FEUC FACULDADE DE ECONOMIA
UNIVERSIDADE DE COIMBRA

Ekaterina Sergeevna Lavrenova

Russian stock return forecasting using industry indices and macroeconomic variables

Master's thesis in Economics, in the specialty of Financial Economics,

presented to the Faculty of Economics of the University of Coimbra

for the obtainment of the degree of Master

Supervisor: Prof. Nuno Miguel Barateiro Gonçalves Silva

Coimbra, 2017

Index

List of tables:

List of figures:

List of abbreviations and symbols:

OLS – Ordinary least squared
MSFE – Mean-squared forecast error
MICEX – Moscow interbank currency exchange
RTS – Russian trading system
MOEX – Moscow exchange
GFCF – Gross fixed capital formation
OECD – Organization for Economic Co-operation and Development
IMF – International Monetary Fund
JB – Jarque-Bera

Resumo

Neste trabalho, estudamos a previsibilidade do prémio de risco no mercado acionista Russo desde 31-01-2008 até 31-01-2017. Inicialmente, investigamos se as rentabilidades dos índices industriais têm capacidade para prever as rentabilidades futuras do mercado. Tmebém estudámos a capacidade previsional de diversas variáveis macroeconómicas. Usando regressões lineares tradicionais, descobrimos que três das nove indústrias e cinco das oito variáveis macroeconómicas são estatisticamente significantes. Contudo, todos os modelos baseados nestas variáveis apresentam pseudo R-quadrados negativos. Logo, têm um pior desempenho fora da amostra do que a média histórica. Também mostramos que dois dos nove previsores significativos na totalidade da amostra geram ganhos de utilidade para um investidor com função de utilidade média-variância.

Palavras-chave: prémio de risco, mercado acionista Russo, previsão, variáveis macroeconómicas, índices industriais

Abstract

In this research, we study the equity premium predictability in the Russian stock market from 31.01.2008 to 31.01.2017. First, we investigate whether the returns of industry portfolios forecast future stock market return. We also investigated a particular set of traditional macroeconomic variables as predictors. Using traditional linear regressions, we discovered that three out of nine industries and five out of eight macroeconomic predictors are statistically significant. However, all the models based on these predictors have negative pseudo R-squared values, therefore, they underperform the historical average model out-of-sample. We also show that two out of nine forecast models, based on significant predictors, provide utility gains for a mean-variance investor.

Keywords: equity premium, Russian stock market, forecast, macroeconomic variables, industry indices

JEL Classification: C22, C53, G11, G17

1 Introduction

Over the last decade, the development of the Russian stock market occurred under the conditions of the globalization, increasing internationalization of securities markets, and expanding competition in international financial markets. However, the Russian financial market is still not competitive on the global market.

To maintain and stimulate the economic growth of Russia, it is necessary to provide a well-developed financial center. The Russian stock market, today it is not sufficiently developed. The national stock market has limited capacity, insufficient to ensure investment needs of Russian companies, lags behind the largest and most developed equity markets in the world. The Russian stock market evolution will help to ensure balance, innovation-based and stable Russian economic growth in the long run.

In the opinions of many analysts, the Russian stock market is expected to decline further. The almost complete absence of the collective investment schemes, as well as the low investment attractiveness as a whole, is among the factors of the weakness of the Russian equity capital market. In this regard, the question about an appropriate forecasting method for the Russian stock market prices is really significant, because it would allow both small and large investors to predict the movement of the Russian stock market, to make a profit, and to increase the activity on the Russian stock market in general.

Forecasting stock market performance has a high significance for many economic problems. Successful forecasting the future equity premium could lead to obtaining a considerable return. Investors always take into account the historical price performance to form the forecast of future market movement and to make an investment decision.

The stock return predictability represents a widely studied subject in the economic literature. There are various points of view on predictions in the field of the stock market performance. For instance, the efficient market hypothesis assumes that the stock prices reflect all currently available information and all changes in the prices are not dependent on information recently revealed, thus, movements of the market prices could not be predicted on the whole. The opposite point of view says that there are different methods that allow generating information about the future market prices. The equity premium predictability problem and forecasting methods of stock market movements still remain open and controversial.

The main objectives of this research project are:

i) To study various approaches to forecast the stock market return;

ii) To choose the most suitable methods of prediction and apply these to analyze the Russian stock market;
iii) To find out whether the returns of industry portfolios could forecast movement of the stock market in Russia;
iv) To determine the sectors and macroeconomic indicators whose predictive ability is higher for the Russian stock market;
v) To create forecasts of the Russian stock market movement, using the predictive models based on the returns of industry portfolios and other indicators;
vi) To investigate whether the derived models are more profitable for a risk averse investor than the model based on the historical price data.

The empirical model is mainly based on the analysis of Hong et al. (2007). For the purpose of this work, the initial database will be analyzed through the two periods. First, we will apply in-sample (full sample) performance evaluation. We are going to use traditional predictive regressions, which include industry and other macroeconomic indicators and market returns. Second, we will provide out-sample performance evaluation. We are going to divide the total sample into two periods: from t to t1, and from t1 to t2. In the beginning, we will estimate the model, using data from the period t to t1, and then we will repeat this procedure for the most predictable industries and indicators, using as the out-of-sample period the last three observed years. At the end, we will compute the forecast errors as a difference between real values of the out-of-sample period and the forecasting measures. We should examine, whether the derived model is a better performance predictor than the model based on the historical returns.

As the last step of our empirical calculations, we are going to estimate the utility gain for a mean-variance investor and whether it profitable for him to use the equity premium predictions derived from the models to make investment decisions. We are going to compute the difference between the average utility of an investor who based the investment decisions on the predictive model and the average utility of an investor who formed portfolio using only information about the historical mean returns for the out-of-sample period (the net average benefit).

The remainder of this research is structured as follows. The next section focuses on the theoretical and empirical review of the literature on this research topic. Then, we are going to present a brief characterization of the Russian stock market, as well as the database and the methodology. The empirical analysis will be performed using the econometric methods described in the previous section. At the end of the project, we will present the conclusions of the study and compare our results with similar previous studies.

2 Literature review

Stock return predictability is extremely important for the solution of many fundamental issues of economy and finance. Therefore, it is logical that researchers spent time and resources trying to find economic indicators capable of predicting stock returns.

In this research, we studied various articles concerning the forecast of the equity premium. There are various methods for implementing this analysis. The most widespread approach is predictive linear regression which reveals dependence between stock market returns and some market indicators, such as inflation, dividend yield or default spread. Most of the existing literature on forecasting stock returns considers that there is a linear relation between market indices and stock returns, put another way, it is possible to predict future stock market movements applying econometric approaches.

Several authors show that despite a number of the existing econometric problems, it is possible to find a considerable predictive component from in-sample studies (for instance, Campbell (1987) found that the interest rate and spreads in the US are significant predictors). It is markedly more difficult to find predictors that are effective out-of-sample. Goyal and Welch (2008) examined a broad set of predictors and concluded, that the most common indicators previously used in this literature are not able to predict returns out-of-sample because predictive regressions are unstable over extended periods. However, Campbell and Thompson (2008) found considerable predictive ability in the out-of-sample period after the application of theoretical restrictions. Later Rapach et al. (2010) showed that the application of a forecast combination generates smoother and more reliable predictions in the real economy, and improves the asset allocation of a risk-averse investor. They also provided evidence that individual forecasts are too volatile.

There are several articles which estimate returns predictability for specific portfolios. For instance, Avramov (2002) applies a Bayesian method to predict 6 portfolios (formed as the intersection of two size and three book-to-market groups) using 14 economic variables. The study showed that in the out-of-sample period the Bayesian model outperforms other model selection criteria. The research also proved that the equity premium is predictable, moreover, stocks of small companies are more predictable than stocks of large ones. There is evidence that model uncertainty is more important for the investor's utility than estimation risk.

Similar to our research in Hong et al. (2007) the main purpose is to test whether the returns of industry indices forecast stock market movements. The study also verified the hypothesis that the ability of the industries to predict the market movement are correlated with its ability to forecast indicators of economic activity. They used monthly returns to 34 value-weighted industry portfolios for the years from 1946 to 2002 for the U.S. The linear relation between the equity premium and returns for each industry was estimated by GLS. As the main conclusion of this paper, the authors discovered that 14 out of 34 industries are able to forecast market direction by one month. Other industries such as petroleum, metal, and financial can predict the movement even two months ahead. The authors also investigated the cross-predictability at a time horizon of up to six months and it was proved that it is almost impossible to provide a forecast for such a long time lag. The study demonstrated the ability of the industries to predict the stock market returns is strongly linked to their ability to forecast indicators of economic activity. In this paper, they also show that an expansion to each of the largest eight stock markets outside of the U.S. corroborates the U.S results.

Pettenuzzo et al. (2014) used a new method to impose economic restrictions on forecasts of the equity premium and analyzed a broad set of predictors explored in Goyal and Welch, 2008. The database included monthly excess returns from 1927 to 2010. They developed a Bayesian approach that let them estimate the predictive density of the equity premium, based on the traditional linear prediction model, estimated by OLS. As a result, the authors found that economic constraints systematically diminish uncertainty about parameters of the model, and provide better out-of-sample performance at both the statistical and economic levels. Moreover, the gains obtained from the economic constraints tend to increase with the prediction horizon.

The alternative sum-of-the-parts approach to investigate stock return predictability was proposed by Ferreira and Santa-Clara (2011). They decompose the stock market return into three variables – the dividend yield, the earnings growth rate, and the growth rate in the price-earnings ratio. The forecast analysis was provided separately for each of these components. They analyzed monthly and annually data of stock market returns over the period from December 1927 to December 2007. The authors used traditional predictive regressions. They concluded that there is significant predictability in equity market returns.

Nyberg and Pönkä (2015) used a bivariate probit model for predicting the sign of the equity premium in the U.S. and ten other markets. The major focus of this research is to consider the lead-lag relationships in international asset markets. The objective of this paper is to reveal possible benefits from predicting the signs of returns jointly, focusing on the forecast from the U.S. to the foreign markets. They examined a monthly international dataset containing 11 industrialized countries including the U.S. from 1980 to 2010. In the conclusion, it was proved that the stock market returns of the U.S. are an appropriate predictor for stock returns in other foreign markets.

The empirical and theoretical forecast research of the stock market returns was conducted taking into account the different time horizon by the group of authors Govorkov et al. (2016). The main interest was to investigate the nature of stock market predictability over different time horizons. In this paper, the authors applied homogeneous and heterogeneous models, figured as a dynamical system to estimate three independent variables: market price, investor sentiment, and information flow. They examined daily returns from 2003 to 2015. Their main conclusions are that in order to predictor the stock market behavior it is necessary to consider the information asymmetry of the market, and also the fact that the collective investors' opinion, created by merging various individual opinions, that differ according to the time horizons, determines dynamically the prices in the market.

Kong et al. (2009) analyze return predictability for indicators of the aggregate market, including portfolios classified on industry. The database was created from the monthly returns on 33 industry portfolios available from 1945 to 2004 covering the U.S. stock market. In-sample and out-of-sample predictability tests were performed in the context of a bivariate predictive regression model with the help of OLS estimator, and a macroeconomic risk indicator was estimated by CAPM methodology. As result of the paper, it was concluded that industrial portfolios present considerably predictability.

The question of forecasting excess stock market returns using the lagged excess returns of industrial portfolios and a set of traditional indicators as predictors was researched by Pönkä (2014), employing predictive regression and dynamic probit models. He used monthly U.S. data ranging from 1946 to 2012. He concludes, that only a small number of the market indicators have a significant force to predict stock returns. Additionally, it was proved that binary response models surpassed traditional predictive regressions in forecasting the market return.

Maio (2012) focused on predictability stock market returns using as predictor the difference between the dividend yield of the stock market and the yield of the ten-year Treasury bond yield, also known as the FED model. The author collected monthly data on prices, earnings, and dividends associated with the S&P 500 Index. The result of the research showed that for the one-month time horizon the yield gap has a significant force of a prediction. Moreover, it is significantly more accurate than traditional predictors, such that default spread or the dividend ratio. In the out-of-sample analysis, the yield gap outperforms the historical average, especially when the equity premium is constrained to be positive.

Uhl (2011) seek to explore whether fundamental and behavioral factors influence the U.S. stock returns. He analyzed monthly price return data, covering the U.S. market from January 2003 to December 2010. The author found evidence of significant correlations between stock returns and returns sentiment. Moreover, expectations can forecast movements in stock returns better than macroeconomic factors and over the one month period.

In the opinion of Neely et al. (2014) academic literature relies extensively on macroeconomic variables to predict the movement of the stock market, and relatively less attention is paid to the technical indicators. The main purpose of this study is to cover this gap and to compare the predictive ability of macroeconomic variables and technical indicators. In the research, the authors applied in-sample and out-of-sample analyses of the regression model using OLS estimation. They examined monthly data of 14 macroeconomic indicators of the U.S. stock market, including the dividend yield, the earnings-price ratio, the equity risk premium volatility, the long-term government bond yield, the default yield spread and the inflation over the period from December 1950 to December 2011. As a result of the study, the authors proved that technical indicators have statistically and economically significant in-sample and out-of-sample predictive ability, as the macroeconomic variables. In addition, they found that technical indicators and macroeconomic variables have different properties of information, in particular, technical indicators (macroeconomic indicators) perform better in a period of a decline (rise) in the risk premium near business-cycle peaks (troughs).

There is a vast literature investigating the predictability of the stock market returns, but relatively few studies focus on the impact of various indicators on the performance of the Russian equity capital market. For instance, Rockinger and Urga (2000), found that stock market returns were predictable in Russia, but not in other East European countries. Ivanter and Peresetsky (2000) exploring a Russian daily stock market data for the period from may 1996 to October 1997 conclude that the integration of the Russian market and international financial markets increased during this period.

Jalolov and Miyakoshi (2005) examined monthly data for the period from May 1995 to March 2003 using an EGARCH model. They found evidence that the German market was more strongly correlated with the Russian market than the U.S. market due to the flow of investment between Russia and Germany. They found no significant influence of oil prices on the Russian stock market performance. The authors found, that an application of a one-step prediction with the EGARCH model implies larger mean squared errors than when using the random walk model.

Kutan and Hayo (2005) examine the daily returns of the Russian market, using an asymmetric GARCH model with a t-student distribution of errors. The authors found evidence that lagged Russian stock index returns S&P returns and oil index returns are significant predictors of the Russian stock market performance. They also proved that all news and shocks are not relevant both for forecasting market returns and the market volatility index.

Anatolyev (2008) explores weekly stock market returns for the periods from January 1995 to January 2005 and from October 1999 to January 2005. The main aim of the study was to test how significant are various macroeconomic and financial indicators for forecasting the Russian stock market. He concluded that the Russian equity capital market is not stable. It was also shown that certain indicators such as oil prices and foreign exchange rates have reduced their influence on the stock return, whereas others, such as the U.S. stock prices and international and domestic interest rates has increased.

Korhonen and Peresetsky (2013) explores the Russian stock index daily returns for the period from October 1997 to February 2012 and the stable period since 2000 to 2007 using a traditional regression model and estimation models in rolling windows. This research shows that the impact of oil prices on the Russian stock market performance is weak and not regular. They also find evidence indicating a high integration of the Russian stock market in the global world markets. Similar to the results of the study of Anatolyev (2008), the authors concluded that oil prices are not significant after 2006. However, the Japan stock index is significant over the whole studied period. They also found that news like Yukos arrests or Georgian war had only a short-term impact on the Russian stock market performance.

The study of Kinnunen (2013) tests whether the conditional multifactor model could predict the movement of Russian equity market. Similarly to our study he used the market industry indices, excluding telecommunications, media and information technology, the exchange rate and the oil price as predictors. He examined monthly Russian stock market data from 1999 to 2012. It was concluded, that in general the Russian stock market has a high level of predictability. However, the sources of predictability change over time. In periods of high volatility and high level of new information, the ability of the conditional multifactor model to forecast stock market is high. During periods of low information flow, there is a relative persistence of the market returns. The lagged global stock market indicator and currency returns are insignificant predictors for the Russian stock market.

Despite the large diversity of approaches to analyzing and forecasting stock market returns, for the purposes of this study, we chose the most widespread and traditional approach of forecasting stock market performance, specifically, the traditional regression model using OLS estimation. This research is based on the predictability of stock returns depending on the industries of the economy, expressed by the industry indices, and other macroeconomic indicators.

3 Russian stock market

Today the Russian stock market is emerging and has a lot of problems that effectively prevent further progress of this market.

The history of the Russian stock market began in 1993 when the main regulatory authority (the Commission on securities and stock exchanges) was created. However, in reality, stock trading began only in 1996 at the regional exchanges. First, the trading volume of the largest stock exchange (MICEX) grew rapidly, however, since the beginning of 1998 due to the negative trends in the economy it began to decline. The August 1998 crisis significantly struck the stock price of the biggest companies, and investors suffered very heavy losses. In 1999, the domestic stock market began to recover, Russian and foreign investors tended to buy cheap Russian stocks.

Figure 1 shows two measures that characterize the dimension of the Russian stock market. Up to 2007, the capitalization of the Russian stock market and the trading volume grew significantly, but in 2008 they declined by 66% and 18% respectively. For comparison, the price of Brent crude oil in 2008 fell by 58%.

Since 2011, the capitalization of Russian stock market almost has not changed, and the volume of trading in 2012-2014 even decreased compared to 2009-2011. In 2015-2016, the capitalization of Russian companies grew, however, the volume of trading decreased, which proves that the activity on the Russian stock market declined (figure 2). The ratio of capitalization to GDP reached 100% in 2006-2007, against the background of a rapid growth of both GDP and market capitalization, which corresponds to the level of developed countries. But after the financial crisis in 2008, this ratio decreased from 62% in 2009 to 32% in 2014 both due to GDP growth and lack of growth of capitalization. Therefore, in recent years, the ratio of the national securities market capitalization to GDP diminished. This fact indicates the existence of significant gaps between the capitalization of the stock market and GDP, which also reduces the role of the Russian stock market in the world economy, and makes the domestic market unattractive for investors. In 2015-2016 the ratio of capitalization to GDP increased, partly due to the slowdown of the GDP growth rate.

The interest in the Russian securities has gradually recovered since June 2012. At the end of this year, the main Russian stock market index (MICEX) grew by 3,1%. In January 2013, the MICEX grew by 6,18%, but at the end of the year it still fell by 4,97%. Due to events in Ukraine and economic sanctions against Russia in 2014, the ruble depreciated considerably and the oil prices decreased greatly. These factors contributed to the downfall of the Russian stock market index by 45% at the end of 2014. Figure 3 shows a further decline in MICEX in 2015. Note also that in 2014-2015 there were observed opposite trends of the two main Russian indices: MICEX and RTS (the first one is denominated in Russian rubles, the last one in USD). These facts were driven by the instability of the Russian currency during this period and the weakness of the Russian economy in general. Starting in 2016, the trend of both indices becomes one-directional and mostly positive.

Figure 1. Market capitalization and volume of trading in Russian stock market, trillion of rubles[1]

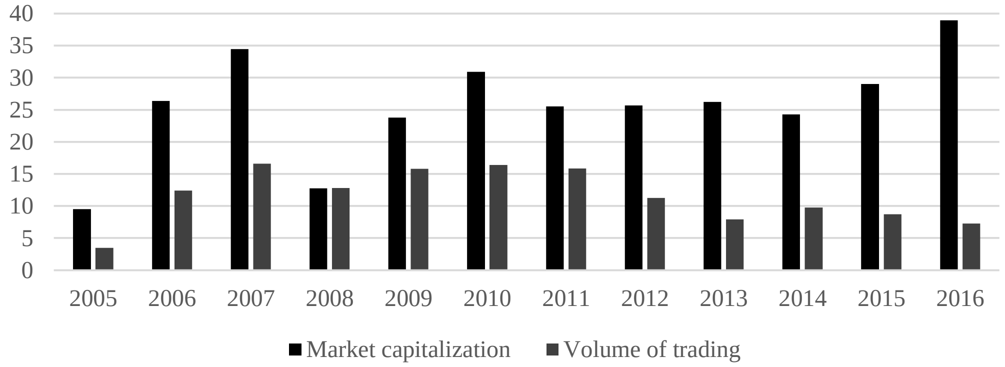
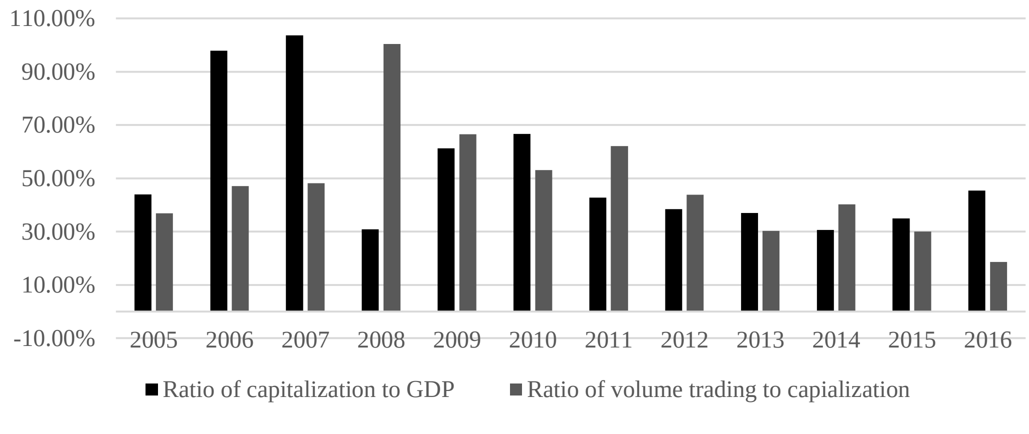


Figure 2. Ratio of capitalization to GDP and ratio of volume trading to capitalization, percentage[2]



The liquidity of the national companies (the ratio of trading volume to capitalization) has always been close to its average value of 45%, except during the

[1] Calculations based on data sources https://www.investing.com/analysis/stock-markets and http://cbr.ru/Eng/statistics
[2] Calculations based on data sources https://www.investing.com/analysis/stock-markets and http://cbr.ru/Eng/statistics

financial crisis of 2008. However, in 2015-2016, the liquidity of the Russian stock market has dropped to 30% and 18,5% respectively[3]. This also demonstrates the negative trend of the Russian stock market.

Today about 80% of the Russian stock market trading volume is generated by the ten largest issuers. The capitalization of the ten largest national companies remained stable over the last five years at around 56% of total market capitalization (table 1). About half of all transactions in 2015 was generated by three securities: PJSC "Sberbank", PJSC "Gazprom" and PJSC "LUKOIL".

The number of listed companies decreased by 7,1% in the period after the sanctions, from 266 companies at the end of 2015 to 247 at the beginning of 2017.

Table 1. Capitalization of the 10 largest Russian public companies in 2015-2016[4]

Company	Capitalization, bln. RUB		The share in total capitalization	
	2015	2016	2015	2016
PJSC "Gazprom"	2 957,91	3 589,69	10,2%	9,2%
OJSC "NK Rosneft"	2 489,49	4 187,16	8,6%	10,7%
PJSC "Sberbank"	2 002,96	3 663,19	6,9%	9,4%
PJSC "LUKOIL"	1 835,02	2 879,56	6,3%	7,4%
OJSC "NOVATEK"	1 657,83	2 349,13	5,7%	6,0%
PJSC "Norilsk Nickel"	1 331,16	1 569,34	4,6%	4,0%
OJSC "Surgutneftegas"	1 119,15	1 091,13	3,9%	2,8%
PJSC "Magnit"	964,80	1 018,53	3,3%	2,6%
PJSC "VTB Bank"	941,32	947,98	3,2%	2,4%
PJSC "Gazprom Neft"	668,06	1 011,53	2,3%	2,6%
The sum	15 967,70	22 307,22	**55,0%**	**57,3%**
Total capitalization of the MICEX	29 032,88	38 953,42	100,00%	100,00%

A comparison of the relative indicators of Russia and some developed countries is shown in figures 4 and 5. On average the ratio of turnover to capitalization in developed markets is 100% or more during the review period (excluding 2008), while for the Russian market it fluctuates around 45% (figure 4). The ratio of capitalization to GDP in developed countries is 150% on average, whereas in Russia, the maximum value of 100% was achieved once in 2008 (figure 5).

[3] http://moex.com/en/indices
[4] Calculations based on data sources https://www.investing.com/analysis/stock-markets and http://moex.com/en/indices

Figure 4. The ratio of trading volume to capitalization of Russia in comparison with developed markets, percentage[5]

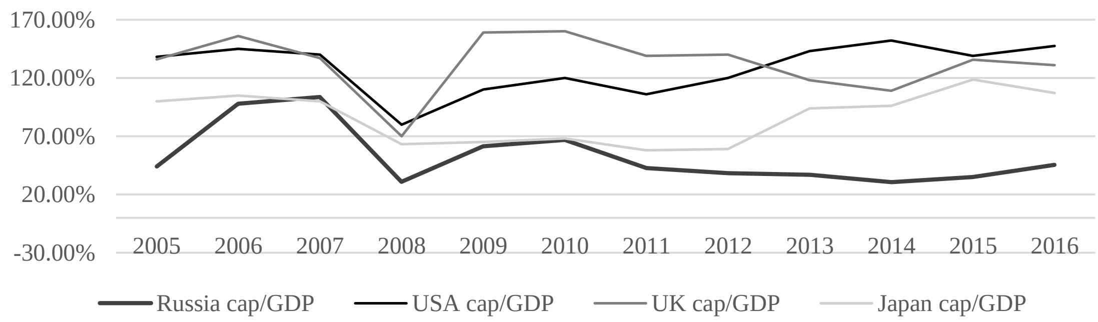
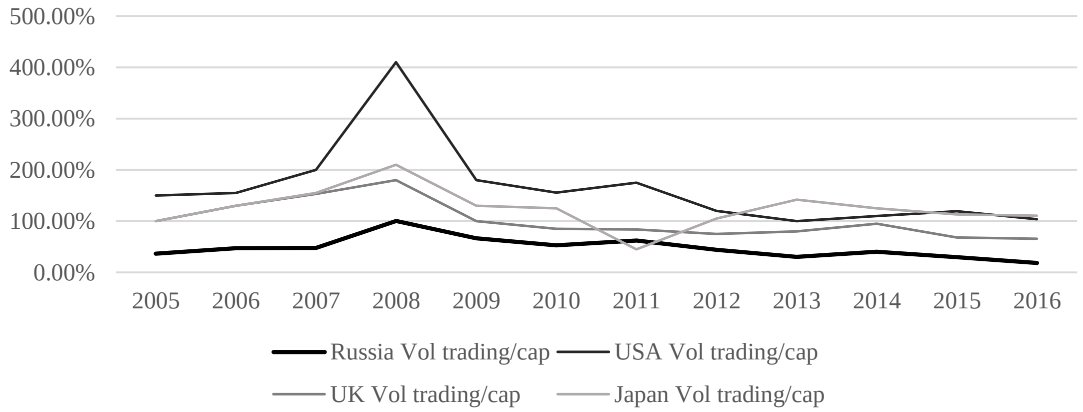


Figure 5. The ratio of capitalization to GDP in Russia in comparison with developed markets, percentage[6]



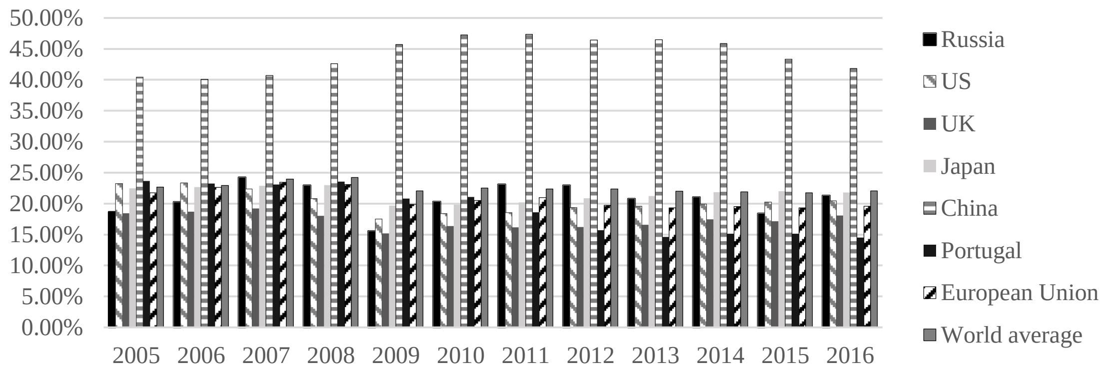
One of the major disadvantages of the Russian securities market is the commodity nature of the economy, therefore there is a strong dependence of economic activity on commodities' price movements (figure 6). The Russian stock market is also considered to be highly volatile and unstable. We calculated monthly returns' standard deviations for the MICEX and three foreign indices (FTSE 100, S&P 500 and Nikkei 225) for the period from December 2008 to January 2017, that were equal to 8,39% 4,3%, 4,71% and 6,55% respectively. Therefore, during this period, the volatility of the Russian stock market was almost 2 times higher than the market volatility of the U.K. and the U.S., and 1.3 times higher than the volatility of the Japanese market.

The Russian stock market is also characterized by low investment activity of companies and private investors on the market. Figure 7 shows a comparison of the ratio of investment to GDP in some countries. According to this relative indicator,

[5] Calculations based on data sources https://data.oecd.org and http://www.imf.org/en/data
[6] Calculations based on data sources http://www.imf.org/en/data and https://www.world-exchanges.org

Russia is in a satisfactory position. On average, during the analyzed period, the share of investment in GDP in Russia was 20,78%, whereas it was 20,33% in the U.S., 17.29% in the U.K., 21,53% in Japan, 44% in China, 19,09% in Portugal 19,09%, 20,80% in the European Union, and the World average was 22,57%. However, given that GDP per capita at current prices in 2016 for Russia and China were very close (8838,2 USD and 8260,9 USD, respectively, according to the OECD data), we can conclude that Russia is characterized by a low investment activity compared to a country with a similar development. The rest of the countries is characterized by the following GDP per capita values: 19758,7 USD in Portugal, 37304,1 USD in Japan, 40411,7 in the U.K. and 57293,7 in the U.S.

Figure 7. Share of investment in GDP, percentage[7]



Another weak feature of the Russian stock market is the insufficient development of regional equity markets. Today the Central Bank of the Russian Federation officially registered only 7 operating stock exchanges: the largest is MOEX. Other 5 exchanges are also located in Moscow (the capital) or Saint-Petersburg (the second most import city of Russia) and specialize predominantly on trading commodities and raw materials, or currencies. The only regional stock exchange is the Crimean stock exchange, located in Simferopol (the third Federal city of Russia). Table 2 presents the share of the capitalization of companies traded on the central Russian stock exchanges (MICEX or MOEX after the reorganization) to total market capitalization from 2011 to 2016. During this period it is 93,3% on average. Therefore, stock trading in Russia is almost entirely realized in one central exchange platform.

[7] Calculations based on data source https://data.oecd.org

Table 2. Share of MOEX capitalization, %[8]

Year	Total market capitalization, bln. Rub	Capitalization of MOEX, bln. Rub	Share of MOEX capitalization, %
2011	25533,8986	19883,8939	77,87%
2012	25676,7823	24657,0158	96,03%
2013	26247,0222	25255,5736	96,22%
2014	24275,6211	22838,2358	94,08%
2015	29032,8771	28733,1821	98,97%
2016	38953,4249	37748,0352	96,91%

Many researchers also note a close correlation and dependence of the Russian market with foreign equity markets. We calculated the correlation coefficients between MICEX and FTSE 100, S&P 500 and Nikkei 225 monthly rates of return for the period from January 2008 to June 2012. Their values are 0,72, 0,72 and 0,69, respectively. However, in a later period from October 2011 to April 2017, the correlation coefficients decreased to 0,41, 0,34 and 0,29, respectively. Therefore, we may conclude that there is a positive correlation between the MICEX and foreign indices. The higher correlations during the 2008-2012 period can be justified by the 2008 crisis, that strongly affected all economies. Figure 8 also shows scatterplots, which shows the close positive correlation between the MICEX and the relevant indices.

The Russian stock market is very young compared to foreign exchanges. It is characterized by high volatility and instability, and other features, among them:

i) Low investment activity of companies and private investors on the market;
ii) Insufficient development of regional equity markets;
iii) Close positive relationship between the Russian and foreign markets;
iv) High dependence on commodity prices.

To conclude, it was found that since 2011 the development of the Russian stock market has almost stopped. The absolute indicators, characterizing the market scale, remained fixed at the same level, never reaching the value of 2007. The relative indicators, characterizing the level of the market development and its role in the economy, demonstrated a stagnation or a negative trend since 2011. The developed markets continue their upward movement in comparison with Russian stock market, which reached the level of developed countries only once in 2006-2007.

[8] Calculations based on data sources http://moex.com/en/indices and https://www.investing.com/analysis/stock-markets

4 Methodology

4.1 In-sample

The empirical part of our research starts with the in-sample performance evaluation, which covers the full observed sample from January 2008 to January 2017. We are going to use the traditional predictive regression approach, which tests if there is a linear relation between the equity premium and the predictors, as described by Hong et al. (2007), among others

$$RM_t = \alpha_i + \beta_{i,1}\ \mathrm{Pred}_{i,t-1} + \beta_{i,2}\ RM_{t-1} + e_{i,t}, \tag{1}$$

where RM_t is the market excess return over the risk-free rate in month t, $\mathrm{Pred}_{i,t-1}$ is the predictor i lagged one month, RM_{t-1} is variable that controls the existence of autocorrelation in the equity premium, and $e_{i,t}$ is the error term. We are interested in the coefficients $\beta_{i,1}$, which indicates the ability of each predictor to guide the stock market profitability.

Among all diverse methods to analyze the predictability of the stock market, we chose the most widespread and traditional approach of evaluation, specifically traditional linear predictive regression (Ordinary least squared estimation). In this approach, we used robust standard errors (that is, corrected for heteroskedasticity and autocorrelation). As software support, we used Microsoft Excel and Gretl.

We start our study by analyzing the capability of industries returns to predict the movement of the Russian stock market. To estimate the forecasting ability of industries to lead the future stock price we evaluated 9 portfolios using equation 1. We estimate equation 1 separately for each of the 9 industries, namely oil and gas, electric utilities, telecoms, metals and mining, manufacturing, financials consumers' goods and services, chemicals and transport.

Then we expand our evaluation by this methodology and we test, additionally, the predictive ability of several macroeconomic variables, such as inflation rate, bond yield spread, the excess return of MICEX corporate bond index, oil price, USD/RUB exchange rate, the market volatility index and dividend yield.

After applying this approach and estimating the 16 predictive regressions using equation 1 we identify the significant predictors for the Russian stock market. In order to determine the in-sample significance of the predictors, we use a standard t-statistic test (equation 2).

$$t = \frac{\hat{\beta}_{i,1}}{\hat{S}_i}, \tag{2}$$

where $\hat{\beta}_i$ is the estimated coefficient and $\hat{S}_i$ is its standard deviation.

4.2 Out-of-sample

For the predictors that were identified as significant in-sample, we implement an out-sample performance evaluation. We split the total sample into two periods: from t_1 to t, which comprises the period from January 2008 to December 2013, and from t to t_n, which covers the period from January 2013 to January 2017.

First, we estimate, for each predictor, model (1), using data from the period t_1 to t. Then we collect the estimated parameters of the regression for the constant, the MICEX index and the predictors for the period t (December 2013).

Therefore, at the moment $t+1$ (January 2014) we will predict MICEX return using the estimated coefficients for the previous month applying equation 3:

$$\widehat{RM}_{i,Jan2014} = \hat{\alpha}_i + \hat{\beta}_{i,1}\, Pred_{i,Dec2013} + \hat{\beta}_{i,2}\, RM_{Dec2013}, \tag{3}$$

where $\hat{\alpha}_i$, $\hat{\beta}_{i,1}$ and $\hat{\beta}_{i,2}$ are the estimated coefficients and $\widehat{RM}_{Jan2014}$ is the excess return forecast of the MICEX based on predictor i in January 2014.

We are going to repeat this procedure for all industries and indicators of economic activities that exhibit predictive ability in-sample, until the end of the out-of-sample period, which requires estimating 37 regression model for each significant predictor. At the end of this step, we will obtain the MICEX return forecasts for the out-of-sample period, then we will compute the forecast errors as the difference between real MICEX returns in the out-of-sample period and the forecasted returns. We are also going to calculate the mean-squared forecast error (MSFE) from the derived predictive models and mean-squared forecast error from the historical mean (equation 4). We compute the squared errors to estimate whether our model is close to the actual excess returns.

$$MSFE_t^i = \frac{1}{t_n - t} \sum_{s=t}^{t_n - 1} \left(RM_{s+1} - \widehat{RM}_{i,s+1}\right)^2, \tag{4}$$

where $\widehat{RM}_{i,s+1}$ is the excess return prediction from predictor i, for period s + 1. The MSFE computation starts at the moment t+1, and comprises 37 periods.

Then we will compute the pseudo R-squared out-of-sample, R_{OOS}^2 (equation 5). If R_{OOS}^2 is positive, the derived model outperforms the prediction based on the historical mean.

$$R_{OOS}^2 = 1 - \frac{MSFE^{mod}}{MSFE^{mean}}, \tag{5}$$

where $MSFE^{mod}$ represents the measure based on the the model, and $MSFE^{mean}$ is the MSFE from the historical mean (as the sum of squared errors for the out-of-sample period).

The out-of-sample forecasting ability of the predictors can be tested using the MSFE-adjusted test statistic similarly to McCraken (2007). This test is used to examine the null hypothesis that the unrestricted model MSFE is equal to the constrained model MSFE, whereas the alternative hypothesis says that the first model's MSFE is lower than the later (equation 6).

$$\hat{f}_{i,t} = \left(RM_t - \widehat{RM}_t^{mean}\right)^2 - \left[\left(RM_t - \widehat{RM}_{i,t}^{mod}\right)^2 - \left(\widehat{RM}_t^{mean} - \widehat{RM}_{i,t}^{mod}\right)^2\right], \tag{6}$$

where $\widehat{RM}_{i,t}^{mod}$ is the excess return forecast for predictor i, at month t, based on the model, and $\widehat{RM}_t^{mean}$ is the excess return forecast at month t, based on the historical mean. The MSFE-adjusted statistic is calculated by regressing $\hat{f}_{i,t}$ on a constant, and applying the resulting t-statistic for a zero coefficient. The null hypothesis of equal forecast ability is rejected, at the 5% significance level, if the t-statistic exceeds 1,645 (one-sided test).

It is well known that forecasts based on a single predictor tend to be too volatile. Thus, we followed Rapach et al. (2010) and tested if combinations of forecasts present better predictive ability than forecast based on a single variable. That is, we also computed the out-of-sample performance of forecasts based on the simple average of: i) significant industry predictors, ii) significant macroeconomic variables and iii) all significant predictors. For these three obtain average forecasts and we also compute the mean-squared prediction error and we examine whether the derived mean models are better predictors than the historical mean model.

4.3 Utility gains

In the last stage of our empirical calculations, we estimate the utility gain for a mean-variance investor, who has to choose which fraction of his wealth to invest in the risk-free asset and the stock market and whether it is profitable for him to use the derived model to make an investment decision. Thus, we will compute the utility gain for a risk-averse investor who uses stock returns' forecasts based on the derived models against an investor who makes his decision based on the historical mean. For this purpose, it is necessary to compute the difference between the average utility of these two investment strategies (equation 7). This difference should be positive if an application of the predictive model generates benefits for a mean-variance investor.

$$\Delta \mathrm{U} = \hat{v}_i^{mod} - \hat{v}^{mean}, \tag{7}$$

First, we calculate the utility for an investor who makes his decisions applying the historical mean model. It is required to compute the share of his wealth, w_t^{mean}, that is optimal to invest in equity at each month t. We consider a mean-variance investor with coefficient of relative risk aversion, γ, equal to 5.

$$w_t^{mean} = \frac{1}{\gamma} \frac{\widehat{RM}_{t+1}^{mean}}{\hat{\sigma}_{i,t+1}^2}, \tag{8}$$

where $\hat{\sigma}_{i,t+1}^2$ is the rolling window (72 months) estimate of the variance of stock returns. Applying this strategy to forecast excess return, a mean-variance investor will get an average utility given by

$$\hat{v}^{mean} = \hat{\mu}_{mean} - \frac{1}{2} \gamma \, \hat{\sigma}_{mean}^2, \tag{9}$$

where $\hat{\mu}_{mean}$ and $\hat{\sigma}_{mean}^2$ are the sample average and variance, respectively, over the out-of-sample period, for an investor's portfolio formed using only historical mean model.

Similarly, we calculate the share of investments in equities $w_{i,t}^{mod}$ and the average utility $\hat{v}_i^{mod}$ for the mean-variance investor, who makes his decision on the basis of the predictive models (equations 10 and 11):

$$w_{i,t}^{mod} = \frac{1}{\gamma} \frac{\widehat{RM}_{i,t+1}^{mod}}{\hat{\sigma}_{i,t+1}^2}, \tag{10}$$

$$\hat{v}_i^{mod} = \hat{\mu}_{i,mod} - \frac{1}{2} \gamma \, \hat{\sigma}_{i,mod}^2, \tag{11}$$

where $\hat{\sigma}_{i,t+1}^2$ is the rolling window (72 months) estimate of the variance of stock returns, $\hat{\mu}_{i,mod}$ and $\hat{\sigma}_{i,mod}^2$ reflect the sample average and variance, respectively, over the out-of-sample period, for the investor's portfolio formed using predictive model.

At the end of the mean-variance investors' utility evaluation, we also compare the utility from the predictive models with the utility that an investor would get if he was fully invested in the stock market (that is, an investor who chooses a weight equal to 1 for all months).

5 Database

In this work, we analyzed the ability of several variables to predict the equity premium for the Russian stock market over the period from 31.01.2008 to 31.01.2017. We collected monthly data for the MICEX general index returns and several predictors of its evolution, namely:

- 9 industry indices returns, including oil and gas, electric utilities, telecoms, metals and mining, manufacturing, financials, consumer goods and services, chemicals and transport;
- Other indicators of macroeconomic activity, among them the inflation rate, the bond yield spread, the MICEX corporate bond index, the Brent oil price in USD and RUB, the USD/RUB exchange rate, the market volatility index and the dividend yield.

Thus, we examined 16 variables as predictors. The MICEX was taken as the indicator of the dynamic of the Russian equity market. It is calculated as a weighted composite index based on prices of the 50 most liquid Russian stocks of the largest and most dynamic Russian issuers traded on the Moscow Exchange. The MICEX index is denominated in Russian rubles, in contrast, the RTS index, which has the same base of calculation, but it is denominated in USD. We selected the MICEX as the analyzed index, because it is presented in the national currency, therefore it is free from currency risks and represents the movement of the Russian stock market more properly, from the perspective of a Russian investor.

The database was obtained from Thomson Reuters Datastream, Eikon, the official website of several Russian statistical services, such as the Moscow exchange, the Central Bank of the Russian Federation, the Federal State Statistic Service, and other supplementary statistical sources, among them Financial Cbonds information, Stock Markets Analysis of Investing.com and Global world-exchanges.

In order to analyze the predictability in the Russian stock market, we had to perform some transformations in the raw data that we collected:

- The indicator of the Russian stock market performance (the explained variable) was computed as the difference between the MICEX monthly return and the risk-free rate (1-month Russian bond yield obtained from Cbond website);
- For each industry, the excess industry return was calculated as the difference between the monthly industry return and the risk-free rate;
- Bond yield spread was calculated as a difference between the monthly ten-year government bond yield and the risk-free rate;
- The excess return of the MICEX corporate bond index is the difference between the monthly return of the MICEX corporate bond index and the risk-free rate;

- The dividend yield was approximated by a weighted average of the dividend yields of the 30 largest companies in the MICEX, according to their weights in the index;
- Regarding the oil prices and the USD/RUB exchange rate, in our research, we used a normalized value of these indicators, which is calculated as the division of their value at the end of the month by their moving average values over the previous 12 months[9].

We calculated correlation coefficients between absolute values of the MICEX and other predictive variables. The results are presented in table 3. The strongest positive correlation was observed between the MICEX and the oil price, denominated in rubles, and the MICEX and USD/RUB exchange rate (0,51 and 0,53). The strongest negative correlation is between the MICEX and the Russian market volatility index, and the MICEX and the dividend yield (-0,66 and -0,71). The inflation rate and the bond yield spread are weakly correlated with the MICEX returns. Figure 9 also presents scatterplots between the MICEX and some indicators.

Table 4 displays some descriptive statistics for the equity premium and the predictive variables.

On average the mean value of equity premiums of 9 industry portfolios is 0,003 units, the minimum is -0,332 units, the maximum is 0,289 units. Thus, the average of the industry indices excess returns over the study period is almost equal to zero. The mean value of the MICEX excess return is -0,003 units, the minimum is -0,305 units, and the maximum is 0,212 units. It proves the overall negative trend of the Russian stock market during the study period. The mean inflation growth for the period amounted to 0,007 units in the month. The average value of oil price, the USD/RUB exchange rate, the market volatility index and the dividend yield were 1,032 units, 1,060 units, 38,166 points, 0,031 units per month, respectively, during the study period. In opposite, the dynamics of excess return of the corporate bond index was negative, it was -0,001 units on average per month. The skewness is negative for almost all the indicators (except the inflation rate, the USD/RUB exchange rate, the market volatility index and the dividend yield), which means that for most indicators the distributions are left-skewed (right-skewed). All indicators have positive excess kurtosis, which means that the variables have more probability mass in the tails of their distribution than a normally distributed variable. That is, the probability of getting extreme values (either very high or very low) is higher. According to the standard deviation value, electric utilities, metals and mining, manufacturing and chemicals industries have the highest volatility (0,111 units, 0,102 units, 0,113 units and 0,116 units

[9] These variables exhibit a trend. Thus we have chosen to apply the transformation proposed by Rapach et al. (2005) to circumvent this problem.

respectively). In general, industry indices are more volatile than the MICEX (as expected, given that the MICEX is more diversified than industry indices).

Table 4. Descriptive Statistics

Variable	Mean	MIN	MAX	St. dev.	SKEW	KURT	JB normality test	
							JB statistic	p-value
MICEX	-0,003	-0,305	0,212	0,078	-0,680	2,544	37,80	< 0,0005
Oil and gas	0,002	-0,267	0,215	0,078	-0,464	2,135	24,62	< 0,0005
Electric utilities	-0,005	-0,434	0,320	0,111	-0,247	2,902	39,36	< 0,0005
Telecoms	-0,006	-0,345	0,217	0,091	-0,872	2,274	37,30	< 0,0005
Metals and mining	0,002	-0,481	0,298	0,102	-0,859	4,285	96,79	< 0,0005
Manufacturing	-0,007	-0,462	0,302	0,113	-0,521	3,241	52,63	< 0,0005
Financials	-0,002	-0,262	0,309	0,090	0,096	1,501	10,39	0,0055
Consumers goods and services	0,003	-0,453	0,426	0,089	-0,302	9,099	377,64	< 0,0005
Chemicals	0,009	-0,368	0,402	0,115	-0,162	3,074	43,40	< 0,0005
Transport	-0,005	-0,254	0,269	0,093	-0,085	0,735	2,59	0,2746
Inflation rate	0,007	-0,002	0,039	0,006	2,341	7,709	369,41	< 0,0005
Bond yield spread	< 0,005	-0,013	0,004	0,003	-2,032	5,704	222,73	< 0,0005
Corporate bond index	-0,001	-0,098	0,033	0,016	-2,695	13,322	938,02	< 0,0005
Oil price	1,032	0,447	1,437	0,161	-0,703	1,800	23,69	< 0,0005
USD/RUB	1,060	0,906	1,749	0,137	2,139	6,102	252,25	< 0,0005
Market volatility index	38,166	17,200	167,890	22,523	3,596	16,138	1404,65	< 0,0005
Dividend yield	0,031	0,010	0,129	0,019	3,012	11,746	784,11	< 0,0005

The Jarque-Bera normality test shows that the test statistic greatly exceeds the critical value for any reasonable significance level (that is 4,61 for the 10% significance level, 5,99 for the 5% significance level and 9,21 for the 1% significance level) which leads us to conclude that the monthly data for almost all the variables do not follow a normal distribution. The only exception is the transport industry, that has the JB test statistic of 2,59, which is less than the critical value for any significance level, and therefore, the transport industry excess returns could have a normal distribution.

6 Results

6.1 In-sample results

The model given by equation 1 was applied to Russian stock market data for the period since January 2008 until January 2017. We used this approach and collected from equation 1 the estimated coefficients, the standard deviations, the t-statistics and the p-values, and the R-squared for each of the 16 variables. This was done sequentially for all indicators to determine their significance as predictors of the MICEX return. This procedure was applied using the Gretl software. Table 5 shows the regression results, for each indicator.

Table 5. Econometric in-sample results

	Variable	Coefficient estimates	Standard deviation	Statistical significance (t-statistics)	R-squared
1	Oil and gas	0,02510	0,28767	0,08724	0,08732
2	Electric utilities	0,05026	0,07688	0,65380	0,08985
3	Telecoms	-0,02550	0,21721	-0,11740	0,08748
4	Metals and mining	0,325626 ***	0,08000	4,07000	0,14832
5	Manufacturing	0,244333 **	0,11664	2,09500	0,13833
6	Financials	0,11684	0,15295	0,76390	0,09391
7	Consumers goods and services	0,27354	0,17335	1,57800	0,12472
8	Chemicals	0,168582 **	0,08110	2,07900	0,11864
9	Transport	-0,04425	0,09416	-0,46990	0,08900
10	Inflation rate	1,83846 *	1,01777	1,80600	0,10784
11	Bond yield spread	2,96804	2,41784	1,22800	0,09919
12	Ex. return of corp. bond index	1,3294 **	0,66382	2,00300	0,14083
13	Volatility index	0,00009	0,00042	0,20060	0,08781
14	USD/RUB (norm.)	0,100653 *	0,05436	1,85200	0,11962
15	Oil price Brent (norm., USD)	-0,05826 *	0,03235	-1,80100	0,11939
16	Oil price Brent (norm., RUB)	-0,07784	0,05136	-1,51600	0,11421
17	Dividend yield	1,30634 ***	0,22964	5,68900	0,20069

The asterisk stands for the significance level, where one, two and three asterisks represent significance levels of ten, five and one percent, respectively.

Table 5 shows the results after estimating the equation 1 for all the 16 variables (note, that the impact of oil price was estimated twice, denominated in USD and RUB), with the methodology presented in previous section 4.1. The first 9 variables in the table represent industrial portfolios' indices, the rest of variables are macroeconomic indicators.

The most significant variables according to p-value and t-statistics are the metals and mining industry and the dividend yield (at the 1% significance level). Also the manufacturing and chemicals industries and the excess return of the corporate bond index (at the 5% significance level), and the inflation rate, the USD/RUB exchange rate, and the oil price, denominated in USD (at the 10% significance level) present predictive ability. That suggests that for metals and mining and the dividend yield, we are 99% confident that we obtained estimated regression coefficients that really affect the dependent variable. Therefore, we got 3 significant industry predictors out of 9 and 5 significant macroeconomic predictors out of 8. Hong et al. (2007) discovered that 14 out of 34 industries are able to forecast market direction by one month, he also found that indicators such as the inflation, the dividend yield and the market volatility are also significant for the U.S. stock market (at the 10% significant level), with corresponding coefficients -0,578, 1,418 and 0,241, which are close to the obtained values in our model, except for the inflation coefficient which has the opposite sign. Pönkä (2014), for instance found that, on the contrary, only a small number of industries are useful in predicting market movements. In the out-of-sample analysis, it was shown that three industries show predictive ability on the excess market returns at the 5% level and a further three at the 10% level.

In this research, the R-squared are low for all the predictors both significant and not significant, which is typical in this kind of studies because the equity premium is notoriously difficult to predict. However, significant variables, such as the dividend yield, the excess return index for corporate bonds, the metals and mining, and manufacturing industries, have the highest R-squared (20,1%, 14,1%, 14,8% and 13,8% respectively). The rest of variables have R-squared values, on average, of 10,3%. Taking into account that R-squared is a statistical measure of how close the fitted data is to the realized equity premia, the higher R-squared, the better the model fits the data. However, in our example, the data inevitably contains a large amount of unexplained variability. Moreover, the study period is characterized by high volatility and variability for the Russian stock market. Note, that even though the R-squared are low, the high t-statistics still indicate that there are relevant relations between the predictors and the dependent variable.

Among the significant indicators, we conclude, that when the metals and mining industry return increases by 1%, the MICEX return also increases by 0,326%, ceteris paribus, while increasing the manufacturing industry return by 1% leads to an increase of the MICEX return by 0,244%, and increasing chemicals industry return by 1% leads to an increase of the MICEX return by 0,169% Thus, metals and mining, manufacturing and chemicals industries have a significant positive effect on the MICEX dynamics.

Taking into account that the Russian economy and the Russian stock market, in particular, is strongly correlated with the oil price, it is unexpected that oil price, denominated in RUB, and oil and gas industry are not significant predictors. Moreover, Russia is an oil exporter, which implies that an increase in oil prices should have a positive impact on the MICEX. The oil prices significance was also confirmed by many studies. Anatolyev (2008), for instance, discovered that until 2006 the oil price was a significant predictor with a positive effect on the Russian stock market. On the contrary, Korhonen and Peresetsky (2013) proved that the impact of oil prices on the Russian stock market performance is weak, not regular, and insignificant after 2006. Kutan and Hayo (2005) found that the oil price growth rate is a statistically significant predictor with 99% confidence level in the in-sample analysis (the estimated coefficients is 0,08).

However, it should be noted that the fact that there is a strong contemporaneous correlation between the MICEX and oil prices does not imply that the oil and gas industry or oil price is a significant predictor. Remember that we are using past predictors' returns to forecast the MICEX return. Therefore, if investors incorporate immediately the information from this sector in the MICEX, the past industry return will not be a useful predictor.

The classical economic theory suggests that for developed countries inflation is undesirable but integral to economic growth, it leads the expansion of production, reduces unemployment and increases household expenses. The more profits companies get the more stocks' price increase and stock market growths in general. Normally, the trend of the stock market and inflation are the same in developed countries. According to the Fisher hypothesis, inflation should have a positive effect on stock price due to the fact, that if the expected real return is constant, a higher inflation rate implies a higher stock return. However, there is a surprising international evidence that common stock returns and inflation are negatively related in the post-war period (for instance, Nelson, 1976). The relationship between stock returns and inflation systematically varies in time depending on the ratio of monetary demand and supply. Applying our model, we obtained a significant result: the growth of the inflation rate by 1% causes a rise in the MICEX by 1,84% on average per month.

The corporate bond index, as expected, has a positive effect on the MICEX dynamics. Historically, the bonds' return is lower than the return of stocks, and bond and stock compete for investors' funds. Thus, if the corporate bonds return increases, the stocks return must increase, so that stocks remain competitive. In our sample, a growth of corporate bond returns by 1% leads the MICEX excess return to increase by 1,33% on average per month. A similar effect is expected concerning the dividend yield: a high dividend yield should forecast a high MICEX return, thus this coefficient should be positive. In our model, the rise of the dividend yield by 1% leads to a 1,31% increase in the MICEX return on average per month. Our result corroborates the study of Fama and Kenneth (1989), which says, that stock and corporate bond returns change in the same direction, and dividend yields move in a similar way with the long-term business conditions.

Kinnunen (2013) concludes that the predictability of the Russian stock market return is high. He discovered, that the demeaned dividend yield is significant at 10% significance level (with estimated coefficient of 0,009) and excess oil return is significant at the 5% significance level (with the estimated coefficient of -0,257 respectively).

6.2 Out-of-sample results and the utility gains

Table 6 shows the MSFE values for the historical mean model and for the significant models (according to equations 4 and 5 in the methodology section). The MSFE value was calculated both for the 8 significant predictors and for the average forecast of significant industries, for the average forecast of significant macroeconomic indicators (excluding the oil price in USD, due to the fact that the estimated coefficient has an unexpected sign and, therefore, it is economic irrelevant as a predictor, as well as for the average forecast of all the 7 significant predictors. From table 6 we can see that every forecast (even the average forecasts) have a larger MSFE value than the model based on a historical mean. Therefore, we got only negative pseudo-R^2 for each forecast model, which implies, that all the prediction obtained from the models underperform the forecast based on the historical mean, in a mean-squared sense[10]. Note, that the metals and mining, chemicals industries and industries' average forecast have the best MSFE value (0,0028, 0,0030 and 0,0030 against 0,0025 of the historical mean model). The highest errors were observed in the forecast models based on the USD/RUB exchange rate and the general average forecast (both of 0,0045).

Table 6. Econometric out-of-sample results

	Variable	MSFE	Pseudo-R^2
	Mean model	0,0025	
1	Metals and mining	0,0028	-0,1030
2	Manufacturing	0,0041	-0,6251
3	Chemicals	0,0030	-0,1746
4	Average forecast (industries)	0,0030	-0,2009
5	Inflation rate	0,0036	-0,4098
6	Ex, return of cor. bond index	0,0040	-0,5837
7	Oil price Brent (norm., USD)	0,0034	-0,3402
8	Dividend yield	0,0033	-0,2945
9	Average forecast (macr. ind.)	0,0045	-0,7828
10	Average forecast (general)	0,0032	-0,2468

Table 7 presents the utility difference for a mean-variance investor with the risk aversion coefficient equal to five, as an economic measure of forecasting performance (calculated according to the equations 7, 9 and 11 in the methodology part). We are interested in the last two columns in the table that represent the net

[10] We have not computed the MSFE-adjusted statistic because all the models present a negative pseudo-R^2.

average benefit per month for an investor who uses the predictive model. The first utility difference was calculated between the average utility of derived model (the fraction of the investment in the stock market, in this case, was calculated according to equation 10 from the methodological section) and the average utility of the historical mean model. The last column was calculated as the difference between the average utility of the derived model and the average utility of an investor who fully contributes all his funds in the stock market. The last measure is positive for the metals and mining industry, the excess return of corporate bond index and the USD/RUB exchange rate. The chemical industry and the dividend yield were found the most economically attractive predictors, given that they have a positive utility difference on both columns. This indicator can be interpreted as the percentage of the investor's wealth, which he is willing to pay per month to have access to the model's predictions. For instance, a mean-variance investor with the risk aversion coefficient of five is willing to pay 0,091% of his wealth per month in order to use the predictive model based on dividend yield.

Table 7. Econometric utility gains results

	Variable	$\hat{\mu}_i$	Variance ($\hat{\sigma}_i^2$)	Utility	Utility diff. (mod-mean mod)	Utility diff. (mod-full stock mod)
	Mean model	0,967%	0,000006	0,966%		
	Full invested stock m-t model	1,179%	0,002615	0,525%		
1	Metals and mining	0,993%	0,000671	0,825%	-0,141%	0,300%
2	Manufacturing	0,551%	0,000322	0,470%	-0,496%	-0,054%
3	Chemicals	1,062%	0,000290	0,990%	0,024%	0,465%
	Average forecast (industries)	0,646%	0,000495	0,523%	-0,443%	-0,002%
4	Inflation rate	0,615%	0,000621	0,460%	-0,506%	-0,065%
5	Ex, return of corp. bond index	0,646%	0,000357	0,557%	-0,409%	0,032%
6	USD/RUB (norm.)	1,083%	0,001676	0,664%	-0,302%	0,139%
8	Dividend yield	1,086%	0,000116	1,056%	0,091%	0,532%
9	Average forecast (macr. ind.)	0,098%	0,000761	-0,092%	-1,058%	-0,617%
10	Average forecast (general)	0,568%	0,000500	0,443%	-0,523%	-0,082%

Pettenuzzo et al. (2014), similarly to our research, presented the economic performance of portfolios based on out-of-sample return forecasts using a coefficient of risk aversion of five. They found a negative utility difference both for the model based on log dividend yield (-0,26%) and for the model based on inflation (-0,09%).

Therefore, evaluating the utility difference, which represents the economic gains that can be obtained by an investor who uses the model to choose the fraction of wealth to invest in the stock market, we obtained 5 models that outperform a strategy that fully invests in the stock market. Whereas the pseudo R-squared out-of-sample, as a statistical measure of performance, presents negative results for all estimated models. Therefore, we may conclude that the models underperform the forecasts based on the historical average at the statistical level.

The general conclusion of our study is similar to the conclusions of many other studies. It is really difficult to predict the stock market movement. Using separately only any conventional macroeconomic indicator or industry portfolio as a predictor, not many of them present predictive abilities. Furthermore, applying the predictive models based on traditional methods (such as predictive linear regression) without additional constraints or conditions and techniques, in general, derived predictive regression forecasts based on these predictors fail to outperform the historical average out-of-sample.

7 Conclusion

The Russian stock market is relatively young. It began its functioning in the 1900s, but due to the economic and social tensions in Russia, most of the trading started only with the beginning of the 2000s. The remaining 17 years covered two major economic crises. The Russian stock market is still characterized by problems such as high volatility, low investment attractiveness and activity, high commodity dependence. In general, the Russian stock market is still characterized as emerging, and the latest trend of the market movement has been negative. In this regard, the question of proper equity premium forecasting of Russia is very important, because this may stimulate an investors' expected return growth and raise the investment activity in the market as a whole.

After reviewing the economic literature concerning the stock market forecasting, we can conclude that there are many approaches and studies of this issue. There are two main opposing viewpoints, one of them says that there are certain indicators that predict the future stock market return under certain conditions. The opposite opinion states that the stock market prices are already adjusted for all currently available information, therefore the future stock price is unpredictable.

Regarding the Russian stock market, most of the authors conclude that the impact of oil prices on the Russian stock market performance is weak and not regular. Moreover, some authors find the oil price is not a significant predictor after 2006. Many authors also prove the dependence of the Russian stock market on foreign exchanges, such as the U.S. or Germany.

So far the most common method that has been used to test stock return predictability is the linear regression, estimated by OLS. Therefore, this was the approach used in our study. We analyzed data on Russian stock market over the period from 31.01.2008 to 31.01.2017 in the in-sample analysis, we examined 9 industry indices of Russia, and 8 macroeconomic indicators as predictors. We found 3 out of 9 industries, and 5 out of 8 macroeconomic indicators are significant predictors. Among the significant predictors, all (with the exception of oil prices in USD) have a positive impact on the MICEX.

However, through the out-of-sample analysis (the last three observed years), we found that all models, based on significant predictors, have larger MSFE than the historical mean model (that is a negative pseudo-R^2). That implies, that the prediction models underperform forecast based on the historical mean.

In our study, we also evaluated the utility gains of using the predictive models for a mean-variance investor. We calculated the difference between the average utility obtained by the investor who makes a decision based on the predictive model and the historical average model. We found positive utility gains for 2 out of 9 models (based on, the chemicals industry and the dividend yield).

Our results are partly caused by the difficulty of stock market forecasting, in general, and by the problems inherent in the Russian stock market (described in section 3). Due to the lack of available data, we were forced to analyze a small time period in this study (our full sample is 10 years long, against the 20 years of the full sample and 10 out-of-sample in most of the other studies). Therefore, the lack of data, as well as the high market volatility and uncertainty associated with political and economic shocks may be partly responsible for the lack of predictive ability that we found in the out-of-sample period.

Thus, we plan to improve this study further in the future by applying other approaches of stock market prediction, as well as by expanding the range of predictive indicators.

References

Anatolyev, S. (2008) “A ten-year retrospective of the behavior of Russian stock returns” *Research in International Business and Finance.* 22(1), 56-67.

Avramov, D. (2002) “Stock return predictability and model uncertainty” *Journal of Financial Economics*. 64(3), 423-458.

Campbell, J. Y. (1987) “Stock returns and the term structure” *Journal of Financial Economics.* 18(2), 373-399.

Campbell, J. Y.; Thompson S. B. (2008) “Predicting excess stock returns out of sample: Can anything beat the historical average? “ *Review of Financial Studies*. 21(4), 1509-1531.

Data of the OECD “Official website of the OECD” https://data.oecd.org [10 March 2017].

Data of the IMF “Official website of the IMF” http://www.imf.org/en/data [12 March 2017].

Federal State Statistic Service “Official website” http://www.gks.ru [15 March 2017].

Fama, F.; Kenneth, R. (1989) “Business conditions and expected returns on stocks and bonds” *Journal of Financial Economics*. 25 (1), 23-49.

Ferreira, M. A.; Santa-Clara, P. (2011) “Forecasting stock market returns: The sum of the parts is more than the whole” *Journal of Financial Economics*. 100(3), 514-537.

Govorkov, B.; Gusev, M.; Kroujiline, D.; Sharov, S.; Ushanov, D. (2016) “Forecasting stock market returns over multiple time horizons” *Quantitative Finance*. 16(11), 1695-1712.

Goyal, A.; Welch, I. (2008) “A comprehensive look at the empirical performance of equity premium prediction” *Review of Financial Studies*. 21(4), 1455-1508.

Hong, H.; Torous, W.; Valkanov, R. (2007) “Do industries lead the stock market?” *Journal of Financial Economics*. 83, 367–396.

Indices of bond market “Financial Cbonds” http://cbonds.ru/indexes [20 April 2017].

Ivanter, A.; Peresetsky, A. (2000) “Interaction of the Russian financial markets” *Economics of Planning*. 33, 103-140.

Jalolov, M.; Miyakoshi, T. (2005) “Who drives the Russian financial markets?” *The Developing Economies*. 43(3), 374-395.

Kinnunen, J. (2013) “Dynamic return predictability in the Russian stock market” *Emerging Markets Review*. 15, 107-121.

Kong, A.; Rapach, D.; Strauss, J.; Tu, J.; Zhou, G. (2009) “How predictable are components of the aggregate market portfolio?” *Working paper of the Chian School of Business at Institutional Knowledge*, Singapore Management University.

Korhonen, I.; Peresetsky, A. (2013) “What determines stock market behavior in Russia and other emerging countries?” *Discussion Papers of Bank of Finland 4*, BOFI.

Kutan, A.; Hayo, B. (2005) “The impact of news, oil prices, and global market developments on Russian financial markets” *Economics of Transition*. 13(2), 373-393.

Maio, P. (2012) “The "Fed model" and the predictability of stock returns” *Rewiev of finance*. 17(4), 1489-1533.

McCraken, M. W. (2007) “Asymptotics for Out-of-Sample Tests of Causality” *Journal of Econometrics*. 140 (2), 719-752.

Moscow Exchange indices “Official website of the Moscow exchange” http://moex.com/en/indices [15 April 2017].

Neely. C. J.; Rapach, D. E.; Tu, J.; Zhou, G. (2014) “Forecasting the Equity Risk Premium: The Role of Technical Indicators” *Management Science*. 60(7), 1772-1791.

Nelson, C. R. (1976) “Inflation and rates of return on common stock” *Journal of Finance*. 31(2), 471-483.

Nyberg, H.; Pönkä, H. (2015) “International sign predictability of stock returns: The role of the United States”. *Research paper of the Department of Economics and Business Economics*, Aarhus University.

Pettenuzzo, D.; Timmermann, A.; Valkanov, R. (2014) “Forecasting stock returns under economic constraints” *Journal of Financial Economics*. 114(3), 517–553.

Pönkä, H. (2014) “Predicting the direction of US stock markets using industry returns”. *Discussion Papers of the Helsinki Center of Economic Research*, University of Helsinki.

Rapach, D. E.; Mark E.; Rangvid, J. (2005) “Macro variables and international stock return predictability” *International Journal of Forecasting*. 21(1), 137-166.

Rapach, D. E.; Strauss, J. K.; Zhou, G. (2010) “Out-of-sample equity premium prediction: Combination forecasts and links to the real economy” *Review of Financial Studies*. 23(2), 821-862.

Rockinger, M.; Urga, G. (2000) “The Evolution of stock markets in transition economies” *Journal of Comparative Economics*. 28(3), 456-472.

Statistics of the Central Bank of the Russian Federation “Official website of the CB” http://cbr.ru/Eng/statistics [18 March 2017].

Stock Markets Analysis “Investing.com” https://www.investing.com/analysis/stock-markets [15 February 2017].

Thomson Reuters: Database Thomson Reuters Eikon [10 February 2017].

Uhl, M. W. (2011) “Reuters sentiment and stock return”. *Working paper of the KOF Swiss Economic Institute*, ETH Zurich.

World Federation of Exchanges “Official website of the” https://www.world-exchanges.org [25 February 2017].

Appendix

Figure 3. Dynamics of indices of RTS and MICEX 2006-2016[11]

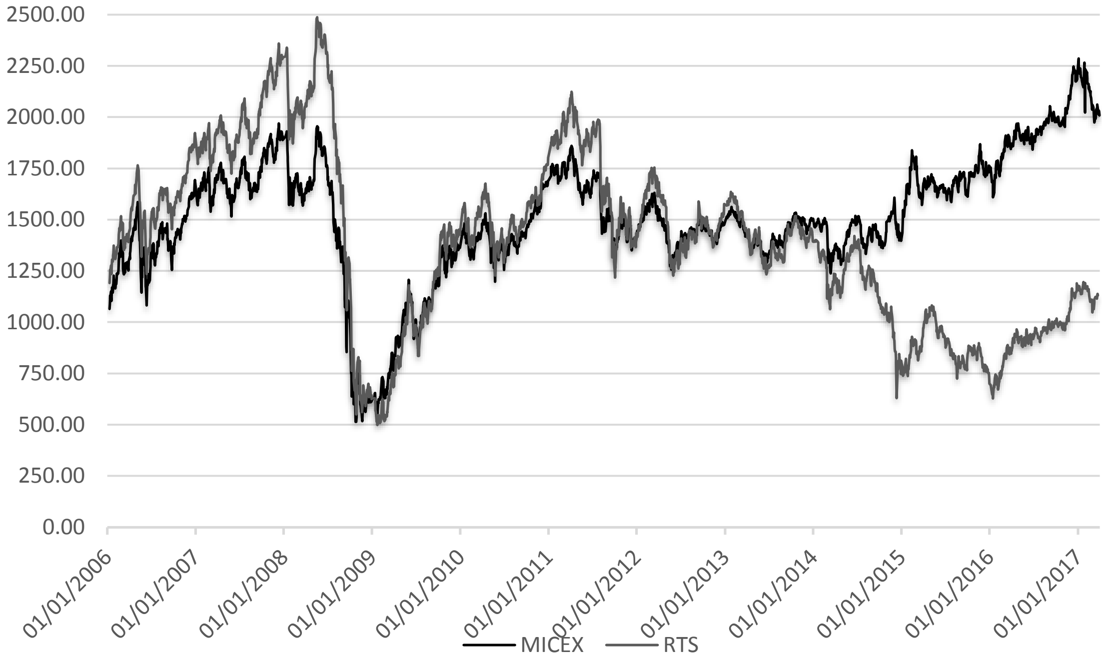
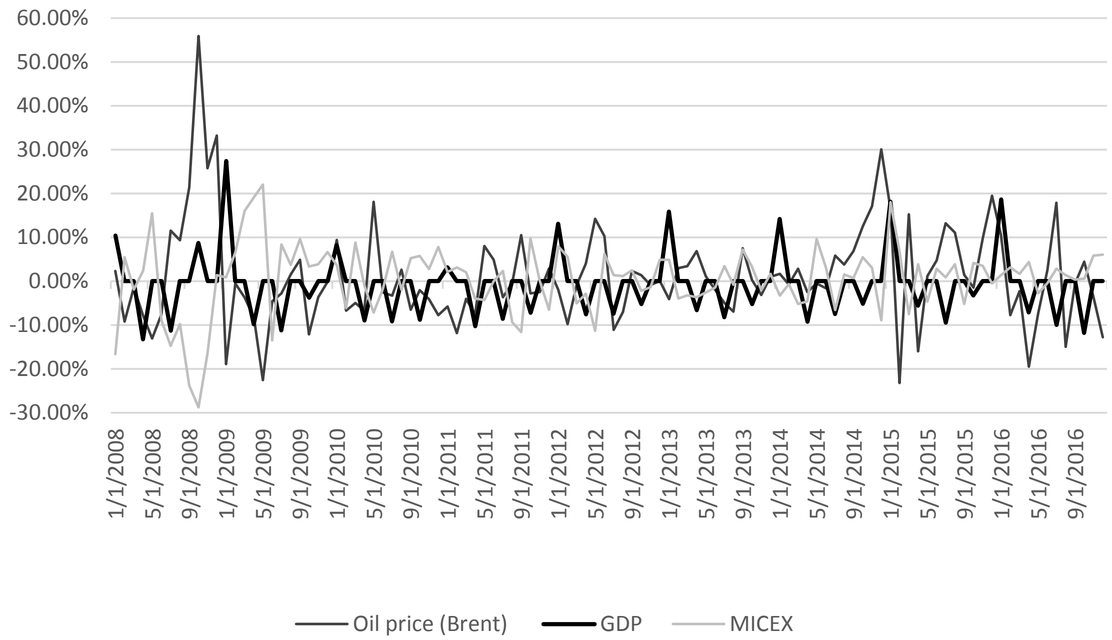


Figure 6. Dynamics of differences of GDP, prices of Brent and MICEX 2008-2016[12]



[11] Calculations based on data source http://moex.com/en/indices

[12] Calculations based on data sources http://www.gks.ru and http://www.imf.org/en/data

Figure 8. Scatterplots between the level of the MICEX and the FTSE 100, the S&P 500 and the Nikkei 225 rates of return over the period from April 2001 to April 2017[13]

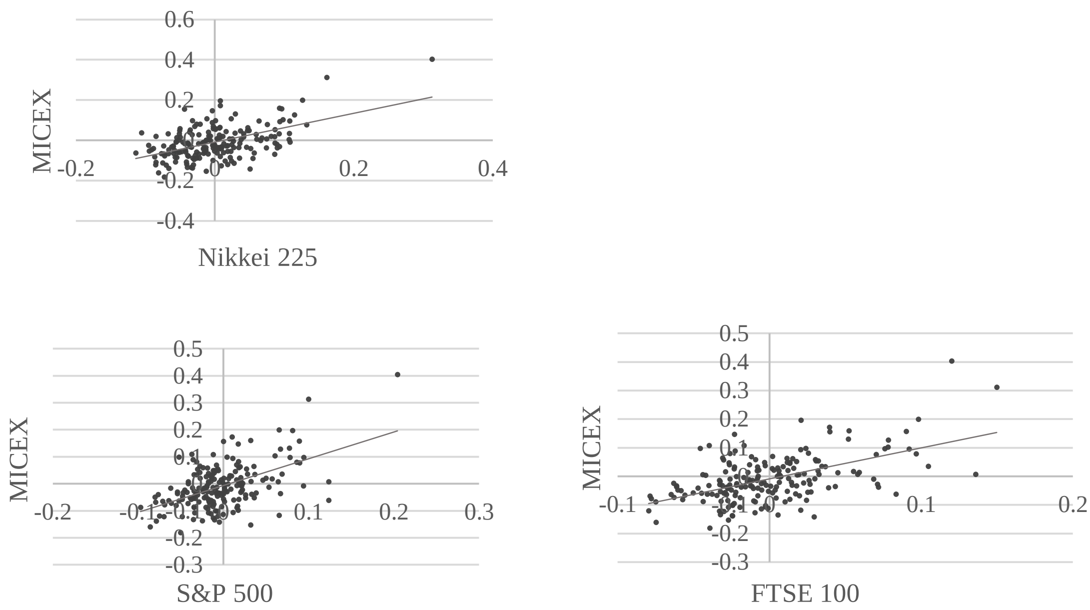
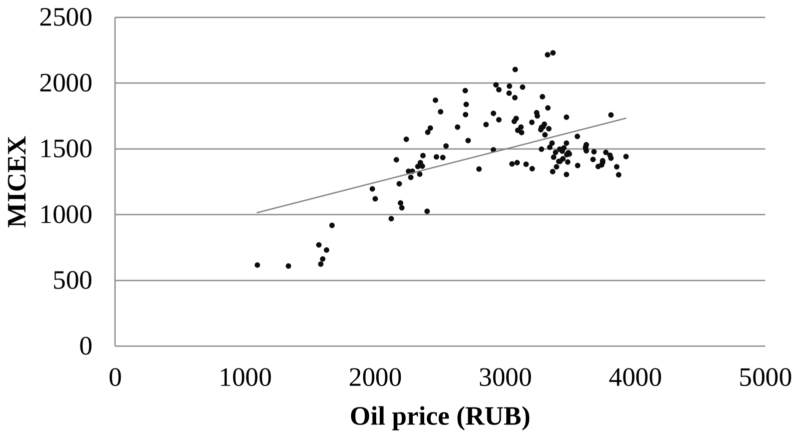


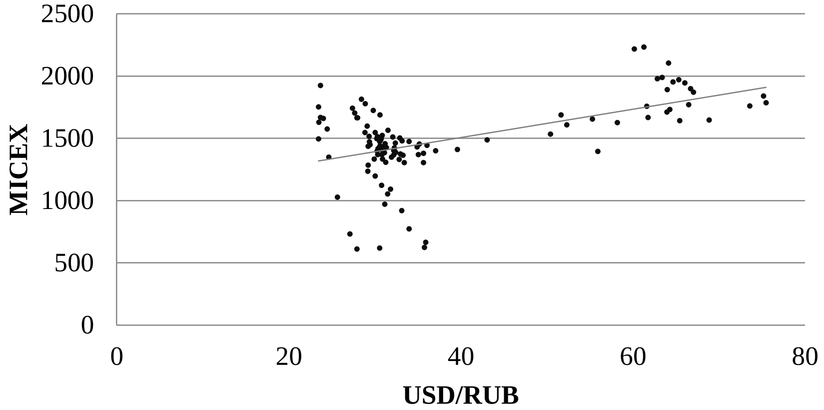
Table 3. Correlation coefficients between the MICEX and some indicators

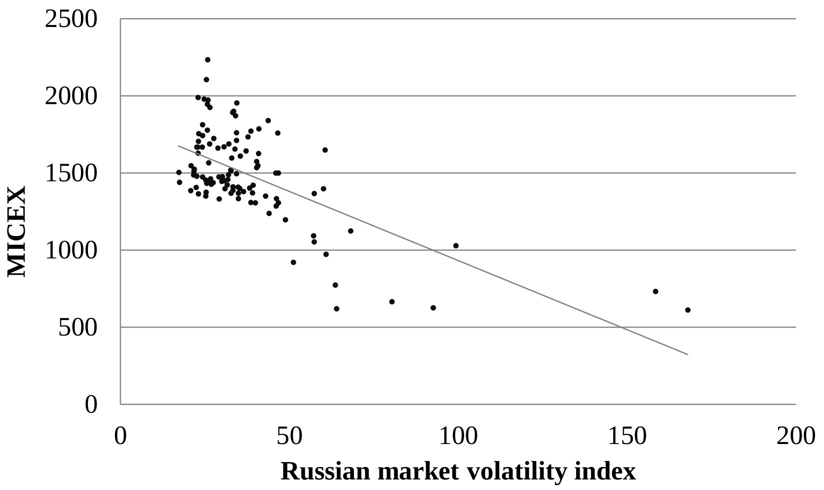
Variable	Correlation coeff. b/n MICEX and variable	Variable	Correlation coeff. b/n MICEX and variable	Variable	Correlation coeff. b/n MICEX and variable
Oil price (Brent) (USD)	-0,01	Manufacturing	0,46	Bond Yield spread	0,28
Oil price (RUB)	0,51	Financials	0,91	USD/RUB	0,53
Oil and gas	0,86	Consumers goods and services	0,79	USD/RUB (normalized)	-0,29
Electric utilities	0,20	Chemicals	0,84	Russian market volatility index	-0,66
Telecoms	0,56	Transport	0,27	Dividend yield	-0,71
Metals and mining	0,78	Inflation rate	-0,09	Corporate bond index	0,71

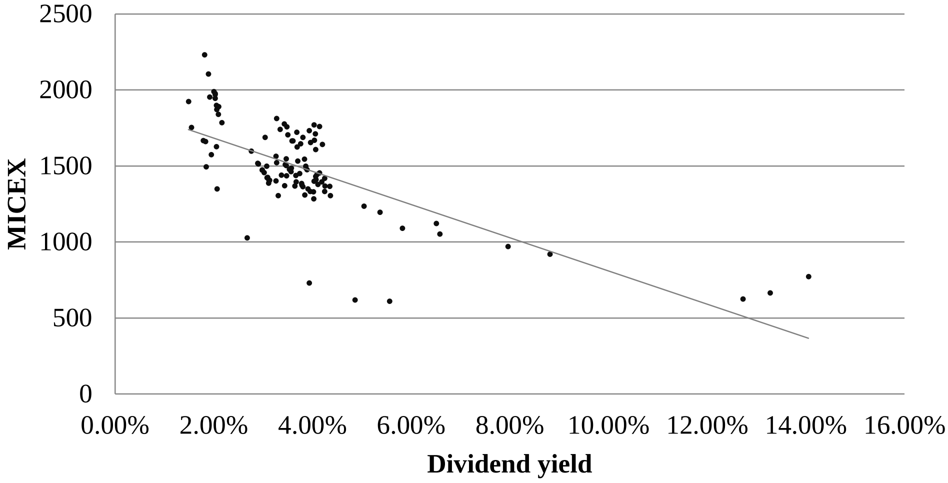
[13] Calculations based on data source https://www.world-exchanges.org

Figure 9. Scatterplots between the MICEX and some indicators

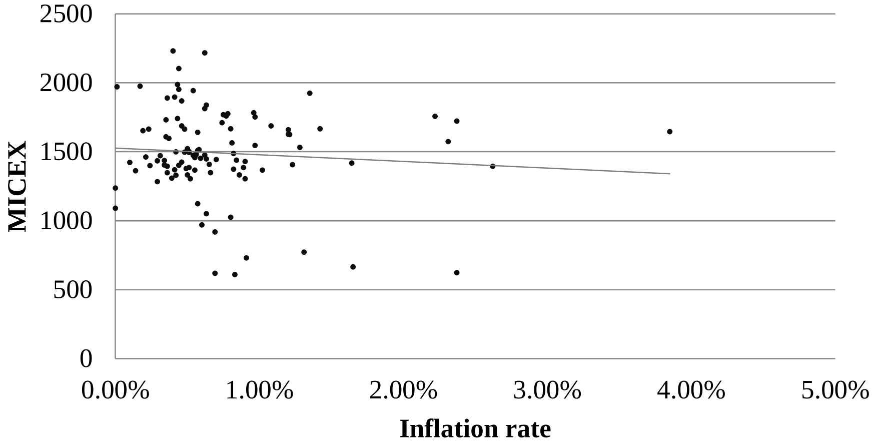




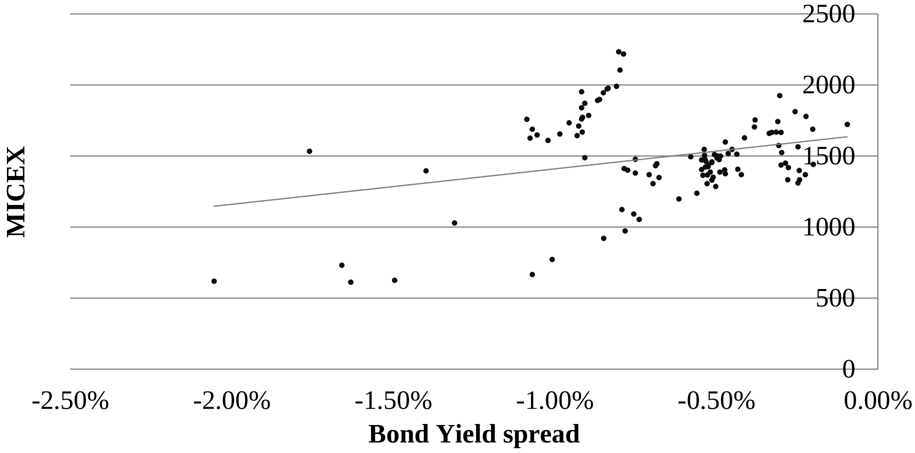




2500
2000
1500
1000
500
0
MICEX
0.00%
2.00%
4.00%
6.00%
8.00%
10.00%
12.00%
14.00%
16.00%
Dividend yield



2500
2000
1500
1000
500
0
MICEX
0.00%
1.00%
2.00%
3.00%
4.00%
5.00%
Inflation rate



MICEX
2500
2000
1500
1000
500
0
-2.50%
-2.00%
-1.50%
-1.00%
-0.50%
0.00%
Bond Yield spread