Is Moscow Stock Exchange Sufficiently Liquid?
The Evidence from Cross-Listing

By

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Abstract

The paper investigates the liquidity of Moscow Stock exchange, analyzing its dynamics for the period from 2006 to March, 2012. To reach the stated goal, cross listed stocks traded in Russia and in London as depositary receipts were taken into the model for OLS estimation. From the one hand, our findings show statistically significant local effects that determine returns for stocks in Russia and in London, allowing for persistent arbitrage on two markets. From the other hand, the results represent that Russian market is not integrated enough in the global financial market. Both of them have several implications for financial market policy authorities. Firstly, more professional arbitrageurs should be on the market to make it integrated and to equalize the prices. Also, policy authorities should think of attracting more foreign investors to Russia. Moreover, over time the situation does not become better, which calls for immediate attention to the problem of illiquidity of the Moscow Stock Exchange.

Keywords: emerging markets, stock exchange, liquidity, cross listing

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List of abbreviations

ADR – American depository receipts

CBR – Central Bank of Russia

GBP – Great Britain Pound

GDR – Global depository receipts

ISIN – International Security Identification Number

LSE – London Stock Exchange

MICEX – Moscow Interbank Currency Exchange

RTS – Russian Trading System

RUR – Russian Ruble

Introduction

In 2008 the president of Russia, Dmitry Medvedev announced an innovative strategic plan to create an International Financial Center in Moscow. One of the priorities to achieve the goal was the development of the Moscow Stock Exchange and the merger of the two exchanges existing before, which took place in 2011.

The goal of this paper is to analyze the liquidity of Moscow Stock Exchange using the OLS model of cross listing Russian stocks on London Stock Exchange. Cross listing is an advantageous method for analyzing liquidity because it does not take into account any specific stocks' shocks, while accounting for the features that matter on both markets only. The baseline model for the research is Froot and Debora's paper (1997) that is relevant for the purpose of our research due to its inclusion of the main local factors such as local indexes and currency exchanges. However, we extended the model by adding VIX index because there are independent effects of currency exchange and VIX index separately. The choice of LSE for the model can be explained by the fact that, according to The Bank of New York, Russian companies issue depositary receipts mostly on LSE. Moreover, there is a problem of "issuers' migration" from Russian exchange to London exchange: Russian companies chose doing their IPOs in London instead of Russia, together with outflow of trading activity on LSE. The findings of our paper show that local indexes, currency exchange rate, and the expectations of investors are important determines of price return differentials. So-called "local effects" are larger for largely-capitalized stocks on those markets where the company is traded more actively, accounting for larger comovement of return differentials with markets' indexes. Exchange rate is more significant for small stocks showing comovement between Russian currency and returns of Russian stock relative to London. After the crisis, the market does not tend to improve; instead, the model seems to describe movements of the

returns better, leaving less place for randomness. Expectations' volatility becomes more significant over time, which was expected because after and during the crisis investors became more risk averse and their expectations influence returns differentials.

Thus, the importance of the paper is obvious first of all for policy implications: now, whilst creating policy for Moscow Stock Exchange it is crucial to know how liquid it is today in order to pursue further changes in its policy and regulations. Moreover, there are only few studies about cross listing through issuing Russian depositary receipts: Smirnova's (2004) and Jithendranathan's (2006) papers are the most relevant for this research. Their researches are different in several aspects. Smirnova used a GARCH model and found negative abnormal returns on the day of cross listing and several days after. Jithendranathan used a model of dividing underlying Russian stock's price to its depositary receipts in the US and found no arbitrage between them. Due to several limitations, namely old data, exclusion og actively traded stocks, and the simplicity of the models, which will be discussed in Chapter 2, they can be used only for historical analysis of the part, not for policy implications nowadays.

In other words, the model shows the possibility of persistent arbitrage, which is consistent with Scleifer and Vishny's model (1997). To improve the situation policy authorities should pursue measures for attracting both domestic and foreign investors on the exchange. One of the solutions is to lower the government share in the ownership structure of largest companies, which accounts for 27% of MICEX Index that is USD 432 million of the most liquid stocks that could be traded instead of being in the government's hands.

The structure of the paper is the following: firstly, the current situation on the Russian and London exchanges will be presented in order to give the overall picture of both markets nowadays. Important to note that recently, at the end of 2011, the two largest Russian

exchanges, MICEX and RTS, were merged, which has several consequences analyzed in the first chapter. Then, since cross listing was selected as a way to measure the liquidity of Russian Exchange, the literature review on cross listing will be presented for developed countries and for developing economies as well to analyze why companies do cross listing and how other economists measure the advantages and disadvantages of cross listing. There is plenty of literature for developed countries because their exchanges have a longer history and experience, while only few researchers pursued in last few years are available for emerging markets, especially for Russia. The paper closes with our model, its results, their explanations and relevant policy recommendations.

Chapter 1. Current situation on the markets

The goal of this chapter is to present both markets, to analyze their structure and specific features in order to have an overview about the exchanges that we analyze. Firstly, Russian exchanges' merger is studied, then the current situation of depository receipts on LSE introduces the way companies do cross listing there. The chapter finishes with an overview and statistical data of Russian ADRs in London, which explains the choice of exactly LSE for the research.

1.1. Russian stock exchange MICEX

In the globalization period each transition country is faced with a choice: either to stay away from competing with already settled global leaders or to intervene and try to get its own competitive position. Currently, Russia, in its attempts to restore its leading position in the world in different aspects, has chosen the latter alternative: in late 2008 the president of Russia, Dmitry Medvedev, first publicly announced the target to make Moscow a global financial center. Now the creation of International Financial Center in Moscow is now on the main agenda of financial and economic strategy of Russia.

In the concept of a global financial center, financial market policy authorities decided to make a merger of two Russian exchanges: Russian Trade System (RTS) and Moscow Interbank Currency Exchange (MICEX) which took place on December 19, 2011.

First of all, there is a reasonable question concerning the initial existence of the two different exchanges in Russia together with their differences and similarities. Let us firstly analyze how these exchanges were functioning before the merger. RTS was established in 1995 as the first regulated stock market in Russia, now trading the full range of financial instruments from cash equities to commodity futures. In 2001 options and futures started to be traded, in 2008 the merge of clearing centers of RTS occurred and in 2010 RTS Exchange

Europe Limited was created as a representative of RTS in Europe. Today RTS consists of several products:

- RTS Standard - an equity market for the most liquid Russian securities characterized by absence of 100% asset depositing;

- RTS Classica - the only trading platform in Russia that allows for settlement in both rubles and foreign currency. RTS Classica is equally accessible to both Russian and foreign investors. Over 500 securities are trading on this market;

- FORTS - futures and options market with ruble settlement traded since 2001. Today, 47 contracts are offered on shares of Russian companies, bonds, short term interest rates, currency, RTS Indices, oil, oil products, metals and sugar. In 2010 this branch of RTS held the first place in the world according to the trade volume of futures contracts.

RTS exchange had its own indicators – indices depending on the industries and regions. For the first time RTS Standard Index was calculated on September 1, 1995 and it is generally considered to be the overall indicator for Russian securities market. 50 of the most liquid and highly-capitalized securities were selected to consist RTS Index. To limit the impact of stocks of individual issuers on the RTS Indices, the proportion of each issuer's securities in the total market capitalization was capped at a certain maximum allowed level.

The structure of RTS Index can be represented in Figure 1. The oil & gas issuers account for more than 47% of the total capitalization of the index. However, companies representing other sectors have been strengthening their positions lately. Other large-weight industries reflected in the RTS Index are the banking & finance and the metals & mining sectors. The electric utilities sector accounts for about 8%, whereas the chemical industry sector makes up roughly 4% of the RTS Index capitalization. In 2010, the RTS Index

increased by 22.5% (or by 325.7 points). The positive effect leaders were ordinary shares of MMC NORILSK NICKEL, Sberbank, NOVATEK, Uralkali and Gazprom. These constituents taken together moved the RTS Index 182 points up which accounts for more than 50% of the total growth (RTS, 2011).

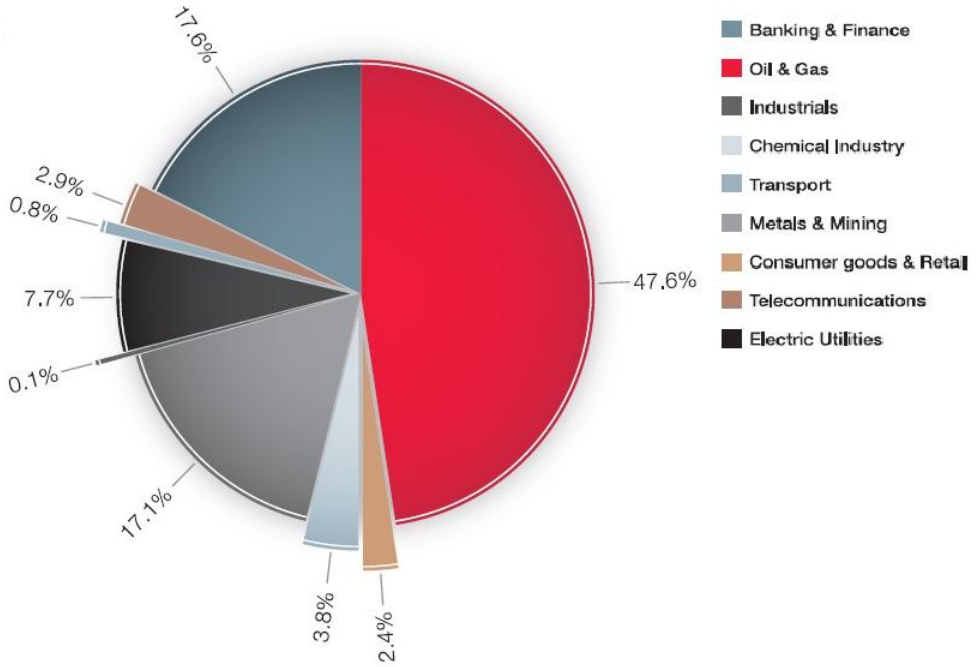


Table 1. RTS Index structure by sectors of economy (December, 2011)

Source: RTS website

MICEX Group, the other exchange, was established in 1992 as a result of agreement among leading commercial banks, Central Bank of Russia (CBR), Moscow government, and the Association of Russian Banks, the main goal of which was the initiative to start operating in purchase-sale of foreign currencies for Russian rubles. MICEX creation was one of the first steps in forming the infrastructure of the Russian financial market. In May 1996 CBR gave up the official mechanism of pegging of Russian currency to MICEX rate. The MICEX Group currently includes several companies that perform their services using a unified technological platform: MICEX Stock Exchange CJSC (the leading Russian stock exchange, which holds trading in shares and bonds of hundreds of leading Russian issuers every day), the MICEX Settlement House, National Depositary Center, National Commodities Exchange, National

Clearing Center, regional exchanges, etc. The group's companies provide trade, settlement-clearing, and depositary services to about 1,500 leading Russian organizations - participants in the exchange market both in Moscow and in large financial-industrial centers of Russia.

MICEX has a similar index' scheme as RTS (Figure 2), in addition to the main MICEX Index, the MICEX Stock Exchange offers the MICEX 10 Index, measuring the average price change of the 10 most liquid stocks traded on the Exchange. MICEX index structure also seems to be similar to that of RTS' - as we can see from Figure 2, the significant part of the index is represented by oil and gas sector; thus, RTS Index should correlate somehow with the oil price– the price is up (or futures for oil), the index is also up. The most weight to the Index belongs to Gazprom (15%), Lukoil (14,91%), Sberbank (13,85%), Nornikel (8,53%), and Surgutneftegas (5,38%).

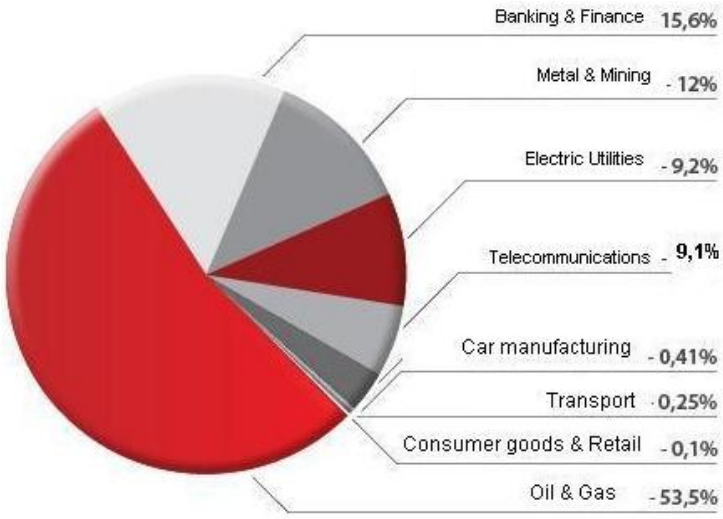


Figure 2. MICEX Index structure by sectors of economy (December, 2011)

Source: MICEX website

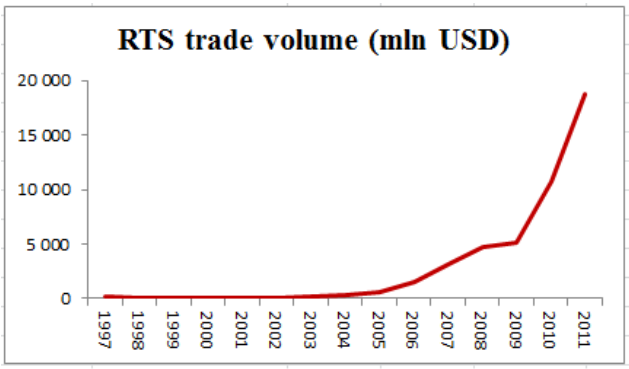
The difference between these two indexes is that RTS Index is based on the stock prices denominated in US dollars, while MICEX Index is in Russian rubles. Thus, the dynamics of RTS Index is influenced by the changes in the changes of US Dollar exchange rate – if USD depreciates, RTS Index appreciates by the same magnitude, mispresenting the real price

change of securities. Secondly, RTS Index is calculated on the basis of 50 securities, while MICEX Index covers 30 securities; this is the advantage of RTS Index – it shows more reliable and wider information. Generally, the trade volume in MICEX is much higher than that of RTS (see the graph), which makes MICEX Index more representative in the sense of market dynamics.

Aside from exchanges' indices and trade volumes, the exchanges were quite different in several aspects. First of all they have different complicated structures, technical indicators, and composition of shareholders. For example, MICEX' major shareholder is Central Bank which holds 30% of ownership, while the ownership of RTS is free from the government.

Generally speaking, RTS is a country leader in derivatives trading, while MICEX is a leader in stocks, bonds, and currency trading. This can be supported by the statistical data from 2010: on MICEX the trade volume of stocks was 13,3 billion RUR, bonds – 10,5 billion of RUR, and currency – 79,5 billion RUR, while on RTS – stocks – 3,1 billion RUR, derivatives – 29,3 billion RUR. MICEX stock exchange is much larger than that of MICEX – 11, 2 billion RUR versus 3,1 billion in RTS in 2010 (RTS and MICEX official websites).

The process of the merger started at the end of 2010 when first negotiations took place. In February 2011 board of directors began to work out the exact procedures for the merge, and on June 29, the final agreement concerning the merger was signed. Taking into consideration much larger size of MICEX, the idea of acquiring RTS was obvious (Figure 3). RTS' value was estimated USD1,15 billion, MICEX – three times more expensive than RTS. As was negotiated, 35% of stocks will be paid out in cash and the rest is in new merged stock exchange shares. By 2013 it is planned that the new joint exchange will do IPO, and according to experts' estimates, its capitalization already exceeds $4,5 billion (Forbes News, 2011)



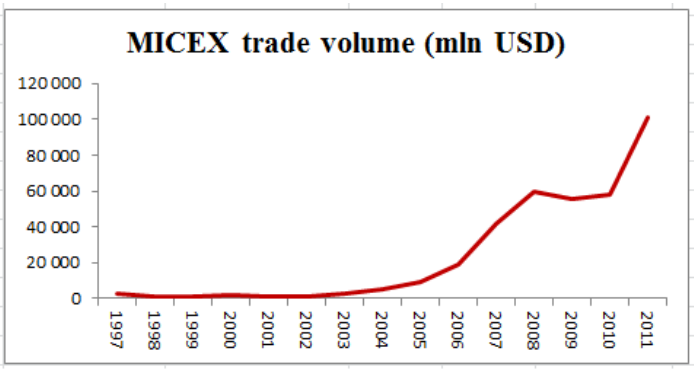


Figure 3. RTS and MICEX trade volume

Source: MICEX-RTS website

Such an event will certainly have an impact on different spheres of economic and financial life of Russia. However, it is not easy to say that this will cause only positive effects; that is why there is a necessity to analyze this issue more closely. Firstly, it is reasonable to look at the perspectives of the new exchange among its competitors from other developing markets. According to the table below, this new Russian exchange is supposed to be the most integrated among them, offering all the variety of the instruments, comparing with Warsaw, Shanghai, Hong Kong, and Brazilian exchanges (Table 1).

Table 1. Comparative analysis of financial products on Emerging markets exchanges

	MICEX-RTS	HKE (Hong Kong)	BM&F Bovespa (Brazil)	Warsaw Stock Exchange	Schanghai Stcok Exchange
Stocks	+	+	+	+	+
Bonds	+	+	+	+	+
Currency	+		+		
Derivatives	+	+	+	+	
Commodities	+	+	+		
Clearing and depositary services	+	+	+	+	+
Informational services	+	+	+	+	+

Source: personal analysis from the data on WFE, 2011

Although this range of financial instruments seems to be a great advantage, this is not the case. As the research The Great Game (Z/Yen Group) shows, the specialization of the financial center can be either broad (the full specter of services in London) or narrow (as Switzerland banking services), but the specialization may determine the exact path of

development. In Russia there is no such narrow specialization for now, there are just propositions of wide financial services both in financial sector and on the exchange. One of the perspectives in this direction can be privatization. When financial market grows, privatization transactions will take place, especially in Russian privatization – huge transactions' potential in the worldwide context: about USD 200 billion (Guriev, 2011). Beside exchange development, the banking sector can be developed extensively – the current financial sphere is so underdeveloped that the growth can be huge.

Moreover, taking the specializations of exchanges in more detail, 90% of world trade of metals and 70% of international bonds are concentrated in London, for example, or New York has a great competitive advantage in stocks trades because of the huge size of domestic stock markets the center of which is Wall Street. Some experts say that the largest potential to grow for MICEX-RTS is a derivative market, which will help Russia to exploit fully its advantages in having many raw resources and the opportunity to trade them in Russian currency. Also, comparing the trade volume of derivatives with Brazil, Germany, China and US (Table 2), we can obviously see that the potential for growth is huge, especially concerning Stock and Percentage Derivatives:

Table 2. Derivatives' market in different countries

Share of GDP	Russia	China	Brazil	Germany	US
Derivatives on index	0,3	0,9	0,4	5,7	3,9
Derivatives on stocks	0,1	0	0,6	0,1	0,6
Derivatives on currency	0,1	0	2,1	0	1,4
Commodity derivatives	0	1,8	0	0	0,4
Percentage derivatives	0	0	5	18	51

Source: World Federation of Exchanges

According to the statistics, the derivative market in Russia is developing very well (in 2010 RTS was among 10 biggest exchanges in derivatives' trades), but the total value stays at the considerable low level comparing with Russia's GDP, while in the UK and USA this

number exceeds their GDP more than 10 times (Zdenek, 2012[1]). However, the risk is that derivatives markets for export prices are already well-established (USA – CBOE, CME; London – London Petroleum Exchange, London Metal Exchange, London Gold Exchange) and it will be too difficult for Russia to be an equal competitor being a new player. Rather, there is no domestic derivative market, because all oil is concentrated in the hands of large vertically integrated companies. Thus, we need antimonopoly laws, and as a result, these oil companies will get investors who will be interested in innovations in oil production and the creation of market prices. When this happens, Russian raw resources' exchanges will have large demand and the domestic prices for oil will not be something mystical. In addition, as a result of regression the share of stock trading relative to GDP against GDP per capita, we can demonstrate that there is a huge potential for a new exchange to increase its stock share of trade to the existing level of GDP per capita (Figure 4).

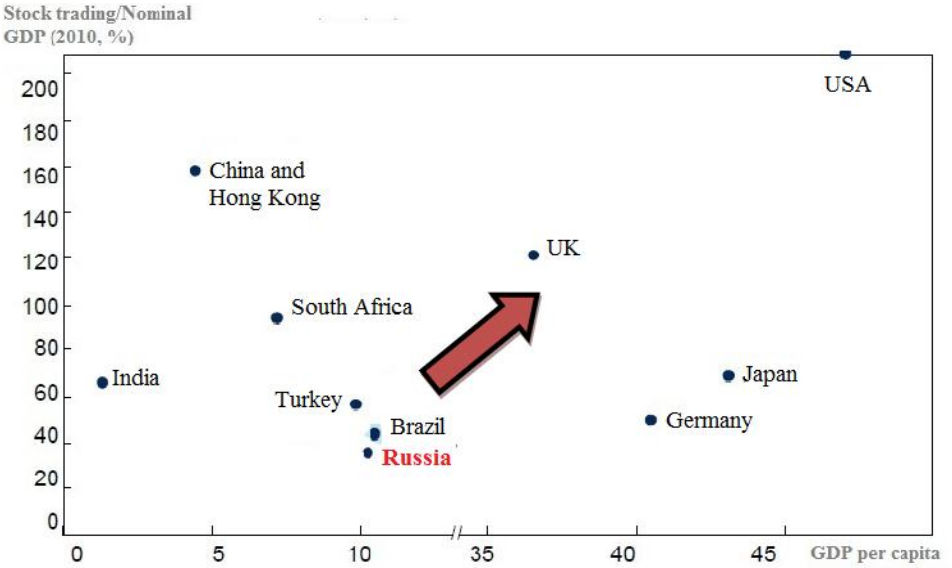


Figure 4. Potential for growth for Russian Exchange

Source: Zdenek (2012)

In addition, there seems to be a real broadening of the clients because before the merger there were 622 investors on MICEX and 194 – on RTS, among which 178 investors who

[1] - Komsomolskaya pravda Newspaper, http://usa.kp.ru/daily/25835/2808815/, in Russian

traded on both these exchanges (91% from RTS and 28% from MICEX) – so, the pool of investors is extended – for those RTS investors who did not access MICEX before the merger there is a special discounted fee for that – just 30 USD instead of the requirement of 1 USD million initial capital (MICEX, 2011).

Looking at the financial results of the new merged exchange, its profits for the first half of 2011 increased 4.5 for MICEX and 2 times for RTS year-on-year. MICEX reports a net profit of RUB5.5 billion, the net profit of RTS for the same period reached 353.8 RUB million. Financial market experts believe that the net profit of the integrated exchange may exceed 500$ million by 2015, and its revenue may amount to more than 850$ million[2].

Analyzing the negative perspectives, the existence of two different exchanges with different set of financial instruments and in different currencies helped to reduce the risk of fluctuation caused by external shocks – this is extremely important in the context that Russia is still among the developing countries. To demonstrate the problem more clearly, here is the chart that summarizes the argument:

Table 3. How Russian market reacts on currency change

	USD depreciates	USD appreciates
Market goes down	MICEX	RTS
Market goes up	RTS	MICEX

Source: RTS Analytic Research Center

These data is supported by RTS Analytic Research Center who claims that when the market and the USD exchange rate move in opposite directions, then the trades operate mostly on RTS to provide the market with stability, while when USD exchange rate and market move in the same direction, it is rational to trade mostly on MICEX. Thus, to increase the stability

[2] - Kommersant News (2011), http://www.kommersant.ua/doc-rss/1852611 (in Russian)

of the Russian stock exchange against external crisis risks, there should be at least two exchanges and the more different financial securities they have, the better for overall stability. Thus, a merger of exchanges is likely to lose such a comparative advantage of our financial economy.

In general, as we see on the Table 4 below, Russian exchange in 2011 was among 10 biggest exchanges of European and emerging markets in market capitalization – that is certainly a good result to start with.

Table 4. European largest capitalized exchanges (2011)

	Exchange	Market capitalization (USD, million)
1	London SE Group	3 266 418
2	NYSE Euronext (Europe)	2 446 767
3	Deutsche Börse	1 184 500
4	SIX Swiss Exchange	1 089 519
5	BME Spanish Exchanges	1 030 988
6	NASDAQ OMX Nordic Exchange	842 101
7	Johannesburg SE	789 037
8	**MICEX -RTS Exchange**	783 555

Source: WFE Reports

1.2. London Stock Exchange and its depositary receipts

London Stock Exchange (LSE) is one of the leading exchanges in the world. It is comprised of two different stock markets: the Main Market and the Alternative Investment Market (AIM). The Main Market is solely for reputable companies with high performance, and the listing requirements are rather strict. Approximately 1,800 of the LSE's company listings trade on the Main Market, and the total market capitalization is over 3,500 billion (LSE, 2012). The Alternative Investment Market on the other hand trades small-capitalized or new enterprises with high growth potential. Over 1,060 companies list on this market, with a total capitalization of 37 billion[3]. Currently, LSE is one of the most popular destinations for

[3] - ASDVFN, Financial market website, http://uk.advfn.com/

many foreign listings globally – some experts say that such a heavy dependence on foreign listing may cause the most risk for LSE in the future: currently 20.4% of listings were international as of March 2011 (PriceWaterHouseCoopers, 2011). It may be even more challenging for LSE especially in new global environment when foreign companies will tend to shift to developing markets such as China, Brazil, or Hong Kong, as some economists forecast. In addition, there are fears that UK's ties to the European Union with its instable economic position currently together with strict regulatory regime, will make it even harder for London to compete worldwide.

One of the most common ways for the company to start to be cross listed on LSE, is to issue depositary receipt (DR) that are advantageous both for the shareholders who buy them and for the companies which issue them. DRs are negotiable certificates issued by depositary banks which represent ownership of a given number of a company's shares which can be listed and traded independently from the underlying shares (LSE, 2012). The main advantage for DRs' shareholders is the opportunity to diversify their portfolios since there are now about 2000 programs of depositary receipts in 76 countries. By purchasing a depositary receipt, a shareholder gets an opportunity to trade in US dollars, to get all the payments through international central depositaries, to have dividends paid in US dollars, and to obtain analytical and reporting materials published in English – so, an investor can buy a security from a foreign investor, and avoid the difficulties they would face if they bought it on the local market. From the side of company-issuer of DRs, a clear advantage is the diversification of their shareholder base as well as higher liquidity and lower cost of capital advantages. (Baichorova, 2011). Thus, the value of traded DRs worldwide in 2011, $3.8 billion, is not surprising when considering all of the mutual advantages of DRs for both parties explained above (Bank of New York, 2011). Among DRs the most popular are American depositary

receipts (ADR) and Global depositary receipts (GDR). They are both issued with compliance with American law, while the difference between them is in the markets where they can be traded: American depositary receipts are traded only within the US, while Global depositary receipts are securities with limited circulation, can be traded in Europe and other countries except the US.

Currently, there are two alternatives of issuing DRs in LSE: on the Main Market or on the Professional Securities Market (PSM). The PSM is the Exchange's market for the listing of specialist securities, including debt, DRs and convertible securities. This alternative offers more flexible regulatory regime for listing, allowing to get the additional financing from the market supported by London's institutional investors' community. When listing on both markets, DRs are subject to checking by the UK Listing Authority. The majority of Russian ADRs are traded on the Main Market (30 out of 31), while only one company, Federal Grid Corporation, is traded on PSM (as of April, 2012). Global depositary receipts in London are usually used to access two or more markets (London and the US), and the US element in it is either Rule 144a ADR or Level III ADR that depends on the issuer's wish to make a public US or private placement. So, the securities are traded being denominated in US dollars on London's International Order Book and the dividends are settled in Euroclear Bank or in Depositary Trust Company (DTC), which allows for increased cross border liquidity. One more type of DRs is Reg S depositary receipts that are considered to be global depositary receipts. The main difference is that Reg S is aimed at non-Americans whereas rule 144A is aimed at qualified institutional buyers in the US. At the same time, ADRs are also traded and listed in London (LSE website, 2012).

1.3. Russian DRs

Cross-listing using DRs is very popular way of going abroad for Russian companies. They issue DRs in different markets all over the world. Initially, all DRs were listed in the US, and only parallelly or later were listed in European exchanges. The value of Russia's DRs in the world is $505 billion as of 2011, making 13.3% of all the DRs in the world. In 2011 Russian DRs accounted for 92.8% of all new sponsored programs DRs in Eastern Europe and 55.2% of all sponsored programs in the region. Considering liquidity, the Bank of New York reports $505 billion of the value of Russian DRs, constituting 13.23% of world value, and 33.4 billion accounts for the volume of Russian DRs, being 19.42% of the world volume[4].

Currently, in the extent of creating the International Financial Center in Moscow, discussed above, there is a serious problem of outflow of IPOs of Russian companies to London Stock Exchange – "issuers' migration" as Russian economists call it. During the last six years the share of Russian companies that made IPO on LSE was about 57% (Figure 5).

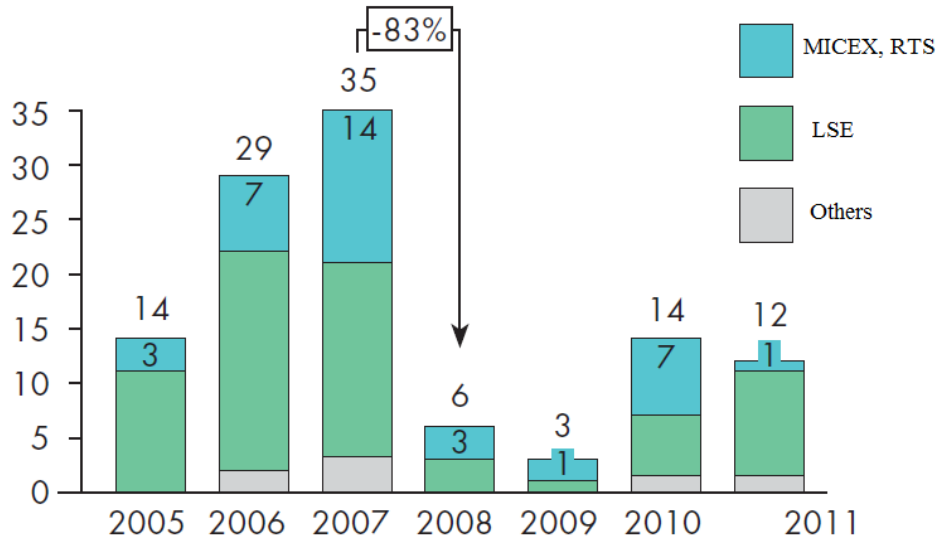


Figure 5. IPO of Russian companies, 2005-2011

Source: PWC

[4] - Bloomberg, http://www.bloomberg.com/markets/

According to the data taken from LSE, the average trade volume of Russian DRs on LSE was rather volatile from 2006 to 2012, but still increasing over time (Figure 6).

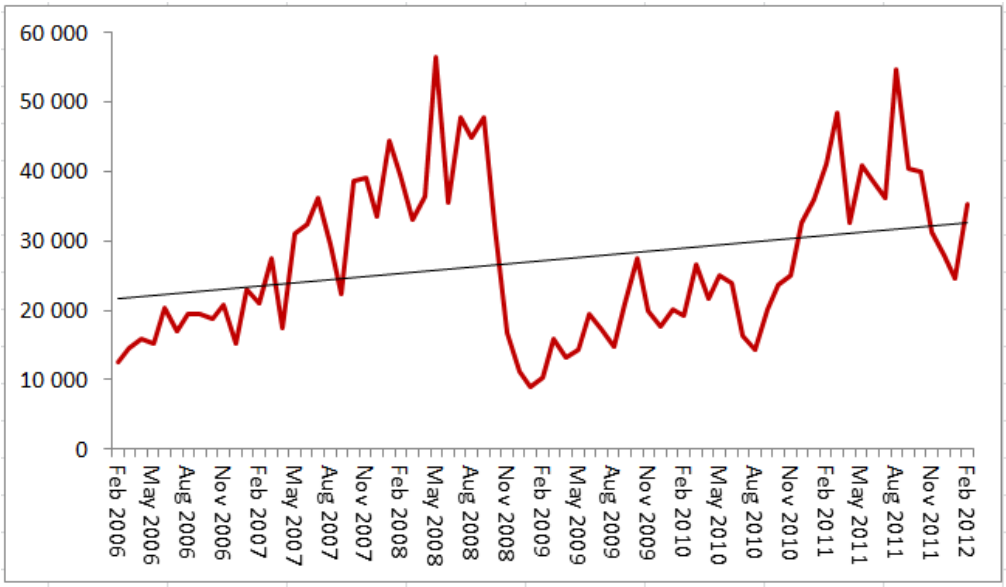


Figure 6. Average trade volume of Russian DRs on LSE (GBP, mln)

Source: LSE

The other side of the problem is the outflow of trading activity from Russian to London exchange for already cross listed stocks: currently, there are 31 Russian companies registered in International Order Book in LSE with total capitalization of GBP 289,851 million with monthly turnover of GBP 16, 368 million in March, 2012 (LSE, 2012). During the last five years the share of transactions in London has been about 65% of trading volumes of underlying stocks traded in Russia (Moscow IFC Strategic Session, 2012).

Due to the two important problems arising in Russia such as issuers' migration and trading activity outflow from Russian to London the paper will study cross-listing of Russian companies in London Stock Exchange only.

The trading of Russian companies on LSE is concentrated mostly among few companies such as Gazprom, Lukoil, Rosneft, Norilskij nikel, VTB bank, Novatek, Uralkalij; their share constitutes 90.2% of total Russian companies' trading (Figure 7). We cannot say now if the share will stay at the same high level in the future or Russian companies will

follow overall pattern of shifting the trading to emerging markets that are developing quickly such as China, Singapore, and others, but, for example, Lukoil already announced that the company is planning to make IPO in Singapore by 2013 (Forbes, 2012).

	March-12		March-11	
	TRADES number	TURNOVER £m	TRADES number	TURNOVER £m
Countries				
British Virgin Islands	11,915	115	3,586	42
India	20,985	202	21,114	229
Netherlands	26,610	197	16,581	180
Russia	1,546,303	16,358	960,719	17,045
South Korea	12,337	213	7,817	159
Rest of the world	63,033	417	74,365	812
Total	**1,681,183**	**17,503**	**1,084,182**	**18,467**

Figure 7. International Order Book statistics, LSE Source: LSE (2012)

One of the reasons why Russian companies leave Russian market is insufficient liquidity of the market. Thus, the particular question of the research is the market liquidity of Russian exchange, which is an important issue due to several points. First of all, some researchers claim that high liquidity is one of the most decisive factors why companies allocate their stocks in London. The liquidity itself matters a lot because it determines the ease, with which the securities are traded and this has a large impact on price changes: as activity falls, risk increases due to increased price volatility. For example, according to Economist Intelligence Unit survey (2011) about the most important factors for the companies when choosing stock exchange/market IPO, and exactly market liquidity is on the first place being the most important criterion with huge difference between other factors. So, one can say that liquidity is the king on the market. (Figure 8).

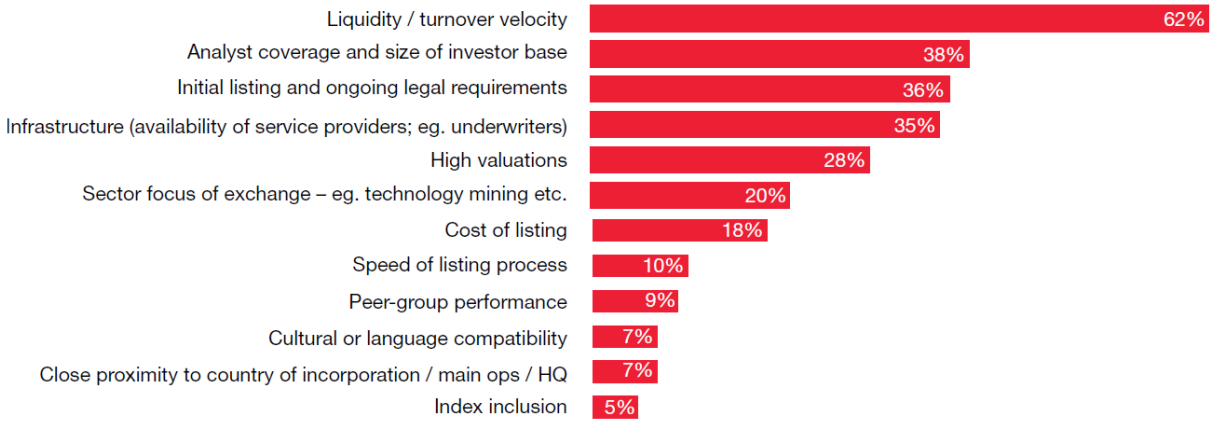


Figure 8. What are the most important factors when choosing a stock exchange for IPO? Source: PWC

From another point of view, from investors' perspective, liquidity is a key issue because more liquid market is more attractive because the higher the volatility the less the effect of every single transaction on price changes of other stocks. Moreover, increased liquidity is one of the reasons of stock exchanges' mergers all over the world: the most noteworthy merger activities include the Euronext merger – a joint stock exchange of former national exchanges of France, Belgium, Netherlands, and Portugal; the OMX merger – joint exchange of 7 different exchanges in Baltic and Nordic countries (CNN Money, March 9, 2011). Stock liquidity in this case increases because each company faces a large pool of potential international investors. One more reason for improving liquidity is the deepening of the market meaning that individual trades drive the price movements less significantly because larger number of shares is available at price above or below the prevailing market prices (Pownall, 2011). Other experts, for example, Dushin[5], propose that recent trend of mergers of exchanges is a kind of response to the world financial crisis challenges, such as restricted capital movement across borders, scarcity of liquidity, and the control of free capital interflows among different trade platforms in the world.

[5] - RBC, 2011, http://top.rbc.ru/finances/29/05/2012/652650.shtml, in Russian

Moreover, judging by Mancini et al (2011), the central role of financial markets' liquidity became even more significant during and after the financial crisis in 2007-2009 when the lack of liquidity in the funding and foreign exchange markets required all policy makers and authorities all over the world to create and implement several alternative policies together with fast coordinated attempts in order to stabilize the financial system and restore liquidity. Emerging markets, such as Russia, behave a bit differently in the crisis considering liquidity issue. According to Yeyati (2007), there is a strong link between crisis episodes and liquidity in emerging markets: at the beginning of the crisis there is no market slow down, instead trading activity increases as prices fell, declining only later during the crisis. Thus, whereas trading activity moves inversely to trading costs during good times, both increase during crises.

Thus, to analyze the liquidity of Russian exchange, it is sensible to make an analysis on the stocks that are cross listed in Russia and in London. This way of testing market liquidity through cross listing is advantageous because it allows to eliminate specific effects inherent for a particular market because such effects do not matter until they have an impact on both markets for cross listed stocks.

Chapter 2. Literature review on cross listing

The choice of cross listing as a method of measuring the liquidity explains this chapter's content: the chapter is divided into two parts: literature about developed and developing countries because in our analysis we have both developed market (LSE) and developing (MICEX). In the end available literature concerning cross listing of Russian companies will be presented and evaluated.

2.1. Cross-listing in developed economies

Current financial globalization offers plenty of alternatives in financial markets and stock exchanges for both investors and companies who are listed on exchanges. Over time traded volumes are increasing largely: in 1980 the total cross-border portfolio flows of capital between U.S. residents and other countries represented less than 1% of U.S. Gross Domestic Product, according to the U.S. Treasury (2006), while in 2006, they already consist about 30% and total $3.5 trillion. At the same time, there was a large increase in the number of cross listed companies in USA through issuing American Depositary Receipts (ADRs): the number of cross-listed firms jumped from 158 in 1990 to more than 2,000 in 2006. However, looking at the world's statistics, the things are not as optimistic as they seem to be for American financial market: in of the end of 2002, the number of internationally cross-listed stocks had retreated to 2,300 from its 1997 value of 4,700, a decline of over 50% (Karolyi 2006).

Historically, there are two main waves of cross listing development worldwide: the first one, starting from the mid 1980s and going together with extensive integration among world capital markets, and the second wave - late 990s, which was characterized by slowing down of the process of cross listings and even rapid delisting took place (You, 2008). Generally, cross listing is a well-studied issue in the literature, mostly analyzed from the viewpoint of the advantages for the company being cross-listed together with more specific studies concerning

companies' premium or discounts, trade volume shift and convergence of the prices on both markets. However, in the recent literature there is some bias toward the absence of well-studied cross listing's benefits, referring mostly to the problems raised as a result of cross listing such as increased risk factors, corporate governance problem, information asymmetry problems, and other risk factors connected with global trading of shares.

Earlier researches explain early waves of cross listings as a direct results of such advantages as market segmentation, increased capital market flows, tax benefits, increased liquidity, and global market prestige (Errunza and Losq (1985), Foerster and Karolyi (1993). Alternatively, in later studies different factors, connecting with the internal structure and relations inside companies, takes place: investor protection, agency problems, and other corporate issues (Doidge (2004), Doidge et al. (2004), La Porta et al. (1998).

One of the most popular benefits of cross-listing among economists developed in 1990s is connected with market segmentation hypothesis, which concentrates on the opportunity for the firm to reduce its cost of capital due to removing investment barriers and, thus, spreading risks across the pool of a lot of investors (Karolyi, 1998; Ji, 2005). However, there are economists who came up with reasonable critics against this hypothesis. For example, Stulz (1981) named several difficulties that go against the theory. The first one is that almost all studies that support market segmentation hypothesis are concentrated around event-study tests based on market reaction after they went of cross listing, and the abnormal return of 1 to 2% that they report (Miller, 1999) is extremely low comparing to large changes in the cost of capital caused by market risk exposures. Moreover, such an abnormal return is represented for those firms who were already integrated in the world market (Doukad and Switzer (2000) support Stulz in this argument). Stulz' next criticism arises from the fact that if the main driver for being cross-listed for a firm is the lower cost of capital due to removing investment

barriers, then each firm for whom the cost of capital due to cross-listing would fall more than the cost of going internationally would do so. However, one can observe in almost each country that not all firms that consider cross-listing "profitable" do so: for example, Doidge (2004) demonstrates that for every one firm cross-listed ten firms remain at home. Moreover, according to Stulz, the hypothesis is unable to explain the time-series pattern of the listings, which is growing over the past ten years: with the growing number of the cross-listing companies the marginal advantages should be diminishing, and there should be reduction in cross-listing. The final argument against the common hypothesis is if the inability of market segmentation hypothesis to explain the smaller decline in post-listing share-price fraction for listings associated with capital-rising activity (Foerster and Karolyi, 1999).

Basically, to verify all the reasons and advantages behind cross listings, it is worth seeing if there is a really large and persistent trading activity on a foreign market for a cross listed company. According to so called "flow-back" phenomenon proposed by Karoliy (2003) after her analysis of Daimler Chrysler AG cross listing pattern, there is a common case of immediate jump in trading activity just after cross listing was made but later followed by declining trend. Thus, one can observe the presence of agglomeration effect, meaning that companies' main goal for cross listing is not necessarily active trading activity on a foreign market, being demonstrated by the agglomeration of trading later after the jump after cross listing (Halling, 2004). Despite aggregate results support the idea, authors find significant cross-sectional variation in the extent and persistence of this agglomeration effect: it is higher for small, export-oriented and high-tech companies, as well as for companies that are better protected from insider trading (since it carries additional risks for foreign investors, they certainly wish to invest in the companies that they feel contain less disadvantage relative to domestic investors). Such an aggregation is explained by positive externalities when

company's stocks are traded on two markets simultaneously: larger number of investors help to reduce one's order flow adverse effect on stock's trading price (Pagano, 1989).

Consequently, the aggregation of trading activities is caused by the fact that in the presence of two distinct markets with the similar trading costs, either of the equilibriums is possible: all investors' trade concentrates on one market or some "knife-edged" equilibrium occurs between these markets and due to that they become fully indifferent from each other. Glosten (1994) claims that two markets can coexist only having different microstructures. In addition, the concept of asymmetric information discussed above is likely to support the aggregation of trade pattern: Chowdry and Nanda (1991) separate traders into discretionary and non-discretionary, saying that all traders with discretion over their trades' location will make their orders in the market with the largest number of non-discretionary traders.

2.2. Cross-listing in emerging economies

Shifting the issue of cross-listing from developed to emerging markets, it is important to distinguish several important points. First of all, emerging markets have in common several factors such as financial fragility, instability of domestic currency, and usually underdeveloped stock exchanges (Smirnova, 2004). In the literature, there are several explanations why companies from emerging markets tend to be cross-listed on developed markets. The most intuitive one is that since emerging economies frequently have the problem with macro and political stability, together with low investor protection, there is a possibility that firms in emerging markets became cross-listed because they would like to overcome weak institutions in their home country. However, there is no precise conclusion about supporting this in the literature: some researchers claim that cross-listing on US obviously improves corporate disclosure (Doidge, et al(2005), while others suggest that cross listing is

not necessarily effective replacement of home country institutions, finding the evidence that home institutions significantly matter for NYSE-listed non-US stocks (Eleswarapu, 1997).

Furthermore, since emerging economies' exchanges have several limitations, risks, and low liquidity for investors, then the wish of firms domestically located in these markets can be justified by increasing the liquidity of their stocks. Despite this argument seems to be rather reasonable, there are research evidences that this is not always the case. For example, Silva and Chavez (2008) after studying stocks and ADRs from four main Latin American markets concluded that liquidity effect greatly varies among the firm's country of origin and size. More specifically, they found that since there is more information exists for large companies that reduce information asymmetry, ADR market gives less contribution to investors' protection for large firms than for small firms. Their research comes together with Domowitz et al. (1998) who reported that liquidity effects heavily depend on the order flow migration from one market to another and intermarket competition that each firm and country faces when cross listed: under the condition of sufficient information linkages between home and ADR market, competition between the markets enhances liquidity of cross listed companies. In addition, according to Umutlu (2010) not only liquidity of emerging market's firm is not necessarily affected by cross-listing, but also risk characteristics of underlying shares stay unchanged: in their time-series conditional heteroscedasticity model of 14 emerging markets, authors find no statistically significant change in beta value after cross-listing together with the level of conditional volatility of the stock.

Despite these counter facts against obvious positive effects of cross-listing, one can observe that this can be a significant advantage at the crisis' times: according to Chandar, firms in emerging markets that were cross listed at the times of currency crises in the 1990s (Mexican crisis in 1994, the East Asian crisis in 1997 and the Russian default in 1998)

suffered significantly less negative effects, especially during the consequences of the crisis compared with other firms that were not cross listed (2009).

Generally, the reason why firms decide to be cross listed is easily explained for emerging markets: in order to find a solution for their home constraints and to enhance their companies' growth; the same arguments that were mentioned previously are even more crucial for emerging markets because of their financial markets' underdevelopments. At the same time, using the methodology of Tobin's *q*, Doidge et al.(2004) showed that the cost of cross-listing for emerging markets is higher than for the countries from developed countries, but these expenses are outweighed by the premium caused by cross listing. In addition to that, there are several diverse points in cross listing when analyzing emerging markets.

However, there are several economists who claim that the issue of cross-listed premium is not always the case and cross listed companies not always get the expected advantages. Particularly, Hope et al.(2007) says that the firms from low-disclosure regime receive lower valuation effect, while firms from high-disclosure system receive higher valuation. Thus, benefits from cross listing do not always cover costs required to be cross listed (cost of implementation of the GAAP accounting standards, for example). Consequently, there is little surprise that one of the main reasons of companies' delisting in the US is high costs of Securities and Exchange Commission compliance that was expanded after Sarbanes- Oxley Act in 2002. What is more, gains from being cross listed does not materialize immediately, but rather only after 5 years when a firm from emerging markets is traded in USA (Connor, 2007).

The next factor for describing special features of cross listing in emerging markets is connected with their low investor protection. The evidence supporting a strong link between the level of investors' protection and financial market development, posed by several economists, plays crucial role. For example, Brockman and Chung (2003), basing their

research on China-based firms cross-listed on Hong Kong exchange market, concluded that strong investor protection (regulations, market-supportive laws, enforcement) reduces the liquidity costs posed by information asymmetry. Moreover, Eleswarapu and Venkataraman (2006) extended this theory by claiming that macro institutions also significantly affect the cost of liquidity in equity markets: trading costs appear to be lower for countries with higher ratings for accounting standards, political stability, and judicial efficiency. This concept is consistent with other researches who analyzed the problem (Eleswarapu (1997), and Easley, Hvidkjaer, O'Hara (2002). But, from the other side, information disclosure can have an adverse effect, and this is particularly important for emerging markets. As Fernandes and Ferriera (2008) research, analyzing Mexican firms' cross listing, concluded, additional scrutiny and informational disclosure caused by cross-listing can have different effects. More analyst coverage and more extensive public information may divert investors from collecting the information that is firm-specific and also reduce trading of informed traders. The authors also find negative relationship between firm-specific and cross-listing stock return variation under conditions of additional analysts' coverage, which can be an important matter for emerging markets' economic policy implication meaning that policies that intend to deepen accounting information transparency that can crowd out private information from the market, but, instead, create disclosure standards to encourage investments in private information in order to decrease crowding out effects.

2.3. Cross listing of Russian stocks

Since Russia is considered as an emerging (or developing) country (IMF, 2012), all the problems of low liquidity, financial system fragility, low investor protection and others, mentioned above as features of emerging market economies are relevant for Russia. Despite the size and strategic importance of the Russian security market, there are few studies analyzing it. One of them is Kolodyazhny and Medvedev (2002), who carried out their

research concerning Russian stock exchange market microstructure and found the presence of market making that allows earning higher returns than compared to benchmarks with lower risks associated. Kuznecov and Muravyov (2001) studied the impact of ownership structure on stock performance, Hall and Urga (2002) using GARSH testing concluded that there is an improvement in the market efficiency in Russia over time. Tov (2007) studied the relationship between price and volume on Russian Stock Exchange and concluded that there is bi-directional causality between them, and price changes of stock adjust to lagged trading volume during one week and, vice versa, trading volume adjusts for the price during the same period of time.

Fewer studies are devoted to cross-listing of the companies located in Russia: the impact of ADR listing for Russian stocks was examined by Smirnova (2004). She collected a sample of 16 Russian cross listed firms that issued ADRs during 1996 and 2001. The method used in her model was GARCH instead of OLS, and the model accounted only for changes in local returns around the listing date. She found the significant negative abnormal stock returns on the listing day and increase in variance of returns after the cross-listing date, which contradicts the hypothesis of beneficial cross listing effect for the stock from emerging markets

One more study about Russian ADRs from 1995 to 2004 found that there is no significant difference between Russian ADRs in America and underlying stock in Russia together with overall even distribution of trading volume between Russian exchange and foreign ones where ADRs are traded (Jithendranathan, 2006). In this study the author used Russian cross listed stocks in the U.S. for time period between 1994 and 2003, thus excluding Gazprom, because it issued its stocks in Russia only in 2006. Since Gaprom now is the most actively traded DRs abroad with the largest capitalization, we should account for this company to make conclusions about cross listing. Thus, one should be careful to use

Jithendranathan's paper as a basis for current policy implications because current changes on Russian stock exchange that were explained in the first chapter, should be taken into account and more recent data period should be analyzed.

Chapter 3. The model

This chapter presents our model, which measures the liquidity of the Russian stock exchange. This model is based on Froot and Debora's paper (1998) which is relevant for the purpose of the research because it controls for such local effects as domestic market indexes and currency exchange. We extend the model by adding VIX index and looking at the dynamics of the liquidity. The chapter ends with policy implications of the results.

3.1. The baseline model

The model is based on Froot and Dabora's research (1998) that was done to test whether stock prices of the three largest and most liquid multinational companies are strongly influenced by locational factors. The authors' initial hypothesis was that the stocks of a company traded in different countries should move together because of integrated financial markets where they are traded. Three companies were analyzed: Royal Dutch, Shell, and Unilever, being traded on different exchanges in the US, UK, and Netherlands. The model contained the difference between the log returns of the same company in different markets as a dependent variable, returns of S&P, FTSE and Dutch Indices, and the change in exchange rates between the pairs of dollar, pound, and guilder as given variables.

$$r_{A-B,t} = \alpha + \sum_{i=-1}^{1} \beta_i * S\&P_{t+i} + \sum_{j=-1}^{1} \delta_j * FTSE_{t+j} + \sum_{k=-1}^{1} \lambda_k * DI_{t+k} + \sum_{l=-1}^{1} \gamma_l gl/\$_{t+1} + \sum_{m=-1}^{1} \upsilon_m gl/GBP_{t+m} + \varepsilon_t$$

Researchers found that there is an evidence of comovement between relative prices and market indexes for both short and long horizons. Moreover, the model shows that one of the two stocks in "twin pair" move more like the markets where it trades most intensively. Generally, the location of trade matters for pricing according to the authors' model. Despite the authors admit that none can explain a meaningful fraction of the price differentials or comovement patterns, they propose several explanations that could be a source of this pattern.

Taking the largest twin pair (Royal Dutch/Shell), the researchers analyze the splitting of the cash flows inside the company: the company actively maintains its 60:40 net income split policy, even intervening to offset this asymmetry in the two countries' corporate-tax regimes. Moreover, the ratio of paying off the dividends deviated from this ratio, but only for an insignificant magnitude, which cannot explain the volatility of price differential. There is a similar explanation concerning the ratio: the difference between the parent companies' expenditures because in the case when the expenditure deviates much from 60:40 ratio, then net receipts of shareholders would also deviate. However, as in the previous explanation, they are too small to explain the findings. Differences in corporate control is another explanation for price disparities: there seems to be a "control premium" of Royal Dutch who has 60% share in cash flows as well as voting power, thus it could really use this power to hurt Shell shareholders' interests. However, this reason also falls short of the full explanation because it cannot explain the periods when Shell was more expensive in comparison to Royal Dutch, and also control premium can explain the issue only in case of economy-wide changes in the value of control. The last explanation offered by the authors is dividends and currencies: since dividends are converted into guilders or pounds at the current spot rate, during the time period between announcement and payment days, fluctuations in exchange rates change the values of dividend payments relative to both stocks. Since it matters only in the time window between the dates and only for the current dividends, these factors can explain only minor price differential.

Our model is different in several aspects: we use Russian stocks that are cross listed on LSE through issuing GDRs. Also, we extend the model by including VIX Index, and we find that Exchange rate and VIX variables both have independent effects; thus, we use the extended version of the model as a base.

3.2. Data

The list of all the Russian DRs was taken from the Bank of New York official website together with the information about the issuing date, ISIN code, underlying Russian stock, and the related industry[6]. Based on ISIN code provided, we found that the majority of DRs are traded in London Stock Exchange that is supported by the problem of "issuers' migration" of Russian stocks to LSE discussed above.

The daily closing prices were obtained from LSE and MICEX official websites, and LSE prices were converted to Russian rubles in accordance with the daily RUR/USD exchange rates taken from Central Bank of Russia website (GDRs are traded on LSE in American currency because of 144A Rule regulation, as was discussed above); RUR/GBP exchange rate was also taken from the Central Bank of Russia official website. The logarithms of returns were taken after dividing the price in the next period by the price in the last period, and these data were used in the regression. Daily values of Russian stock exchange index were taken from MICEX website (MICEX Index) and Index for London exchange - from finance.yahoo (FTSE Index), expressed in their native currencies. Four companies were chosen for the estimation based on the criteria of market capitalization and presence on both markets during 2006 and 2012. Thus, we took two companies with relatively big market capitalization and the other two - with relatively small market capitalization: Gazprom with its market capitalization of GBP 98,456.01m, Lukoil – with GBP 66,263.13m capitalization, Severstal – with GBP 9,741m, and Novolipetsk Iron and Steel Corporation – with GBP 9,018m capitalization (data as of February 2012, LSE). The data includes on average about 1350 daily observations for each company starting from the beginning of 2006 and ending on March 30, 2012 (Table 5).

[6] - http://www.adrbnymellon.com/dr_directory.jsp

Table 5. Companies' summary				
	Market capitalization (GBP, mln)	Number of observations	Trade volume (USD, mln)	
			MICEX	LSE
Gazprom	98,456	1480	61,9	85,8
Lukoil	66,263	1228	20,9	43,6
NLMK	9,018	1431	3,214	567,585
Severstal	9,741	1289	6,689	6,373
Source: LSE, companies' annual reports				

Gazprom is one of the largest energy companies in Russia and its major business lines are based in geological exploration, production, transportation, storage, processing and sales of gas, gas condensate and oil, as well as generation and marketing of heat and electric power. The Russian government owns the control share in the structure of equity capital – directly 50.002% and indirectly, through the Federal Agency for State Property Management – 38.373%. Currently, Gazprom is listed on Russian, London, and Frankfurt exchanges. It is notable that the listing date of the company on LSE was October 29, 1996 while in Russian MICEX much later – January, 2006. Gazprom's trade volume on LSE is more than on MICEX: $61.9 billion versus $85.8 billion. In the model we use DR 144A standard GDRs company's depositary receipts on LSE (Gazprom Annual report, 2011).

Lukoil is the other company related to "largest capitalization" group, international vertically-integrated oil and gas company, accounting for 2.2% of global output of crude oil. Russian government share in equity structure of the company is 13.87%. It started to trade on LSE in 1997, a year after Gazprom. Lukoil relates to the same industry as Gazprom - oil and gas. Gazprom's trade volume on LSE is also more than on MICEX, as was the case with Gazprom: $20.9 billion versus $43.6 billion. In the model we use DR 144A standard GDRs company's depositary receipts on LSE (Lukoil Annual report 2011).

The other pair are the companies with the lowest capitalization cross-listed companies traded on both exchanges in 2006 – Novolipetsk Iron and Steel Corporation (NLMK) and Severstal. NLMK is an integrated steel-making company, which produces a large variety of flat steel products including slabs, coated and electrical steel as well as long steel products. Notably, the company does not have the government among its shareholders. It started to trade on LSE in December 2005, on MICEX – in April 2006. NLMK's trade volume on LSE is $3,214 million, and on MICEX - $567,585. In the model we use DR 144A standard GDRs company's depositary receipts on LSE (Novolipetsk Steel and Iron Corporation Annual report 2011).

Severstal is a vertically integrated steel and steel related mining company, with assets in Russia and the USA, in Ukraine, Latvia, Poland, Italy, Liberia and Brazil. Like NLMK, it does not have government among its shareholders. It started to trade on LSE in November 2006, on MICEX – in June 2005. Severstal's trade volume is almost the same on two exchanges: on LSE is $6,373 million, and on MICEX - $6,689. In the model we use DR 144A standard GDRs company's depositary receipts on LSE (Severstal Annual report 2011).

Looking at the descriptive statistics of the data (Table 6), we see that standard deviation is higher for small companies as it is expected because they contain more risk than large companies, thus, the amplitudes of their returns should be broader. Notable to mention is that standard deviation is higher for ADRs that are traded on London exchange than for underlying stocks traded in Russia. It means that holding ADRs is more risky, but an investor is likely to earn more or lose more in London than in Russia. That is why the means of returns are higher in London for all the companies beside Gazprom for the period analyzed.

Table 6. Descriptive statistics for the data								
	LUKOIL		GAZPROM		NLMK		SEVERSTAL	
	London	Russia	London	Russia	London	Russia	London	Russia
Mean	1,00081	1,00059	1,00012	1,00031	1,00103	1,00078	1,00144	1,00084
Median	1,00091	1,00005	1,0004	0,0001	1,00021	1,00017	0,99968	0,9998
Standard deviation	0,0373	0,03164	0,03846	0,0301	0,0462	0,04052	0,04987	0,0375
Skeweness	-0,07794	0,55585	-1,04332	0,62995	0,15784	0,41286	0,32072	0,39609
Source: Eviews								

So, to measure the liquidity of Russian market and to see if the local effects are significant for these stocks, we regress cross-listed stocks' return differentials on MICEX and LSE and Russian and London market index log returns plus VIX log changes and plus the relevant log currency changes. Our initial hypothesis is that price differentials should not correlate with anything:

$$r_{A-B,t} = \alpha + \sum_{i=-1}^{1} \beta_i * MICEX_{t+i} + \sum_{j=-1}^{1} \delta_j * FTSE_{t+j} + \sum_{k=-1}^{1} \lambda_k * RUR/GBP_{t+k} + \sum_{l=-1}^{1} \gamma_l * VIX_{t+1} + \varepsilon_t$$

For the selected large-capitalized companies it is important to note that if to take just Russian index' returns, the results would be biased because these companies are already included in the index with significant weights. That is why we net out the company's share to get the net index for the regression: we net out 14% for Gazprom and 16% for Lukoil from MICEX Index (the share of companies in the Index did not change significantly during the period between 2006 and 2012).

Since Gazprom had a price difference jump on April 26, 2006 caused by a sharp price decrease on LSE, we tried to include a dummy variable controlling for this jump. The reason behind this jump is the official announcement of the number of Gazprom's ordinary shares corresponding to one ADR, which was decreased from ten to four; ADR, floated earlier were automatically converted pursuant to the announced ratio. We introduce a dummy variable with the values of zero before the jump (from February 8, 2006 to April 26, 2011) and values

of one after the jump (from April 27, 2011 to March 30, 2012). We saw that this dummy variable is not statistically significant, so, we do not include it (see Appendix 1, Table A1.3).

3.3. Results

First of all, we pay attention to the results of the model without VIX coefficient, like in the baseline model. The results for the largely capitalized companies show the negative and statistically significant coefficients for FTSE Index with -0.32464 for Lukoil and -0.22837 at time *t* for Gazprom (Appendix 1, Tables A1.2, and A1.5). The other index, MICEX, is not significant when the model is without lead and lag specifications, while it is becoming significant at lead time at 5% confidence level with the negative coefficients of -0.06939 for Lukoil and -0.06678 for Gazprom. According to these results, we can conclude that Froot and Debora's results are supported in our model for large companies: where a company has larger trade volume, the comovement of this index and returns are larger as the respective coefficient shows, and the index is more significant than the other. For example, both Lukoil and Gazprom are traded twice as much in London than in Russia and they have 99% confidence interval for FTSE Index with the negative coefficients larger than MICEX. This can be logically explained: when London Index rises, the ratio of Russian stock's returns over London returns decreases because the return in London increases, making the ratio smaller and vice versa. Exchange rate is statistically significant at 10% confidence interval with negative coefficients (Appendix 1, Tables A1.1 and A1.4). This means that if the Russian currency appreciates by 1% against the pound (in other words, when the ratio RUR/GBP becomes smaller), then the relative price of Lukoil in Russia over London increases by about 0.1638% (in other words, ratio of returns MICEX/LSE will become larger by this amount), and domestic investors gain in such a case getting more returns than investors in London.

Analyzing the results for small-capitalized companies, NLMK and Severstal, we find different results. For these companies, both indexes' coefficients are also significant: MICEX is significant at time *t* with the coefficients -0.09909 and 0.10899 for Severstal and NLMK respectively (Appendix 1, Tables A1.7, and A1.9). Coefficients for London FTSE Index are -0.31357 for Severstal and -0.27042 for NLMK. Also, for small companies exchange rate coefficient is more statistically significant than for large companies and with negative signs for both companies, even when we use the model without leads and lags: -0.196381 for NLMK and -0.461018 for Severstal (Appendix 1, Tables A1.6 and A1.8). Thus, small companies do not support the baseline model: Severstal, being traded equally in both markets, has three times higher coefficient for London, while NLMK has a positive coefficient for Russia, being traded there more than in London, demonstrating a reverse pattern than the baseline model shows.

Generally, it can be concluded that we find evidence that do not support our initial hypothesis - "local effects" have an impact on returns: price return differential depends on the local market shocks both in Russia and in London. This is an evidence of insufficient liquidity of Moscow exchange. Using the proxy model of Froot and Debora, we can support their findings considering larger comovement between returns difference and market index if a stock is more traded on the market either for large-capitalized stocks: Lukoil and Gazprom, being more actively traded on LSE they have stronger coefficients than MICEX has. The exchange rate is more significant for small companies with negative coefficient. The larger relative importance of exchange rate negative coefficient for small-capitalized stocks can indicate that these stocks follow Russian currency movements: when it appreciates, their returns become larger in Russia.

One more important finding in the results is the analysis of R^2: although its value is not high for all the companies, for large stocks it is surprisingly lower than for small ones (Table 7). In other words, the movements of the variables of the model explain movements of price difference of large stocks less than movements between cross-listed stocks of small companies. Thus, there is more randomness in the price returns of large stocks than of small stocks, allowing for more frictions of large stocks.

Table 7. R squared	
R^2	
Lukoil	0,047487
Gazprom	0,020529
NLMK	0,056774
Severstal	0,075105
Source: Eviews	

3.3.1. Extension to the model

To include the stationary effect in the model we added VIX index daily changes as a measure of volatility. This index is constructed on the basis of the implied volatility of wide range of S&P500 options and frequently used as a measure of a market risk[7]. Sometimes the index is called "fear index" because if the index is high then investors feel uncertainty about future prices, becoming more risk averse. That is why it is expected that VIX changes should be negatively correlated with MICEX and FTSE indexes because daily changes of the index are lower due to the low activity of investors when the VIX is higher. In the model, correlation between MICEX and VIX is -0.302267, and between FTSE and VIX is -0.490117.

As a result of including VIX in the model, we see the independent effects of exchange rate variable and VIX variable for both small and large stocks. For small stocks VIX is more significant, at 99% confidence interval, neither at lead or lag time specifications, but at *t*,

[7] - Investopedia, 2011

while for large companies it is significant only at 10% confidence internal (see Appendix 2, Tables A2.3 and A2.4). Also, small stocks have larger positive coefficients for VIX than large stocks: 0.062111 and 0.055414 for Severstal and NLMK versus 0.007036 and 0.021790 for Lukoil and Gazprom. Judging by the positive VIX coefficient for all the companies, the more risk investors expect in the future that the market will go either up or down sharply, the more returns stocks in Russia bring.

Using this modified model as a main one, we can observe that MICEX and FTSE variables change their signs in leads and lags time specifications. The probable reason for that is the negative first order autocorrelation in dependent variable (Appendix 3, Table A3.1.)

3.3.2. Dynamics

It was interesting to observe the dynamics of the observations to see if Moscow stock exchange becomes less or more liquid over time. In order to do that, the sample was divided into two subsamples, the threshold of which was September 15, 2008 – the day of bankruptcy of Lehman Brothers, the official day when the financial crisis began. Below the outcomes for all four companies are represented (see Appendix 3).

Table 8. Changing variables over time for Gazprom and Lukoil

GAZPROM	2/10/2006 - 9/15/2008		9/16/2008 - 3/31/2012	
	Value	Probability	Value	Probability
Net MICEX (lead)	-0,021464	0,3427	-0,101468	0,0745
FTSE (lag)	0,127896	0,0093	-0,006894	0,0055
FTSE (t)	-0,088349	0,0805	-0,18577	0,1326
VIX (lead)	0,011362	0,1276	0,032384	0,1131
R^2	0,040196		0,031371	

LUKOIL	1/11/2006 - 9/15/2008		9/16/2008 - 2/25/2011	
	Value	Probability	Value	Probability
Net MICEX (lead)	-0,036596	0,0879	-0,103914	0,0254
FTSE (t)	-0,120488	0,0111	-0,419663	0,0001
Exchange rate (lag)	-0,172018	0,0792	-0,145513	0,1932
VIX (lead)	0,005861	0,0518	-0,001674	0,0823
R^2	0,067906		0,072656	

Source: Eviews

Table 9. Changing variables over time for Severstal and NLMK

SEVERSTAL	11/10/2006 - 9/15/2008		9/16/2008 – 3/30/2012	
	Value	Probability	Value	Probability
MICEX (t)	0,14722	0,0014	-0,15353	0,0041
FTSE (lag)	0,08106	0,3047	0,18015	0,1183
FTSE (t)	-0,27345	0,0008	-0,26491	0,023
FTSE (lead)	0,14212	0,0568	0,41485	0,0003
Exchange rate (lag)	-0,28369	0,0971	0,26763	0,0374
Exchange rate (t)	-0,4204	0,0142	-0,42918	0,0007
VIX (lead)	0,00612	0,5921	0,05228	0,0067
VIX (lag)	0,01346	0,2772	0,09861	0,0000
R^2	0,083667		0,12469	

NLMK	4/21/2006 – 9/15/2008		9/16/2008 – 3/30/2012	
	Value	Probability	Value	Probability
MICEX (t)	0,14861	0,0033	0,07974	0,0039
FTSE (lag)	0,102	0,2971	0,26564	0,0128
FTSE (t)	-0,30165	0,0044	-0,07821	0,4675
(lead)	0,00033	0,9974	-0,19428	0,0711
Exchange rate (t)	-0,18029	0,414	-0,22598	0,0504
VIX (lead)	0,01296	0,4087	0,08538	0,0000
VIX (t)	0,00514	0,7527	0,03209	0,0782
R^2	0,035941		0,04364	

Source: Eviews

As we can see in all cases represented – either the liquidity decreases or stays at the same level as it was before the crisis (only Gazprom shows slightly different results with decreased R squared). In other words, R squared of the model either increases or does not change over time that means that local effects persistently or even more explain the movements of cross listed price returns during and after the crisis. The most notable change is increase in VIX significance for all the companies, which shows that after the crisis investors' expectations became more important and they started to matter in price movement of stocks. For policy implications it may mean that although at good times things on stock exchange seem to look well, crisis situations, or so-called "bad times" can do the situation much worse than was expected.

Also, the Russian index MICEX increased its significance in the latter period for all the stocks, while FTSE did not change a lot. For the market efficiency such dynamics cannot indicate optimistic results because it means that local effects matter even more with time. Moreover, this can be explained from the side of arbitrageurs: they suffered big losses in the crisis, and, thus, everything lost the liquidity. Also, since R squared is increasing, the

predictability of returns' difference becomes easier during time, leaving less for randomness of stocks' prices and allowing more chance to predict the returns.

To conclude, Moscow Stock exchange is not perfectly liquid because local effects play the role in determining the returns. This situation is crucially important for policy makers and can be studied from different perspectives: from the point of view of local market agents and from the view of global agents. Investors are different in Russia and in London, and they can present different behavior; in London they seem to be less risk averse, and that is why they can get bigger returns. From the other side, there are people globally who are persistently looking for the price difference when it is less or more attractive, but their activity is not enough for London and Russia as presented by the results. In other words, persistent arbitrage is possible despite the fact that according to the economic research, arbitrage should not matter because of integration of financial markets and, as a consequence, the equalization of prices. Arbitrage should not be possible because otherwise market forces should eliminate it. Much of financial theory is built on the assumption that securities trade at prices that make arbitrage impossible. Thus, when persistent arbitrage opportunities do exist, as in our case during the period from 2006 to 2012, it means that there should be something wrong with financial markets.

There are several researches in financial economics that can explain the findings of the model. One theory is market segmentation theory that tells that if capital markets are segmented, then cross listed securities can be traded at different prices, which is consistent with our preposition about different investors' behavior or different local regulations. The main claims on this theory is the foreign ownership restrictions and premium/discounts of cross listed internationally stocks. Foreign ownership restrictions are likely to change the demand function of both local and foreign investors. In such a country, foreign investors are

ready to pay higher price for local stocks than home investors (Stulz, 1995). There are also several studies that demonstrate that unrestricted ownership of stocks, relative to those matching shares whose ownership is restricted, are traded with premiums because of international demand for such stocks, larger informational coverage, and higher liquidity. The second point if market segmentation is the studies with similar findings as we have: for example, Bailey (1999) found that Taiwanese GDRs were sold at discount relative to the underlying stocks, and the barriers made the arbitrage difficult. Miller (1996) also found that ADRs of British companies' daily prices did not match matching securities. Jithendranathan (2000) also found that Indian GDRs' prices are not equal, and underlying Indian securities are affected by local factors, while their GDRs are influenced by both local and foreign factors because of market barriers.

Looking at the problem from the point of view of global arbitrage, there are several models of why persistent arbitrage can happen and convergence of prices does not happen on the market. One of the most famous is Shleifer and Vishny's model (1997). They studied efficiency of financial markets considering no convergence of prices as textbooks suggest should prevail. Financial economics literature claims that arbitrage plays a crucial role in the analysis of financial markets because exactly collective actions of arbitrageurs bring back securities' prices to security's fundamental value, keeping the market efficient and making persistence arbitrage impossible. Shleifer and Vishny developed performance-based arbitrage model and showed that arbitrage in real life is very limited especially if arbitrageurs play with other people's money who force them to liquidate volatile positions that could bring money. In such cases, arbitrageurs should get more capital from investors and, in the presence of agency problems, managing money possessed by other people who do not exactly know and understand what he/she is doing with his/her money, they observe how they lose their money

and refuse to provide him/her with extra capital. Exactly such an avoidance and fear of extreme volatility helps to understand persistent excess returns in stock prices. Also, the authors emphasize that concentrating arbitrage transactions in the hands of just few investors, which is happening in real life, even more prevents theoretical "full" arbitrage and full equalization of prices. According to the statistics from Moscow exchange, the number of professional investors together with individual investors on Moscow Stock Exchange is even decreasing over recent years, which makes arbitrage more difficult (Table 10).

Table 10. The structure of investors on MICEX

	2006	2007	2008	2009	2010	2011
Individual investors (including those who use brokers' services or buy mutual funds, thousands of people)	68,5	74,3	82,6	114,1	113,7	93,3
Professional investors	1711	1813	1863	1674	1512	1387

Source: NAUFOR

Professional investors are represented mostly by mutual funds, non-governmental pension funds, and investment banks. Russian working group responsible for creating International Financial Center in Moscow claim that such a low level of individual investors is one of the crucial problems for Russian exchange: generally, only 1.7% of economically active population is individual investors. For comparison, this share in China is 14%, in Brazil – 19%, in Germany – 30%, in UK – 48%, and in the US – 60%. According to economists, low average income of population, heavy territorial concentration of financial services in Central Russia, low financial knowledge of the population and no trust to domestic financial markets are the reasons for such a low level of individual investors (Moscow IFC, 2012). This calls financial markets authorities for paying attention to the necessity to attract more domestic investors on the Moscow Stock Exchange. One of the options to achieve this goal can be pension reform, encouraging people to participate in voluntary pension programs, which will bring "long money" to the market and private pension funds as new players.

One more policy implication of the results is insufficient integration of Moscow Stock Exchange in the world financial market, which is likely to limit arbitrage and equalize the prices on both exchanges. Looking at the number of foreign clients on Moscow Stock Exchange and on its dynamics (Figure 9), we can see that the number of foreigners is decreasing in 2011. Such a dynamics of active clients who are non-residents of Russia on Moscow Stock Exchange shows more volatile pattern than dynamics of total number of non-residents. However, there is some optimistic tendency: the number of foreign funds who invest in local stocks and depositary receipts, has been increasing in 2010-2011 and reached 2410, which is a rise by 12.8% in comparison to the beginning of 2011 (Thomson One for IR Database, 2012).

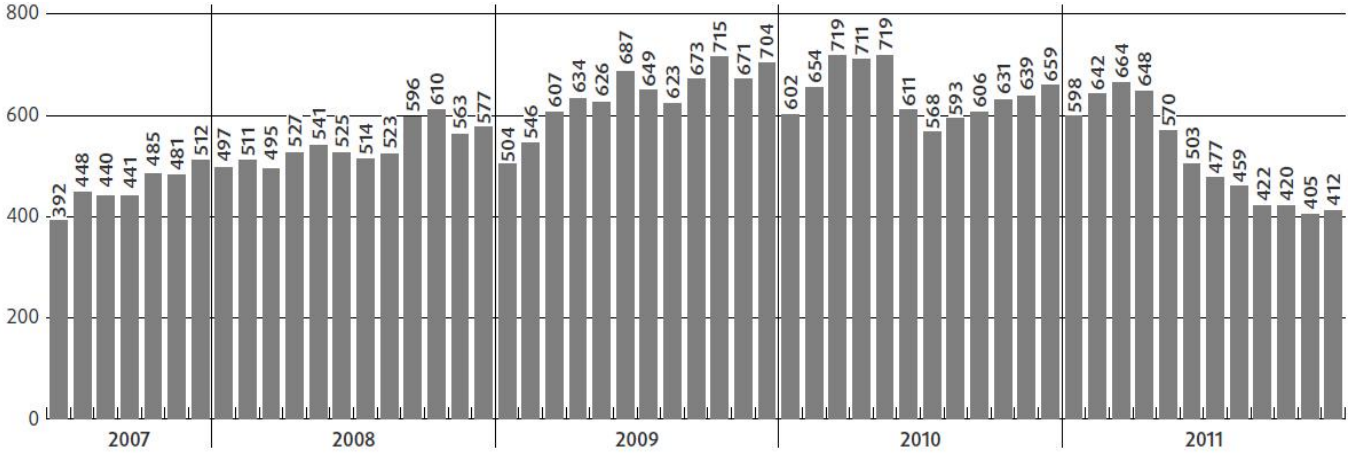


Figure 9. The number of foreign invetsors on Moscow stock exchange

Source: NAUFOR

However, their investments in Russian stocks decreased in 2011 for the first time for the last 6 years to USD15.6 billion, which is the fall of 17.2%. One probable explanation for this can be excessive government share in the ownership of the largest Russian companies (more than 50%) that obviously does not allow participating of enough number of arbitrageurs enable them to equalize the prices. Based on the official information and our calculations, the weighted average government share of Russian index is 27% (see Appendix 5 for the calculations), so, these 27% out of the whole MICEX index is so-called "non-tradable" part, which is USD432 millions monthly (27% out of USD1,6 billion monthly; MICEX, 2011).

Conclusion

The purpose of the paper was to determine whether Moscow Stock Exchange is sufficiently liquid. To achieve this goal, we used the OLS estimation model of cross listed stocks traded in Russia and in London with daily observations for a six-year period. As a result of the research, we found several outcomes that are valid for both types of stocks: for largely capitalized and for small capitalized ones. Firstly, returns of Russian ADRs and underlying stocks are subject to local effects such as local indexes, exchange rate, while volatility index also matters. This demonstrates the insufficient liquidity of Russian exchange, which calls for the attention of policy authorities to emphasize the need for being more integrated in the world financial market in order to allow for more arbitrage for equalization of prices on both exchanges, which is consistent with Schleifer and Vishny's model (1997).

Certainly, the liquidity varies across stocks: the indexes' coefficients are larger for those markets where the stock is traded more actively; however, small stocks do not support the theory. The other difference is the larger significance of the exchange rate with negative coefficients for small stocks than for large stocks: appreciation of Russian currency increases the price of Russian stock relative to London's price. During time, the situation on the market does not seem to be optimistic – Russian stock exchange has become less integrated in the world market since the crisis. As was expected, VIX became more significant over time, showing the increased importance of investors' expectations on returns.

Despite the important results of the model, there are some limitations. We address only four companies: two with the highest capitalization and two with lowest capitalization selected randomly. For future research it would be better to collect the data for all 31 cross listed companies in London and on other foreign markets where Russian depository receipts are traded and to do the panel data for this model and compare the results with Russian stocks

cross listed on other foreign markets. Moreover, cross listing is only one aspect of looking at the liquidity among other methods. Also, it would be interesting to see which macroeconomic factors influence Russian stock returns to find how change in regulations would impact investors in Russia. However, the model contains about 1400 observations; thus, it can be extensively used for future financial market policy reforms in Russia. Due to the specifications of Russian financial market, the results should be used for other emerging economies after close considerations, which limits the external validity of the paper.

Policy context

The results of the paper shows that there are local effects that influence the movements of price return differentials between depositary receipts of Russian stocks traded in London and underlying Russian stocks traded on Russian exchange MICEX. It indicates insufficient liquidity and low integration of Moscow stock exchange in the global financial market, which prevent enough arbitrage to take place for sufficient integration. Moreover, after the crisis, the liquidity became even worse, which shows that at bad times, when arbitrageurs suffer big losses, the liquidity can decrease even more than expected (since VIX and MICEX variables' significance is greatly increasing). One option for the current situation is to pursue reforms for attracting domestic investors (possibly by reforms considering voluntary pension) and foreign ones, which will allow for more market players, extensive arbitrage, and equalization of prices. A relevant measure can be privatization, since currently 27% of Russian Index that otherwise could be traded on the market, is in the hand of the government that constitutes about USD 432 million a month. Now, in the current situation of creating one merged exchange, it is possible to follow the necessary reforms, otherwise, the trend of lowering the liquidity will continue to develop.

Appendixes

Appendix 1

Table A1.1. *Results on Lukoil baseline model's regression*

Dependent Variable: L_RET
Sample (adjusted): 1 1230
Included observations: 1230 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX	0.025617	0.026237	0.976378	0.3291
L_FTSE	-0.324723	0.052209	-6.219690	0.0000
L_EXCH	-0.118937	0.074665	-1.592932	0.1114
C	-5.56E-06	0.000249	-0.022309	0.9822

R-squared	0.044499	Mean dependent var	-2.86E-06
Adjusted R-squared	0.042161	S.D. dependent var	0.008924
S.E. of regression	0.008734	Akaike info criterion	-6.639871
Sum squared resid	0.093529	Schwarz criterion	-6.623238
Log likelihood	4087.521	Hannan-Quinn criter.	-6.633613
F-statistic	19.03230	Durbin-Watson stat	2.793293
Prob(F-statistic)	0.000000		

Table A1.2. *Results on Lukoil baseline model's regression with leads and lags*

Sample (adjusted): 2 1229
Included observations: 1228 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	-0.024136	0.026402	-0.914172	0.3608
L_NMICEX	0.029719	0.026417	1.124996	0.2608
L_NMICEX(1)	-0.069390	0.026297	-2.638665	0.0084
L_FTSE(-1)	0.092252	0.052653	1.752079	0.0800
L_FTSE	-0.324646	0.052765	-6.152681	0.0000
L_FTSE(1)	0.091218	0.052695	1.731039	0.0837
L_EXCH(-1)	-0.163787	0.075302	-2.175062	0.0298
L_EXCH	-0.088243	0.074892	-1.178266	0.2389
L_EXCH(1)	-0.082210	0.074831	-1.098618	0.2722
C	8.26E-06	0.000249	0.033239	0.9735

R-squared	0.057487	Mean dependent var	3.94E-07
Adjusted R-squared	0.050523	S.D. dependent var	0.008931
S.E. of regression	0.008703	Akaike info criterion	-6.642264
Sum squared resid	0.092247	Schwarz criterion	-6.600626
Log likelihood	4088.350	Hannan-Quinn criter.	-6.626597
F-statistic	8.254484	Durbin-Watson stat	2.772779
Prob(F-statistic)	0.000000		

Table A1.3. *Results on Gazprom baseline model's regression with dummy variable*

Dependent Variable: L_RET
Sample (adjusted): 1 1482
Included observations: 1482 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX	0.029424	0.035137	0.837408	0.4025
L_FTSE	-0.219103	0.066348	-3.302323	0.0010
L_EXCH	-0.179115	0.096817	-1.850040	0.0645
D2011	0.001294	0.000863	1.498598	0.1342
C	2.12E-05	0.000342	0.062072	0.9505

R-squared	0.013005	Mean dependent var	0.000230
Adjusted R-squared	0.010332	S.D. dependent var	0.012140
S.E. of regression	0.012077	Akaike info criterion	-5.991719
Sum squared resid	0.215413	Schwarz criterion	-5.973834
Log likelihood	4444.864	Hannan-Quinn criter.	-5.985053
F-statistic	4.865214	Durbin-Watson stat	2.506065
Prob(F-statistic)	0.000672		

Table A1.4. *Results on Gazprom baseline model's regression without dummy variable*

Dependent Variable: L_RET
Sample (adjusted): 1 1482
Included observations: 1482 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX	0.028656	0.035148	0.815298	0.4150
L_FTSE	-0.218601	0.066375	-3.293416	0.0010
L_EXCH	-0.178287	0.096856	-1.840746	0.0659
C	0.000224	0.000314	0.713222	0.4758

R-squared	0.011504	Mean dependent var	0.000230
Adjusted R-squared	0.009497	S.D. dependent var	0.012140
S.E. of regression	0.012082	Akaike info criterion	-5.991550
Sum squared resid	0.215741	Schwarz criterion	-5.977241
Log likelihood	4443.738	Hannan-Quinn criter.	-5.986216
F-statistic	5.733521	Durbin-Watson stat	2.505991
Prob(F-statistic)	0.000672		

Table A1.5. *Results on Gazprom baseline model's regression with leads and lags*

Sample (adjusted): 2 1481
Included observations: 1480 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	-0.065858	0.035728	-1.843316	0.0655
L_NMICEX	0.035076	0.035679	0.983081	0.3257

L_NMICEX(1)	-0.066781	0.035284	-1.892664	0.0586
L_FTSE(-1)	0.060363	0.067174	0.898608	0.3690
L_FTSE	-0.228368	0.067142	-3.401270	0.0007
L_FTSE(1)	-0.038565	0.067284	-0.573159	0.5666
L_EXCH(-1)	-0.069484	0.098249	-0.707225	0.4795
L_EXCH	-0.164203	0.097138	-1.690417	0.0912
L_EXCH(1)	-0.054941	0.097292	-0.564705	0.5724
C	0.000229	0.000313	0.731000	0.4649

R-squared	0.020529	Mean dependent var	0.000226
Adjusted R-squared	0.014532	S.D. dependent var	0.012147
S.E. of regression	0.012058	Akaike info criterion	-5.991403
Sum squared resid	0.213740	Schwarz criterion	-5.955594
Log likelihood	4443.638	Hannan-Quinn criter.	-5.978054
F-statistic	3.423350	Durbin-Watson stat	2.485167
Prob(F-statistic)	0.000352		

Table A1.6. *Results on Severstal baseline model's regression*

Dependent Variable: L_RET
Sample (adjusted): 1 1290
Included observations: 1290 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX	-0.089109	0.040382	-2.206650	0.0275
L_FTSE	-0.330116	0.072112	-4.577849	0.0000
L_EXCH	-0.461018	0.103449	-4.456489	0.0000
C	-3.42E-05	0.000354	-0.096564	0.9231

R-squared	0.066519	Mean dependent var	-1.21E-05
Adjusted R-squared	0.064341	S.D. dependent var	0.013156
S.E. of regression	0.012726	Akaike info criterion	-5.887275
Sum squared resid	0.208263	Schwarz criterion	-5.871267
Log likelihood	3801.292	Hannan-Quinn criter.	-5.881266
F-statistic	30.54645	Durbin-Watson stat	2.914902
Prob(F-statistic)	0.000000		

Table A1.7. *Results on Severstal baseline model's regression with leads and lags*

Dependent Variable: L_RET
Sample (adjusted): 2 1290
Included observations: 1289 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	0.039767	0.040702	0.977029	0.3287
L_NMICEX	-0.099092	0.040595	-2.441015	0.0148
L_NMICEX(1)	-0.042891	0.040537	-1.058067	0.2902
L_FTSE(-1)	0.054220	0.072764	0.745148	0.4563
L_FTSE	-0.313575	0.072697	-4.313464	0.0000
L_FTSE(1)	0.131486	0.073154	1.797386	0.0725
L_EXCH(-1)	0.215048	0.104971	2.048636	0.0407
L_EXCH	-0.452346	0.103764	-4.359374	0.0000
L_EXCH(1)	-0.040583	0.103947	-0.390416	0.6963
C	-2.28E-05	0.000354	-0.064419	0.9486

R-squared	0.075105	Mean dependent var	-9.45E-06
Adjusted R-squared	0.068597	S.D. dependent var	0.013161
S.E. of regression	0.012701	Akaike info criterion	-5.886478
Sum squared resid	0.206336	Schwarz criterion	-5.846435
Log likelihood	3803.835	Hannan-Quinn criter.	-5.871448
F-statistic	11.53995	Durbin-Watson stat	2.928456
Prob(F-statistic)	0.000000		

Table A1.8. *Results on NLMK baseline model's regression*

Dependent Variable: L_RET
Sample (adjusted): 1 1432
Included observations: 1432 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_EXCH	-0.196381	0.096104	-2.043421	0.0412
L_FTSE	-0.265576	0.066637	-3.985429	0.0001
L_NMICEX	0.110967	0.035528	3.123381	0.0018
C	-6.97E-06	0.000316	-0.022037	0.9824

R-squared	0.013908	Mean dependent var	1.79E-06
Adjusted R-squared	0.011837	S.D. dependent var	0.012036
S.E. of regression	0.011965	Akaike info criterion	-6.010875
Sum squared resid	0.204434	Schwarz criterion	-5.996163
Log likelihood	4307.786	Hannan-Quinn criter.	-6.005382
F-statistic	6.713795	Durbin-Watson stat	2.814446
Prob(F-statistic)	0.000169		

Table A1.9. *Results on NLMK baseline model's regression with leads and lags*

Sample (adjusted): 2 1432
Included observations: 1431 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_EXCH(-1)	-0.033423	0.097907	-0.341372	0.7329
L_EXCH	-0.188637	0.096712	-1.950497	0.0513
L_EXCH(1)	-0.044971	0.096835	-0.464415	0.6424
L_FTSE(-1)	-0.101800	0.067298	-1.512667	0.1306
L_FTSE	-0.270427	0.067281	-4.019368	0.0001
L_FTSE(1)	0.050614	0.067796	0.746562	0.4555
L_NMICEX(-1)	0.017297	0.035873	0.482170	0.6298
L_NMICEX	0.108993	0.035842	3.040922	0.0024
L_NMICEX(1)	-0.035184	0.035786	-0.983191	0.3257
C	-1.04E-05	0.000317	-0.032760	0.9739

R-squared	0.016774	Mean dependent var	6.71E-07
Adjusted R-squared	0.010546	S.D. dependent var	0.012041
S.E. of regression	0.011977	Akaike info criterion	-6.004709
Sum squared resid	0.203837	Schwarz criterion	-5.967909
Log likelihood	4306.369	Hannan-Quinn criter.	-5.990967
F-statistic	2.693546	Durbin-Watson stat	2.810587
Prob(F-statistic)	0.004151		

Appendix 2

Table A2.1. *Results on Lukoil extended model's regression with leads and lags*

Dependent Variable: L_RET
Sample (adjusted): 2 1229
Included observations: 1228 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	-0.023484	0.026450	-0.887840	0.3748
L_NMICEX	0.030458	0.026439	1.152035	0.2495
L_NMICEX(1)	-0.071959	0.026323	-2.733684	0.0064
L_FTSE(-1)	0.058638	0.058381	1.004389	0.3154
L_FTSE	-0.312385	0.059431	-5.256234	0.0000
L_FTSE(1)	0.102535	0.057577	1.780828	0.0752
L_EXCH(-1)	-0.154639	0.075576	-2.046132	0.0410
L_EXCH	-0.097166	0.075060	-1.294505	0.1957
L_EXCH(1)	-0.076420	0.074973	-1.019299	0.3083
L_VIX(-1)	0.007036	0.004144	-1.698034	0.0898
L_VIX	0.002228	0.004376	0.509022	0.6108
L_VIX(1)	0.000550	0.004252	0.129312	0.8971
C	1.03E-05	0.000248	0.041613	0.9668

R-squared	0.060589	Mean dependent var	3.94E-07
Adjusted R-squared	0.051311	S.D. dependent var	0.008931
S.E. of regression	0.008699	Akaike info criterion	-6.640674
Sum squared resid	0.091943	Schwarz criterion	-6.586545
Log likelihood	4090.374	Hannan-Quinn criter.	-6.620307
F-statistic	6.530299	Durbin-Watson stat	2.768537
Prob(F-statistic)	0.000000		

Table A2.2. *Results on Gazprom extended model's regression with leads and lags*

Dependent Variable: L_RET
Sample (adjusted): 2 1481
Included observations: 1480 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	-0.061542	0.035730	-1.722419	0.0852
L_NMICEX	0.036526	0.035645	1.024737	0.3057
L_NMICEX(1)	-0.070594	0.035303	-1.999656	0.0457
L_FTSE(-1)	0.031403	0.075744	0.414596	0.6785
L_FTSE	-0.170106	0.076714	-2.217418	0.0267
L_FTSE(1)	0.025585	0.074241	0.344624	0.7304
L_EXCH(-1)	-0.058970	0.098351	-0.599590	0.5489
L_EXCH	-0.179239	0.097217	-1.843708	0.0654
L_EXCH(1)	-0.053121	0.097347	-0.545691	0.5854
L_VIX(-1)	-0.014983	0.011930	-1.255943	0.2093
L_VIX	0.015234	0.012591	1.209914	0.2265
L_VIX(1)	0.021790	0.012181	1.788754	0.0739
C	0.000228	0.000313	0.727934	0.4668

R-squared	0.025069	Mean dependent var	0.000226
Adjusted R-squared	0.017094	S.D. dependent var	0.012147
S.E. of regression	0.012043	Akaike info criterion	-5.991995
Sum squared resid	0.212749	Schwarz criterion	-5.945442
Log likelihood	4447.076	Hannan-Quinn criter.	-5.974641
F-statistic	3.143438	Durbin-Watson stat	2.484036
Prob(F-statistic)	0.000194		

Table A2.3. *Results on Severstal extended model's regression with leads and lags*

Dependent Variable: L_RET
Sample (adjusted): 2 1290
Included observations: 1289 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_EXCH(-1)	0.206736	0.104190	1.984226	0.0474
L_EXCH	-0.444744	0.102962	-4.319488	0.0000
L_EXCH(1)	-0.067496	0.103117	-0.654562	0.5129
L_FTSE(-1)	0.138969	0.081994	1.694857	0.0903
L_FTSE	-0.249964	0.083344	-2.999204	0.0028
L_FTSE(1)	0.282915	0.080791	3.501831	0.0005
L_NMICEX(-1)	0.044748	0.040367	1.108526	0.2678
L_NMICEX	-0.097703	0.040225	-2.428916	0.0153
L_NMICEX(1)	-0.042601	0.040251	-1.058376	0.2901
L_VIX(-1)	0.034418	0.013094	2.628494	0.0087
L_VIX	0.004842	0.013891	0.348529	0.7275
L_VIX(1)	0.062111	0.013366	4.647037	0.0000
C	-2.86E-05	0.000350	-0.081567	0.9350

R-squared	0.095629	Mean dependent var	-9.45E-06
Adjusted R-squared	0.087124	S.D. dependent var	0.013161
S.E. of regression	0.012574	Akaike info criterion	-5.904264
Sum squared resid	0.201757	Schwarz criterion	-5.852207
Log likelihood	3818.298	Hannan-Quinn criter.	-5.884724
F-statistic	11.24374	Durbin-Watson stat	2.906545
Prob(F-statistic)	0.000000		

Table A2.4. *Results on NLMK extended model's regression with leads and lags*

Dependent Variable: L_RET
Sample (adjusted): 2 1432
Included observations: 1431 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_EXCH(-1)	-0.020712	0.097496	-0.212436	0.8318
L_EXCH	-0.207475	0.096279	-2.154932	0.0313
L_EXCH(1)	-0.053905	0.096364	-0.559382	0.5760
L_FTSE(-1)	-0.100169	0.075507	-1.326615	0.1848
L_FTSE	-0.166584	0.076484	-2.178023	0.0296
L_FTSE(1)	0.197722	0.074369	2.658671	0.0079
L_NMICEX(-1)	0.024981	0.035679	0.700153	0.4839
L_NMICEX	0.112156	0.035615	3.149174	0.0017
L_NMICEX(1)	-0.037872	0.035609	-1.063551	0.2877
L_VIX(-1)	-0.002653	0.011865	-0.223561	0.8231

L_VIX	0.021316	0.012517	1.703057	0.0888
L_VIX(1)	0.055414	0.012126	4.569934	0.0000
C	-1.38E-05	0.000315	-0.043984	0.9649

R-squared	0.031876	Mean dependent var	6.71E-07
Adjusted R-squared	0.023683	S.D. dependent var	0.012041
S.E. of regression	0.011897	Akaike info criterion	-6.015996
Sum squared resid	0.200706	Schwarz criterion	-5.968155
Log likelihood	4317.445	Hannan-Quinn criter.	-5.998131
F-statistic	3.890744	Durbin-Watson stat	2.809243
Prob(F-statistic)	0.000007		

Appendix 3

Table A3.1. *Autocorrelation of the dependent variable (log return differences)*

Gazprom

Sample: 1 1483
Included observations: 1482

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.245	-0.245	89.432	0.000
		2	-0.083	-0.153	99.726	0.000
		3	0.054	-0.008	104.02	0.000
		4	-0.027	-0.029	105.09	0.000
		5	-0.016	-0.026	105.49	0.000
		6	0.031	0.015	106.92	0.000
		7	0.011	0.022	107.10	0.000
		8	-0.003	0.013	107.11	0.000
		9	-0.001	0.004	107.11	0.000
		10	0.003	0.006	107.13	0.000
		11	-0.052	-0.053	111.25	0.000
		12	0.012	-0.018	111.45	0.000
		13	0.034	0.022	113.21	0.000
		14	-0.018	-0.001	113.72	0.000
		15	-0.014	-0.016	114.02	0.000

Lukoil

Sample: 1 1231
Included observations: 1230

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.390	-0.390	187.74	0.000
		2	-0.170	-0.380	223.22	0.000
		3	0.091	-0.205	233.40	0.000
		4	-0.031	-0.198	234.55	0.000
		5	-0.015	-0.171	234.82	0.000
		6	0.019	-0.141	235.27	0.000
		7	-0.021	-0.153	235.82	0.000
		8	0.060	-0.052	240.32	0.000
		9	-0.056	-0.101	244.20	0.000
		10	-0.036	-0.145	245.85	0.000
		11	0.029	-0.158	246.88	0.000
		12	0.015	-0.148	247.18	0.000
		13	0.026	-0.094	248.05	0.000
		14	0.016	-0.038	248.36	0.000
		15	-0.082	-0.124	256.77	0.000

Severstal

Sample: 1 1291
Included observations: 1290

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.450	-0.450	261.76	0.000
		2	0.005	-0.248	261.78	0.000
		3	-0.027	-0.182	262.71	0.000
		4	-0.072	-0.232	269.41	0.000
		5	0.079	-0.120	277.51	0.000
		6	-0.018	-0.090	277.92	0.000
		7	0.018	-0.051	278.32	0.000
		8	-0.024	-0.062	279.07	0.000
		9	-0.015	-0.072	279.37	0.000
		10	0.026	-0.037	280.27	0.000
		11	-0.046	-0.088	283.06	0.000
		12	-0.056	-0.202	287.18	0.000
		13	0.151	-0.013	317.02	0.000
		14	-0.020	0.045	317.56	0.000
		15	-0.044	-0.016	320.04	0.000

NLMK

Sample: 4/20/2006 3/30/2012
Included observations: 1432

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.400	-0.400	230.14	0.000
		2	-0.051	-0.251	233.81	0.000
		3	-0.002	-0.162	233.81	0.000
		4	-0.025	-0.141	234.74	0.000
		5	-0.016	-0.133	235.12	0.000
		6	-0.055	-0.189	239.44	0.000
		7	0.061	-0.108	244.83	0.000
		8	0.032	-0.039	246.31	0.000
		9	-0.016	-0.032	246.66	0.000
		10	-0.051	-0.098	250.36	0.000
		11	0.067	-0.014	256.84	0.000
		12	-0.060	-0.072	262.03	0.000
		13	-0.044	-0.134	264.85	0.000
		14	0.055	-0.079	269.30	0.000
		15	0.030	-0.030	270.61	0.000

Table A3.2. *Autocorrelation of the given variable (local indexes)*

FTSE

Date: 05/24/12 Time: 22:40
Sample: 1 1483
Included observations: 1482

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.038	-0.038	2.1099	0.146
		2	-0.064	-0.066	8.2209	0.016
		3	-0.046	-0.052	11.395	0.010
		4	0.048	0.040	14.807	0.005
		5	-0.090	-0.093	26.766	0.000
		6	0.016	0.012	27.130	0.000
		7	0.040	0.034	29.537	0.000
		8	0.008	0.001	29.621	0.000
		9	-0.010	0.004	29.777	0.000
		10	0.013	0.008	30.026	0.001
		11	-0.034	-0.034	31.749	0.001
		12	-0.006	-0.002	31.811	0.001
		13	0.013	0.009	32.048	0.002
		14	-0.037	-0.044	34.071	0.002
		15	-0.005	-0.003	34.110	0.003

MICEX

Date: 05/24/12 Time: 22:40
Sample: 1 1483
Included observations: 1482

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.000	-0.000	4.E-07	1.000
		2	-0.039	-0.039	2.2642	0.322
		3	-0.050	-0.050	5.9189	0.116
		4	0.047	0.046	9.2208	0.056
		5	-0.047	-0.051	12.446	0.029
		6	0.003	0.004	12.456	0.053
		7	0.032	0.034	14.025	0.051
		8	-0.060	-0.067	19.312	0.013
		9	-0.039	-0.032	21.639	0.010
		10	-0.045	-0.049	24.644	0.006
		11	0.035	0.023	26.500	0.005
		12	0.037	0.039	28.524	0.005
		13	0.063	0.058	34.373	0.001
		14	-0.040	-0.035	36.796	0.001
		15	0.033	0.039	38.467	0.001

Appendix 4

Table A4.1. *The results on the regression in different periods for Gazprom*

- Earlier period (10/02/1006 – 15/09/2008)

Dependent Variable: L_RET
Method: Least Squares
Included observations: 626 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	-0.010630	0.022234	-0.478111	0.6327
L_NMICEX	0.016730	0.023462	0.713069	0.4761
L_NMICEX(1)	-0.021464	0.022602	-0.949635	0.3427
L_FTSE(-1)	0.127896	0.049011	2.609530	0.0093
L_FTSE	-0.088349	0.050471	-1.750474	0.0805
L_FTSE(1)	0.027480	0.046389	0.592382	0.5538
L_EXCH(-1)	-0.115879	0.104503	-1.108857	0.2679
L_EXCH	-0.085059	0.104661	-0.812708	0.4167
L_EXCH(1)	-0.041738	0.106119	-0.393316	0.6942
L_VIX(-1)	-0.003987	0.006970	-0.571959	0.5676
L_VIX	0.005353	0.007785	0.687616	0.4920
L_VIX(1)	0.011362	0.007446	1.525877	0.1276
C	2.79E-05	0.000183	0.152640	0.8787

R-squared	0.040196	Mean dependent var	4.03E-05
Adjusted R-squared	0.027525	S.D. dependent var	0.004621
S.E. of regression	0.004556	Akaike info criterion	-7.923976
Sum squared resid	0.012727	Schwarz criterion	-7.831785
Log likelihood	2493.204	Hannan-Quinn criter.	-7.888156
F-statistic	2.474158	Durbin-Watson stat	2.869931
Prob(F-statistic)	0.003644		

- Later period (16/09/2008 – 30/03/2012)

Dependent Variable: L_RET
Method: Least Squares
Included observations: 854 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	-0.092115	0.058482	-1.575094	0.1156
L_NMICEX	0.053620	0.056530	0.948525	0.3431
L_NMICEX(1)	-0.101468	0.056823	-1.785695	0.0745
L_FTSE(-1)	-0.006894	0.123399	-0.055865	0.0055
L_FTSE	-0.185770	0.123394	-1.505495	0.1326
L_FTSE(1)	0.064874	0.122125	0.531205	0.5954
L_EXCH(-1)	-0.042899	0.135561	-0.316456	0.7517
L_EXCH	-0.204573	0.133201	-1.535816	0.1250
L_EXCH(1)	-0.046599	0.133225	-0.349774	0.7266
L_VIX(-1)	-0.025716	0.020309	-1.266263	0.2058
L_VIX	0.027459	0.020989	1.308221	0.1912
L_VIX(1)	0.032384	0.020420	1.585909	0.1131
C	0.000414	0.000526	0.787891	0.4310

R-squared	0.031371	Mean dependent var	0.000363
Adjusted R-squared	0.017550	S.D. dependent var	0.015496
S.E. of regression	0.015360	Akaike info criterion	-5.499016
Sum squared resid	0.198413	Schwarz criterion	-5.426710
Log likelihood	2361.080	Hannan-Quinn criter.	-5.471325
F-statistic	2.269824	Durbin-Watson stat	2.455259
Prob(F-statistic)	0.007818		

Table A4.2. *The results on the regression in different periods for Lukoil*

- Earlier period (10/02/2006 – 15/09/2008)

Dependent Variable: L_RET
Method: Least Squares
Included observations: 645 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	0.011285	0.021708	0.519871	0.6033
L_NMICEX	0.027546	0.021684	1.270364	0.2044
L_NMICEX(1)	-0.036596	0.021408	-1.709433	0.0879
L_FTSE(-1)	0.086930	0.045849	1.896029	0.0584
L_FTSE	-0.120488	0.047306	-2.547006	0.0111
L_FTSE(1)	0.096235	0.043807	2.196806	0.0284
L_EXCH(-1)	-0.172018	0.097828	-1.758381	0.0792
L_EXCH	-0.083802	0.097869	-0.856271	0.3922
L_EXCH(1)	-0.033224	0.098952	-0.335762	0.7372
L_VIX(-1)	-0.003062	0.002826	-1.083440	0.2790
L_VIX	0.002209	0.003142	0.702884	0.4824
L_VIX(1)	0.005861	0.003008	1.948455	0.0518
C	-3.61E-05	0.000170	-0.212375	0.8319

R-squared	0.067906	Mean dependent var	-1.66E-05
Adjusted R-squared	0.050208	S.D. dependent var	0.004412
S.E. of regression	0.004300	Akaike info criterion	-8.040436
Sum squared resid	0.011686	Schwarz criterion	-7.950358

Log likelihood	2606.041	Hannan-Quinn criter.	-8.005485
F-statistic	3.836948	Durbin-Watson stat	2.967337
Prob(F-statistic)	0.000011		

- Later period (16/09/2008 – 28/02/2011)

Dependent Variable: L_RET
Method: Least Squares
Included observations: 583 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	-0.048219	0.046478	-1.037462	0.3000
L_NMICEX	0.058205	0.046204	1.259730	0.2083
L_NMICEX(1)	-0.103914	0.046362	-2.241373	0.0254
L_FTSE(-1)	0.068047	0.105759	0.643415	0.5202
L_FTSE	-0.419663	0.106518	-3.939826	0.0001
L_FTSE(1)	0.145991	0.105375	1.385440	0.1665
L_EXCH(-1)	-0.145513	0.111712	-1.302572	0.1932
L_EXCH	-0.094964	0.110780	-0.857233	0.3917
L_EXCH(1)	-0.087662	0.110436	-0.793783	0.4277
L_VIX(-1)	-0.011284	0.008354	-1.350630	0.1774
L_VIX	0.005312	0.008598	0.617830	0.5369
L_VIX(1)	-0.001674	0.008414	-0.199019	0.0823
C	7.26E-05	0.000489	0.148495	0.8820

R-squared	0.072656	Mean dependent var	1.92E-05
Adjusted R-squared	0.053133	S.D. dependent var	0.012109
S.E. of regression	0.011783	Akaike info criterion	-6.022305
Sum squared resid	0.079136	Schwarz criterion	-5.924901
Log likelihood	1768.502	Hannan-Quinn criter.	-5.984339
F-statistic	3.721566	Durbin-Watson stat	2.729453
Prob(F-statistic)	0.000020		

Table A4.3. *The results on the regression in different periods for NLMK*

- Earlier period (20/04/2006 – 15/09/2008)

Dependent Variable: L_RET
Method: Least Squares
Included observations: 578 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	-0.058340	0.049806	-1.171342	0.2420
L_NMICEX	0.148618	0.050385	2.949660	0.0033
L_NMICEX(1)	0.000489	0.047515	0.010286	0.9918
L_FTSE(-1)	0.102000	0.097739	1.043590	0.2971
L_FTSE	-0.301659	0.105441	-2.860915	0.0044
L_FTSE(1)	0.000337	0.102427	0.003290	0.9974
L_EXCH(-1)	0.013554	0.223281	0.060704	0.9516
L_EXCH	-0.180295	0.220561	-0.817439	0.4140
L_EXCH(1)	-0.291306	0.220584	-1.320612	0.1872
L_VIX(-1)	0.012965	0.015680	0.826847	0.4087
L_VIX	0.005144	0.016318	0.315269	0.7527
L_VIX(1)	0.009977	0.014620	0.682392	0.4953
C	-5.61E-05	0.000393	-0.142817	0.8865

R-squared	0.035941	Mean dependent var	-9.67E-06
Adjusted R-squared	0.015465	S.D. dependent var	0.009482
S.E. of regression	0.009408	Akaike info criterion	-6.472206
Sum squared resid	0.050012	Schwarz criterion	-6.374153
Log likelihood	1883.468	Hannan-Quinn criter.	-6.433973
F-statistic	1.755306	Durbin-Watson stat	2.816070
Prob(F-statistic)	0.052429		

- Later period (16/09/2008 – 31/03/2012)

Dependent Variable: L_RET
Method: Least Squares
Included observations: 853 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	-0.031518	0.049208	-0.640503	0.5220
L_NMICEX	0.079741	0.048975	1.628189	0.0039
L_NMICEX(1)	0.047407	0.050588	0.937131	0.3490
L_FTSE(-1)	0.265640	0.106436	2.495781	0.0128
L_FTSE	-0.078210	0.107600	-0.726857	0.4675
L_FTSE(1)	-0.194283	0.107495	-1.807363	0.0711
L_EXCH(-1)	-0.055279	0.115346	-0.479247	0.6319
L_EXCH	-0.225984	0.115358	-1.958980	0.0504
L_EXCH(1)	0.015255	0.117531	0.129795	0.8968
L_VIX(-1)	0.085381	0.017700	4.823785	0.0000
L_VIX	0.032095	0.018199	1.763559	0.0782
L_VIX(1)	-0.016551	0.017602	-0.940275	0.3473
C	2.44E-05	0.000456	0.053452	0.9574

R-squared	0.043641	Mean dependent var	7.68E-06
Adjusted R-squared	0.029979	S.D. dependent var	0.013507
S.E. of regression	0.013303	Akaike info criterion	-5.786532
Sum squared resid	0.148655	Schwarz criterion	-5.714159
Log likelihood	2480.956	Hannan-Quinn criter.	-5.758814
F-statistic	3.194263	Durbin-Watson stat	2.802111
Prob(F-statistic)	0.000172		

Table A4.4. *The results on the regression in different periods for Severstal*

- Earlier period (09/10/2006 – 15/09/2008)

Dependent Variable: L_RET
Method: Least Squares
Included observations: 437

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	0.020222	0.045831	0.441228	0.6593
L_NMICEX	0.147224	0.045830	3.212374	0.0014
L_NMICEX(1)	-0.012010	0.045812	-0.262161	0.7933
L_FTSE(-1)	0.081069	0.078895	1.027559	0.3047
L_FTSE	-0.273457	0.080817	-3.383659	0.0008
L_FTSE(1)	0.142125	0.074404	1.910172	0.0568
L_EXCH(-1)	-0.283699	0.170643	-1.662530	0.0971
L_EXCH	-0.420403	0.170735	-2.462311	0.0142

L_EXCH(1)	-0.052978	0.173354	-0.305608	0.7601
L_VIX(-1)	0.006128	0.011429	0.536143	0.5921
L_VIX	0.007377	0.013144	0.561219	0.5749
L_VIX(1)	0.013460	0.012370	1.088125	0.2772
C	-0.000127	0.000316	-0.399917	0.6894

R-squared	0.083667	Mean dependent var	-5.73E-05
Adjusted R-squared	0.057733	S.D. dependent var	0.006741
S.E. of regression	0.006544	Akaike info criterion	-7.191353
Sum squared resid	0.018155	Schwarz criterion	-7.069982
Log likelihood	1584.311	Hannan-Quinn criter.	-7.143458
F-statistic	3.226151	Durbin-Watson stat	2.833258
Prob(F-statistic)	0.000187		

- Later period (16/09/2008 – 30/03/2012)

Dependent Variable: L_RET
Method: Least Squares
Included observations: 852 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L_NMICEX(-1)	0.058531	0.053632	1.091335	0.2754
L_NMICEX	-0.153537	0.053294	-2.880957	0.0041
L_NMICEX(1)	-0.055257	0.053467	-1.033480	0.3017
L_FTSE(-1)	0.180155	0.115235	1.563378	0.1183
L_FTSE	-0.264915	0.116276	-2.278329	0.0230
L_FTSE(1)	0.414857	0.114693	3.617104	0.0003
L_EXCH(-1)	0.267635	0.128350	2.085190	0.0374
L_EXCH	-0.429181	0.126260	-3.399181	0.0007
L_EXCH(1)	-0.071060	0.126261	-0.562798	0.5737
L_VIX(-1)	0.052284	0.019239	2.717514	0.0067
L_VIX	-0.005686	0.019898	-0.285769	0.7751
L_VIX(1)	0.098615	0.019359	5.094045	0.0000
C	5.90E-05	0.000499	0.118230	0.9059

R-squared	0.124696	Mean dependent var	1.51E-05
Adjusted R-squared	0.112177	S.D. dependent var	0.015455
S.E. of regression	0.014563	Akaike info criterion	-5.605564
Sum squared resid	0.177929	Schwarz criterion	-5.533125
Log likelihood	2400.970	Hannan-Quinn criter.	-5.577819
F-statistic	9.960370	Durbin-Watson stat	2.903329
Prob(F-statistic)	0.000000		

Appendix 5

Table A5.1. *Calculations of weighed average government share in MICEX Index in Russia*

TICKER	Weight in Index	Government share	Weighted share
MAGN	0,14%	0,17	0,000238
OGKC	0,18%	0,1211	0,00021798
MSNG	0,20%	0,2735	0,000547
RASP	0,31%	0	0
MTLR	0,37%	0	0

AFLT	0,40%	0,5117	0,0020468
RUALR	0,66%	0	0
IRAO	0,71%	0,1479	0,00105009
SIBN	0,71%	0	0
MRKH	0,72%	0,5369	0,00386568
NLMK	0,01	0	0
MTSS	0,01	0	0
CHMF	0,01	0	0
SBERP	0,01	0,576	0,0079488
FEES	0,01	0,7948	0,01176304
MGNT	0,02	0	0
HYDR	0,02	0,5811	0,01051791
TRNFP	0,02	0,7811	0,01437224
SNGSP	0,02	0	0
TATN	0,02	0	0
VTBR	0,03	0,755	0,024764
RTKM	0,03	0	0
GMKN	0,05	0,0001	0,00000466
SNGS	0,05	0	0
URKA	0,06	0	0
NVTK	0,07	0,04	0,002612
ROSN	0,07	0,7516	0,04938012
GAZP	13,88%	0,3837	0,05325756
LKOH	14,87%	0	0
SBER	15,28%	0,576	0,0880128
	99,99%		**27,06%**

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