-22,9	30,4	-3,2	-4,11
Apr-02	-41,15	-21,7	27,8	-59,3	0,18
May-02	-27,77	-20,8	24,0	-46,9	3,72
Jun-02	-18,27	-20,3	20,3	-37,4	6,61
Jul-02	-5,61	-18,0	22,4	-29,7	8,96
Aug-02	5,60	-15,3	23,5	-23,7	10,81
Sep-02	15,74	-12,6	24,6	-18,8	12,26
Oct-02	27,37	-6,3	28,6	-15,0	13,35
Nov-02	43,11	-2,0	34,2	-11,9	14,13
Dec-02	56,00	3,3	39,8	-9,5	14,68

Source: Author's calculations

Conclusions

As can be seen from the results, the mix of loose fiscal and tight monetary policy (i.e. the current case of Poland) leads to high portfolio capital inflow. Consequently, one can expect an increase in the foreign currency reserves and higher credit rating, which should stimulate further capital inflow. This may cause the domestic currency appreciation, resulting in the deterioration of terms of trade and current account balance. Therefore the positive net capital inflow cannot last ad infinitum. It is very possible that the external balance crisis will put an end to it.

This is the reason why, apart from portfolio inflow modeling, the key variables that increase the probability of currency crisis should be analyzed. The study of Milesi-Ferretti and Razin [1997] provides a theoretical framework of the potential factors that may cause the reversal of foreign capital from domestic financial market. According to the results of their studies, if the ratio of the external liabilities to GDP is stable, i.e. the

sufficient condition for solvency is accomplished, then the risk of external balance crisis is low. From the above facts it can be concluded that an additional model of the external balance crisis should be estimated in order to judge the problem whether the probability of panic capital escape from domestic market is high or low.

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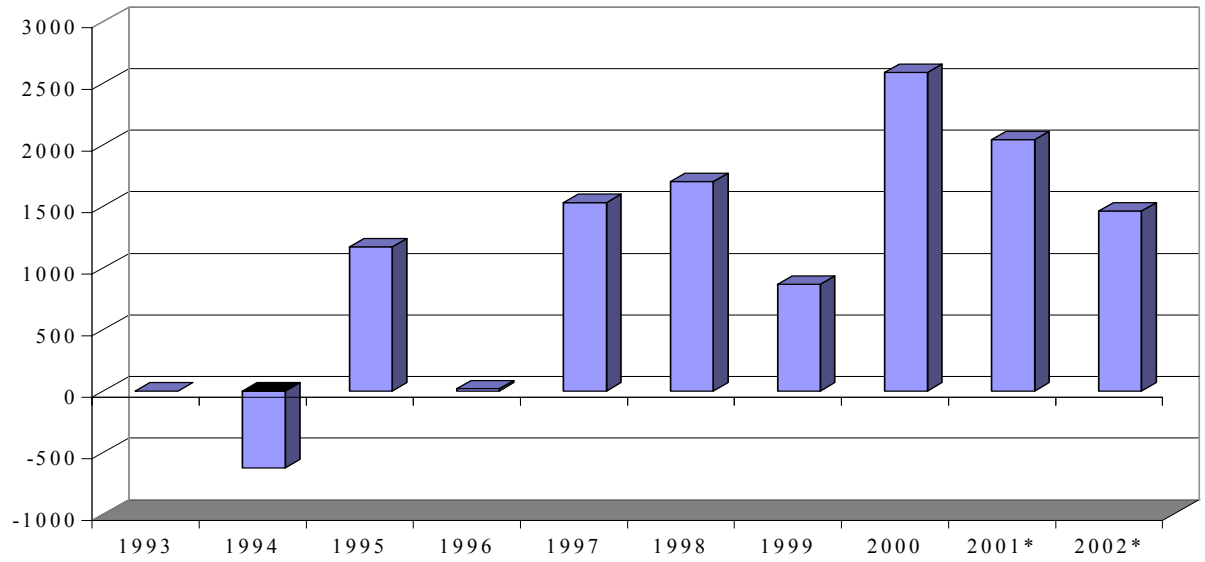
Appendix 1 - Charts

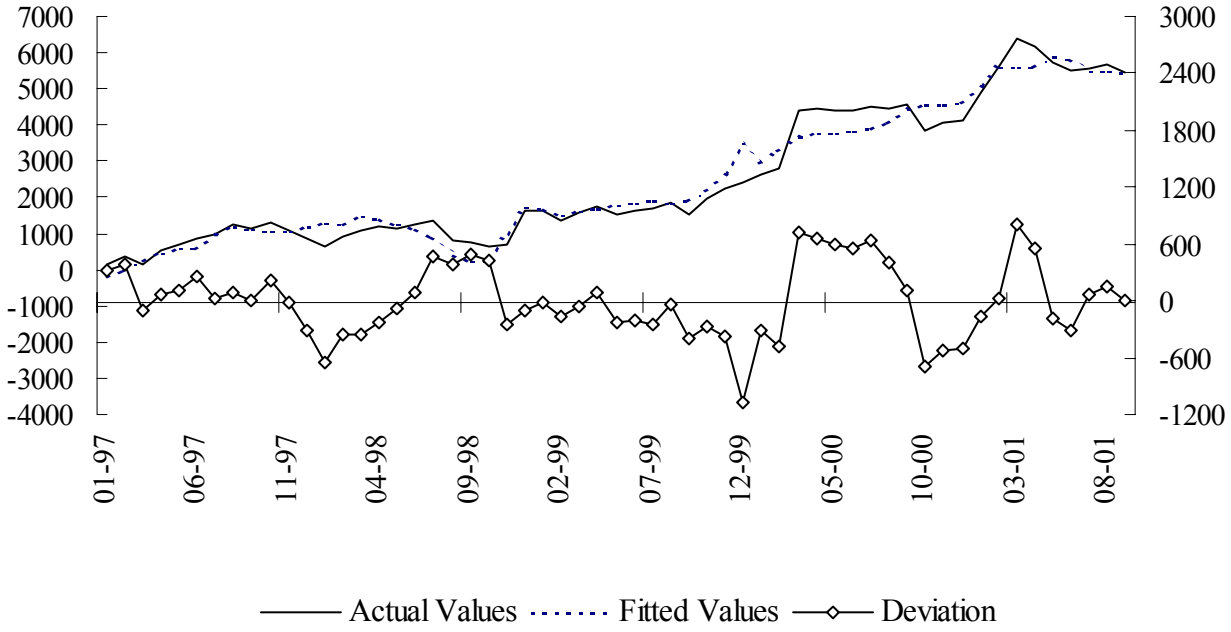
Chart 1
Net portfolio investments in Poland 1993-2002



*- Forecasted value

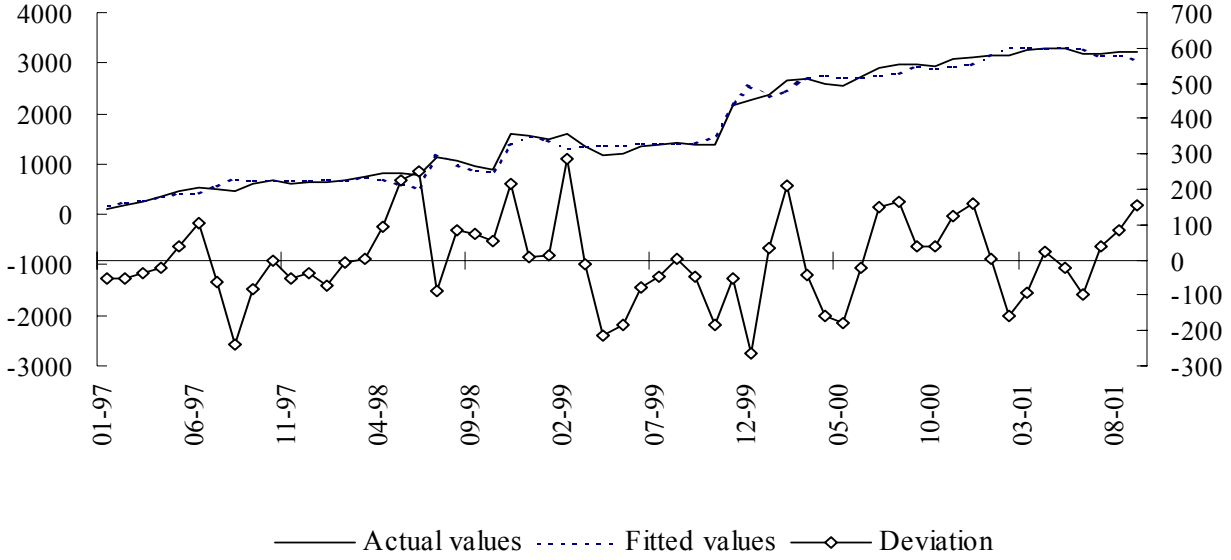
Source: National Bank of Poland

Chart 2.
Long-term relation of net portfolio flows in equity securities.



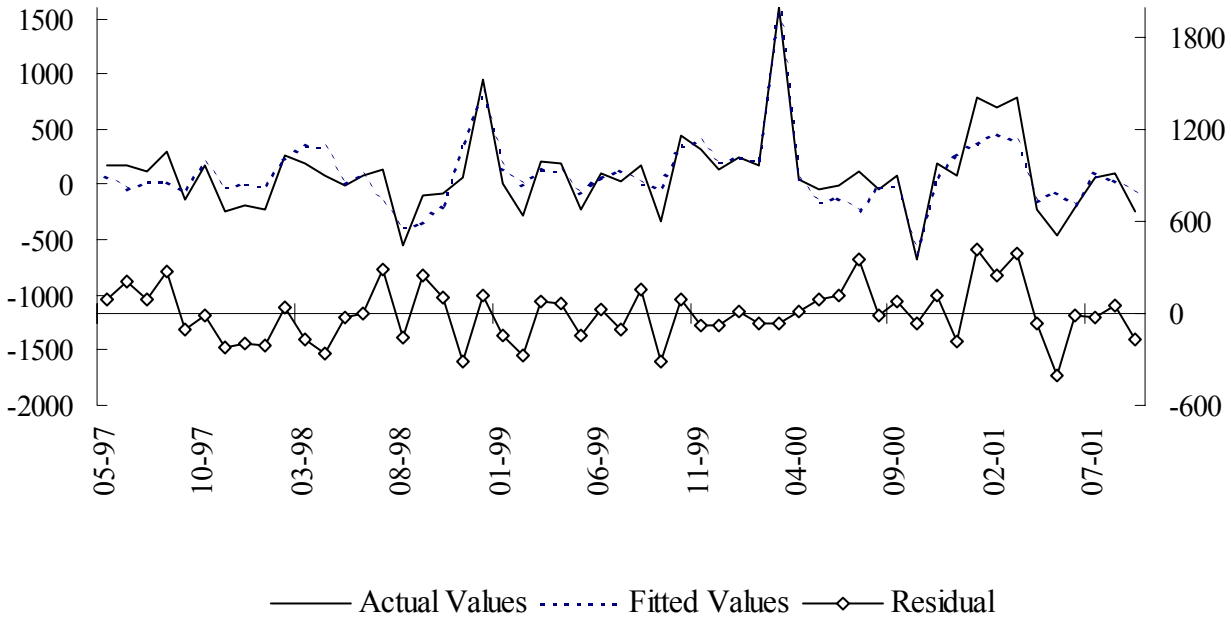
Source: Author's calculations

Chart 3.
Long-term relation of net portfolio flows in equity securities.



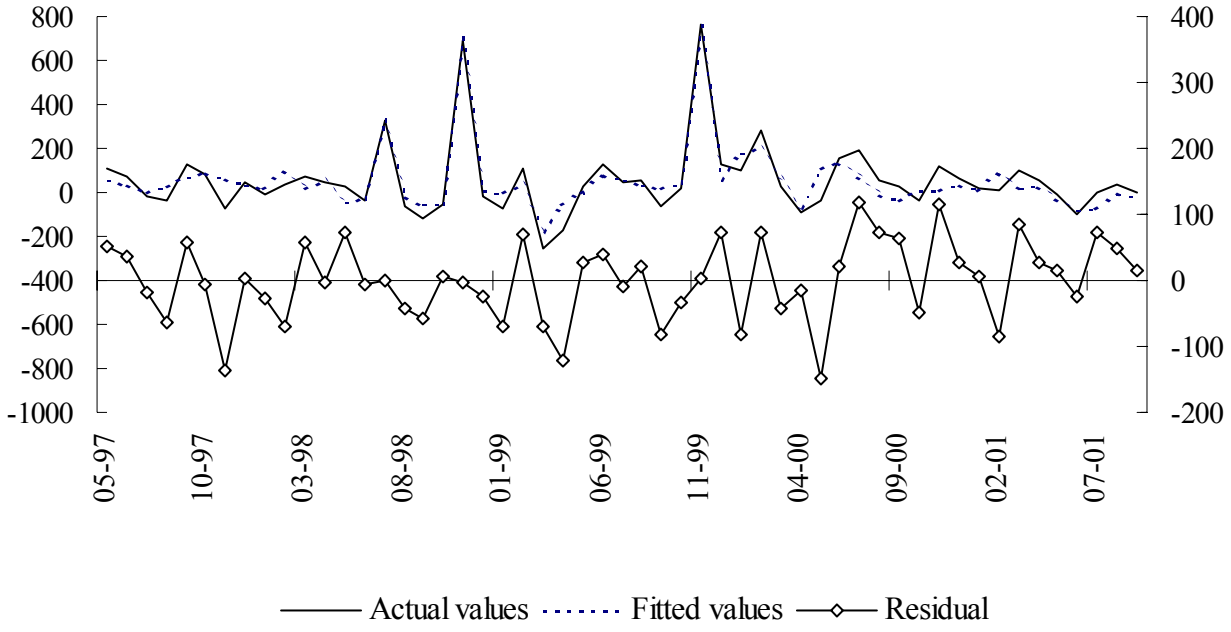
Source: Author's calculations

Chart 3.
Short-term relation of net portfolio flows in debt securities



Source: Author's calculations

Chart 4.
Short-term relation of net portfolio flows in equity securities



Source: Author's calculations