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What Causes Correlations of Equity Returns to Change Over Time? – A Study of the U.S. and the Russian Equity Markets

Thadavillil Jithendranathan

Abstract

This paper addresses the changing nature of the correlations between the equity returns of the U.S. and Russian markets and the factors that cause these correlations to change. Correlations were estimated using the "Dynamic Conditional Correlation Model". The sovereign credit risk of Russia, changes in exchange rates and changes in world energy prices were significant factors that affected the correlations of equity returns.

Key words: International Finance, International Financial Markets.
JEL: F37, G15

1. Introduction

Investing in foreign equities can increase the portfolio diversification benefits of the domestic investor. According to the classic portfolio theory such diversification benefits depend on the correlation between the domestic and foreign securities. In this respect understanding the correlation dynamics of the equity returns is important to the portfolio managers. Several studies over the past twenty years have looked into the nature of the return correlations and found that they vary over time. For example, Erb, Harvey and Viskanta (1994) and Longin and Solnik (1995) looked into equity correlations and found that these tend to vary over the phases of the business cycle.

There are two key issues that should be addressed in the study of time-varying correlations. The first is the measurement of the dynamics of the correlation itself and the next is finding the factors that cause these variations in correlations between equity returns over time. In this paper I use a computationally efficient method of estimating the correlations and then identify some of the factors that cause, in a statistically significant way, the correlations to change over time.

Let us first look at the different techniques used in measuring time varying correlations. The most popular method is to use a moving average specification in which the correlations are estimated using a moving window of time. The drawback of this method is that it gives equal weight to all the observations during that time period used in the moving average calculations. The other method of estimating the time varying correlations is to use multivariate GARCH models. Initial models of this genre were based on the Constant Correlation Coefficient model of Bollerslev (1990). But the assumption that the correlation coefficient was constant remained the main weakness of these models. The second set of GARCH models is based on the multivariate GARCH models introduced by Kroner and Ng (1998). Even though these multivariate GARCH models are appealing from a theoretical standpoint, computationally they suffered from the problem of estimating too many coefficients at the same time. Engle (2002) introduced a new class of multivariate GARCH models called "Dynamic Conditional Correlation Models", which combined flexibility of the univariate models with the theoretical appeal of time-varying correlations. In this paper I will use this technique to estimate the time-varying correlations.

The next issue is to explore the factors that cause the correlation to vary over time. There are several studies that look into this issue and the conclusions from these studies can be divided into the following two categories -– leverage effect models and volatility feedback models. In the leverage effect model the assumption is that a drop in the value of an asset causes the debt equity ratio to change, the increased leverage causes the increase in financial risk premium and this in turn increases the return volatility. A one sided increase in volatility of an asset then cause its covariance with other assets to change, which explains the changes in correlation of that asset with other assets (see, for instance, Black (1976), Christie (1982) and Schwert (1989)). Another explanation for changes in the volatility is the feedback model. In this model the anticipated changes in volatility of an asset cause the change in the returns of the stock.

Empirical studies using the above two models have produced mixed results. For example, French, Schwert, and Stambaugh (1987) and Campbell and Hentschel (1992) found that the relation between volatility and expected return to be positive, while Turner, Startz, and Nelson (1991), Nelson (1991) and Glosten, Jagannathan, and Runkle (1993) found the same relationship to be negative.

The current literature on the time-varying correlations in equity markets does not address the economic factors that cause the changes in correlations. From a practitioners perspective it would be helpful if the economic factors that cause changes in the correlation between equity markets across different countries can be identified. Unfortunately these factors can vary from country to country and a single model that captures these factors may not be practical. Therefore, in this paper an empirical model that estimates the time-varying correlations between the Russian and the U. S. equity markets and identifies the variables that cause these correlations to change both at the aggregate market level as well as at the individual firm level is developed.

There are several reasons why the Russian and the U. S. equity markets were chosen for this study. Since the breakup of Soviet Union, a market economy has been evolving in the Russian Federation. One of the key components of this emerging market economy is the Russian equity market. The groundwork for an equity market in Russia was laid when the Russian government started privatizing the state owned enterprises in the early 1990's. The privatization in Russia was carried out in two phases. During the first phase that took place between 1992 and 1994, about 14,000 medium and large enterprises were privatized (Vaatanen, 2000). The ownerships of these firms were transferred to employees and general public in the form of vouchers. Soon after the vouchers were issued, entrepreneurs started purchasing these vouchers that gave them controlling interests in these privatized firms. During the second phase of privatization, which was completed by 1996, most of the remaining state owned firms were privatized by direct sale to investors using a bidding process.

By mid nineties some of these privatized firms organized themselves as joint stock companies and issued equities to the public. Russian Trading System (RTS) was established in 1995 to act as a secondary market for the Russian equities. RTS is modeled after the NASDAQ market in United States and the trading is done electronically. Currently there are twelve stock exchanges in Russia and the dominant ones are Moscow Interbank Currency Exchange (MICEX) and RTS. The Federal Commission on the Securities Market (FCSM) and Central Bank of Russia regulate these equity markets.

The sizable presence of foreign investors in the Russian equity market is the reason to choose to study the dynamics of the correlation between the Russian and the U.S. equity markets. Russia in the mid nineties was considered as one of the most attractive emerging markets by foreign investors. In the mid-nineteen nineties, U.S. based financial institutions started country funds that invested in Russian equity markets. Apart from the direct investment by foreign investors, many of the Russian stocks are also listed as American Depositary Receipts and are actively traded in the U.S. and European stock exchanges. There is some evidence that the foreign investors have reduced their presence since the Russian Financial Crisis of 1998. But overall Russian equity markets still have sizable foreign participation.

A possible reason for the correlations between two equity markets to change is the integration of the markets itself. Integration of equity markets is a gradual process that begins when foreign investors are allowed to invest in a country's domestic market and the domestic investors are allowed to invest in foreign equities. The other necessary condition for full integration of equity markets is the elimination of barriers to cross boarder investments. The following are some of the barriers to integrated equity markets.

i. Restrictions on convertibility of the country's currency.
ii. Restrictions on foreign ownership of domestic equity.

iii. Restrictions on domestic investors investing in foreign equity.
iv. Taxation and other legal barriers.

There are several studies that look into the effect of foreign ownership restrictions and the segmentation of equity markets. Stulz and Wesserfallen (1995) show that demand function of domestic shares differs between domestic and foreign investors and, as a result, foreign investors may pay a higher price for the shares than the domestic investors. Higher prices the foreign investors are willing to pay should lower the returns on these domestic securities, which also have foreign holdings. In the case of Russia, even from the earlier days of evolution of equity markets, foreign investors were a dominant presence. For this reason it can be assumed that the Russian equity markets should be more integrated with the world markets, compared to other emerging markets at the same level of development.

Market integration itself is not static and can vary over time. Bekaert and Harvey (1995) used a conditional regime-switching model to study the level of integration between equity markets of several countries and found that the level of integration changes over time. Adler and Qi (2002) studied the integration of the Mexican and the North American capital markets. Their results show that the integration is affected by both global and domestic factors. One of the interesting conclusions of this paper is that the changes in Mexican currency risk and the default risk of the Mexican peso denominated bonds had significant effect on the integration of the Mexican capital markets with the rest of the North American capital markets.

In this paper a simple regression model has been used to identify the factors that cause the correlation between the Russian and U. S. equity markets to change over time. There are three factors that are significant in explaining the changes in the correlation between the U.S. and Russian equity returns. They are (1) Country Risk as measured by the spread between the Russian Government Bonds and the U.S. Long-term Treasury Bonds, (2) The change in Russian ruble exchange rate with U.S. dollar, and (3) The change in world energy prices. An explanation of the reasons to why these variables have a significant impact on the correlations of equity returns is discussed later in this paper.

The time period of this study covers 426 weeks between September 1995 and October 2003. During this eight-year period the Russian economy had been through considerable upheaval, with the financial crisis of 1998 being the most significant. Investor confidence in the Russian equity market has also taken several twists and turns during this period. The results of this study capture some of these using the changes in correlations between the two markets.

The rest of the paper is organized as follows. Section 2 describes the empirical methodology, section 3 contains the details of the source of data, section 4 includes the analysis of the results and the conclusions are in section 5

2. Empirical Model

In this paper I estimate the time-varying correlation using the Dynamic Conditional Correlation (DCC) model of Engle (2002). The conditional correlation between two random variable r_1 and r_2 that have mean zero can be written as:

$$\rho_{12,t} = \frac{E_{t-1}(r_{1,t} r_{2,t})}{\sqrt{E_{t-1}(r_{1,t}^2) E_{t-1}(r_{2,t}^2)}} . \qquad (1)$$

Let $h_{i,t} = E_{t-1}(r_{i,t}^2)$ *and* $r_{i,t} = \sqrt{h_{i,t}\varepsilon_{i,t}}$ *for* $i = 1,2$, where $\varepsilon_{i,t}$ is a standardized disturbance that has zero mean and variance of one.

Substituting the above into equation (1) we can get:

$$\rho_{12,t} = \frac{E_{t-1}(\varepsilon_{1,t}\varepsilon_{2,t})}{\sqrt{E_{t-1}(\varepsilon_{1,t}^2) E_{t-1}(\varepsilon_{2,t}^2)}} = E_{t-1}(\varepsilon_{1,t}\varepsilon_{2,t}) . \qquad (2)$$

Using a GARCH(1,1) specification, the covariance between the random variables can be written as:

$$q_{12,t} = \overline{\rho}_{12} + \alpha\left(\varepsilon_{1,t-1}\varepsilon_{2,t-1} - \overline{\rho}_{12}\right) + \beta\left(q_{12,t-1} - \overline{\rho}_{12}\right). \quad (3)$$

The unconditional expectation of the cross product is $\overline{\rho}_{12}$, while for the variances

$\overline{\rho}_{12} = 1$

The correlation estimator is:

$$\rho_{12,t} \frac{q_{12,t}}{\sqrt{q_{11,t}q_{22,t}}}. \quad (4)$$

This model will be mean reverting if $\alpha + \beta < 1$. The matrix version of this model can then be written as:

$$Q_t = S(1-\alpha-\beta) + \alpha(\varepsilon_{t-1}\varepsilon_{t-1}^{'}) + \beta Q_{t-1}, \quad (5)$$

where S is the unconditional correlation matrix of the disturbance terms and $Q_t = \left|q_{1,2,t}\right|$.

The log likelihood for this estimator can be written as:

$$L = -\frac{1}{2}\sum_{t=1}^{T}\left(n\log(2\pi) + 2\log\left|D_t\right| + \log\left|R_t\right| + \varepsilon_t^{'}R_t^{-1}\varepsilon_t\right), \quad (6)$$

where $D_t = diag\left\{\sqrt{h_{i,t}}\right\}$ and R_t is the time varying correlation matrix.

Most of the previous studies of correlation dynamics failed to provide the economic reasons for the changes in the correlations over time. In the following sections an empirical model to explain the correlation dynamics between the Russian and the U.S. equity markets has been developed. Bekaert and Wu (2000) give an empirical framework for analyzing the asymmetric volatility in the equity markets and this has been extended to the model to explain the correlation dynamics between two different equity markets.

According to Bekaert and Wu, a negative shock at the market level produces two effects: (1) Investors may revise their conditional variance expectations upwards, since this increase in conditional volatility at the market level will be compensated by increase in returns, the current value of the market will decline, and (2) The market-wide price decline will result in an increase in leverage at the market level and hence higher stock volatility. The second effect will go on to reinforce the volatility feedback.

The correlation between the expected returns of two markets can change if an external shock causes a change in the conditional variance of one or both markets. If the effect of the external shock is identical on the conditional variances of both markets, the external shock will not have any effect on the correlation between the expected returns of those two markets. On the other hand if the effect of external shock is asymmetrical on the conditional variances, it will cause a change in the correlations. The next step is to identify some of the variables that can cause such shocks to the conditional variances of these markets.

If the expected risk of a security changes, it will affect the expected return of the security as well as its correlation with other security returns. In the case of an emerging market like Russia, a change in the overall risk of the country by itself can change the risk of individual equities from that country. To capture this changing country risk we use the spread between the yields of the Russian Government Bonds and the U.S. long-term bonds as one of the variables that can cause the changes in the expected risk of the Russian stocks and consequently its correlation with the U.S. equities.

Similarly the change in exchange rate between the Russian ruble and the U.S. dollar can change the expected returns of the Russian equities and this change in exchange rate is used as the second variable in the empirical model. The last variable used to explain the change in the correlation is the change in world energy prices. Russian economy is heavily dependent on its energy resources and a change in world energy prices will have an effect on the energy related firms as well as the overall economy.

I use the following regression model to estimate the economic factors that causes the correlations to vary over time:

$$\rho_{i,t} = \alpha_i + \beta_1 Spread_t + \beta_2 FXrate_t + \beta_3 Energy_t + \varepsilon_t, \quad (7)$$

where *Spread* is the interest rate spread between the Russian State Bonds and the U.S. long-term bond yields, *FXrate* is the rate of change in the Russian ruble exchange rate with the U.S. dollar and the *Energy* is the rate of change in World energy index. This model is tested at the aggregate market level and also at the firm level.

3. Data

In this paper the weekly returns of the RTS index and the S&P 500 index for the time period from September 8, 1995 to October 31, 2003 have been used. RTS quotes prices in US dollars and all the returns are calculated in the US dollar terms. RTS index is a value-weighted index, which currently has 59 equities in it. For the U.S. equity market returns the weekly dollar returns of the S&P 500 index are used as the proxy. The study was further extended by looking at the changes in correlation between thirteen most widely traded stocks in the RTS index and the S&P 500 index. All the prices are obtained from Datastrem.

In order to calculate the country risk premium I use the spread between the Russian Government dollar denominated bonds and the U.S. long-term Treasury bond yields. For the Russian bond yields, I used the weekly yields of the U.S. dollar denominated hard currency bonds issued by the Russian Ministry of Finance. These bonds were issued in 1993 with 3% coupon and maturing in May 2008. For the U.S. bond yield, I used the U.S. long bond yields supplied by Datastream.

Since Russian economy is dominated by energy related industries, I used the changes in the world energy prices as a variable that can cause the correlation to change. For this purpose we used the FTSE world energy index as supplied by Datastream.

4. Results

In this paper the correlation dynamics of the weekly returns of RTS index and thirteen of the stocks listed in the RTS index with that of the S&P 500 Index are calculated using the Dynamic Conditional Correlation Model. The time period of this study covers 426 weeks from September 1995 to October 2003. The list of stocks in this study and their market capitalization are given in Table 1. One of the main characteristics of the Russian market is the low daily volume of trade. Many of the listed stocks will go on for days without trading. The thirteen stocks in this study were selected based on the availability of trading data on a continuous basis. These thirteen stocks together accounted for 56.38% of the total market capitalization of the RTS market and just two firms – Lukoil and Yukos – together account for 1/3 of the total market capitalization.

Table 1

Market Capitalization of Individual Stocks as of October 31, 2003

Symbol	Name	Industry	Market Cap. (in US$)	Market Cap. As % of RTS market
AFLT	Aeroflot	Airline	556,418,766	0.40
EESR	Unified Energy System	Electric Utilities	10,427,888,852	7.46
IRGZ	Irkutskenergo	Electric Utilities	488,597,789	0.35
KUBE	Kubanenergo	Electric Utilities	266,446,167	0.19
LKOH	Lukoil	Energy	17,042,455,255	12.19
LSNG	Lenenergo	Electric Utilities	429,362,622	0.31

Table 1 (continuous)

Symbol	Name	Industry	Market Cap. (in US$)	Market Cap. As % of RTS market
NNSI	Volgatelecom	Communications	546,052,490	0.39
RITK	Russian Innovation Fuel and Energy	Energy	169,575,000	0.12
RTKM	Rostelecom	Communications	1,308,009,894	0.94
SBER	Sberbank RF	Banking	4,759,500,000	3.40
SIBN	Sibneft	Energy	9,861,903,249	7.06
SPTLP	St. Petersburg Telephone	Communications	279,648,544	0.20
TATN	Tatneft	Energy	2,287,625,235	1.64
YUKO	Yukos	Energy	30,380,499,956	21.73
Total			78,803,983,819	56.38%
RTS Market Capitalization		US$139,783,027,885		

The summary statistics of the indices, stocks and independent variables in the regression model are given in Table 2. The average weekly return of the RTS index during the 426 week period was 0.68% as compared to the weekly return of 0.18% for the S&P 500 index. On the other hand the RTS index returns showed a higher standard deviation of 7.71% as compared to the 4.27% standard deviation of the S&P 500 index. All the thirteen stocks studied also had an average positive weekly return for the period. Russian Innovation Fuel and Energy had the highest mean weekly return 3.91%, while Yukos and Kubanenergo had mean returns over 2%. These three firms also had the highest standard deviation among the stocks studied. Two of the telecommunication firms in the study –Volgatelecom and St. Petersburg Telephone – had the lowest weekly returns (0.56%) and at 8.39%, Lukoil had the lowest standard deviation of weekly returns among the thirteen stocks.

Table 2

Summary Statistics of the Returns and Interest Rate Spread

Stock	Mean	Std. Dev.	Minimum	Maximum	Starting Date (# of obs.)
RTS - Index	0.0068	0.0771	-0.3148	0.3425	09/08/1995 (426)
S&P 500	0.0018	0.0427	-0.1160	0.0778	09/08/1995 (426)
FXRtate	0.0051	0.0398	-0.1429	0.7123	09/08/1995 (426)
FTSE Energy Index	0.0023	0.0427	-0.1671	0.1080	09/08/1995 (426)
Interest rate spread	0.1293	0.1235	0.0015	0.5873	09/08/1995 (426)
AFLT	0.0079	0.1285	-0.5556	0.8000	10/10/1997 (317)
EESR	0.0123	0.1209	-0.4444	0.5833	09/08/1995 (426)
IRGZ	0.0106	0.1544	-0.5000	2.0000	09/08/1995 (426)
KUBE	0.0230	0.2997	-0.7273	4.5000	03/14/1997 (347)
LKOH	0.0065	0.0839	-0.3109	0.4189	09/08/1995 (426)

Table 2 (continuous)

Stock	Mean	Std. Dev.	Minimum	Maximum	Starting Date (# of obs.)
LSNG	0.0128	0.1378	-0.7000	1.0000	10/20/1995 (420)
NNSI	0.0056	0.1432	-0.7159	1.4750	08/22/1997 (324)
RITK	0.0391	0.3670	-0.3857	4.5556	08/11/2000 (169)
RTKM	0.0065	0.1049	-0.4296	0.7647	09/08/1995 (426)
SBER	0.0085	0.1167	-0.5000	0.5789	06/06/1997 (335)
SIBN	0.0138	0.1655	-0.8400	2.2500	11/21/1997 (311)
SPTLP	0.0056	0.1415	-0.6909	1.6000	12/05/997 (309)
TATN	0.0126	0.1143	-0.5000	0.7500	09/20/1996 (372)
YUKO	0.0200	0.1860	-0.9091	1.5833	09/12/1997 (321)

The summary statistics of correlations of the RTS index and the individual Russian stock returns with the S&P 500 index returns are given in Table 3. The average correlation between RTS index and S&P 500 index during the period was 0.2791, but the correlations did show considerable variation over time as illustrated in Figure 1. The lowest correlation (0.0738) between the two indices was in April 1999 and the highest (0.4663) was in February of 2001. The correlation dynamics of individual stocks with S&P 500 index shows considerable variations. All the stocks except St. Petersburg Telephone had positive mean correlations, with 5 of the 13 stocks having a mean correlation over 0.2. The plots of correlations of individual stocks with S&P 500 index are given in Figure 2.

Table 3

Summary Statistics of the Correlation of Russian Stocks with S&P 500 Index

Stock	Mean	Std. Dev.	Minimum	Maximum	Starting Date (# of obs.)
RTS	0.2791	0.0535	0.0738	0.4663	09/08/1995 (426)
AFLT	0.0098	0.0506	-0.5467	0.2428	10/10/1997 (317)
EESR	0.2528	0.0689	0.0187	0.4598	09/08/1995 (426)
IRGZ	0.2314	0.0376	0.1971	0.9998	09/08/1995 (426)
KUBE	0.0503	0.0274	-0.1404	0.2311	03/14/1997 (347)
LKOH	0.2659	0.0386	-0.2977	0.4033	09/08/1995 (426)
LSNG	0.0473	0.0827	-0.4115	0.4297	10/20/1995 (420)

Table 3 (continuous)

Stock	Mean	Std. Dev.	Minimum	Maximum	Starting Date (# of obs.)
NNSI	0.0456	0.0254	-0.1721	0.1914	08/22/1997 (324)
RITK	0.0439	0.0626	0.0315	0.8522	08/11/2000 (169)
RTKM	0.2894	0.0286	0.2182	0.3655	09/08/1995 (426)
SBER	0.0696	0.0511	-0.2036	0.3265	06/06/1997 (335)
SIBN	0.1260	0.0157	0.0228	0.2236	11/21/1997 (311)
SPTLP	-0.0194	0.1453	-0.7106	0.5430	12/05/997 (309)
TATN	0.2528	0.0726	-0.9632	0.4782	09/20/1996 (372)
YUKO	0.1414	0.0643	-0.2520	0.6509	09/12/1997 (321)

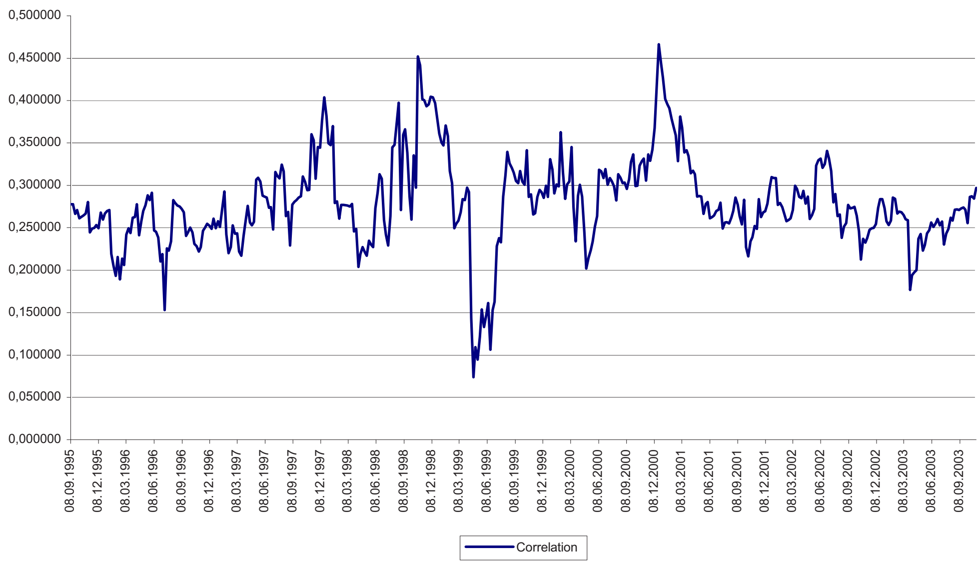

Fig. 1. Correlation of RTS Index with S&P 500 Index

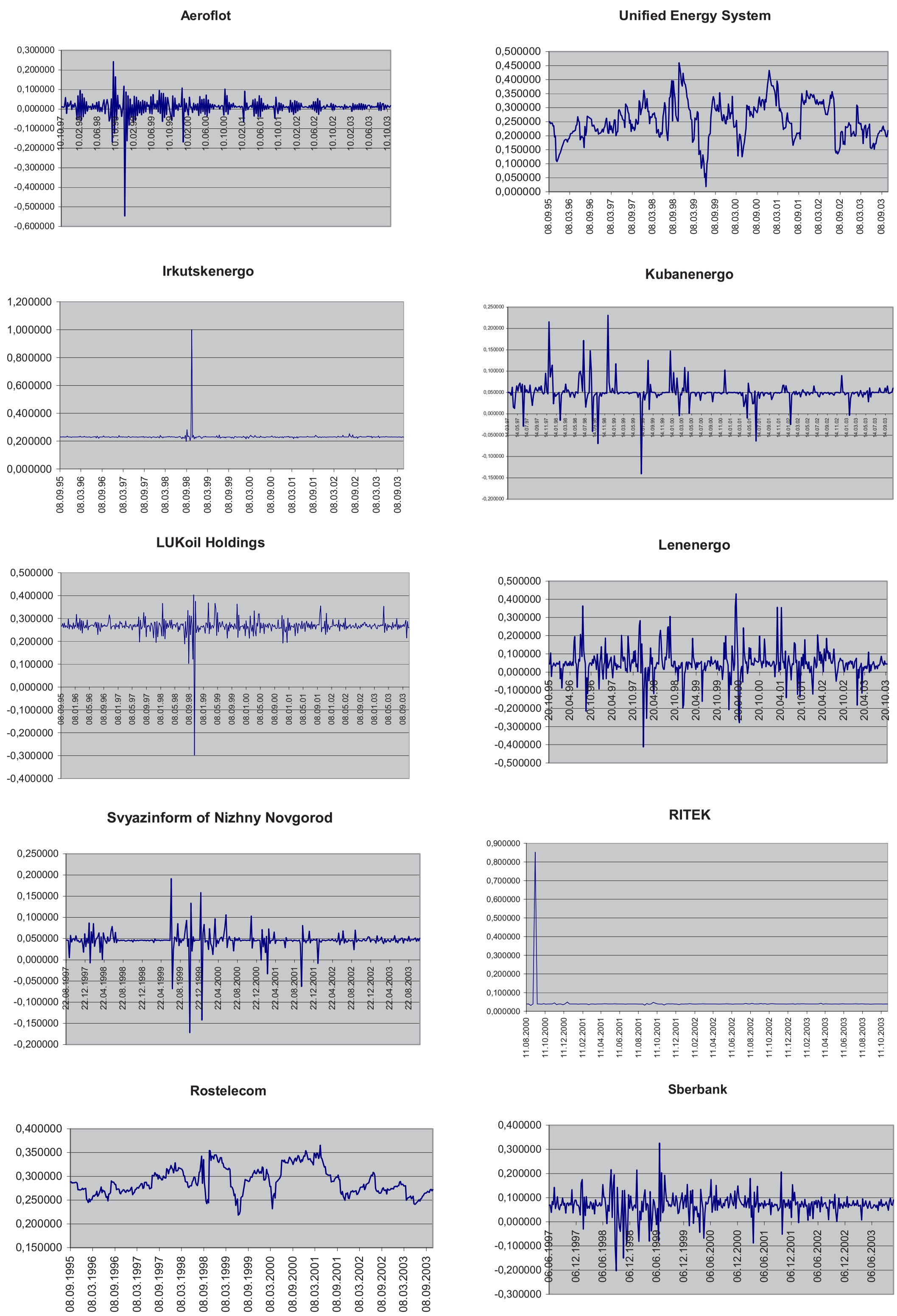

Fig. 2. Correlation Plots of Individual Stocks with S&P 500 Index

The results of the regression analysis of the correlations with the three independent variables are given in Table 4. All three variables – interest rate spread, change in exchange rates and change in energy price index – had statistically significant effect on the correlation between the RTS index and S&P 500 index returns. The interest rate spread and change in exchange rate had a positive effect on the correlations, while the change in energy price had a negative effect on the correlations. These results can be interpreted using the volatility feedback model described earlier. When the interest rate spread and exchange rate changes, it is considered as a negative shock to the market, and this in turn can cause the conditional volatility of the RTS market to increase. It is less likely that same news will have much impact on the conditional volatility of the S&P 500 index. Hence a one sided increase in volatility of the RTS market can increase its correlation with the S&P 500 index. On the other hand an increase in energy prices can be considered as positive news which should decrease the conditional volatility of the RTS market and will not have significant impact on the S&P 500 index. Again this one sided decrease in the volatility can negatively affect the correlation between the two markets.

Table 4

OLS of Factors Affecting the Correlation between Russian Stock and S&P 500 Index Returns

Regression Equation: $\rho_{i,t} = \alpha_i + \beta_1 Spread_t + \beta_2 FXrate_t + \beta_3 Energy_t + \varepsilon_t$

Stock	α (Std. error)	β_1 (Std. error)	β_2 (Std. error)	β_3 (Std. error)	Adj. R^2 (F-value)	Starting Date (# of obs.)
RTS	0.2713 (0.0037)*	0.0548 (0.0211)*	0.2008 (0.0652)*	-0.1358 (0.0597)**	0.0471 (7.9991)*	09/08/1995 (426)
AFLT	0.0147 (0.0041)*	-0.0318 (0.0210)	-0.0555 (0.0631)	-0.0108 (0.0645)	0.0029 (1.3028)	10/10/1997 (317)
EESR	0.2441 (0.0047)*	0.0591 (0.0271)**	0.2931 (0.0840)*	-0.1443 (0.0769)***	0.0453 7.7292	09/08/1995 (426)
IRGZ	0.2289 (0.0026)*	0.0114 (0.0148)	0.2191 (0.0457)*	-0.0256 (0.0419)	0.0519 (8.7553)*	09/08/1995 (426)
KUBE	0.0506 (0.0021)*	-0.0024 (0.0112)	0.0121 (0.0343)	-0.0354 (0.0343)	0.0000 0.4028	03/14/1997 (347)
LKOH	0.2658 (0.0025)*	0.0165 (0.0141)	-0.4186 (0.0438)*	0.0340 (0.0401)	0.1735 (30.7450)*	09/08/1995 (426)
LSNG	0.0492 (0.0058)*	-0.0251 (0.0329)	0.3246 (0.1020)*	-0.1574 (1.6811)***	0.0223 4.1820*	10/20/1995 (420)
NNSI	0.4592 (0.0020)*	-0.0028 (0.0105)	-0.0058 (0.0318)	0.03996 (0.0322)	0.0000 (0.5304)	08/22/1997 (324)
RITK	0.0355 (0.0083)*	0.1126 (0.0997)	1.1156 (1.8416)	0.0284 (0.1032)	0.0000 (0.7706)	08/11/2000 (169)
RTKM	0.2802 (0.0019)*	0.0694 (0.0109)*	0.0677 (0.03371)**	-0.0498 (0.0308)***	0.1056 (17.7263)*	09/08/1995 (426)
SBER	0.0750 (0.0037)*	-0.0220 (0.0195)	-0.4047 (0.0594)*	-0.0230 (0.0599)	0.1323 (17.9708)*	06/06/1997 (335)
SIBN	0.1258 (0.0012)*	0.0018 (0.0066)	-0.0298 (0.0196)	0.0218 (0.0201)	0.0011 (1.1140)	11/21/1997 (311)
SPTLP	-0.0373 (0.0120)*	0.1304 (0.0605)**	-0.2748 (0.1803)	0.1619 (0.1858)	0.0122 (2.2667)***	12/05/997 (309)
TATN	0.2544 (0.0049)*	0.0140 (0.0271)	-0.6771 (0.0837)*	0.0956 (0.0811)	0.1479 (22.4676)*	09/20/1996 (372)
YUKO	0.1425 (0.0051)*	-0.0126 (0.0264)	0.1861 (2.3373)**	-0.1471 (0.0808)***	0.0166 (2.8000)*	09/12/1997 (321)

* Significant at 1%
** Significant at 5%
*** Significant at 10%

The results of the above test at the firm level yielded a mixed bag of results. Only three of the thirteen firms in this study showed statistically significant effect of interest rate spread on correlation of its return with the S&P 500 index. Two of these firms are the Telecommunications sector, while the third one was an electric utility. Changes in foreign exchange rates had an effect on the correlations of 8 of the 13 firms. Interestingly enough the sign of the regression coefficient was negative for three of the eight firms. The change in energy price had statistically significant effect on 5 out of the 13 firms. Three out of these five firms were in energy related industry.

5. Conclusion

This paper looks at the changes in correlations between the Russian and the U.S. equity market returns. The correlations were estimated using the "Dynamic Conditional Correlation Model". The economic factors that cause the changes in the correlations between the returns were investigated and it was found that at least three variables had statistically significant effect on the correlations at the overall market level. The results at the firm were less clear.

This paper is an attempt to look at the specific reasons for changes in the correlations between national markets. It may be possible that these variables affecting the correlations can be different for different markets and also can vary over time. It will be of interest for future researchers to investigate similar models with other markets.

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