A ten-year retrospective on the determinants of Russian stock returns

by

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Acknowledgements: This work was done when the author was visiting the Bank of Finland Institute for Economies in Transition (BOFIT). I am grateful to the participants of BOFIT seminars, especially Iikka Korhonen and Jouko Rautava, for helpful discussions. I thank BOFIT and its staff for providing an excellent research environment. My thanks also go to the editor and a referee of *RIBAF*. Andrey Shabalin was a great help in processing the data.

Key words: Russia, transition, stock returns, predictability.

JEL codes: C22, G14, G15.

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Abstract

We study factors influencing returns at the Russian stock market from 1995 to 2004, putting emphasis on how these evolved over time. We find that the relationship is highly unstable and this instability is not confined to financial crises alone. Most computed statistics exhibit constant ups and downs, but there has been recently a sharp rise in explainability of stock returns. Domestic factors have been playing a gradually diminishing role, while the importance of international factors has been increasing. In recent years, the effect of oil prices and foreign exchange rates has diminished, the impact of US stock prices and international and domestic interest rates has increased, while the influence of monetary aggregates such as gold reserves and credit balances has fallen to practically zero.

1 Introduction

In the handful papers that consider the Russian financial market at the aggregate level (e.g., Gelos and Sahay, 2001; Jithendranathan and Kravchenko, 2002; Lucey and Voronkova, 2005; Hayo and Kutan, 2005), it is generally presumed that, apart from the period of the Russian financial crisis of 1998 and possibly a few other crises, relationships in the market have been temporally stable. At the same time, it is documented that relationships in developing financial markets, particularly those in post-communist countries, have evolved differently (e.g. Zalewska-Mitura and Hall, 1999; Rockinger and Urga, 2000).

In this paper, we conduct a systematic investigation of how various macroeconomic and financial variables, both global and domestic, have impacted the Russian stock market at the aggregate level and how this impact has changed over time. To accomplish this goal, we run rolling predictive regressions within a window of one year of data, with this window moving in time from early 1995 to late 2004–early 2005. We find tracking the statistics of interest over time in this manner is better suited to the environment of a developing financial market than the popular methodology of identifying structural breaks at unknown dates developed by Bai and Perron (1998), which is often applied to developed markets (e.g. Rapach and Wohar, 2006). On the other hand, the strong assumptions underlying, say, the ARCH models used in Rockinger and Urga (2000) and Hayo and Kutan (2005), do not necessarily hold in a constantly changing environment. Moreover, our modest sample sizes preclude reliable inference of complicated parametric models. To the best of our knowledge, no study has applied such robust tools as ours to analyze developing stock markets.

Our results yield substantial evidence that the Russian stock market has been afflicted by considerable structural instability, and that this instability has not been confined to one-time events such as the documented financial crises. Moreover, the influence of certain factors on Russian stock returns such as oil prices and foreign exchange rates has diminished, while the influence of other factors such as US stock prices and international and domestic interest rates has increased recently. The explanatory power of domestic and global factors has fluctuated appreciably, with the regression R^2 taking values from mere few percent to as much as 60%.

The paper is organized as follows. In section 2, we describe the data used in this study. In section 3, we show how we specially construct a variable to reflect the political riskiness or attractiveness of the Russian stock market. In section 4, we conduct the analysis of factors influencing Russian stock returns, and the evolution of their impact through the years. Finally, section 5 concludes.

2 Data

Ostrovsky (2003), section 3 of Lucey and Voronkova (2005), and section 2 of Anatolyev and Shakin (2006) provide succinct overviews of the Russian stock market. Although regional stock exchanges in Russia existed from as early as 1993, the two largest exchanges, the Russian Trading System (RTS) and Moscow Interbank Currency Exchange (MICEX), were launched in mid-1995 and mid-1997, respectively. In addition to the RTS and MICEX indexes, there are several other indexes of the Russian stock market performance composed by various information agencies (AK&M, RBC, S&P-RUX, etc.). The most comprehensive index presumably is the *Morgan Stanley Capital International Inc.* (MSCI) Emerging Markets (EM) index for Russia (expressed in USD), which is also used in Lucey and Voronkova (2005). This index is available from January 2, 1995, when it had an initial value of 100. The MSCI index dynamics is shown in Figure 1. Fortunately, the MSCI index has no missing data on Wednesdays which we use for weekly observations. We call this variable $msci^{ru}$.

Along with $msci^{ru}$, we employ:

- *oil* – Brent crude oil price (in USD prices);

- er – ruble/USD official exchange rate (in rubles per USD);
- $msci^{us}$ – MSCI index for USA (in USD prices);
- $tbill$ – 3-month US Treasury bills rate (in percent);
- $mibor$ – 1-month Moscow interbank offer rate (in percent);
- $gold$ – gold reserves kept by the Central Bank of Russia (in USD million);
- $money$ – credit balances of correspondent accounts in the Central Bank of Russia (in billions of rubles).

The variables $msci^{ru}$, oil, er, $msci^{us}$, and $tbill$ are available from the beginning of 1995; the variables $mibor$, $gold$, and $money$ from 1999. For the background of these variables and description of monetary and exchange rate policies in Russia see section 2 of Granville and Mallick (2006), section 2 of Vdovichenko and Voronina (2006), and section 5 of Vymyatnina (2006).

In addition, we use the following volatility indexes:

- vol^{oil} – index of oil price volatility;
- vol^{er} – index of ruble/USD exchange rate volatility;
- vol^{us} – index of US stock price volatility.

Each volatility index is computed from daily data corresponding to absolute changes occurring during five days preceding the day by which the index is dated. For example, the value of vol^{oil} in week t corresponding to the Wednesday quote is computed as

$$\left|\ln(oil^{wed}) - \ln(oil^{tue})\right| + \left|\ln(oil^{tue}) - \ln(oil^{mon})\right| + \left|\ln(oil^{mon}) - \ln(oil^{last\ fri})\right|$$
$$+ \left|\ln(oil^{last\ fri}) - \ln(oil^{last\ thu})\right| + \left|\ln(oil^{last\ thu}) - \ln(oil^{last\ wed})\right|,$$

where the superscripts are self-explanatory. Similarly constructed indexes of volatility are used, for example, in LeBaron (1992), albeit with squares instead of absolute values. Such indexes have a clear advantage of being nonparametric and hence robust to misspecification, in contrast to model-based volatility measures such as coming from ARCH-type models.

3 The risk variable

There is a universal perception in the Russian financial market that market prices of traded equities do not reflect their underlying fundamental values. Blue chip stocks rarely pay dividends, and when they do, they constitute a tiny fraction of the market price. Capitalization figures, inherited from Soviet era bookkeeping, also likely underestimate the fundamental value of companies. Hence, price fluctuations may reflect more the dynamics of overall economic and political factors than changes in fundamental values. It is widely accepted that the "Yukos case" pushed down prices of Russian stocks in the second half of 2003 in comparison with what would have presumably happened without this case (see Goriaev and Sonin, 2005). As the risk factor is hard to quantify, especially at the going weekly level, we use as a proxy the filtered *JPMorgan* Emerging Market Bond Index Plus for Russia, or $embi^{rus}$ for short, which tracks all of Russia's traded external debt instruments (including Brady bonds, loans, Eurobonds, and local market instruments). In its raw form, however, this variable not only reflects political risks but also contains fundamental movements in the domestic bond and stock markets. Therefore, we first need to filter out the latter factors.

The Johansen cointegration test (both maximum eigenvalue and trace) for the variables $\ln(embi^{ru})$, $\ln(msci^{ru})$, $\ln(msci^{us})$, $\ln(oil)$, and $tbill$, indicate one cointegrating relationship at the 5% significance level. We regress the log of $embi$ on a constant and contemporaneous values of log of $msci^{ru}$, log of $msci^{us}$, log of oil, and $tbill$:

$$\ln(\widehat{embi}^{ru}) = \underset{(0.52)}{3.69} + \underset{(0.045)}{0.800}\ln(msci^{ru}) - \underset{(0.090)}{0.540}\ln(msci^{us}) + \underset{(0.101)}{0.334}\ln(oil) - \underset{(0.0117)}{0.0808}\,tbill$$

(robust standard errors in parentheses), and take minus of the residuals. We call this variable *risk* and use it as a proxy for the level of political and economic risk. In addition, this variable may also reflect unattractiveness of the Russian stock market for investors because of temporary attractiveness of alternative international stock markets. The dynamics of the variable *risk* is presented on Figure 2. Even though this variable is quite persistent and does not seem strictly stationary, it apparently no longer contains stochastic trends.

By construction, the sample average of *risk* is zero, so that the periods of positive and negative values of *risk* can be treated as periods of higher and lower levels of risk than the average level, or lower and higher levels of attractiveness of this market. The period of highest risk preceded the August 1998 Russian financial crisis. Of a relatively high risk are two episodes around the beginnings of years 1996 and 1997, which may be associated with political uncertainty related to presidential elections in June 1996, as well as the 2001, somewhat the end of 2002 and the beginning of 2003, which may be explained by uncertainty of president Putin's intentions at the beginning of his presidency. In contrast, there is relatively high attractiveness in 1995 when the Russian stock market was just starting out, during the Asian financial crisis in the second half of 1997, during a relatively long period after the Russian financial crisis, and in 2004 after the market had been rocked by the Yukos case.

4 Results

We analyze the factors (global and domestic, macroeconomic and financial) driving Russian stock returns, and how the importance of these factors has changed over the years, by applying a simple regression analysis within a moving window. As a left side variable, we employ the growth rate of $msci^{ru}$. As right side variables, we utilize the indicators listed in section 2, most in a growth form, along with the risk variable constructed in section 3.

More concretely, we run rolling predictive regressions with a window of 52 observations corresponding to one year, for two data spans. The first period covers ten years from January 1995 to January 2005. The second period covers a bit more than five years from October 1999 to January 2005. More local-factor data is available for the latter period. For this shorter period, we also supplement the set of regressors by volatility variables. We use conventional (non-robust) standard errors, despite slight serial correlation in the residuals (as evidenced by small departures of the Durbin–Watson statistics from 2) because it is documented that their simplicity may actually hold an advantage over robust standard errors in small samples (Mishkin, 1990). Of course, we do not take the standard errors at face value as the actual level of testing for significance of coefficients under sequential testing differs from that under one-shot testing. Still, the standard error bands are informative; for example, they may be used as indicators of estimation uncertainty.

For the longer time interval, the dependent variable is $\Delta \ln(msci^{ru})$, the independent variables, apart from a constant, are local instruments $\Delta \ln(er_{-1})$ and $risk_{-1}$, and global factors $\Delta \ln(oil)$, $\Delta \ln(msci^{us})$, and $\Delta tbill$. The exchange rate and risk are lagged (one week) to avoid the simultaneity effect, while global factors are taken with a lag of one day, since the US markets operate when Russia's domestic markets are already closed. Otherwise, global factors are presumed exogenous. The evolution of regression coefficients together with 5% (pointwise) confidence bands are presented in Figure 3, and the evolution of the regression R^2 is depicted in Figure 4.

The top left panel in Figure 3 shows the evolution of influence of growth in oil prices. This influence was found significantly positive in Hayo and Kutan (2005). The explanation is simple: increases in oil prices raise revenues and hence investment, both into the capitalization of oil companies and the stock market. Most of the time this effect is found to be positive. The exceptions are the "puberty" period of 1995 and the period preceding 1998 crisis, when the market operated in a speculative mood. When positive, the elasticity is rather small despite the large share of oil extracting companies – possibly because oil export earnings were moved to affiliated companies for the purpose of tax minimization in a greater degree than they were invested. Interestingly, the confidence band tends to shrink as time passes. making it easier to pin down this influence. The top right panel in Figure 3 shows the evolution of influence of exchange rate depreciation. There is a distinct period of relatively large negative influence before the window takes on observations after the Central Bank of Russia (CBR) has announced it will pursue gradual devaluation of the ruble. Once the window includes the crisis observations, the influence of exchange rate depreciation goes completely flat (with a slight non-zero influence after 1999).

An interesting pattern unfolds in the two middle panels that present the evolution of influence of indicators from two US financial markets – stock and credit. The positive and significant influence of the US stock market is apparent and confirms previous findings on the integration of Russian and US stock markets (e.g., Jithendranathan and Kravchenko, 2002; Hayo and Kutan, 2005). The degree of integration, however, is not constant. There is a remarkable downward trend extending from 2000 to 2003. This trend only recently changed to a strong positive trend, taking the degree of integration to its typical level of 1996–2000. At the same time, dependence on US interest rates is less pronounced, varying from negative to positive and back throughout the entire period. Recently, however, it has taken on large and significant negative values.

Finally, the evolution of influence of risk/attractiveness factors is depicted in the bottom panel. This influence turns out to be strong, negative, and very volatile throughout, except for the pre-crisis and crisis periods when is was non-trivially positive, presumably because of a highly speculative mood in the market during turbulent times.

In Figure 4, the evolution of the regression R^2 is depicted. The explanatory power of the regression varies considerably, from a few percent in 1996 and 2003 to nearly 50% in 1997, 2000–2001, and 2004. The initial noisy behavior of the Russian stock market in 1996 can be explained by uncertainty over the outcome of the presidential elections. The fall in explanation power during the 2000 presidential elections was much smaller as the outcome of these was much more predictable. The most stable periods of the Russian economy (1997, 2001–2002, and 2004), are marked with a very high predictability of returns. Market preformance in 2004 also reflects increased dependence on world financial markets.

The high variability of the estimated coefficients clearly suggests instability. An important conclusion from this is that regressions on long time intervals may lead to spurious findings of causality for some factors, and conversely, to seeming insignificance of factors that were sources of significant influence during some periods. This may be a reason, in addition to the omitted variables bias, that e.g. Hayo and Kutan (2005) did not find their news variables significant. To illustrate, we run a one-shot regression using the data from the whole sample. This regression yields the following results:

$$\begin{aligned}\Delta \ln(\widehat{msci^{ru}}) \quad = \quad & \underset{(0.0035)}{0.0016} + \underset{(0.0632)}{0.0773}\Delta \ln(oil) - \underset{(0.065)}{0.108}\Delta \ln(er_{-1}) - \underset{(0.0170)}{0.0139}\, risk_{-1} \\ & + \underset{(0.140)}{0.896}\Delta \ln(msci^{us}) - \underset{(0.0384)}{0.0230}\, \Delta tbill,\end{aligned}$$

with $R^2 = 8\%$. The overall regression R^2 conceals much higher predictability during certain periods. As far as the coefficient significance is concerned, only $\ln(msci^{us})$ turns out to be significant at the 5% level. The robustness analysis in Hayo and Kutan (2005), surprisingly, does not though lead to conclusions about structural instability.

For the shorter time interval, we add several instruments. The additional local instruments are vol^{er}_{-1}, $\Delta mibor_{-1}$, $\Delta \ln(gold_{-1})$ and $\Delta \ln(money_{-1})$, and the additional global factors are vol^{oil} and vol^{us}. The evolution of regression coefficients together with 5% (pointwise) confidence bands are presented in Figure 5, and the evolution of the regression R^2 is depicted in Figure 6.

The upper two panels of Figure 5 suggest the role of energy prices in forming stock prices decreased. During the last couple years, the influence of oil prices switched from positive to negative. If one takes this negative impact at face value, it may be explained by the growing perception that excessive dependence on oil exports and high oil prices reduces the future prospects of the real sector, and thereby pushes stock prices down. The decreasing influence of the volatility of oil prices confirms the diminishing impact of the energy market. Hayo and Kutan (2005) also found insignificance of coefficients on various model-based indicators of oil price volatility in a one-shot regression.

The next pair of panels shows the evolution of the influences of exchange rate depreciation and exchange rate volatility. The sign of the impact of exchange rate changes varies from negative to positive, as does the sign of the impact of the exchange rate volatility. There is, however, a tendency toward insignificance of both factors, especially recently, as well as toward less uncertainty in pinning down the estimates.

The third pair of panels pictures the evolution of the impact of the US stock market. The left panel shows that, after years of decline, this impact reached zero around 2003 and then began to increase. Recently, it climbed to near its historical maximum, with the elasticity exceeding unity. US stock return volatility positively influences Russian stock prices most of the time, and this influence has also increased during recent years. The big positive impact of US stock returns and their volatility indicates that foreign investors are more willing to invest in the Russian stock market, especially when alternative markets are more volatile.

The fourth pair of panels tracks the influence of US and Russian short-term interest rates. It is clear that the influence of neither encompasses the influence of the other: sometimes only one has an effect, sometimes both, sometimes neither. The influence is largely negative and consistent with evidence in developed stock markets (e.g., Rapach and Wohar, 2006), except for few episodes where they were positive. Recent years have witnessed a sharp rise in the degree of influence of both international and domestic credit markets.

The fifth pair of panels shows how the money market in Russia influences the stock market, specifically the CBR's gold reserves and credit balances, i.e. money that domestic banks keep at correspondent accounts with the CBR that could otherwise be invested in the stock market. Both variables exerted both positive and negative influences on the stock market until mid-2002. Thereafter, the influence of both variables has been essentially zero.

Finally, the influence of risk factors depicted in the bottom panel is negative (although quite variable) throughout the last five years. The evolution of the regression R^2 shown on Figure 6 is also quite variable, and recently reached nearly 60%.

From the above analysis, one can infer slow progress toward the integration of the Russian and international stock markets: domestic factors playing a gradually diminishing role, while the importance of international factors has been increasing.

5 Conclusion

The results reported in this paper provide overwhelming evidence of structural instability in the Russian stock market and that the instability was not confined to financial crises. In recent years, the influence of oil prices and foreign exchange rates on Russian stock returns has diminished, while the influence of US stock prices and US and Russian interest rates has increased. The influence of monetary aggregates such as gold reserves and credit balances, once non-trivial, has recently fallen to practically zero. In total, the explanatory power of available domestic and global factors has fluctuated appreciably, with the value of regression R^2 swinging from just a few percent in 2003 to as much as 60% in 2004.

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Figure 1.

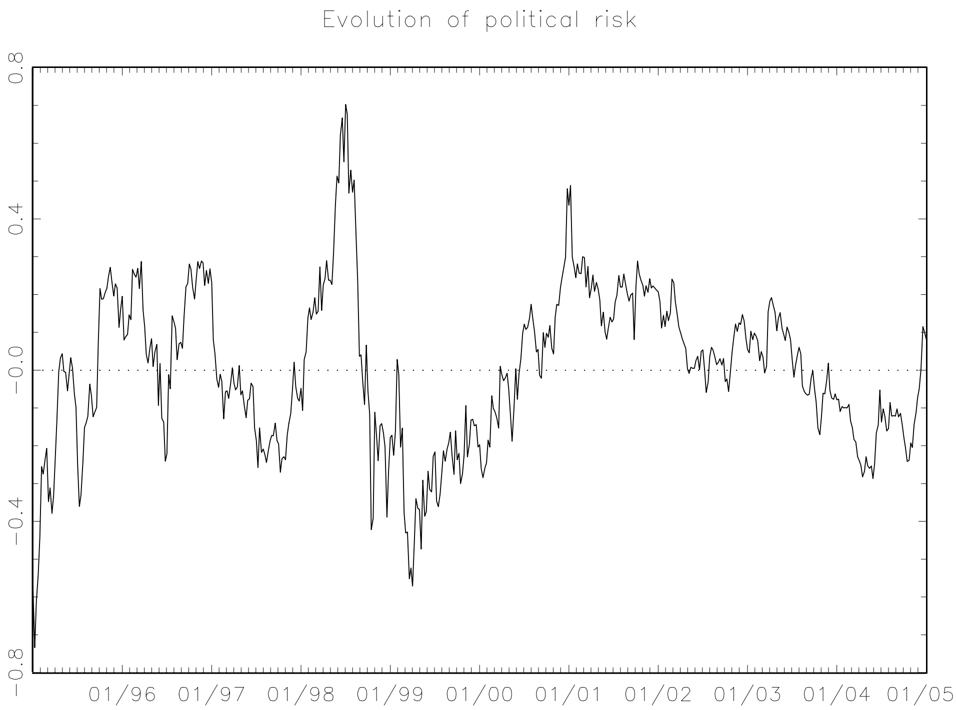

Figure 2.

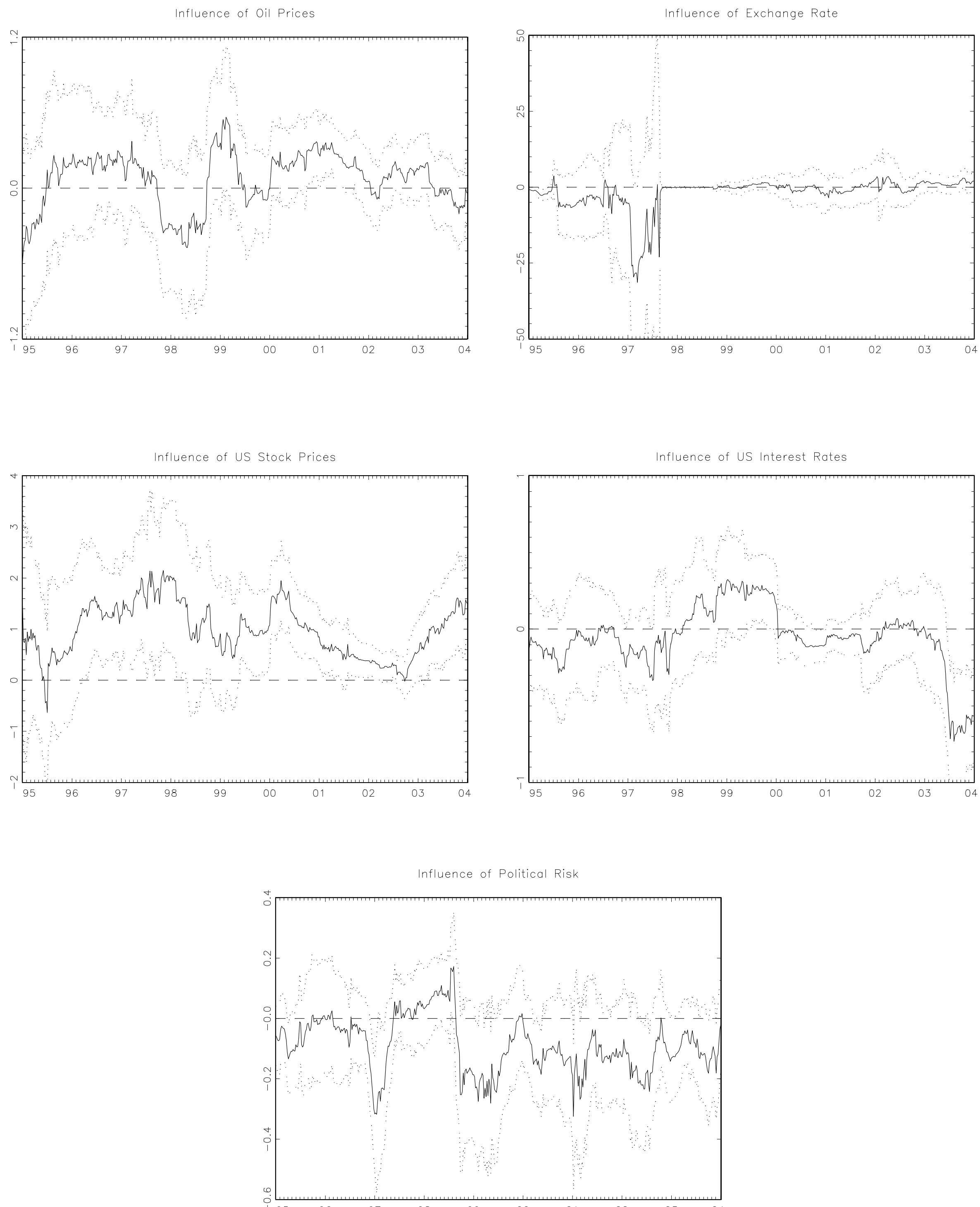
Influence of Oil Prices
1.2
0.0
−1.2
95
96
97
98
99
00
01
02
03
04
Influence of Exchange Rate
50
25
0
−25
−50
Influence of US Stock Prices
4
3
2
1
0
−1
−2
Influence of US Interest Rates
1
0
−1
Influence of Political Risk
0.4
0.2
−0.0
−0.2
−0.4
−0.6

Figure 3.


Evolution of regression R2
0
10
20
30
40
50
60
95
96
97
98
99
00
01
02
03
04

Figure 4.


Influence of Oil Prices
Influence of Volatility of Oil Prices
Influence of Exchange Rate
Influence of Volatility of Exchange Rate
Influence of US Stock Prices
Influence of Volatility of US Stock Prices

Figure 5.

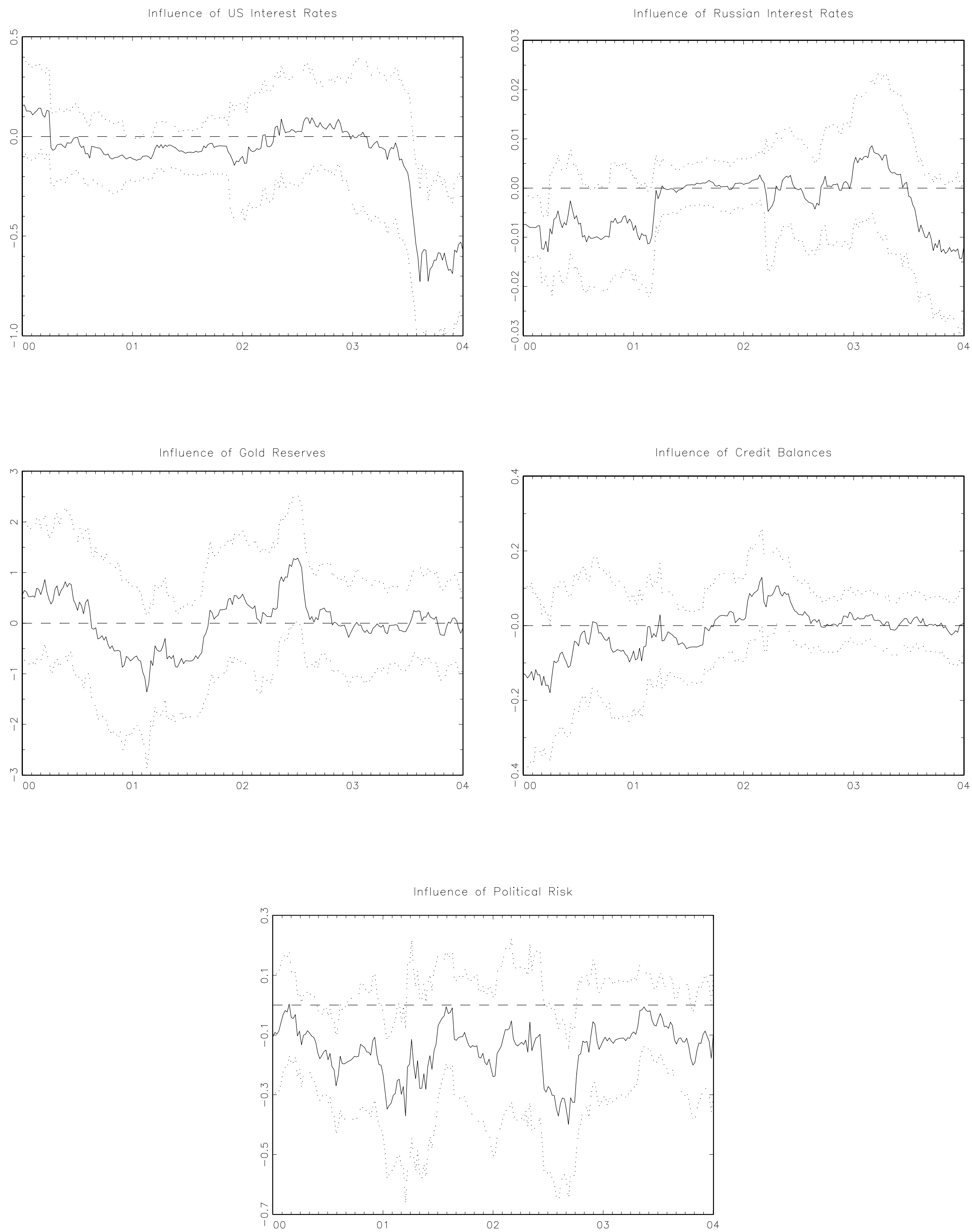

Figure 5 (continued).

Figure 6.