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**FRONTIER EQUITY MARKET VALUATION**  
**Securities' Return Behavior, Informational Efficiency, and Valuation**  
**in a Pre-Emerging Equity Market:**  
**The Case of Russia**

A thesis  
Presented to the Faculty  
of  
The Fletcher School of Law and Diplomacy  
by  
Oliver S. Kratz  
In partial fulfillment of the requirements for the  
Degree of Doctor of Philosophy  
February, 1998

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## Prologue

Every period seems to have its own gold rush. What LBOs represented during the 1980s, 'frontier' emerging markets represent during the 1990s. Leading participants in such developments are often rewarded with fortunes beyond their imaginations. By-standers more often than not assess the risks as too high and disregard such developments as a passing fancy with future moral repercussions. Only after some time has passed, will journalists point out the revolutionary changes brought about by those developments – our modern gold rushes - and consequently broader acceptance and general interest becomes ubiquitous. For example, there are few left today who would question the virtues of LBOs which radically transformed American industry during the 1980s and introduced such terms as shareholder value and performance measurement into boardroom vocabulary. Pre-emerging equity markets in the 1990s are again sources of fabulous wealth for those who are dedicated market participants. In the same instance frontier markets bring about dramatic changes in the way resources are allocated, financial assets are valued, and the formerly centrally-planned economies are transformed.

The most pronounced difference between the very gradual rise of mature emerging markets such as the Korean or the Mexican equity market, and the pre-emerging markets of Eastern Europe, is the speed at which the latter are transforming themselves, and with it their societies. Stock markets fill many roles. Primarily they serve as a conduit via which companies can raise capital from both the domestic and international capital markets. In pre-emerging European markets, however, stock markets also serve the role of steering a society into the right direction. More than the efforts of public diplomacy could ever impact a society, stock markets pragmatically and quickly introduce the values and virtues of the free world.

Stock valuation in pre-emerging markets differs from conventional equity valuation. The 'hope' factor is spelled in capital letters. 'Potential' is assessed and provisional credit is extended if informational efficiency allows for some form of frontier market analysis. In fact, many of such economies are still characterized by negative GDP growth rates and political instability. Thus, the imaginative, informed view behind the curtain uncovering future developments by extrapolating current informational efficiencies into the future is often the backbone of sober investment analysis in these countries.

Accordingly, it will be the speed of transformation, the creativity applied to valuation by the market participants, and the role those two factors play in creating the positive externality of democracy, which may enter books to be written about economic history in the future. The wealth created by dedicated hedge funds and pioneering individuals will serve as a reminder of what happened and which is yet to come

## ABSTRACT

This work is about how to value frontier equity markets. First and foremost, the portfolio managers perspective is taken. Secondly, the frontier market policy maker's perspective, who is charged with steering and controlling the young emerging market, is assumed. The case study of the pre-emerging Russian equity market is used to demonstrate what the criteria should be for the portfolio manager and the policy maker in the frontier market to profitably assess equities and to bring about a speedy transformation to a fully-fledged stock exchange and a high degree of informational efficiency and transparency.

There are four main parts composing this work:

- (1) Relative market efficiency: Only the full consideration of stock market predictability possibly leading to a prohibitive degree of relative market inefficiency can allow for reasonable entry and exit decisions. The topic of relative market efficiency is scrutinized with advanced econometric testing methodology taking into account the unique probability distributions of pre-emerging market equity returns.
- (2) Equity market infrastructure: The equity market infrastructure is assessed as it evolves from virtually non-existent to a self-regulatory and investor friendly environment. No single equity can be isolated from the risks created by settlement, clearing, trading, custody, etc.
- (3) The role of American depositary receipts (ADRs): The general role of American depositary receipts (ADRs) in pre-emerging equity markets is examined in the context of informational efficiency. ADRs in the Russian equity market affect returns of underlying shares. The results of an event-study test confirm the conventional wisdom that buying underlying shares around the ADR issuance date can be a lucrative investment. Common pitfalls and trends are outlined and serve the analyst as a guideline to the future of the market for underlying shares of future Russian ADRs.
- (4) The frontier market valuation model: A dynamic valuation model for pre-emerging market equities is established by examining two subsequent periods in the Russian equity market—an initial pre-emerging market period, and a follow-up period characterized by more available information on securities. The results indicate that fundamental measures are of little or no relevance during the initial phase of the equity market, when information is scarce and unreliable. During this period, a composite measure (WAM) including the factors (1) Western auditor, (2) ADRs, and (3) Market capitalization, establishes itself as more meaningful for assessing future equity performance. On the basis of market segmentation theory, which deters many investors from purchasing securities which score poorly on WAM, high WAMs create a stronger demand for equities in an environment which is still more marked by liquidity driven share price performance, than performance based on more fundamental measures. As more securities compete with acceptable WAM scores, more fundamental measures become relevant for assessing future performance of equities.

This study concludes by taking a look at the nucleus and three surrounding layers of pre-emerging market equity analysis. (1) political risks, (2) macro-risks, (3) equity market infrastructure valuation, and (nucleus) WAM/fundamental analysis.

The ubiquitously present phenomenon in this study is market segmentation and informational efficiency. Relative market efficiency, underlying shares of depositary receipts, and finally pre-emerging market equity valuation all share the common dimension of segmented investor groups which in their actions affect relative market efficiency, underlying shares of depositary receipts, and early valuation of equities with specific transparency and liquidity characteristics. Hence it becomes quintessential to identify investor characteristics and relate those to specific equity characteristics. In a market which can be largely described by an informational vacuum and 'back-of-the-envelope' equity analysis, such a fine-tuned-lateral thinking approach can yield superior returns.

# **FRONTIER EQUITY MARKET VALUATION**

**Securities' Return Behavior, Informational Efficiency, and Valuation in  
a Pre-Emerging Equity Market:  
The Case of Russia**





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O.S.K.  
Cambridge, MA  
February 1998

## Chapter 1

### INTRODUCTION

The performance of the Russian equity market since the inception of the Russian Trading System (RTS) in September 1995, has attracted awareness not only by hedge funds and fairly dedicated emerging markets institutional investors but also increasingly by mainstream international mutual funds. With its movement to one of the center stages of emerging market equity investment and its inclusion in the major emerging market indices, the Russian equity market has also become the focus of attention at an increasing number of Russia-dedicated equity conferences in New York, London, Moscow and some of the off-shore investment bases. The discussions that have arisen at many of such events and in the global asset management departments of institutional money managers have and still center around the questions of how really to analyze the behavior of Russian equities for valuation purposes and timely investment.

Traditional fundamental analysis, ratio analysis or 'mining' for cash flow data seem justifiably not the right method in an environment where financial statements initially have not been available or frequently are only formatted in Russian Accounting Standards (RAS) which often bear few similarities with US GAAP or International Accounting Standards (IAS). For many of the companies, management was, and sometimes still is, not at all forthcoming in providing information about their assets, operations, future strategy or ownership structure.<sup>1</sup> The most telling occurrence, that all

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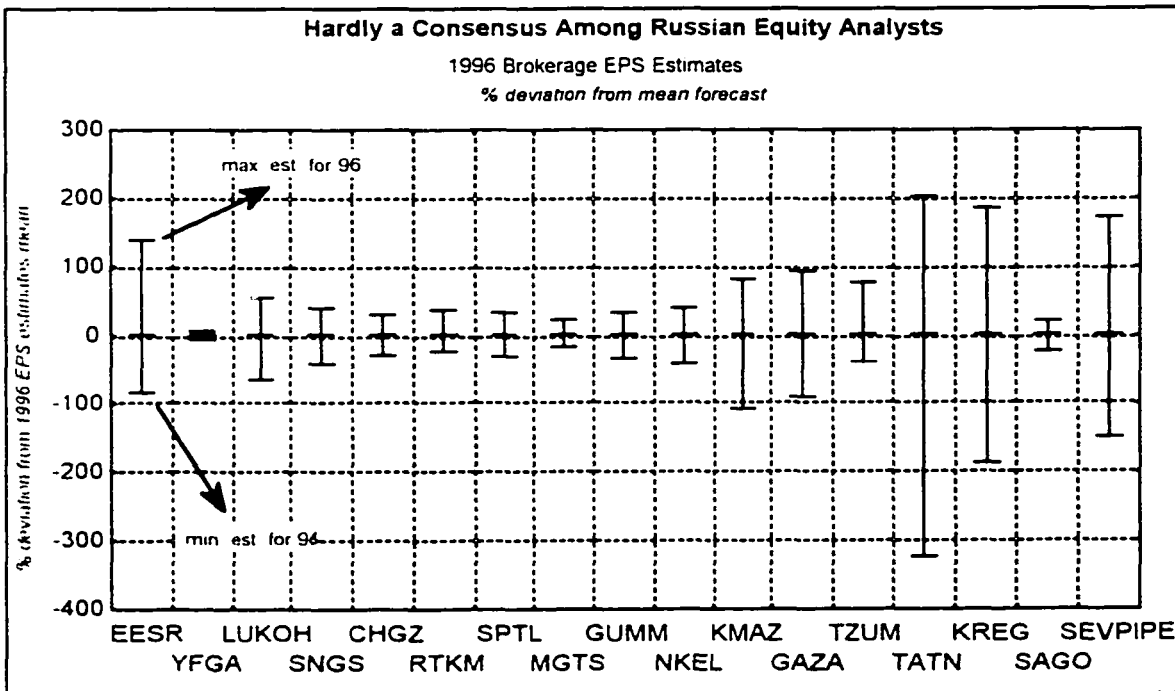
Merrill Lynch reports on August 27th, 1997 in the weekly Russia comment that a survey of US investment institutions found:

1 Nearly 90% of respondents said Russian companies failed to provide adequate financial, operational and strategic information to shareholders.

equity analysts of Russian securities will recall, is when again one of the blue-chip Wall Street brokerages' earnings estimates of Russian companies deviate 50% or more from the actual reported earnings.

This, however, has been the environment in which equity analysts of Russian securities have been operating, and this has been the environment in which the question of how to separate the winners from the losers in the Russian equity universe has become the topic of choice among the market participants. As Chart 1.0 depicts, not only have brokerages malfunctioned in forecasting actual earnings, but even more interestingly, they have not remotely come close to a consensus when deriving their estimates. An average deviation of +/-65% from mean forecasts indicates sell-side research analysts are

**Chart 1.0. 1996 Brokerage EPS estimates dispersion of Russian equities**

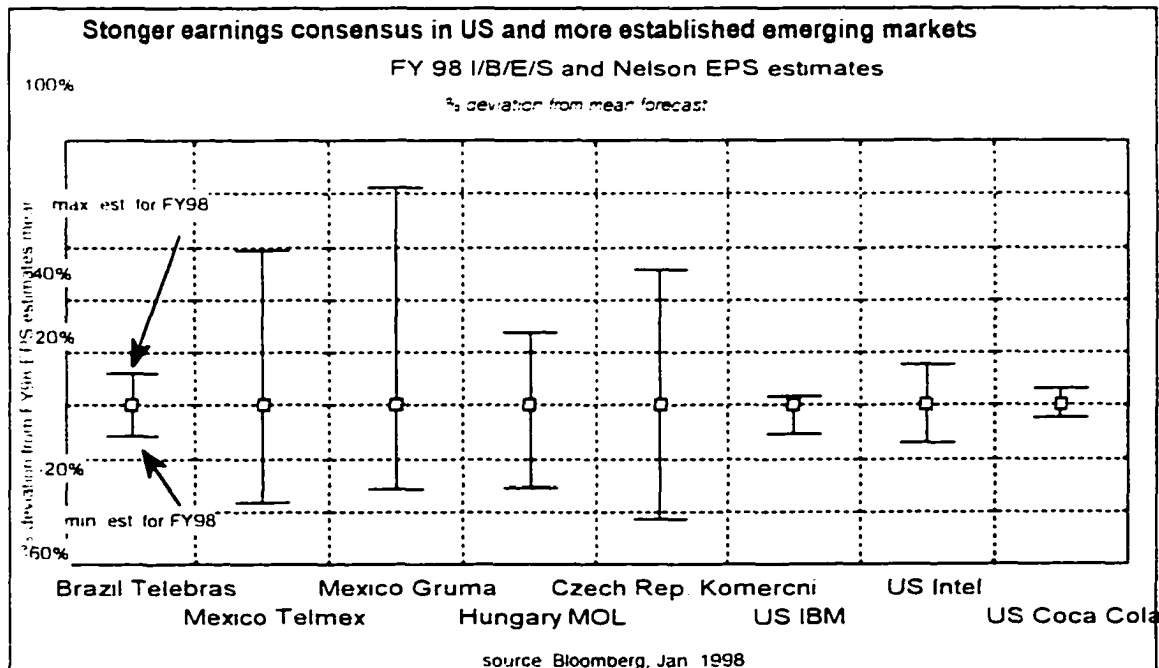


Source: Refer to brokerages covering Russia in bibliography

- 2. Nearly 70% said that government attempts to enforce shareholder-friendly legislation were only 'fair to poor'
- 3. More than 80% of investors said that they expected to maintain or increase exposure to Russia over the next twelve months

either not working under the same assumptions or that companies inform securities analysts poorly. The first view could be supported by the fact that many research analysts dealing with Russian companies lack the experience to derive meaningful assumptions. This phenomenon is not unusual for a number of newly emerging markets where the lack of experts in such markets and countries, forces banks to fill sell-side research analyst positions with recent graduates who sometimes happen to speak the particular local language. The other view, that Russian firms seem to less than adequately address securities analysts' quantitative inquiries, however, appears to be more plausible. In either case, buy-side analysts and portfolio managers are often presented with a melange of different estimates and hence cannot deduce much meaning from any of them.

**Chart 1.1. I/B/E/S EPS estimates for other emerging market blue chips and US blue chips**



As one can see in chart 1.1. , which has been added to demonstrate the deviation from mean earnings estimates for some blue-chip equities in Brazil, Mexico, Czech Republic and Hungary, and finally some US technology and food sector stocks, it becomes apparent that the Russian blue-chips depicted in chart 1.0. have higher deviations from their mean estimates than those blue-chips in more established Central European and Latin American markets. Particularly noteworthy is the realization that US technology stocks, which are often referred to as volatile, or speculative investments, enjoy dramatically lower dispersion in their earnings estimates than the Russia sample in chart 1 0.<sup>2</sup>

Given this current state of affairs, a need has developed to become more imaginative and to apply different concepts to assessing equities, in Russia as well as in those 'frontier' markets which are to emerge in Ukraine, Romania, Bulgaria and the Central Asian republics. This study shall focus on such methods which, on the basis of generally available information, can create a new insight into the price behavior of Russian equities maturing from their infant stages to well-researched, transparent, and sufficiently liquid equities.

While recognizing that the Russian equity market has made substantial progress in its development and that there are companies which manage their investor relations well and report reliable numbers, it is obvious that these firms still form a minority. In the beginning, before the three digit returns were recorded, those companies virtually did not exist at all. In this context it must be understood, that this study shall primarily shed light upon the phase when Russia was still referred to as the Wild East and the country of

Robber Baron Capitalism – or maybe infant capitalism. All the credit is given to those champions of transparency that have most recently allowed the first full Economic Value Added (EVA) analysis on their enterprises and fashion multimedia presentations at investor conferences in New York. In this sense, one should not forget to pay tacit homage to the progress that has been made since 1994. The usefulness of this study, however, must mainly be, besides shedding light upon securities behavior of the second and third tier stocks in Russia, its application to those frontier markets that are yet to emerge in Central Asia, Eastern Europe and sub-Saharan Africa.

Given the progress that has been made and that will finally have been responsible for Russia's inclusion into every international investment portfolio, it must be noted that Russia nevertheless remains a pre-emerging or frontier market in many ways. There are few other markets where some of the largest enterprises, such as gigantic engineering firms (Uralmash or Izhorsky Zavod) or the world's largest large-aircraft manufacturer (Aviastar) are considered second or even third tier stocks. Thus, as Russian first tiers become increasingly transparent and presumably increasingly fairly valued, the Russian regions remain cluttered with undeveloped enterprise material that has yet to take on the shape of investable joint-stock companies, and as such those firms will automatically qualify for application of the type of pre-emerging securities analysis that is conducted in this study

While there are arguably a number of approaches to find clarification for some of the thoughts and questions that have been evoked during the past two years as pre-emerging equity analysts and securities and exchange commission policy officials have

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<sup>1</sup> The Russian sample has been selected on the basis of liquidity. The most liquid stocks as traded on the RTS (Russian Trading System) during the first 6 months of 1997, are depicted in chart 1.0.

grappled with the many issues pertaining to security valuation or steering and control of the young securities exchanges, the path chosen in this study appears to be intuitive as it takes the reader from a basic introduction to the Russian pre-emerging market, to a more elaborate and formalized analysis of securities price behavior in the context of market efficiency. It finally culminates in a dynamic valuation model for pre-emerging equity markets.

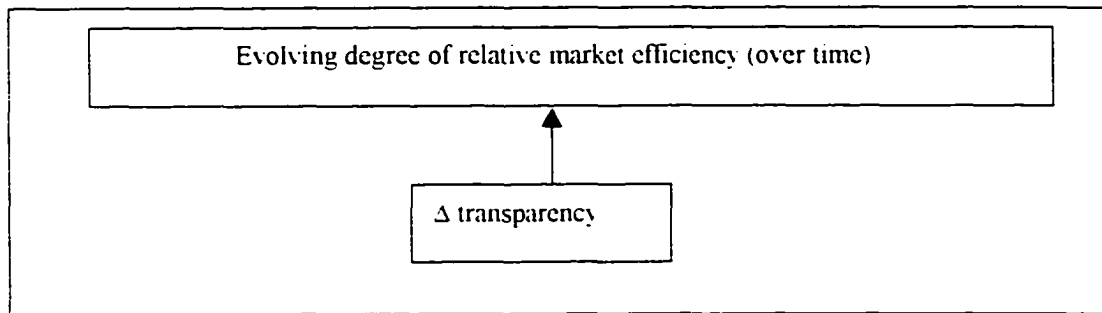
Besides offering an educational journey on pre-emerging markets for the emerging markets layman, for the emerging markets professional, this study has at least two main purposes: firstly, how can the returns process of Russian securities be characterized in statistical modeling terms in the context of market efficiency, and secondly, how can the emerging market portfolio manager assess Russian equities in the attempt to mine for data, which would result in future profitable performance? The first question of evolving relative market efficiency is tied to the latter by the notion of relative market inefficiency being possibly responsible for the erratic behavior of securities that apparently find investors who do not mind the lack of reliable data. If a dynamic process from relative inefficiency to relative market efficiency can be measured, it could be presumed that the market was 'stacked' against outsiders. If this were the case, in the least – it would be important to know. More importantly, however, knowledge about the relative efficiency or relative inefficiency of the Russian equity market would shed light upon the frequently cited notion that inefficiency is less desirable from a policy standpoint as investment is commonly said to shun inefficient markets and thus not fuel the real economy with capital, and such investments that are



made are poorly allocated. Under such circumstances, the economic efficiency of the financial intermediation process (which allocates savings to investments) would be impaired.

Furthermore, the exploration of informational efficiency or inefficiency may help the portfolio investor to understand this market and possibly generate ideas for exploiting inefficiencies in this market, or any other market with similar characteristics. To round up the exploration of informational efficiency in the Russian equity market, it will also be assessed to what extent measured relative market efficiency is a function of transparency, which in itself is an informational efficiency-enhancement factor (see diagram 1.0).

**Diagram 1.0 Exploratory diagram of causal factor of relative market efficiency analysis**



The attempt to attribute the changing degree of market efficiency to those factors that are believed to increase the appeal of securities to investors could create a new paradigm for policy makers in frontier markets to think about the various development paths of their capital markets in a more targeted and market efficiency-oriented fashion (i.e. if transparency is a factor contributing to market efficiency and market efficiency leads to a lower risk perception and thus higher investment, then transparency itself

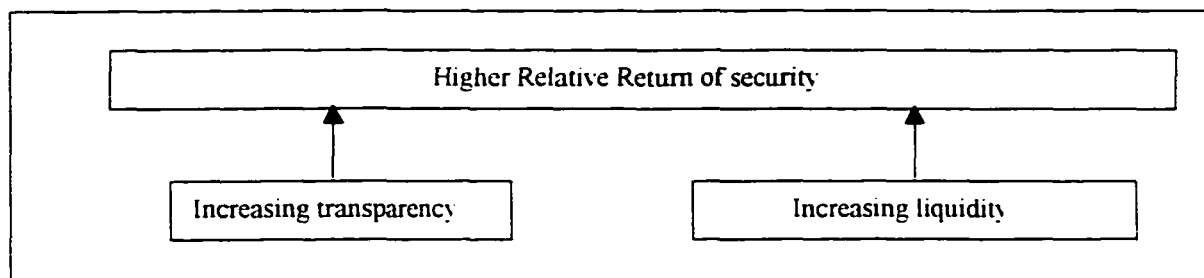
should be targeted as one of the first statutes to be implemented by any securities exchange commission.) This argument is based on the premise that improving relative market efficiency helps the development of an emerging equity market. To support this premise, one must agree on the benefits of having an emerging equity market over not having an equity market. The benefits of an emerging equity market are briefly outlined in table 1.0.

**Table 1.0. Benefits of an emerging equity market**



The second part of this study will be dedicated to the detection of measures, events and characteristics of equities that fill the void of more conventional information when analyzing securities. In particular, transparency and liquidity-enhancement programs will be explored. The results can create a new insight into equities and their likely future performance in an environment where such measures remain only second best tools, however, in the absence of better ones.

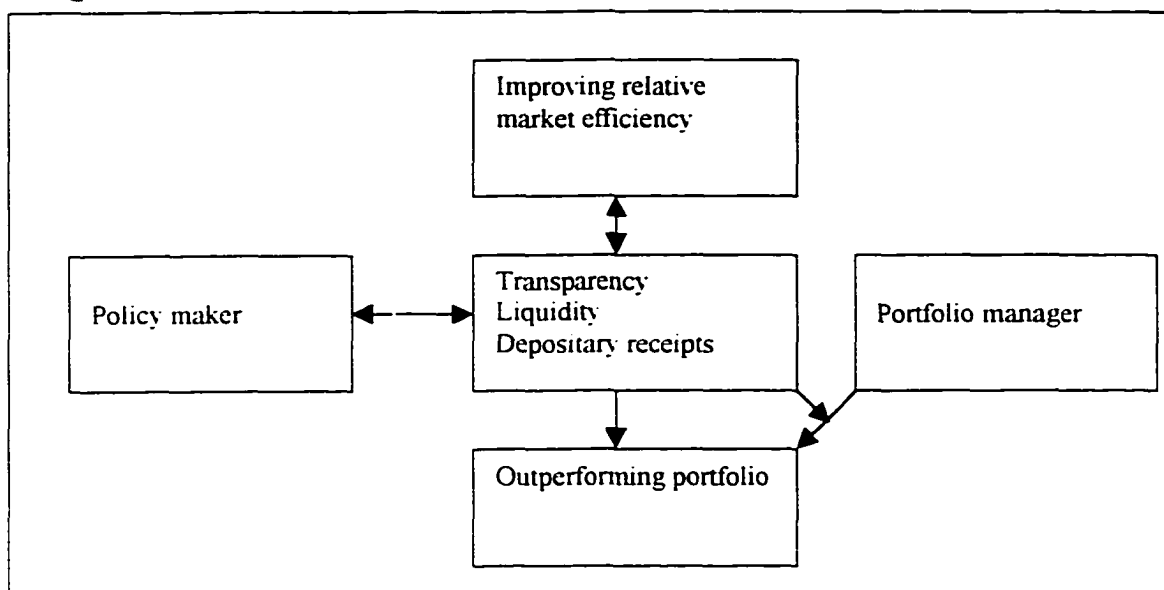
**Diagram 1.1. Exploration of factors contributing to outperforming securities**



The results in the second part of the analysis could lead to further examination of the factors that contribute to companies applying for American depository receipts programs (ADRs) or the factors that cause brokerages to initiate continuous coverage of specific firms. Then, and if the first analysis is meaningful, a potentially lucrative early indication system could be devised for the pre-emerging market portfolio manager. Above all, however, the second part of this study will build a dynamic framework of equity valuation in pre-emerging markets. This goal will be accomplished by measuring fundamental and technical/qualitative criteria in relation to securities price performance.

In a broader context, this study seems to have an immediate relevance for two personae: the policy maker seeking means to nurture the financial intermediation process, and the portfolio manager, seeking ways to assess securities that lack the beneficial membership of the I/B/E/S (International Brokerage Estimates Survey) database and all the transparency features and estimates that would come along with it.

**Diagram 1.2. Outline of Beneficiaries of Analysis**



On a third level, this study also may serve to highlight some subtle points that I have come to notice and that the following analyses may also prove: Pre-emerging market securities are assessed with a blending of the investment community's assumptions of a country which are often tied to a large portion of goodwill and optimism, much of it being generated by the general media or the political bias the country carries. In this sense it does not come as a surprise that investors fully embraced the Russian equity market, as it must be have been something out of the ordinary that undisputedly also marks a historical event which represents the final conversion of the other Cold War power to some form of Capitalism.

The best example which comes to mind is that of the Russian Federation's first Eurobond after the fall of the Russian Czar. The oversubscription of the issue and the 'historical' event of the Russian government coming to New York bore more

resemblance to a grandiose diplomatic event than a shrewd question and answer session probing the credit worthiness of the borrower. Equities such as Gazprom, the giant hydro-carbon conglomerate, are perceived with similar bias which more often than not benefit the company and leave traditional investment analysis marginalized on the sidelines.

While this study will largely abstain from exploring this third notion of intangible country bias accompanying valuation of equity markets, it may be important to keep at least in mind. The only numerical mention of this notion can be found in the analysis of the meaning of the Russian Eurobond spread in the context of the Russian equity market performance, a section which can be found in the second part of this study. Obviously, political biases will vary by country and be determined by size, history, and related variables. For all the usefulness which the results may provide, the difference between Russia and China, and smaller emerging equity markets will also be a function of their political past and thus may not be the best example for the behavior of security prices of smaller markets with less coverage or negligible past impact on global politics and economics.

As this third notion will not be the core of the analysis, it shall be examined only in a cursory fashion. Where appropriate, some elements worthy mentioning shall be presented, primarily in the context of some new theories of behavioral finance – a topic which overlaps with the notion of market efficiency and thus will not derail the study from its two principal objectives as mentioned above.

## Outline by chapter

**Chapter 2** introduces the reader to the overall framework of securities price behavior by outlining the major premises of the efficient market hypothesis. From there a small step will be taken and the most current empirical results of developed markets will be described. The nexus between securities behavior in developed markets and securities behavior in emerging markets will be established via a brief assessment of the meaning of relative market efficiency and the utility of tests of absolute market efficiency versus relative market efficiency. The final section of chapter 2 provides numerous examples of recent empirical work on emerging market securities behavior in the context of market efficiency. Chapter 2 concludes by noting some of the newer, behavioral finance-based explanations for less than perfectly efficient markets.

**Chapter 3** starts out by telling the colorful story of the genesis of an equity market in Russia-which is fairly representative for a number of other newly emerging equity markets. Subsequently issues such as, market regulation, clearing and settlement, custody, the creation of the Russian Trading System (RTS), taxation and offshore investing, Russian accounting peculiarities, and the often ignored connection between equity market infrastructure and equity valuation, are explored. Overall, chapter 3 helps to gain an insight into the detailed characteristics of a young emerging equity market. It highlights the main problems and points out the areas where progress has been achieved. Furthermore, continuous reference to websites help the reader to retrieve current updates on many of the developments addressed. The meaning of chapter 2 in the overall context of this thesis is to establish an understanding of topics in equity market infrastructure.

Above all, equity market infrastructure serves as a valuation benchmark for the companies which are located in a specific market. The example of Russia demonstrates that no single company can be isolated from the valuation of the equity market infrastructure in Russia. These deficiencies in the infrastructure of the Russian equity market are one of the main reasons why a steep discount to Russia's companies versus their peers in more mature emerging market continues to exist.

In **Chapter 4** a more quantitative framework is presented in order to demonstrate some of the data peculiarities of the Russian pre-emerging market. The main financial statistics, such as Sharpe ratio, skewness, kurtosis, mean, standard deviation and normality tests are computed. In addition, the mean-variance frontier is plotted for three time periods.

It becomes apparent that the traditional risk-return trade-off relationship does not hold in the early stages of emerging markets, but is increasingly developing at a later stage. Given the relative neglect of volatility as a measure to trade-off return, it is concluded that pre-emerging market investors are initially less concerned about volatility but instead affected by more fundamental risks.

Furthermore, the underlying probability distribution demonstrates clear deviation from normality. This realization gives rise to a search for methodologies which are robust to non-normality and heteroscedasticity.

**Chapter 5**, in many ways, delivers a novel approach to pre-emerging markets analysis. Here the reader is introduced to the information channels which serve investors in their decision-making process. The investor in the Russian equity market uses

brokerage reports as the most important source of information. Ranking below brokerage reports are several on-line services and newspapers / magazines.

The transparency index, which builds the core of the chapter is established through tracking brokerage coverage of individual companies in the Russian equity market, which then are categorized in top-, medium-, and bottom-transparency portfolios. The overarching theme of informational efficiency finds its closest description in this chapter and lays the groundwork for the analytical assessment of relative market efficiency in chapter 7

In **Chapter 6** the methodology for measuring relative market efficiency in emerging markets is established. The chapter begins by explaining the linkage between the random walk model and the efficient market hypothesis. Subsequently, the technical assumptions of the variance ratio test, which serves to test the random walk model, are described.

**Chapter 7** applies the variance ratio test to three portfolios of Russian equities formed according to the transparency criteria laid out in chapter 5. The empirical results indicate that low- and high-transparency portfolios suffer from similar degrees of relative market inefficiency, whereas the medium-transparency portfolio displays a higher degree of relative market efficiency. The underlying reasons for this phenomenon are mainly related to poor information dissemination (bottom-transparency portfolio), non-dedicated investor participation, institutional characteristics which lead to buy-and-hold strategy (top-transparency portfolio), and dedicated country and emerging market funds predominating the medium-transparency portfolio investors. In the second section of chapter 7, evolving relative market efficiency of the Russian index over time is



examined. Here we can see a trend which indicates increasing relative market efficiency. This trend tends to get interrupted at times of market correction. The reason for such lapses into relative market inefficiency are mainly found in the inadequate infrastructure of the Russian equity market, which excludes smaller brokerages, due to lack of creditworthiness, during times of market correction. This is primarily the result of a lack of a central clearing mechanism.

This chapter explores the basic assumption that informational efficiency fostered by securities transparency, eventually translates into a higher degree of relative market efficiency. This assumption, however, is qualified, as a severe form of market segmentation introduces some initially counterintuitive findings.

These findings demonstrate that relative market efficiency is assaulted as dominating forces related to a special segment of investors in the top transparency portfolio defeat the mechanism which translates higher transparency into a higher degree of relative market efficiency.

**Chapter 8** begins by introducing international depositary receipt programs to the reader. The main benefits to the issuer and to the investor are outlined. Further, the four different types of depositary receipts facilities are explained. Following this introduction, depositary programs issued by Russian companies are examined. Among other facets of Russian depositary receipts, such issues as ADR arbitrage, trading trends in underlying shares with ADRs, and the Gazprom ringfence assault attempt are addressed. Finally, the chapter takes a closer analytical look at the performance of underlying shares before and after the issuance of depositary receipts, and thus adds and denies evidence to many

myths surrounding the investment in underlying shares around the issuance date of depositary receipts.

**Chapter 9** takes the analysis of equities in the Russian pre-emerging equity market a step further by developing a transparency-dynamic equity valuation model. This model which is based on market segmentation theory develops a framework for the investor to decide when to rely on the WAM factor (Western Auditor-ADR-Market Capitalization), and when to switch to fundamental ratios as future performance of pre-emerging market equities is assessed. The chapter rounds up the discussion by presenting a simple reference framework for screening pre-emerging market equities in the context of political, macro-economic, equity infrastructure, and WAM/fundamental factors.

In **chapter 10** the main conclusions of this study are presented. A short and colorful analogy is added to present the reader with an insightful and dynamic understanding of the relationship between pre-emerging market equity valuation and evolving informational efficiency.

## Chapter 2

### LITERATURE REVIEW

In the context of this study the concept of market efficiency becomes relevant as it lends itself as a framework to examine the behavior of securities returns on a level which is of interest to the portfolio manager, whose mandate it is to outperform a benchmark and who can profit from or exploit gross market inefficiencies. Secondly, it is important to the policy maker, whose mandate it is to steer and control the development of a newly emerging market in order to achieve the benefits of an efficient equity market.

The concept of an efficient market differs from the economic notion of a perfect market in which perfect information exchange, zero transaction costs, and perfect trading infrastructure are assumed. The model of an efficient market does neither require rational behavior in an absolute sense of the word, nor does it require that information be perfect and always accurately reflected, although in the long run reality should assert itself. There may, however, be times when investors collectively assess assets to be worth more than their intrinsic value. The major difference between the economic notion of a perfect market and the model which has become known among financial economists as the efficient market hypothesis (EMH) therefore is the relaxation of the assumption of perfection. In simple words, financial markets are considered to display a form of relative efficiency if market participants are operating under the condition of fair game where no single investor has a chance of beating her fellow investors in any consistent fashion, and not only under those circumstances when zero transaction costs are assumed.

and information is understood to be disseminated instantaneously and ubiquitously to all market participants.

Market efficiency also becomes an important concept in this study as its characteristics can be closely linked to the phenomenon of market segmentation, which forms one of the overarching themes of the individual analyses presented throughout the following chapters. Market segmentation appears to be a controlling factor in determining relative market efficiency of securities with different characteristics, particularly in an environment where 'noise traders' or derivatives thereof may be predominant in securities with certain characteristics.

This chapter will begin by outlining the concept of market efficiency and its major underlying assumptions. The linkage between the concept of market efficiency and the random walk model, which is used in many econometric tests as a tool to *measure* market efficiency, is described in detail in the methodology section of this study and thus a more disciplined inquiry into the linkage will be postponed at this point.<sup>1</sup> Following the general framework of market efficiency, an overview of recent empirical results on developed markets will be presented. Particularly, results from two popular methods: autocorrelations and variance ratio tests are discussed. Finally, an overview of the methodologies and of previous studies covering the special cases of emerging equity markets is presented. The chapter concludes by briefly describing some theories derived from behavioral finance and their effect on efficiency in emerging markets.

## II.A. Market efficiency

### II.A.1. Market efficiency in developed markets

Market efficiency has been one of the most widely discussed issues in finance and as such it shall be briefly defined in general terms before proceeding to the more immediately relevant subject of the random walk theory.

There are five key assumption which underlie the efficient market hypothesis (EMH)<sup>2</sup>:

1. a large number of rational, profit-maximizing investors who actively participate in the market by analyzing, valuing, and trading stocks;
2. price-taking behavior;
3. information is free and dispersed to market participants at the same time;
4. information is generated randomly; that is announcements are essentially independent of one another;
5. investors react quickly and accurately to new information, causing stock prices to adjust accordingly.

As we will later see, these assumptions leave substantial room for subjective interpretation. Indeed, there are tests of market efficiency that discredit market efficiency in developed markets on the grounds of non-fulfillment of the assumptions laid out above. Generally, the usefulness of such logical scrutiny of the premises on which the efficient market hypothesis is founded delivers fairly subjective results and as such shall not be the focus of this literature review. Nevertheless, as we will see in the example of a study on the Polish equity market described below, the violation of the five assumption can hint at results that can also be proven quantitatively.

The three commonly discussed forms of the efficient market hypothesis (EMH) have been defined as follows:

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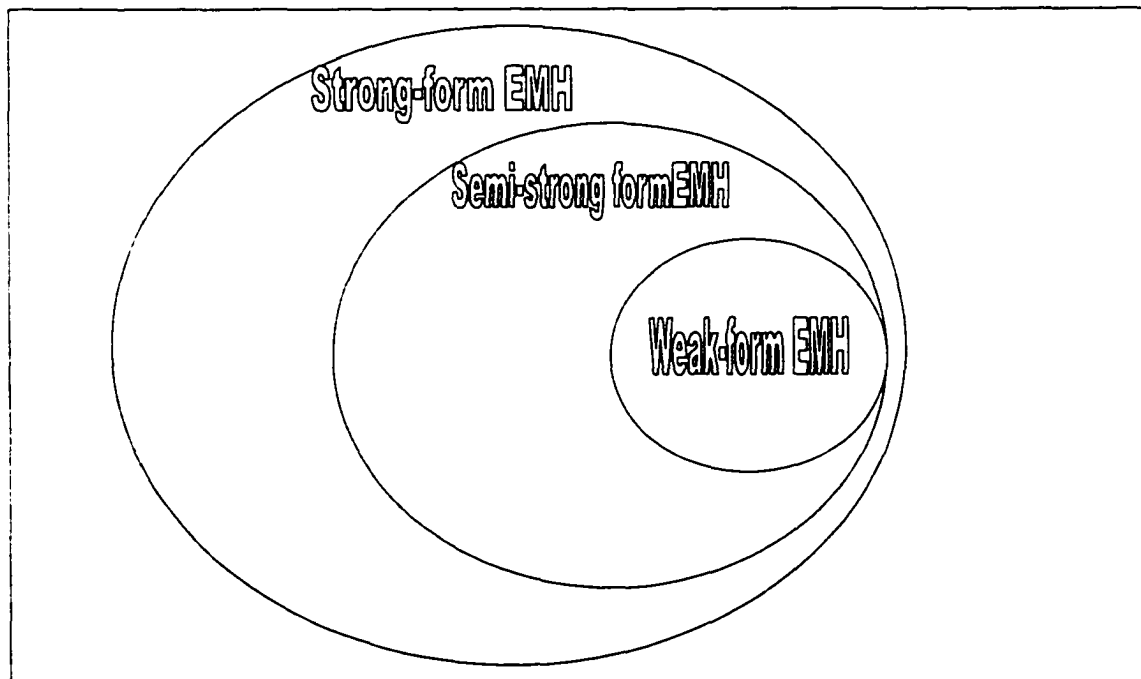
<sup>2</sup>The term to *measure* is deliberately used as preference over to *test* market efficiency. Measuring market efficiency implies a relative degree as opposed to testing market efficiency, which implies an absolute degree of market efficiency or inefficiency.

**Table 2.0. Three Forms of Market Efficiency**

Traditional Three Forms of Market Efficiency	
<b>Weak Form Efficient Market Hypothesis:</b>	Stock prices are assumed to reflect all information that is contained in past history of the stock price itself.
<b>Semi-strong Form of Efficient Market Hypothesis:</b>	All publicly available information, such as financial reports, strategy, past history, etc. is reflected in current stock prices.
<b>Strong Form of Efficient Market Hypothesis:</b>	All public and private information is reflected in the stock price. <sup>3</sup>

The relationship among the informational sets described in table 2.0. can be graphically illustrated in diagram 2.0.

**Diagram 2.0. Relationship among EMH informational sets**



<sup>3</sup> Charles P. Jones, *Investments: Analysis and Management*, 3<sup>rd</sup> ed., (New York: John Wiley & Sons, Inc.), 464

In technical terms the relationship can be defined as

WF EMH= weak form EMH

SSF EMH= semi-strong form EMH

SF EMH= strong form EMH

$WF EMH \subset SSF EMH$  and  $SSF EMH \subset SF EMH$ ,

where all information contained in WF EMH is also contained in SSF EMH but SSF EMH is superior because it contains some additional information, and all information of SSF EMH is contained in SF EMH, but SF EMH is superior because it contains some additional information.

The validity of the weak form EMH would render all technical and chartist efforts meaningless as they solely rely on the past behavior of securities prices. The validity of the semi-strong form of EMH would question not only the technician's but also the fundamental securities analyst's value-added as fundamental analysis based on publicly available information (in the case of private information it would be considered insider trading) would not create excess return over any sustainable period of time. Finally, the implications of the strong form EMH would leave no one with a way to beat the market. In this sense many financial decisions or other actions would perfectly lose their meaning. Share buy-backs based on the company's 'insider' view that the stock price is undervalued, for example, would therefore not be justified.<sup>4</sup>

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<sup>4</sup> For a detailed description of the three forms of the market efficiency see E.F. Fama, "Efficient Capital Markets: Review of Theoretical and Empirical Work," *Journal of Finance* (May 1970), 383-417.

<sup>5</sup> Share buy-backs in order to gain ownership share or to benefit from favorable tax treatment would be justified under the strong-form EMH.

For each of the three forms of EMH, a number of methods have been devised to measure the validity of the respective forms of the market efficiency hypothesis.<sup>5</sup>

**Table 2.1. Common measuring methodologies associated with EMH**

Weak form EMH	Semi-strong form EMH	Strong form EMH
Autocorrelation	Event study tests focussing on:	Examining the performance of alternative investor groups, such as corporate insiders, stock exchange specialists, professional money managers.
Runs Test	stock splits, earnings estimates, new issues, size effects, calendar effects.	
Filter Rules		

The weak form of the EMH is also associated with the random walk theory or hypothesis. The random walk hypothesis states that successive price changes or successive rates of return of a security are independent over time and that the actual price or return fluctuates around an intrinsic, or a theoretical value. Fama, the pioneer of efficient market theory, remarks in this context:

“... the theory of random walks implies that a series of stock price changes *has no memory* -the past history of a series cannot be used to predict the future in any meaningful way. The future path of the price level of a security is no more predictable than the path of a series of accumulated random numbers.”<sup>6</sup>

Furthermore, Fama noted that market efficiency and asset pricing models are inseparably

<sup>5</sup> For a detailed discussion of empirical findings of EMH tests of developed markets please refer to Frank K. Reilly, *Investment Analysis and Portfolio Management*, 3<sup>rd</sup> edition, (Fort Worth: The Dryden Press, 1989), chap. 6 passim.

<sup>6</sup> Eugene F. Fama, “Random Walk in Stock Market Prices,” *Financial Analysts Journal* (Sept./Oct 1965), 56. Since Fama’s classical definition, there have been iterations of this definition. A notable recent definition has been presented by Malkiel (1992): “A capital market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices. Formally, the market is said to be efficient with respect to some information set... if security prices would be unaffected by revealing that information to all participants. Moreover, efficiency with respect to an information set... implies that it is impossible to make economic profits by trading on the basis of [that information set].” This definition includes the notion of economic gains and therefore emphasizes the difference between ‘the perfect market’ and ‘efficient market in financial economics’ where reality can be distorted as long as participants are collectively unaware of some additional information which would lead to a different valuation and as long as no one possesses information beyond the defined informational set which would allow for a trading strategy leading to economic gains.



joint-hypotheses and therefore are not testable. This would imply that existing return predictability would not necessarily establish market inefficiency but could be the result of a joint-hypothesis problem. Given this argumentation, which is based on the premise that any discovered inefficiency may be the result of analysts using the wrong pricing model or possibly the wrong reference benchmark for the measurement of abnormal returns, it would almost lead to the conclusion that any study including measures of market efficiency would lead to questionable results. This theoretical debate, however, has not found its last answer and as such most researchers, particularly those preoccupied with emerging capital markets, have abandoned this notion and have continued to conduct tests of efficiency. The prevailing view is that only relative efficiency can be measured and improvements or deterioration in the serial dependence of assets prices would still be the strongest evidence of improving or deteriorating relative market efficiency

## II A 2 Empirical results in developed markets

The main concern of empirical research in the area of market efficiency has been to prove the hypothesis of the random walk model which states that successive price changes are independent. Most tests fall in one of two categories. The first one relies on statistical tools such as serial correlation, or more precisely, autocorrelations and non-parametric runs tests. If such tests support the independence of price changes, one would infer that no mechanical trading rules or chartist techniques would yield excess returns. It would imply that the market has no memory and historical patterns of price changes do

not repeat themselves in any consistent fashion. The second category of tests has concentrated on testing independence by applying different trading rules and monitoring whether greater profits can be reached than through a simple buy-and-hold strategy.

Predictability in equity prices has been a broadly and continuously researched topic. It is impossible to provide a full survey of the extensive literature that has been produced over the years.<sup>7</sup> Therefore, and for the sake of relevance and currency of data, the most recent empirical evidence shall serve as a good indicator of what results have been achieved by applying autocorrelation tests and variance ratio tests in developed markets.<sup>8</sup> Campbell, Lo, and MacKinlay's recent work *The Econometrics of Financial Markets* (1997) includes the below described empirical results for two popular tests applied to the CRSP (Center for Research in Securities Prices at the University of Chicago) data series.<sup>9</sup> There are a number of other tests ranging from excess volatility-based tests to probability models for stock market crashes following the creation of bubbles. The final focus on emerging markets in this study does not lend itself to tests which depend on analysis of dividend streams, which are components of an equilibrium model used and thus are mostly not applicable in an emerging market environment where equilibrium models such as the CAPM have been proven not representative given less than perfect integration in global capital markets.

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<sup>7</sup> For a good review of the literature on EMH in developed markets, particularly for a good description of excess volatility-based tests, and probability models for stock crashes based on bubble creation which would defeat the EMH also refer to Peter Fortune, "Stock Market Efficiency: An Autopsy?," *New England Economic Review-Federal Reserve Bank of Boston*, (March/April 1991): 17-40.

<sup>8</sup> The recent literature has been built on the works which include: Alexander (1961, 1964), Cootner (1964), Cowles (1960), Cowles and Jones (1937), Fama (1965), Fama and Blume (1966), Kendall (1953), Granger and Morgenstern (1963), Mandelbrot (1963), Osborne (1959, 1962), Roberts (1959), and Working (1960).

<sup>9</sup> John Y. Campbell, Andrew W. Lo, and A. Craig MacKinlay, *Econometrics of Financial Markets* (Princeton, N.J. Princeton University Press: 1997): 66-74.

Literature which attempts to discover causal relationships between security characteristics or market infrastructure and relative market efficiency has been scarce and inconclusive at best. There is, however, a growing body of literature dealing with reasons why markets may not be efficient.<sup>10</sup> Most of the reasoning is based on theories in the relatively new field of behavioral finance. Other reasoning on the causes of market inefficiency is derived from market segmentation theory and models of noise trading.<sup>11</sup>

#### II.A.2.1. Tests of autocorrelation in developed markets

Table 2.2. reports the autocorrelation for both the value- and the equal-weighted CRSP index. The CRSP daily return index is measured by mean return, standard deviation, and 1-4 day lag autocorrelation coefficients. Subsequently the Box-Pierce Q-statistic is computed, which tests the joint-significance of the four autocorrelation measures. The results indicate that both the value- and the equal-weighted index have statistically significant positive serial correlations at the first lag. The Box-Pierce joint-significance test at five autocorrelations has a value of 263.3 which indicates significance at all conventional significance levels.<sup>12</sup> Interestingly, the autocorrelations in the first measurement interval between 1962 and 1978 are in both the value- and the equal-

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<sup>10</sup> For a comprehensive summary of behavioral finance-based reasoning for market inefficiencies see Richard H. Thaler et al., eds., *Advances in Behavioral Finance*, (New York: Russell Sage Foundation, 1993)

<sup>11</sup> Peter Fortune, "Stock Market Efficiency: An Autopsy?," *New England Economic Review-Federal Reserve Bank of Boston*, (March/April 1991): 30-34. For a more detailed discussion of noise traders in the context of market segmentation theory please refer to chapter 7.

*See also:* Andrei Shleifer and Lawrence H. Summers, "The Noise Trader Approach in Finance," *Journal of Economic Perspectives*, (Spring 1990): 19-33.

DeLong, J. Bradford; Andrei Shleifer, Lawrence H. Summers and Robert J. Waldmann, "Noise Trader Risk in Financial Markets," *Journal of Political Economy* (August 1990): 703-738.

<sup>12</sup> The Q-statistic is distributed asymptotically as a  $\chi^2$ -variate (5) for which the 99.5-percentile is 16.7.

weighted index substantially higher than in the second measurement period ranging from 1978 to 1994. The authors of this most recent study attribute this to the notion that predictability has been a 'source' of excess profits and thus its decline is consistent with increasingly competitive financial markets. This result clearly demands that more work can be done on the changing nature of market efficiency as expressed by declining and rising autocorrelation coefficients, particularly on the individual security level, as opposed to the aggregate index level.

**Table 2.2. Autocorrelation Empirical Results of Developed Market**

Sample Period	Sample Size	Mean	SD	$\rho_1$	$\rho_2$	$\rho_3$	$\rho_4$	Q5	Q10
<b>A. Daily Returns CRSP Value-Weighted Index</b>									
62-07-03-94-12-30	8179	0.041	0.824	17.6	-0.7	0.1	-0.8	263.3	269.5
62-07-03-78-10-27	4090	0.028	0.738	27.8	1.2	4.6	3.3	329.4	343.5
78-10-30-94-12-30	4089	0.054	0.901	10.8	-2.2	-2.9	-3.5	69.5	72.1
<b>B. Daily Returns CRSP Equal-Weighted Index</b>									
62-07-10-94-12-30	8179	0.07	0.764	35.0	9.3	8.5	9.9	1301.9	1369.5
62-07-03-78-10-27	4090	0.063	0.771	43.1	13.0	15.3	15.2	1062.2	1110.2
78-10-30-94-12-30	4089	0.078	0.756	26.2	4.9	2.0	4.9	348.9	379.5

#### II.A.2.2. Variance ratio tests in developed markets

The variance ratio test, which is described in detail in chapter 6, has been used to compute the results presented in table 2.3. As described in table 2.3, the data set and the measurement time periods are identical to those used in the above described autocorrelation test results.<sup>13</sup> The results largely confirm those of the autocorrelation tests. The variance ratios are reported in the main rows. The heteroscedasticity-robust test statistics are found in parentheses below the main rows. The random walk null hypothesis implies that the variance ratio is one, and the test statistics have an asymptotic standard normal distribution.<sup>14</sup> Test statistics with an asterisk indicate that their corresponding variance ratios are statistically different from one at the 5% significance level

The equal-weighted index-based tests reject the random walk hypothesis for the entire time period and all sub-periods. Furthermore, as in the autocorrelation tests, predictability seems to decrease in the more recent time period and is stronger in the earlier time period. The value-weighted index, on the other hand, shows different patterns. The random walk hypothesis cannot be rejected for any of the time periods or any of the lags, which seems to suggest that those stocks with large market capitalization introduce a relatively higher degree of randomness in their returns behavior - or alternatively expressed - a higher degree of relative market efficiency

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<sup>13</sup> John Y. Campbell, Andrew W. Lo, and A. Craig MacKinlay, *Econometrics of Financial Markets* (Princeton, N.J. Princeton University Press, 1997), 66-74

**Table 2.3. Variance Ratio Empirical Results of Developed Market**

Sample period	Number nq of base observations	Number q of base observations aggregated to form variance ratio			
		2	4	8	16
<b>A. CRSP Equal-weighted index</b>					
62:07-10-94:12:27	1695	1.20 (4.53)*	1.42 (5.30)*	1.65 (5.84)*	1.74 (4.85)*
62:07-10-78:10:03	848	1.22 (3.47)*	1.47 (4.44)*	1.74 (4.87)*	1.90 (4.24)*
78:10-10-94:12:27	847	1.19 (2.94)*	1.35 (2.96)*	1.48 (3.00)*	1.54 (2.55)*
<b>B. CRSP Value-weighted index</b>					
62:07-10-94:12:27	1695	1.02 (0.51)	1.02 (0.30)	1.04 (0.41)	1.02 (0.14)
62:07-10-78:10:03	848	1.06 (1.11)	1.08 (0.89)	1.14 (1.05)	1.19 (0.95)
78:10-10-94:12:27	847	0.98 (-0.45)	0.97 (-0.40)	0.93 (-0.50)	0.88 (-0.64)

### II.A.3. Autopsy of absolute market efficiency

Overall, those most recent results shed new light upon the efficiency of developed markets as they primarily reject the random walk hypothesis. In this context a step back into the history of market efficiency research seems appropriate. Most previous research has focused on the statistical approach of testing independence of prices, where most studies have largely accepted the random walk theory of independence.

The history of market efficiency is older than most faculties of finance. In 1964, Paul Cootner published an influential 500-page book titled *The Random Character of Stock Prices*, which contained reprints of all the important work done up to that date. Osborne's theory of Brownian motion and the stock market, Working, Cowles, Alexander, and the full text of Bachelier's 1900 thesis on the theory of speculation can be

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<sup>13</sup> Please refer to chapter 6 for an explanation of the properties of the variance ratio test.

found.<sup>14</sup> Studies on the subject of stock market efficiency and the first large scale tests of independence have been conducted in the period between early 1960s and late 1970s. None of the tests have produced evidence of significant non-independence of price changes. This is true for the tests of independence by Cootner, Fama, and Moore.<sup>16</sup> The sample correlation coefficients found were extremely close to zero and thus unanimously supported the independence assumption. Thus, empirical research suggested efficiency.

Nevertheless, over the past few years, some persistent and large irregularities have been detected in developed and sophisticated capital markets. Such irregularities are commonly referred to as market anomalies. Among them are (a) size effects in which firms with low market capitalization seem to produce excess returns, (b) the so-called 'January effect' when stocks seem to produce an excess return during January and (c) the 'high earnings/price effect', in which stocks trading at high E/P ratios seem to generate excess returns.<sup>17</sup> The debate concerning these market anomalies focuses on the interesting question of whether these are true market inefficiencies or simply results of incorrect measurements of risk or the application of a wrong equilibrium model

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Sidney Alexander, "Price Movements in Speculative Markets: Trends or Random Walks," *Industrial Management Review*, Vol. 2, No. 2 (May 1961) 7-26

Luis Bachelier, *Theory of Speculation* (Paris: Gauthier-Villars, 1900)

Alfred Cowles 3rd, "Can Stock Market Forecaster Forecast?" *Econometrica*, Vol. 1 (July 1933) 309-324

M F M Osborne, "Periodic Structure in the Brownian Movement of Stock Prices," *Operations Research*, Vol. 10, (May-June 1992):245-279

Holbrook Working, "A Random Difference Series for Use Analysis of Time Series," *Journal of the American Statistical Association*, Vol. 29, (March 1934) 11-24

"P H Cootner, "Stock Prices: Random vs. Systematic Changes," *Industrial Management Review*, Vol. 3 (Spring 1962) 24-45

E F Fama, "The Behavior of Stock Market Prices," *The Journal of Business*, Vol. 38 (Jan. 1965) 34-105

A Moore, *A Statistical Analysis of Common Stock Prices*, University of Chicago Graduate School of Business Dissertation (1962)

Rolf Haugen, *Modern Investment Theory*, (N.J. Prentice Hall, 1997), 678-92.

This following paper discovers the return differential between value and glamour stocks and it suggests that the differential is a result of expectational errors made by investors, as opposed to a result of a risk-based explanation. Rafael La Porta, Josef Lakonishok, Andrei Shleifer, and Robert Vishny, "Good News for Value Stocks: Further Evidence on Market Efficiency," *Journal of Finance* vol. LII, no. 2 (June 1997): 859-874

Given the history of market efficiency tests which largely accepted the random walk for developed markets and the most recent results which predominantly reject the notion of the random walk, it must be asked what the value-added of another test of market efficiency is. Different data sets employed, different time intervals, different time periods and the multitude of testing methodologies chosen have not led to any consistent results. Therefore, the measurement of absolute market efficiency may not mean much for the policy maker or the investment manager, as results have not displayed any desired form of consistency.<sup>18</sup> In the context of this study, therefore the only meaning that will be attributed to results from tests of the random walk hypothesis shall be the varying degree of *relative* market efficiency under different time intervals, or relative market efficiency as a comparative measure for securities with different characteristics.

**Box 2.0. An intuitive explanation of relative market efficiency**

A very intuitive explanation of relative market efficiency is demonstrated in the analogy of physical systems suggested by Campbell, Mackinlay and Lo (1997). Physical systems are often evaluated according to their performance in terms of how much energy is used in order to create a specific end-product. For example an engine which uses fuel may only effectively use 80% of the energy to create motion. 20% of the energy contained in the fuel would be lost to heat, light, or noise. Therefore the engine would be 80% energy efficient. The absurdity of engineers trying to use statistical tests to measure whether an engine is efficient or not delivers the best intuition of why only relative efficiency may also be useful for financial markets. The physical laboratory setting of a frictionless world, where absolute efficiency could be measured in an engine, would be as unrealistic as pretending the economic notion of a 'perfect market' applies to securities price behavior.

Accordingly, market efficiency itself will not become an issue of analysis, but rather the dynamic aspect of change in relative market efficiency under different conditions. Measured predictability of securities returns therefore is no judgment against market efficiency but merely a characterization of the returns process in equities, which could indicate a trend of evolving or diminishing relative market efficiency.

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<sup>18</sup> For an interesting article on the real world applicability of strategies based on discovered inefficiencies see Z. Fluck, B.G. Malkiel, and R.E. Quandt, "The Predictability of Stock Returns: A Cross-Sectional



**II.B. Market efficiency in emerging markets**

**II.B.1. Overview of methodologies for measuring market efficiency in emerging equity markets**

The literature of market efficiency tests concentrating on developing capital markets is less extensive and substantially younger than its predecessor group which solely focused on developed capital markets. The results are more uniform as most studies clearly indicate some form of securities' prices predictability. One reason why the results on market efficiency in emerging markets are less contradictory and more uniform, is due to the fact that most markets have been the subject of only one study of market efficiency. Most research focuses on the aggregate index as opposed to individual securities, and does not explore issues pertaining to the causality of changing relative market efficiency. A changing degree of relative market efficiency itself has been discovered in a few studies as various sub-periods have occasionally been individually analyzed. The lack of studies pertaining to the causality of changing market efficiency is also a result of the above mentioned fact that the aggregate index has often been the focus of analysis as opposed to individual securities. There are exceptions where individual securities were analyzed. Due to the lack of information about individual securities besides market capitalization and sector, however, the analysis which was conducted on the securities level remained not very insightful.

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Simulation," *The Review of Economics and Statistics* (March 1996): 176-183.

This study on the Russian equity market, on the other hand benefits from a database which contains information on securities characteristics which have not been available to most researchers of market efficiency in emerging equity markets. Particularly, the research coverage proxy index of Russian equities, which has been laboriously obtained, and the details on ADR/GDR programs, are in most cases simply not available to the researcher. Moreover, this study on the Russian equity market, which is often considered a 'frontier' market or a pre-emerging market, differentiates itself from other studies on emerging market efficiency by the simple fact that the time span analyzed covers the very beginning of the Russian equity market. The results obtained could therefore be positioned in the larger context of new emerging markets moving onto the radar screen of global investment professionals (see table 2.4.) This establishes a clear difference between this study and those that have been conducted on mature emerging markets which often act more in line with developed markets and do not display many of the characteristics typical for newly emerging markets.<sup>19</sup>

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<sup>19</sup> The difference between frontier markets and mature emerging markets, such as Portugal (recently included in MSCI EAFE) or Mexico becomes apparent when looking at the return - volatility profile or the quality of companies in which one can invest.

**Table 2.4. Frontier markets**

Market	Size Perspective	Dominant Sector	Largest Export Market	Market Cap (US\$ bn)
Egypt	Merrill Lynch	Manufacturing	Italy	18.8
Hungary	Cadbury Schweppes	Manufacturing	Germany	8.6
Jordan	Rolls-Royce	Financials	Iraq	5.3
Morocco	Fiat	Financials	France	11.6
Nigeria	Henkel	Manufacturing	US	4.3
Pakistan	BMW	Manufacturing	US	13.7
Poland	Societe Generale	Financials	Germany	11.7
Sri Lanka	Swiss Air	Financials	US	2.6
Venezuela	Barnett Banks	Utilities	US	14.0
Zimbabwe	Silicon Graphics	Financials	South Africa	5.2

Source: IFC, Datastream, Merrill Lynch. Market cap data as of June 30, 1997.

As table 2.5 demonstrates, there have been a number of studies on market efficiency and descriptive features of emerging equity markets. The following serve as a representative sample of the previous work in the area. Collectively, they serve to demonstrate the most widely used testing methodologies of the random walk assumption and the relative conformity of the results obtained.

**Table 2.5. Studies on market efficiency in emerging markets**

Author	Country	Methodology	Results	Date	Time Span	Publication
Hakim	Mexico	Autocorrelation	Weak EMH rejected	1992	1967-1979	Dissertation
Butler and Malaikah	Saudi Arabia Kuwait	Autocorrelation Non-parametric tests	Kuwait weak EMH not rejected Saudi Arabia weak EMH rejected	1992	1992-1994	Journal of Banking and Finance
Errunza and Losq	Sample of LDC markets	Autocorrelation Runs tests	LDC mkts are less efficient than devpd mkts	1985	1976-1981	Journal of Banking and Finance
Ayadi and Pyun	Korea	Variance Ratio	Reject weak EMH under homoscedasticity terms- but not under heteroscedasticity-robust test	1994	1984-1988	Journal of Banking and Finance
Urrutia	Brazil, Argentina, Mexico and Chile	Variance Ratio Runs tests	Reject weak EMH for Braz., Arg., Mex. Chile – but under heterosc.-robust test reject only Braz, Chil. and Mex., Runs test does not reject weak EMH for any country	1995	1975-1991	Journal of Financial Research
Claessens, Dasgupta, Glen	IFC Emerging Mkts Database	Autocorrelation Variance Ratio	Partly reject weak EMH	1993	1976/1990-1992	World Bank Working Paper
El-Erian and Kumar	Jordan, Turkey, Greece, India, Philippines	Autocorrelation, Runs tests	Largely reject weak EMH	1995	1992-1994	IMF Staff Paper
Rockinger and U'rga	Czech Rep., Poland Hungary and Russia	AR (1) model with time varying parameters	Poland becomes less efficient Russia becomes more efficient Czech becomes less efficient initially and more efficient later Hungary cannot be predicted	1997	1993-1997	Unpublished working paper
Gordon and Rittenberg	Poland	Test based on intervention in market when price fluctuations exceed $\pm 10\%$ per day	Reject weak and semi-strong EMH	1995	1993-1994	Comparative Economic Studies

Before describing the individual studies, a short note which shall help to associate the particular methodology with the larger framework of testing for market efficiency, will be inserted at this point.

The virtues and the rationale of the random walk as a tool to test market efficiency will be explained in more detail at a more appropriate place in this study.<sup>20</sup> For now it shall suffice to introduce the random walk in its three forms and their implications for testing methodologies.

Campbell, Lo and MacKinlay define three types of the random walk (RW): RW1 assumes identically and independently distributed increments (IID), RW2 assumes independently and not identically distributed increments (INID), and RW3 assumes uncorrelated increments. RW1 can be tested with sequences and reversals, and runs tests. RW2 can be tested with filter rules. RW3, the random walk assumption used in this study, can be tested with autocorrelation tests and variance ratio tests.

The notion of the three different random walk assumptions carries a particular weight in the context of emerging markets. There are at least two reasons why the assumption of RW3 in emerging markets appears more optimal than RW1 or RW2. Firstly, RW1 assumes IID and RW2 assumes INID. Both assumptions are relatively less representative for emerging markets price behavior where heteroscedasticity and non-normality can be common characteristics. Although RW2 allows for unconditional heteroscedasticity, RW3 remains a safer assumption over RW2 for it does allow some transformation of future price increments to be forecastable using some transformation of past price increments. This RW3 assumption can be defined as

$$\text{Cov}[\varepsilon_t, \varepsilon_{t-k}] = 0 \text{ for all } k \neq 0, \text{ but where } \text{Cov}[\varepsilon_t^2, \varepsilon_{t-k}^2] \neq 0 \text{ for some } k \neq 0$$

Accordingly, as opposed to RW1 or RW2, this process has uncorrelated increments but is not independent since its squared increments are correlated in some cases.

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<sup>20</sup> See chapter 6, the first part of the methodology chapter elaborately explains the linkage between the random walk and the Efficient Market Hypothesis (EMH).

Secondly, RW2-based methodologies, such as filter rules or trading rules seem less optimal in the pre-emerging market environment where paper trading simulations (or filter rules based on trading simulations) are difficult if not impossible to conduct given the often opaque trading environment where bid/ask quotes may not reflect the real execution price at all times and thus would render a simulation-based test practically meaningless.

As one will see, different authors have used different random walk assumptions and hence different testing methodologies. Interestingly enough, many times researchers have combined RW1 with RW3 tests, which would imply that both the assumption of identically and independently distributed returns and the assumption of uncorrelated increments are used. Often, the exact assumptions were not stated and a parametric test (such as autocorrelation) was complemented by a non-parametric test (such as a runs test). The virtues of runs tests, sequences and reversals tests, the Spearman rank correlation test, or Kendall's  $\tau$  correlation test, are that non-parametric assumptions can be met. However, often normal asymptotic distributions approximations to the sampling distributions are used, which somewhat defeat the first purpose. Runs tests, as they may not rely on the normal distribution, have severe shortfalls for they do not utilize all the data available. Runs tests measure signs not magnitude of change. Thus valuable information is lost. For many researchers the trade-off therefore pointed towards sacrificing statistical orthodoxy by applying parametric or semi-parametric tests to distributions which deviate to a smaller or larger degree from the normal distribution.

When researchers in financial economics had come to realize that the restriction of the identical distribution assumption is quite unpractical in financial markets, another

set of random walk tests was developed, the random walk 2 (RW2). RW2 only assumes independent increments, thus not making any assumptions about the distribution. Clearly, under such a test assumption, statistical tests are difficult to conduct.<sup>21</sup> Nevertheless, filter rules and technical trading rules qualify as tests under RW2. As one will see in the literature review, Gordon and Rittenberg approach the Polish market with a filter rule.

Finally, there is the random walk 3 (RW3), which enjoys the weakest form of assumptions, namely only uncorrelated increments. Tests for RW3 have become the most intuitive and most widely used. The most famous one being the test of autocorrelation, or serial correlation, as some call it. Another test which has even become a superior application to autocorrelation is the variance ratio test, developed in 1988 by Lo and MacKinlay.<sup>22</sup> The chapter on new, more insightful tests of market efficiency in the context of the random walk has not been closed yet. The next step may take the researcher to more dynamic models such as efficiency tests which incorporate Bayesian learning moments. For this to be applied to the Russian equity market more empirical knowledge on the functioning of the equity market and the specific expected utility function of its participants has to be gathered.<sup>23</sup>

Besides statistical tests of market efficiency, there have been many alternative schools of thought in their attempt to describe logically why markets may or may not be

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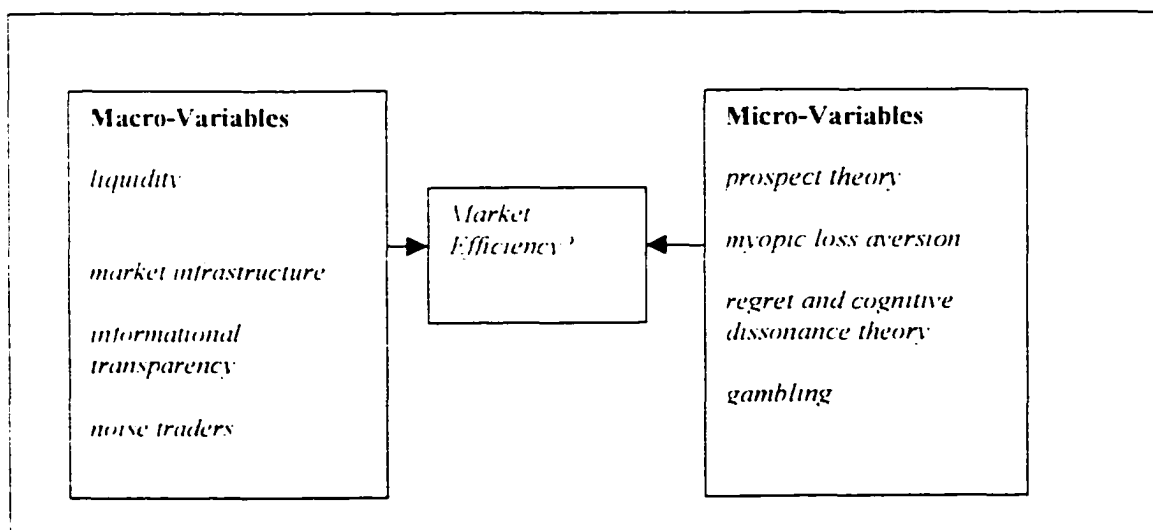
<sup>21</sup> Due to the understanding that the distribution may not be approximated with any known distribution.

<sup>22</sup> Please refer to chapter 6 for an in-depth discussion of the benefits of the variance ratio test. The variance ratio test has been applied by Ayadi and Pyun (1994); Urratia (1995); Claessens, Dasgupta and Glen (1993); Campbell, MacKinlay and Lo (1997); Liu and He (1991)

<sup>23</sup> A good introduction of how to apply efficiency tests with Bayesian components in the context of devaluation expectations in the Greek forex market and the learning component of credibility of policy announcements is given by N. M. Christodoulakis and S.C. Kalyvitis, "Efficiency testing revisited: A foreign exchange market with Bayesian learning," *Journal of International Money and Finance* vol. 16, no. 3 (1997): 367-385.

efficient. As it would be an insurmountable task to review all disciplines in social sciences and natural sciences (such as the theory of Brownian molecular motion which has been applied to markets by Osborne), the most noted have come from the area of behavioral finance. Behavioral finance has tapped into the rich knowledge of psychiatry and psychology to source new evidence why markets may not be efficient. This new area of reasoning why markets may not be efficient and never could be efficient according to conventional definitions sheds new light upon the difference between the macro- and the micro-level of explanatory variables responsible for less efficient markets. Diagram 2.1 demonstrates the two main origins of less efficient markets. The set of variables related to human psychology (or in the cases of the gambler, to psychiatry) can be defined as micro-variables, and the set of variables related to market and institutional infrastructure or information channels can be defined as macro-variables.

**Diagram 2.1 Macro- and micro variables affecting market efficiency**





II.B.2. Review of previous studies on market efficiency in emerging equity markets

There are invariably many ways to classify the stages of development of emerging equity markets.<sup>24</sup> Classification schemes could range from market capitalization/GDP to foreign participation in the equity market. Instead of using one fixed measure as a proxy variable for the development stage of an emerging equity market, a number of generally defined measures are used to portray an impressionist image of each developmental stage.

**Diagram 2.2. Evolutionary stages in emerging markets**

Stage 1 'hatching'	Stage 2 'pre-emerging'	Stage 3 'emerging'	Stage 4 'mature emerging'
Few quoted companies Small mkt capital. High sector concentration Low liquidity High volatility Rudimentary institutional setting	Higher liquidity Wider variety of cos First foreign investors Still small mkt cap/GDP first equity financing Need for institutional market setting is recognized	Less volatile Liquidity on the rise Securities laws and mkt infrastructure improving rapidly First instruments to transfer risk (currency hedging, etc )	Liquid enough to attract main stream pension funds in many sectors Substantial mkt breadth Equity risk prem -risk-adjusted returns relative to ST money market rates comparable to int'l levels
Romania, Ukraine, Cote d'Ivoire	Russia	Hungary	Mexico, Hong Kong

<sup>24</sup> Robert Feldman and Mammohan Kumar. "Emerging Equity Markets: Growth, Benefits, and Policy Concerns." *World Bank Research Observer* (August 1995): 181-200

Despite the large geographical scope of the studies, the research described below has a few features in common. Except for the study by Claessens, Dasgupta and Glen (1993), which encompasses 20 countries which are analyzed over an average time span of ten years, the following individual studies have been selected because the time span examined in the individual studies positions the equity markets analyzed either in stage 1 - 'hatching' or stage 2 - 'pre-emerging'. Accordingly, Hakim's exposé of the early Mexican stock market (1967-1979), Ayadi and Pyun's analysis of Korea (1984-1988), Gordon and Rittenberg's assessment of Poland (1993-1994), Urrutia's analysis of sub-periods in Latin and Central American markets (1975-1991), and Errunza and Losq's work on a LDC sample (1976-1981) all belong to either one of the two initial stages during the time span covered in the analysis. The other studies by Butler and Malaikah on Saudi Arabia and Kuwait (1992-1994), and the study by El-Erian and Kumar on Jordan, India, (Turkey, Greece and Philippines) (1992-1994) focus on markets that are still in stage 1 or stage 2 of their development.<sup>25</sup> Hence, the markets assessed in the studies described below are in many respects comparable to the Russian equity market development between 1994 and 1997

While not being immediately relevant or comparable to the situation of the Russian market, the general study on price behavior in emerging stock markets by Claessens, Dasgupta and Glen (1993) presents a fairly comprehensive introduction to the

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<sup>25</sup> The cases of Philippines, Turkey and Greece may belong to a more advanced stage than Jordan, India, S. Arabia and Kuwait, however, particularly the closely held Turkish and Greek markets, despite mature foreign interest, are still dominated by features (fixed income/equity-risk-adjusted yield gap) which would point towards stage 2.

field of equity returns behavior in emerging markets.<sup>26</sup> In this study, the IFC/World Bank team uses data from the IFC Emerging Markets Database to establish descriptive statistics of security price behavior and to conduct market anomalies and efficiency tests (autocorrelations and variance ratio tests) on twenty emerging markets. Descriptive statistics tests, such as mean, standard deviation, Sharpe ratio, and Jarque-Bera normality tests are complemented by the plotting of mean-variance frontiers. The study of predictability or 'weak-form' efficiency of the individual indices uses autocorrelations, the joint hypothesis Box-Pierce Q-test, and Lo and MacKinlay's (1988) variance ratio test, to control for heteroscedasticity in the data.<sup>27</sup> Furthermore, the authors examine size effects of portfolios on their respective returns by using a test which was pioneered by Fama and French (1990).<sup>28</sup> Market anomalies related to seasonality are also tested. This study stands out by the sheer quantity of countries analyzed and the tedious process of creating different portfolios re-sorted by market capitalization for each market in specified time intervals.

The authors conclusion suggests that the markets under scrutiny do not seem to display the most common of the market anomalies found in industrial countries (turn of the year and small firm effects). The study does however find evidence of predictability of returns (weak-form market inefficiency). Furthermore, normality tests of the returns distribution of individual indices result in the rejection of normality in 18 out of 20 countries at the 1% significance level.

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<sup>26</sup> S. Claessens, S. Dasgupta and J. Glen, "Stock Price Behavior in Emerging Stock Markets," *World Bank Discussion Series on Emerging Stock Markets* (1996).

<sup>27</sup> A.W. Lo and A. MacKinlay, "Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test," *The Review of Financial Studies*, Vol. 1, No. 1 (1988):41-66.

<sup>28</sup> E. Fama, "Efficient Capital Markets II," *Journal of Finance* (1991):1575-1617.

The enormous scope of the study did not allow for the depth to venture into emerging market-specific factors possibly responsible for anomalies, such as liquidity-enhancing structures in place, or transparency-enhancing structures such as research coverage or Western auditors. Moreover, it does not touch upon explanatory variables possibly promoting increased market efficiency over time, such as declining political risk or liquidity and transparency facilitators. Lastly the date of the study (1993), did not allow the inclusion of any of the East European markets, and for that matter, the Russian equity market.

Building on a previous study on the Mexican stock market conducted by Ortiz (1980), who performed a runs test based on monthly prices for 79 shares for the 1967-1979 period, **Hakim's (1992)** study on the efficiency of the Mexican stock market applies a serial correlation tests on returns.<sup>29</sup> The early time period examined in the Mexican market offers interesting parallels to Russia, especially with regard to foreign investors participation and shareholder rights protection. Mexico, during that time is also comparable to Russia as it neighbors the US and thus was of immense interest to foreign investors throughout its entire development cycle. Russia, given its political legacy and its proximity to the West European investment centers, as well, was on the investor radar screen virtually from day one. Thus, it belongs in the general category of 'pull' markets, which attract foreign interest regardless.<sup>30</sup> Whereas, 'push' markets, such as Jordan, Kuwait, Saudi Arabia are characterized by the fact that the burden of attracting foreign

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<sup>29</sup> Miguel Hakim, "The Efficiency of the Mexican Stock Market" (Ph.D. diss., Claremont University, 1988)

investment is solely on them. In other words, international investors can easily live without them.

Hakim's study examines the correlation coefficient between past returns and future returns  $\rho(R_i, R_{i-1})$ . An estimate of  $\rho$  will tell if the return series follows a random walk. As the random walk model states that any price change is independent of the sequence of the previous price changes, it would imply that the autocorrelations of the returns on any security are zero for all lags.

Hakim shows sample autocorrelations using weekly returns for 91 stocks. The time periods vary from stock to stock but on average run from 1972 to 1981. Under the hypothesis that the true autocorrelation is zero, the sample autocorrelations for lags greater than zero are normally distributed with mean zero and standard deviation  $1/\sqrt{n}$  root of the number of observations. In the weekly return analysis with lag one, Hakim discovers that 28 of the autocorrelations are statistically different from zero. Of the 28, 23 are negative. This indicates that the market overreacts. Additionally, Hakim investigates the stationarity over time of the negative serial correlation for Mexican securities by dividing the 1972-1981 period into five-year sub-periods. The results show that statistical significance of the negative autocorrelations was quite consistent over time. Thereby this study touched upon the issue of autocorrelation being a function of the inherent non-stationarity of the data. By examining the individual sub-periods and by finding consistency with the overall period, it is assumed that a possible non-stationarity effect will not have been solely responsible for autocorrelation.

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<sup>30</sup> The terminology of 'push' and 'pull' markets is derived from the on-line industry, where web sites which disseminate their products to one's desktop without the user having to download, or 'pull' the information from the server.

Another study by **Butler and Malaikah (1992)** examines the stock markets of Saudi Arabia and Kuwait.<sup>31</sup> This study appears to be relevant in the Russian context primarily in the sense that both Russia and Saudi Arabia initially suffered from severe liquidity constraints as a consequence of a poorly organized trading infrastructure.<sup>32</sup> Applying autocorrelations and non-parametric runs tests, the authors find that Kuwaiti stocks have mean lag one 0.053 autocorrelation. Of all stocks analyzed in Kuwait, 36% have statistically significant autocorrelations and 72% of these are positively autocorrelated (of which 43% are statistically significant at the 5% level). This finding is in line with results found for developed markets. Fama reports 37% of all stocks have statistically significant autocorrelations in developed markets.

The results found for Saudi Arabia are quite different. In Saudi Arabia, all 35 stocks examined have negative and statistically significant autocorrelations. The mean autocorrelation is -0.471. The magnitude of autocorrelation is also much larger than in other markets. A study done by Conard and Jutter (1973) which found unusually high autocorrelations in the German market resulted in the mean absolute lag one autocorrelation of 0.271. As another comparison, Fama reports that for a relatively efficient market (30 large stocks of the NYSE) the mean absolute lag one autocorrelation was 0.048.

Butler and Malaikah's (1992) study differentiated itself from previous works by adding the runs test which does not require the assumption of normally distributed returns. Conducting this test, the previous autocorrelation results were fully supported. In this study it was concluded that Saudi Arabia, where banks have a brokerage

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<sup>31</sup> K. C. Butler and S. J. Malaikah, "Efficiency and Inefficiency in Thinly Traded Stock Markets." *Journal of Banking and Finance*, vol. 16, iss. 1 (February 1992): 197-210.

monopoly but are prohibited from owning stock, and where specialists and official market makers do not exist to promote liquidity, the statistically significant autocorrelations found would possibly not translate into a trading rule which consistently generated excess profits due to the doubtfulness of whether trades could actually be executed at the prices quoted in the data. Butler and Malaikah, therefore established their objective of proving market inefficiency in Saudi Arabia and hint at a possible explanation which would be given by observed illiquidity in the stock market resulting from the particular regulatory trading infrastructure which fails to promote liquidity

A study conducted by **Errunza and Losq (1985)** sheds light upon the behavior of security prices for a sample of LDC markets, in which, with the exception of a few Mexican firms, there had been no significant foreign portfolio investments in the sample countries in 1985.<sup>33</sup> Therefore, results and testing frameworks could be compared to the pre-emerging markets of Central Asia - many of them still characterized by severe capital inflow controls-that are in similar positions as the countries in the sample Argentina, Brazil, Chile, Greece, Jordan, Korea, Mexico, Thailand, Zimbabwe and India. The first part of the study examines the above mentioned markets for empirical distributions of log price changes by testing for normality of distribution and non-stationarity of variance. The second part tests for independence of price changes by applying autocorrelation analysis and runs test. The study finds that the examined LDC markets display probability distributions consistent with log normal distributions and in some cases exhibit non-stationary variance. Through estimated serial correlation coefficients and

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<sup>33</sup> Prior to the introduction of the Russian Trading System (RTS) in Fall 1995.

corroborated by runs tests, the study also shows that LDC markets are less efficient than more developed capital markets. The authors speculate that the lesser degree of market efficiency observed in LDC markets results from barriers to the dissemination of information, such as loose financial disclosure requirements, which slow down the speed of information dissemination.

The study on the Korean market covering the time span from 1984 to 1988 by **Ayadi and Pyun (1994)** becomes relevant in the Russian context as it contrasts the fact that the Russian market was open to foreign investors during the time span analyzed in this study, whereas until 1991 foreigners were only allowed to invest in Korean securities indirectly through special investment trust.

The methodology used is the variance ratio tests pioneered by Lo and MacKinlay (1988) in order to investigate the behavior of prices of stocks traded on the Korean securities exchange within the general framework of the random walk hypothesis.<sup>34</sup> The virtue of the variance ratio test is its capability to apply a test-statistic under both homoscedastic and heteroscedastic error terms. Following this test the authors reject the random walk under the homoscedasticity assumption but cannot reject the random walk under the heteroscedasticity-robust assumption. While this paper applies a possibly superior model of measuring market efficiency it falls short of exploring causal relationships of market efficiency. The authors briefly note government intervention as

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<sup>34</sup> V. R. Errunza and E. Losq, "The Behavior of Stock Prices on LDC Markets," *Journal of Banking and Finance*, Vol. 16, (1985):561-575.

<sup>35</sup> O.F. Ayadi and C.S. Pyun, "An Application of Variance Ratio Tests to the Korean Securities Market," *Journal of Banking and Finance*, Vol. 18, Issue 4, (September 1994):643-658.



being the reason for price predictability but refrain from further analysis of other factors possibly promoting a higher degree of efficiency.

**Urrutia (1995)** examines Latin American equity markets with respect to market efficiency.<sup>35</sup> As will be demonstrated for the case of Russia, Urrutia also finds that Brazil, Argentina, Chile and Mexico do not follow a normal distribution. Furthermore, Urrutia also refers to the phenomenon of noise trading as a possible cause of the rejection of the random walk.

In this study, Urrutia uses the variance ratio test and a runs test. Using monthly data of equity indices of Brazil, Argentina, Chile and Mexico for the period between 1975-1991, the variance ratio test rejects the random walk hypothesis for Brazil, Argentina, Chile and Mexico. The heteroscedasticity-robust variance ratio test confirms the findings for all countries except for Argentina. A runs test is also conducted and finds that prices follow the random walk.

**Gordon and Rittenberg's (1995)** study on the efficiency of the Polish equity market clearly differentiates itself from other works as it deals with a pre-emerging market and the non-accessibility of reliable data which would lend itself to econometric analysis.<sup>36</sup> Gordon and Rittenberg solve the problem by conducting a qualitative assessment of the fulfillment of the five assumptions underlying market efficiency (see above for the listing of the five assumptions). The methods used may not neatly fit into

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<sup>35</sup> J. L. Urrutia, "Tests of Random Walk and Market Efficiency for Latin American Equity Markets," *Journal of Financial Research*, Vol. 18, Issue 3, (Fall 1995):299-309.

<sup>36</sup> B. Gordon and L. Rittenberg, "The Warsaw Stock Exchange: A test of market efficiency," *Comparative Economic Studies*, vol. 39, no. 2 (Summer 1995).

the conventional literature of market efficiency in emerging markets, however, the elements of behavioral finance discussed are clearly relevant for a pre-emerging market such as Russia, where the lack of hard facts must often be substituted by soft-reasoning and actions derived thereof.<sup>37</sup>

Using public survey data and press releases, they find that the first assumption of investors acting rationally is violated. The main proof is derived from statements that indicate a strong reliance on the perception that great performance in the past can be projected into the future, and that the 'fashion' of stocks dictates their future performance. This notion is closely connected to a phenomenon which has become known among psychologists as "anchoring."<sup>38</sup> Subsequently, assumptions 2-5 are scrutinized in light of the circumstances prevailing at the Warsaw Stock Exchange. The authors find that assumption 2 which premises price taking behavior is violated by the non-existence of an insider trading law. Moreover, the large demand for new brokerage accounts revealed the unpreparedness of the brokers to absorb large volumes and led to time deficiencies when placing orders or setting up accounts. This violated assumption 5, which requires investors to react quickly and accurately to new information. The same assumption was also violated by the imposition of a 10% daily limit on share price movements. Due to this limit, in many cases 'new information' could neither 'quickly' nor 'accurately' be reflected in the share price.

The authors of this study have abstained from any conventional tests of market efficiency but instead have designed a test based on the 10% band limit of daily share

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<sup>37</sup> Soft-reasoning prevails when numbers and facts are only scarcely available. As investors still need to make decisions in many such situations, soft-reasoning sometimes bordering on charlatanism is used to form an opinion on market sentiment.

price movements. Logic dictates that on any day when returns reach the +/-9.5% target, an intervention would take place. This would imply that shares do not fully adjust to the new information available and thus the semi-strong form EMH would be rejected. In 39% of all trading days such intervention takes place. It follows that a carryover effect would take place the following day. This hypothesis is also proven valid. Furthermore, a trading strategy is devised that exploits the carryover effect which is 'knowledgeable' information on the day the intervention by the specialist takes place. With this trading strategy, which outperforms a simple buy-and-hold strategy, the weak-form EMH is also rejected.<sup>39</sup>

Another interesting study has been conducted by **El Erian and Kumar (1995)**.<sup>40</sup> It broadly discusses comparative features of equity markets in Jordan, Turkey, Greece, India and the Philippines before venturing into such subjects as informational efficiency and determinants of stock market development. While the development stage of particularly Jordan and India, both strong representatives of 'push' markets, are comparable to the first period in the Russian equity market, India seems to impose many more obstacles to foreign investors than Russia ever has.

Two tests are conducted on the market efficiency of the respective equity markets. Firstly, an autocorrelation test is conducted, which rejects the random walk for Jordan, Turkey and the Philippines. Secondly, a runs test is conducted as the authors express concern that serial coefficients may be dominated by a few unusual and extreme price

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<sup>39</sup> Robert Shiller, "Human Behavior and the Efficiency of the Financial System," ([www.econ.yale.edu/~shiller/handbook.html](http://www.econ.yale.edu/~shiller/handbook.html)), 43.

<sup>40</sup> See also Christopher Bobinski, "Warsaw Begins to Recover," *Financial Times*, 22 April 1994, 37.

changes which possibly could obscure a tendency toward a coherent pattern of price changes. In addition, the runs test does not depend on the finite variance assumption of the price changes. The results for the non-parametric runs test confirm that all countries exhibit significant positive serial correlation, except for India. Lastly, the authors discuss means of improving equity markets in Middle Eastern countries.

In this study, an aggregate index was used which, due to the averaging effect of index creation, would most likely exhibit more systematic patterns, than those which would be observed on an individual security level. Again, this study delivers a snapshot result of dependence of securities returns. It does not explore changing patterns over time, or causal effects of serial dependence besides some qualitative speculation in inefficiency of information dissemination.

In the context of market efficiency in emerging markets, **Shiller's (1997)** critique of rational investor behavior adds an interesting viewpoint to the current literature.<sup>41</sup> Particularly in emerging markets, where informational shortage and barriers often prevail, investors have to strongly rely on factors such as market sentiment. Market sentiment, traditionally a soft -only imprecisely defined factor- can then become a function of processes that are best described with theories of behavioral finance.

Shiller points out that investors are frequently acting irrationally as demonstrated by prospect theory, myopic loss aversion, or regret and cognitive dissonance theory. Particularly, the theory of regret and cognitive dissonance delivers

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<sup>41</sup> Mohamed A. El-Enan and Mamunohan S. Kumar, "Emerging Equity Markets in Middle Eastern Countries," *IMF Staff Papers*, vol. 32, no. 2 (1995): 313-344.

<sup>42</sup> Robert Shiller, "Human Behavior and the Efficiency of the Financial System," ([www.econ.yale.edu/~shiller/handbook.html](http://www.econ.yale.edu/~shiller/handbook.html)).

potential answers why emerging markets analysts tend to consciously overlook the data which would lead them to believe that stock prices are no longer justified as long as favorable brokerage reports are produced, even in the absence of supportive fundamental data. This theory also highlights the importance of authority that is associated with research reports and their impact on the mind. In other words, as long as research reports support past investment decisions the possible failure in the performance of the stock will not be recognized and regret about a false decision will not be realized, and postponed as long as possible.

The theory of the disjunction effect which states that there is a tendency for people to want to wait to make decisions until some type of information is revealed, even if the information is not really important for the decision, reveals a very remarkable phenomenon in emerging market investing. A representative example of the disjunction effect was given during the frantic market nervousness surrounding Yeltsin's heart surgery in fall 1996. The Russian equity market traded on faxes which depicted a diagram of Yeltsin's heart and every investor made his/her own assessment of whether the president of Russia would have a successful operation. The fact that even if Yeltsin had died during this operation, there would have been nothing the communists could have done to interrupt the process of building a free market economy as they lacked broad support and did not have any legislative or executive force to support a reversal of Russia's successful transition into a free society by nationalizing and expropriating industry, did not matter to the 'irrationally' acting analyst who for disjunction effect-based reasons needed this extra bit of information to allocate further assets to the Russian equity market.

Finally, the theory of gambling and speculation, which statistically supports the existence of between 1% and 3% of the population who are pathological gamblers (as such recognized by the American Psychiatric Association), also contributes an element of irrational behavior and therefore behavior which does not conform to the assumptions underlying the EMH.<sup>42</sup> The assumption that the percentage of pathological gamblers in pre-emerging market environments is probably even larger than in the general population would further support the view that EMH in emerging markets is under threat by market participants who have come to realize that emerging market investing often replicates a casino atmosphere where market behavior could be explained by utility functions that become concave upward in extremely high range, and thus lead to irrational behavior not in line with the assumptions of the EMH.

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<sup>42</sup> D.W. Bolen and W.H. Boyd. "Gambling and the Gambler: A Review and Preliminary Findings." *Archives of General Psychiatry*, 18, 5 (1968): 617-629.

### Chapter 3

## THE VALUATION DIMENSION OF THE RUSSIAN EQUITY MARKET INFRASTRUCTURE AND TRADING

Topics related to the infrastructure of an equity market are best referred to the global custodian or the compliance department associated with an asset manager. This notion could not be more ill-conceived in emerging markets. Both, the emerging market portfolio manager and the policy maker on the ground, should find ample utility in understanding the progress of current equity market infrastructure developments. The degree of development in the equity market infrastructure translates directly into the degree of informational and operational efficiency. The backbone of operational efficiency is a smooth trading, clearing, settlement, and custody system. One of the prerequisites of informational efficiency is a set of transparent and unambiguously interpretable legal and regulatory, tax, and accounting disclosure rules. Thus, this chapter will focus on the progress and the remaining problems in the areas of clearing, settlement, trading, custody, legal and regulatory, tax, and accounting rules.

The other purpose of this chapter is to familiarize the reader with the essentials of the Russian equity environment and the continuous change that has been taking place in the direction of alleviating the obstacles to investing that have existed, and to some degree still do. For practical purposes this chapter also serves to give the reader a reference framework for developments in the equity market infrastructure of Russia. The most reliable, the most current, and the most accessible source of information about

changes in the Russian equity market infrastructure are several web sites sponsored by official Russian bodies and domestic and international brokerages. Thus, where applicable, reference to appropriate web sites will be made.

This chapter will begin by outlining the story of the genesis and emergence of the Russian equity market. Subsequently, the topics of clearing, settlement, trading, custody, legal and regulatory, tax, and accounting rules will be addressed. Finally, a snapshot overview will be given on the situation of the Russian equity market infrastructure outlining the reasons for the existing valuation gap to other emerging markets.

### **III.A. The early equity market**

#### *III.A.1. Genesis of the Russian equity market*

The Russian voucher privatization formally ended June 30, 1994.<sup>1</sup> By that time a total number of 13,832 enterprises had been sold and 97% of the population enjoyed direct or indirect ownership in companies. The simplified process of how foreigners obtained shares in the Russian companies can be described as follows and is also quite representative for other newly emerging equity markets in the region, such as Ukraine and Romania.

The initial owners of shares or certificates that serve as share proxies were employees, private citizens and the Federal Property Fund. Quickly, a new profession was created the regional broker. This first type of intermediary has a keen sense of making money by shrewdly assessing the demand for equities of specific companies.



The regional broker, often associated with the share registries or the companies themselves, prefers to create quasi-monopolies in the sourcing of specific stock, which were conceptually not too different from the role of the market-maker on the RTS (Russian Trading System) which developed in late 1995. Therefore, it is not unusual that the regional broker is an insider in the company. The next intermediary is the Moscow broker, who sources shares from the regional broker – of course, often at an arbitrary premium. The Moscow broker benefits by feeding the shares largely into the international market. The first point of contact are the Moscow-based offices of the international brokerage companies. Other international brokers also become involved at this point. Again, everyone pays a sizable premium to the Moscow broker. Later in the Russian development and particularly in Ukraine and Romania it has become desirable for the international brokers to set up their own stock scouting teams which comb the countryside and knock on the doors of unsophisticated local shareholders to decrease the accumulated premia by disintermediating the army of regional and national brokers.

At this point prices were set more or less arbitrarily as there was no central pricing mechanism in place. Valuation rules were quite undeveloped and the initial seller received a price which was somewhat inversely correlated to the remoteness of the transaction from Moscow, where anyone involved in capital markets had a better idea of how to gauge the demand for specific equities, than those sellers in the provinces. Gradually, some basic valuation rules came into fashion. Due to the absence of any financial information, the most common valuation practice was to estimate how many cents does one pay for a barrel or ton (oil and metal companies), or how many cents for

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<sup>1</sup> For a detailed description of the process of Russia's stabilization process, the political and economic forces underlying the privatization process please refer to: Anders Aslund, *How Russia Became a Market*

reported tonnage (shipping companies). Natural resource stocks, everyone understood, could be assessed with the proxy of global commodity prices. The extractability or the quality of management remained highly subjective parameters.

Only gradually, and only for those companies whose management was open and responsive to questions, could Western brokerage firms start writing their first research reports. In those research reports numbers were still not the centerpiece of information but rather a qualitative assessment was given on the individual companies' operations, occasionally their estimated sales, and generally their survivability. If management was forthcoming, the assessment of management and strategy generally turned out positive. Nevertheless, despite the information vacuum, it is estimated that no less than \$600 million of foreign portfolio investment found its way into the Russian equity market by September 1994.<sup>2</sup>

Most buyers were dedicated emerging markets funds with a fairly high degree of sophistication, others were 'instividuals' (an individual with institutional purchasing power), all of them were presumably in this market because it was the 'greatest asset sale the world had seen'

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*Economy* (Washington, D C The Brookings Institution, 1995)

<sup>2</sup> Salomon Brothers, *Russian Equities Road Map-A Bullish View of the Bear*, (September 1995). This number varies. Other brokers, such as Flemings estimates total foreign holdings at \$2.5 bn by mid-1995

III. A.2. Emergence of an equity market

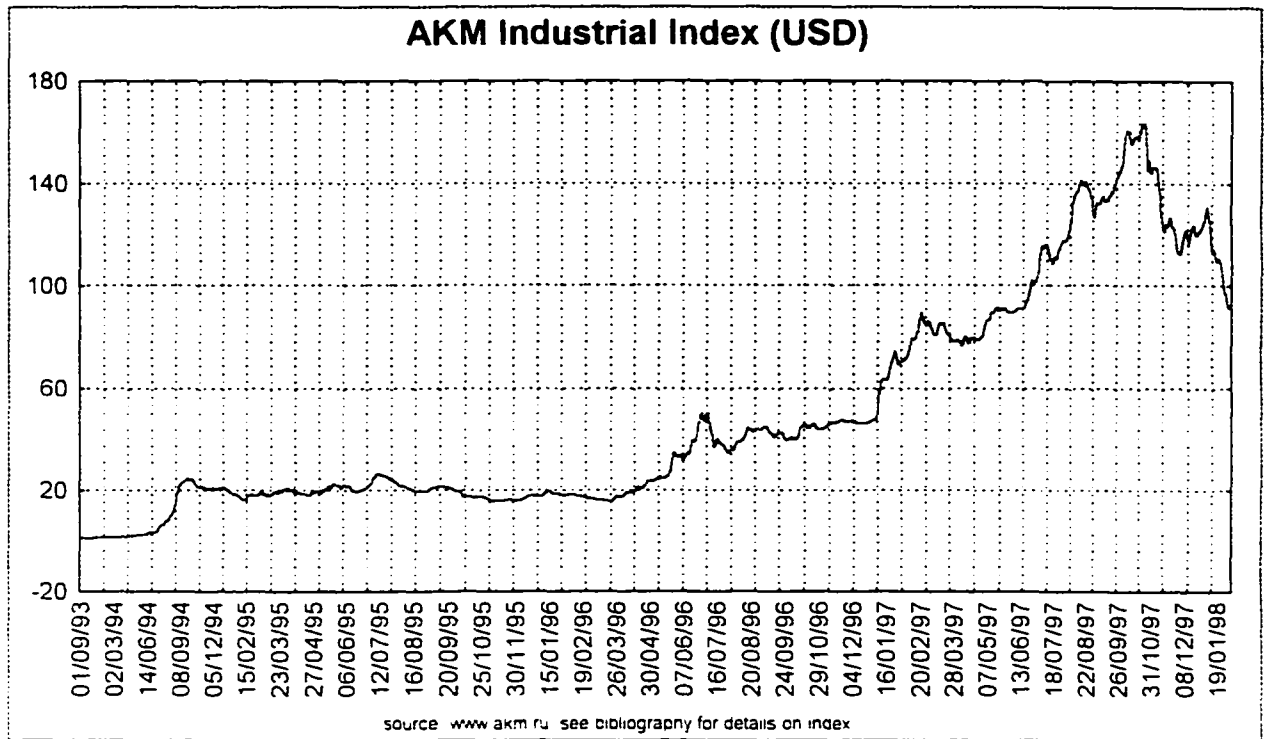
The initial euphoria of the Russian equity market was not sustainable. While the AKM Industrial Index had risen from 1 to 25 between October 1993 and September 1994, it retreated by 40% in the following twelve months.<sup>3</sup> Liquidity was very low and the trading action of a few institutional buyers had disproportionate effects on stock prices. This early Russian experience was truly pioneering work of a few dedicated investors. Investments were made in the absence of fundamental research and stock prices were solely liquidity driven. That stock prices were liquidity driven was true for the whole of 1996, but at least starting after the elections in July 1996, liquidity and flow of funds into stocks became a function of not just supply but some fundamental criteria which became available and were relevant.

The concept of supply creating demand ceased to be valid in the second part of 1996. It was rather the brokerage community who became the 'king makers' of selected stocks. Those stocks were to become the first Russian blue-chips, and not surprisingly they did not differ very much from the 'blue chips' that were bought during the initial euphoria phase. Blue chip material was thought to be found in oil, gas, utility, telecom, and the occasional shipping and paper company.

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This number has to be compared to a total market capitalization of about \$20bn by end-1995. (Flemings Research, *Russia Coming in from the Cold*, August 1996.)

**Chart 3.0. AKM Industrial Index (Sep 1993 – Jan 1998)**



### III.B. Equity market infrastructure

#### III.B.1 Regulatory system

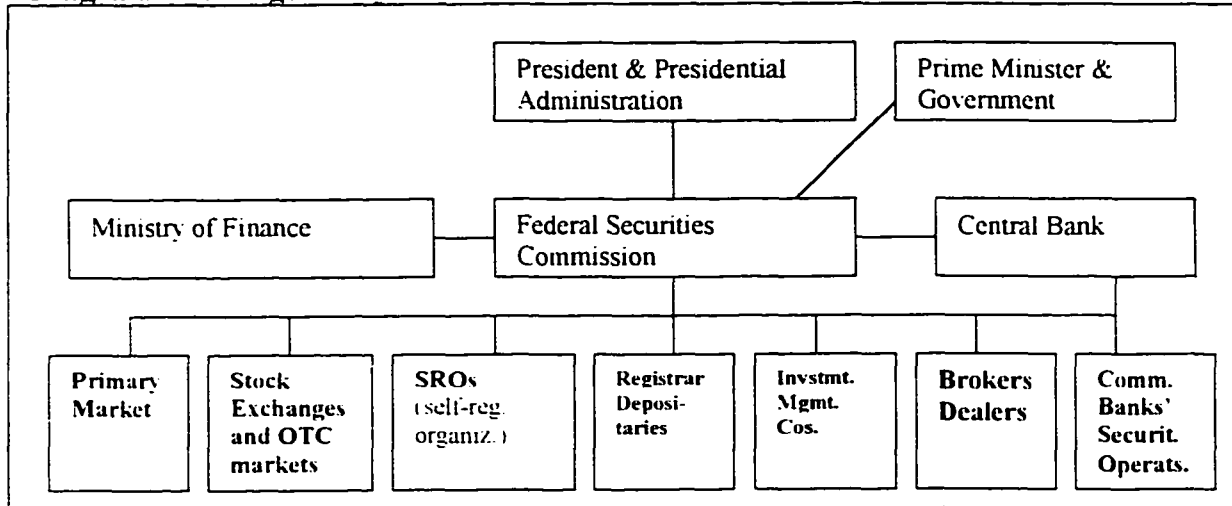
The legal environment for the Russian equity market just recently has become less opaque to the foreign investor. Since the first dedicated law on the Russian securities market appeared on December 28, 1991, the three main agencies: Central Bank of Russia (CBR), ministry of Finance (Minfin), and the Securities and Exchange Commission (SEC) have been trying to organize the market in the most efficient way. This process frequently revealed the underlying politics of the interest groups rather than focusing on

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\* See appendix for details on AKM Index

the most efficient way to regulate the market. The current structure of securities market regulation can be viewed in diagram 3.0.

**Diagram 3.0. Regulatory structure**



Source: Nomura Securities, 1997

The main regulations affecting Russian equity offerings and trading are summarized in table 3.0, and found on the homepage of the Federal Commission for the Russian Securities Market (FCSM):

**<http://www.fe.msk.ru/lat/win/infomarket/fedcom/ewhatsnew.html>**

which is the most reliable and most current source of changes affecting the regulatory environment of the Russian equity market. This website also contains an archive of all the historical statutes and amendments. Due to the continuously changing nature of the regulatory environment, the following descriptions in table 3.1, shall merely serve as a snapshot true as of November 1997, and the interested reader should consult the live-updates on the homepage of the Federal Securities and Exchange Commission.

**Table 3.0. Key laws and regulations**

<b>Key Laws and Regulations</b>	
<b>Regulation</b>	<b>Main focus</b>
Law on the Securities Market (April 1996)	Regulates professional market participants Established procedures for share issues Established structure and responsibilities of the FCSM
Law on Joint Stock Companies (Jan 1996)	Regulates corporate governance, shareholder meeting rules, and information disclosure rules by companies.
Presidential Decree "On Measures to Improve the Investment Policy of the Russian Federation (Jul 1995)	Establishes mutual funds
FCSM Regulations nos. 3.6. and 18 (Jul 1995-Sept 1996)	Regulates shareholder registries
FCSM Regulation No. 20 (Oct. 1996)	Regulates custodians
FCSM Regulation No. 22 (Dec. 1996)	Regulates broker dealers

Source: Brunswick Brokerage, Federal Commission of the Securities Markets

One of the main issues relevant for the future will be the enforceability of the regulatory framework. Although, the Law on Joint Stock companies which came into effect January 1, 1997 criminalizes securities fraud, the 'teeth' of the enforcing agency, the FCSM, have not been sighted. Much of the enforceability is a matter of having sufficient resources to oversee the entire market which, due to its decentralized location, can cause problems. However, only recently the FCSM has expanded its staff from 100 to almost 300 officers, and has begun the process of actively investigating complaints. Most of the issues which have been covered by the media have dealt with a conflict between minority and majority shareholders. Updates on regulatory issues can also be obtained from: <http://www.skate.ru>, or via The Skate Report-Capital Markets Russia, which is produced in association with the Moscow Times.

## III.B.2. Clearing and Settlement

As there is no central clearinghouse or central depository, trades are settled on a trade-by-trade basis through simple re-registration. The registry system in Russia is decentralized. Every company with more than 500 shareholders must declare an independent registry. The FCSM is in charge of licensing new registries. Licensed registries are required to have at least 25 issuers' registries with more than 500 shareholders each, or at least 10,000 shareholder accounts. The idea behind this regulation is to stimulate consolidation in the industry. As can be seen in table 3.1., some progress has already been made with some of the Moscow-based registries attracting several of the large issuers' registries. Previously, the standard for each issuer was to create an independent subsidiary which then became the legally required 'independent' registry and via this setup, the registry remained quasi-in-house and the risk of shareholder exclusion, wrongful deletion from the books, or refusal to enter into transactions always remained an option for the company. Arbitrary deletion from the registry has not happened for some time in Russia. The story of a major shareholder being locked out of the factory by the security guard, however, still is a last resort of conversation at cocktail parties among wealthy older, less astute Russia investors who dearly enjoy portraying themselves as the "Indiana Jones" fighting a Soviet-type environment wherever they can. As long as those stories circulate, and the risk of actual deletion from the registry is perceived as real, a generous discount to other emerging markets will prevail in Russian valuations.

**Table 3.1. Large Shareholder Registries**

Large shareholder registries	
Registry	Issuer
Center-Invest	Chernogorneft, Sidanka, Varyeganneftegaz, Kondpetroleum
Inkol	Rostelekom, Saratovsteklo, Smolensk Sviazinform
Irkutskoe Fondovoe Agentstvo	Irkutskenergo, Irkutsk Eletrosviaz, Baikal Pulp and Paper
Moscow Central Depository National Registry Company	KamAZ, Komineft, Transneft, Uralsviazinform
NIKoil	Cheliabinsk Electrolytic Zinc Smelting Factory, St Petersburg Telephone, Lensviaz, LOMO, Novoship, Alfa cement, Norilsk Nickel, Northwest Shipping, Bee-Line (Vimpelcom)
Reestr-Service	LUKoil
Reestr-Sviaz	Mosenergo
	Moscow City Telephone (will become registry for all regional telcos)

The main dilemma appears to be the resolution of the different opinions on the future of a clearing and settlement organization: (1) NAUFOR (National Association of Securities Markets Participants) supports the creation of the Depository Clearing Company (DCC), (2) the MICEX (Moscow Interbank Currency Exchange) which has adequate infrastructure in place for the clearing and settlement of currency and government securities transactions is promoting an equity clearing and settlement structure via the MICEX. This system is also supported by the Central Bank. (3) Recently the Federal Securities Commission on the Securities Market (FSCM) organized a new initiative which draws upon the participation of the Central Bank, the Ministry of Finance, issuers and market participants to create a new system- the Central Depository Working Group. To what extent it differs from the Central Depository-Clearing Company (DCC) which is sponsored by NAUFOR, has not been established.



The question of shareholder registries has also not found its last answer. There are at least three opposing factions aiming at different outcomes in the creation of an efficient and reliable registration system: (1) regional governments support large local registries from which they could benefit as opposed to rendering this process and the potential revenues to Moscow; (2) issuers still prefer pocket registries; (3) and finally the FCSM and most blue-chip issuers recognize the need for a National Registry Company.

### III.B.3 Custody

So far five local custodians have qualified as subcustodians under rule 17f-5 of the US Investment Companies Act. Subcustody relationships are formed with one of the five eligible subcustodians: Chase Manhattan, Credit Suisse, ABN Amro, Citibank, or Uneximbank, which all, except Uneximbank, must be backed by foreign parent companies with more than \$200 million in shareholders' equity. Although, the growing number of 17f-5 qualified subcustodians has dramatically decreased the risks and obstacles associated with investing in Russian equities, the costs remain exorbitantly high. A typical transaction would involve a fee of \$200 for the transfer of stock, or \$20 for book-entry transfer, expenses for travel to sometimes remote shareholder registries in Russia, a re-registration fee, an account opening fee, and monthly safe custody and administration fees.<sup>4</sup> This fee structure implies that the Russian market is virtually closed to retail investors. The introduction of the nominee-ownership option and the rapid rise of Moscow-based pooled registries has somewhat decreased the total expense incurred

The age of *e-trade* and *Charles Schwab on-line* where a complete transaction can cost as little as \$8.95 has not begun yet in Russia. However, given the relatively low

infrastructure cost of such trading technology, one could foresee a leapfrogging of trading technology taking place in Russia in due time.

Before this would happen, however, the establishment of a Russian Central Depository which would qualify as an eligible 17f-5 custodian, would be necessary.

Currently, the Depository Clearing Corporation (DCC) is in the process of testing a system it has developed with NAUFOR for clearing and settling trades over the Russian Trading System (RTS).<sup>5</sup>

#### III.B.4. The Russian Trading System (RTS) and National Association of Securities Markets Participants (NAUFOR)

The most important and the most successful development in the Russian equity market has been the creation of the Russian Trading System (RTS). The RTS was founded in July 1995 by 12 Moscow-based brokers, organized under the umbrella organization of the Professional Association of Securities Market Participants (PAUFOR). PAUFOR was created to accelerate the progress in creating efficiency in the existing trading infrastructure. As such it was a self-regulated organization which took on the burden of fostering discipline, transparency and order in the Russian equity market during a time when official bodies were not in the position to contribute to this process.

The most remarkable progress of the RTS which links the regional markets and brokers into a unified trading network, has been the quickly diminishing degree of

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<sup>5</sup> Brunswick Brokerage. "Infrastructure Update." (February 19, 1997): 6.

<sup>6</sup> Brad Durham. "Coming of Age." *The Russian*, (July-August 1997): 24.

spreads between bid and ask quotes. Before 1995, the average spread was no less than 25%, in 1996 the average spread was in the range of 7%, and today the average spread is no more than 2%, which is comparable to other emerging markets. This has been one of the primary accomplishments of the RTS which delivers average bids and asks from the participating brokers and distributes the prices over a network.

The RTS currently consists of over 450 members (brokers, dealers, and banks) from the National Association of Securities Markets Participants (NAUFOR) covering ten time zones of the Russian Federation. The instruments traded are exclusively equities, and all shares are dematerialized and registered. The RTS consists of two tiers, first and second tier stocks, RTS-1 and RTS-2. RTS-1 must have a minimum daily trading volume of USD 100,000 and RTS-2 must have a minimum daily trading volume of USD 50,000. Currently there are 62 RTS-1 companies, and 88 RTS-2 companies listed. The RTS is an electronic quote-driven system which in its structure is modeled on the NASDAQ. Brokers and market makers' quotes are displayed in the RTS screens, and trading is primarily conducted via the telephone. RTS-1 companies have a minimum trading lot of USD 10,000 and RTS-2 companies have a minimum trading lot of USD 5,000. Margin trading, short selling, and block trading are not regulated. For hourly life prices and volumes of the RTS-1 and RTS-2 the homepage of the Russian Trading system is the most current and reliable source of information.

**<http://www.rtsnet.ru/rts/lasthour.htm>**

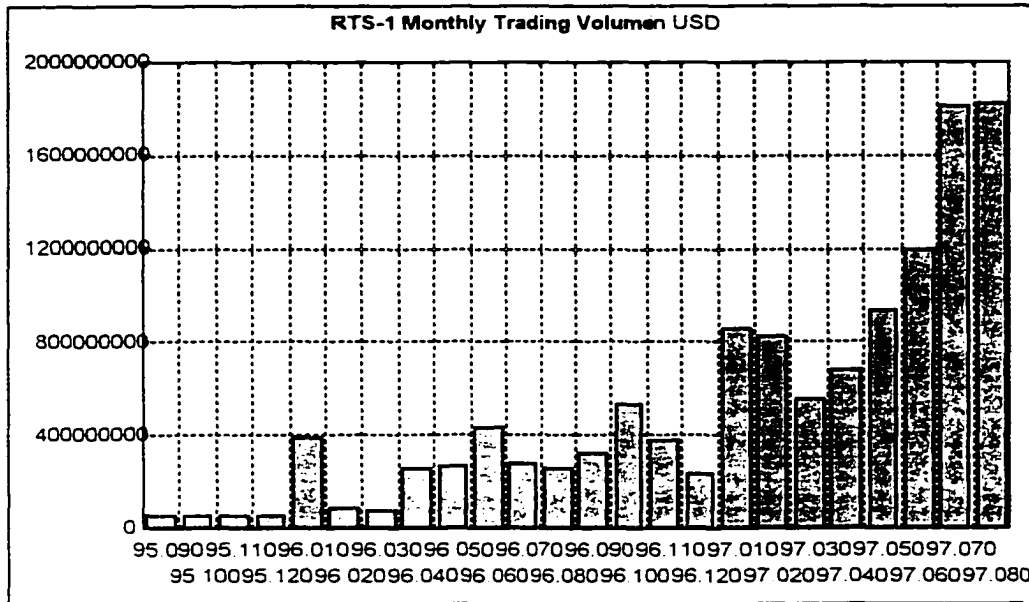
One must take into consideration that only trades among NAUFOR participants are fed into the RTS system, thus transactions in international depositary receipts (ADRs or GDRs) are not conducted via the RTS and their volumes will not be reflected in chart 3.1

FRONTIER EQUITY MARKET VALUATION

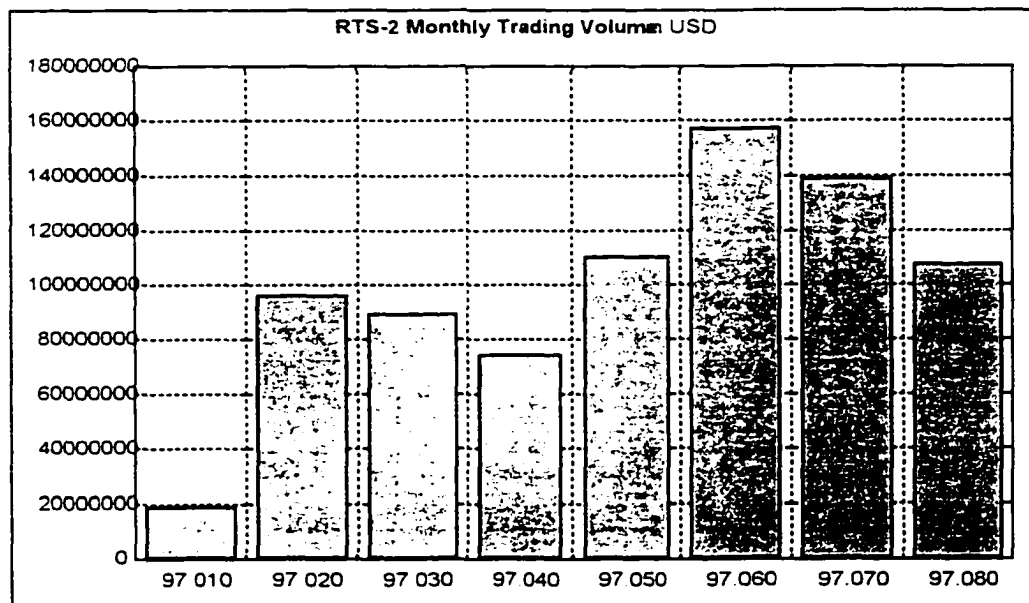
Chapter 3 The Valuation Dimension of the Russian Equity Market Infrastructure and Trading

and chart 3.2. Furthermore, it is estimated that only 40%-50% of all transactions are captured by the RTS as transaction among non-NAUFOR members and between NAUFOR and non-NAUFOR members are not registered under the RTS. Nevertheless, the RTS remains the most reliable indication on prices and volume.

**Chart 3.1. Russian Trading System (RTS-1) first tiers trading volume**



**Chart 3.2. Russian Trading System (RTS-2) second tiers trading volume**



**III.B.5. Taxation and foreign investment approval**

The current tax law has different effects on domestic and foreign investors. Unlike the case of many emerging markets, domestic investors (this includes the first Russian mutual funds) are clearly at an overall disadvantage compared to foreign investors. Returns achieved by domestic investors are taxed at the personal income tax rate which ranges from 12% to 35% depending in the income level of the investor. Russian legal entities are taxed at a flat rate of 35% and banks pay 43% capital gains taxes. Furthermore, capital losses cannot be offset against capital gains. This should explain why most wealthy Russians channel their money via an offshore entity back into the Russian equity market.

Foreigners are required to pay the same rates. In practice, however, their tax rate is 0% as most cash is settled offshore. There is a 15% withholding tax on dividends which is in most cases circumvented as many of the investment entities benefit from a favorable double taxation treaty with Cyprus.<sup>6</sup>

**Box 3.0 Cyprus – Russian off-shore center**

Cyprus established itself as the location of choice for the Russian off-shore market. A double-taxation treaty which was negotiated between the USSR and Cyprus at the peak of the Cold War – in 1982 – was intended to exclude Soviet government-controlled companies, which were set up to handle special tasks for the communist government, from Cyprus taxation. Today, Cyprus is the official home of more than 40,000 off-shore companies of which are close to 7,000 Russian-owned. These include prominent names such as Inkombank and Menatep Bank, and many investment funds.

Although the double taxation treaty has been challenged and continues to be challenged during 1998, as it facilitates tax evasion mechanisms, no conclusion has been reached on the future fiscal relationship between Russia and Cyprus. The costs of potentially cutting off large flows of funds from entering Russia via Cyprus-registered companies has to be balanced against the benefits of creating barriers for easy evasion of taxes. Tax evasion, however, is widely recognized as a domestic problem which cannot be solved by eliminating the legal conduit of Cyprus.

Another development affecting the role of Cyprus as a Russian off-shore location is the negotiation between Cyprus and the European Union regarding Cyprus' accession to the EU. Under such an outcome, existing tax advantages may no longer be available. The time horizon on this development and the precedence cases of Ireland and Luxembourg, however, leave ample room for speculation what in fact will happen to the tax legislation if Cyprus joins the EU in 3 to 5 years.

<sup>6</sup> Christodoulos Pelagias, Seaward Intl., Cyprus, Harvard Univ. Russia Conference, Jan. 9-11, 1998, Cambridge, Massachusetts, panel discussion.

Moreover, there is no stamp duty, no RTS transaction fee, varying registration fees, and brokerage fees which depend on the liquidity of the stock.

### III.B.6. Russian accounting peculiarities

Russian Accounting Rules (RAR) have traditionally served the purpose of informing Gosplan (the central planning agency) about quantities produced and flows of goods in the economy and Comecon trading system. This book-keeping legacy is still felt as RAR primarily serve the tax authorities as opposed to assessing quantitatively the financial situation of the firm. Although RAR have undergone some change in the past three years starting with the July 1994 'Accounting Policy Regulation Number One,' which implemented most IAS principles, there are still caveats in RAR of which the investor should be aware. Besides the imperfections, there are still numerous companies which have not fully adapted the changes required.

While there is a growing number of financial statements created by Western auditors, according to IAS or even US GAAP, the guidelines of converting RAR into IAS or US GAAP are often not consistent across the 'Big Six' – or now 'Big Four'. This makes financial statements prepared on the basis of RAR somewhat valuable for the analyst of Russian equities, as comparability across Russian companies in RAR is an option not necessarily given when using IAS statements prepared by different accounting firms. In reality, this is hardly done as only a small number of analysts of Russian equities have sufficient knowledge of the intricacies of RAR.

The most obvious differences between IAS and RAR can be outlined as follows:

- (1) *Bad debts*: There are no uniform provision guidelines for bad debt. The regulation that Russian firms can only write-off bad debt after a minimum of a three-year legal time limit of claiming debts did not lead to creating bad debt provisions at a timely point when debt seemed to be non-collectible. This is slowly changing as companies are increasingly creating bad debt provisions when they realize the difference between accounting and taxable profit.
- (2) *Fixed Assets*: The revaluation of fixed assets is obligatory on January 1 of each year. The government has created indexation guidelines for over 100 different assets classes, which is an improvement to the 'back-of-the-envelope' approach revaluation indices created before. Nevertheless, a full basket of exceptions is still available, particularly for oil and utility firms which would excessively overstate their assets if revaluation took place according to the official guidelines. Those exceptions have to be taken into consideration when analyzing the NAV of specific firms.
- (3) *Depreciation*: Depreciation is more often than not understated as the depreciation schedule frequently assumes a longer asset life than prudent accounting would justify. However, the shorter depreciation schedule may still lead to understatement if the assets had been excessively understated through opaque revaluation procedures. Thus both elements have to be considered when analyzing depreciation charges.
- (4) *Profit Loss Statement*: Accrual accounting principles have been introduced since the end of 1995 and an increasing number of companies abide by

this rule. Comparison over time, however, remain difficult as not all financial statements have been restated according to accrual accounting principles. The other problem is posed by the valuation of payments received that come in barter form (very often the case for utilities or engineering companies). Barter payments account for as much as 40% of total sales at some firms. The barter goods are valued according to what the two parties involved agree upon, as opposed to fair market value. This has been a problem as many companies associate 'political' terms with the barter deal. Other distortions are caused by the non-inclusion into cost of goods sold (COGS) of items that would reduce taxable income but are categorized as 'transfer to reserves.' Such items include social costs, fines for late tax payments, pollution fines, etc.

- (5) *Consolidated Statements*: This is still a large gray area in RAR as many companies do not consolidate accounts, or only imperfectly.<sup>7</sup>

Generally, accounting information has not been very conclusive when analyzing Russian companies. As more Russian companies aspire to international listings, IAS and US GAAP statements are required and with time there will be a growing number of companies which will also have a three year history of IAS and/or US GAAP financial statements. In the meantime, and for the remaining companies that are lagging in

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<sup>7</sup> Useful comments on Russian accounting rules can be found in:

"Handle with Care: Selected Topics in Russian Accounting," *Morgan Stanley Dean Witter-Emerging Markets Investment Research* (3 June 1997): 6-9.

"Russia Coming in from the Cold," *Flemings Research* (August 1996): 84-85.

"Russian Equity Guide," *Brunswick Brokerage* (1995): 11-12.



progress to more transparent financial statements, the analyst often has to think around corners and question the obvious. For example, the fact that companies own and operate schools, kindergartens and social facilities and list them on their balances sheets as assets could mean that such assets imply a cash outflow and thus have a negative net present value (NPV) associated with them. Furthermore a fair market value of social infrastructure is not easy to estimate as there are not too many potential buyers for a run-down nursery installed during the 1950s for children of working mothers of the factory.

### **III.C. A snapshot of current problems affecting the equity market valuation of Russia**

At the beginning of 1998, the Russian market has reached a new level of interest where the question has emerged of why Russian blue chips are still trading at a discount to comparable blue chips in other emerging markets, such as Brazil or Mexico.<sup>8</sup> The reason for this discount is found primarily in the equity market infrastructure. As of early 1998, the Russian market still lacks many fundamental mechanisms and legal rules that are required for a first-rate emerging market.

- The lack of a centralized clearing mechanism still carries the risk of companies erasing their shareholders from the company share register. Trades have to be hand-settled by brokers. This could lead to long delays and a paper crisis under increased volumes.
- The lack of a central clearing house often shuts out smaller brokerages as the larger brokerages assess the risk of their default as too high.

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<sup>8</sup> The discount is expressed by substantially lower P/E multiples (up to 60%) compared to Brazilian or Mexican stocks in the same industry and similar liquidity-enhancement instruments in place (ADRs).

- The capital gains tax law for foreigners (20%) still deters foreigners from moving with their trading activity on-shore. This leads to a segregated market where foreigners trade with each other off-shore and local banks (which are only allowed to transact on-shore and in rubles) remain on-shore. This situation has given rise to the story that “the market is filled with dollar sellers but only ruble buyers.”<sup>9</sup>
- Shareholder rights are still unsatisfactorily enforced. While there are companies which take minority shareholders interest seriously, such as LUKoil or Mosenergo, other, such as Yukos still pursue top management interests at the cost of minority shareholder, often without legal consequences.

Assessing the Russian market, or for that matter other pre-emerging markets, thus becomes a direct function not only of the micro-level analysis of companies (which will be examined at a later point in this study), or macro-economic fundamentals, but a function of the equity market infrastructure, from which no single company can be isolated. To monitor the progress or setbacks in such a process becomes crucial when gauging the valuation gap disappearance between Russia and other emerging markets.

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<sup>9</sup> Harvey Sawikin, “The Russian Stock Market: First-Rank or Second-Rate?” *The Russian* (December/January 1998): 24-25.

## Chapter 4

### DATA AND DESCRIPTIVE FEATURES OF RUSSIAN EQUITY RETURNS

This chapter has three main purposes: (a) to describe the data set used in the analysis, (b) to assess the probability distribution of the time series of individual Russian equities, and (c) to examine the properties of the return-volatility trade-off (mean-variance frontiers) as it evolves over time. Particularly, the underlying probability distribution properties are noteworthy as the methodology used for assessing the relative degree of market efficiency in a later chapter is selected to conform with and be consistent with the probability distribution observed in Russian equities.

The emergence of on-line technology, which at virtually no cost can distribute live price and other market-relevant information, has drastically altered the approach to data gathering for emerging markets. This study exploits the advantage of electronically-readable data distributed via the internet. Moreover, the availability of live on-line information services has dramatically decreased the infrastructure cost of running an asset management company trading securities from the most exotic places. This is a process which in itself should have its impact on market efficiency and global financial integration. Given the fact that an increasing number of asset management firms trading the Russian market rely exclusively on low or no-cost web sites for their daily business information, the sources of data presented are deemed to be reliable.

#### **IV.A. Descriptive statistics of Russian securities**

##### **IV.A.1. Data sources and selection of Russian securities**

The set of securities presented in table 4.0. was selected for this study as it reflects the composition of the broader Russian equity market. A heavy concentration in natural resource stocks, particularly in oil and gas, followed by electric utilities and telecoms form the core of the equity universe for investors. Limited availability of reliable data for other securities than those presented in table 4.0. did not allow their inclusion.

The most reliable and accurate historical time series of Russian equity prices available to the public are provided by RinacoPlus, one of Russia's more prominent brokerages. RinacoPlus, in order to preserve consistency with their initial methodology still averages best bids and asks at the close of the RTS (6:00pm Moscow time). Bids and asks are sourced from the RTS, or if liquidity does not allow usage of the RTS, the AK&M database.<sup>1</sup> Dividends are not considered as there were virtually no dividend payments for most of the time span analyzed, and even today only a small number of companies pay only token amounts of dividends. Only domestic prices are used, which means that ADR prices are not included. ADR prices are quoted over the counter of global brokerages and are thus not reliably available. Daily data points of prices are used to obtain a sizable data sample. When using daily data points, the assumptions of equi-distance is violated, this however, has to be taken in account as longer time intervals would not allow for meaningful sample sizes. All prices quoted on the RTS are

denominated in US\$, the currency in which trading is conducted. All time series used in the analysis are available under:

<http://www.fe.msk.ru/infomarket/rinacoplus/indicat/metod.html#3>

**Table 4.0. Securities Description**

Ticker	Company Name	Sector	Market Capitalization (in m \$) <sup>2</sup>
EESR	Unified Energy Systems	Utility	18.092
MSNG	Mosenergo	Utility	3.967
IRGZ	Irkutskenergo	Utility	1.655
LENE	Lenenergo	Utility	865
LKOH	LUKoil	Oil/Gas	16.928
YFGA	Yuganskneftegas	Oil/Gas	1.809
SNGS	Surgutneftegas	Oil/Gas	7.317
PFGS	Purneftegas	Oil/Gas	892
MFGS	Megionneftegas	Oil/Gas	1.250
NYGS	Noyabrskneftegas	Oil/Gas	1.241
TOMG	Tomskneft	Oil/Gas	936
NZGZ	Nizhnevartovskneftegas	Oil/Gas	683
CHGS	Chernogomeft	Oil/Gas	373
OREB	Orenburgneft	Oil/Gas	n/a
GAZP	Gazprom	Oil/Gas	16.453
RTKM	Rostelekom	Telecom	4.631
SPTL	St Petersburg Telephone	Telecom	1.224

Prices used in this study are from securities where reliance on AK&M will not be necessary as all securities are traded on the RTS-1. For a discussion on the merits of using bid/ask averages over closing prices refer to the Fisher effect (Fisher 1966).

<sup>2</sup> Market Capitalization as of July 31, 1997.

FRONTIER EQUITY MARKET VALUATION  
 Chapter 4 Data and Descriptive Features of Russian Equity Returns

MGTS	MGTS Telecom	Telecom	3,043
GUMM	Trade House GUM	Retail	253
NKEL	Norilsk Nickel	Mining	1,928
KMAZ	Kamaz	Autos	407
GAZA	Gaz Auto Plant	Autos	480
FESH	Far Eastern Shipping Co.	Shipping	115

IV.A.2. The probability distribution of individual shares

The probability distribution of returns in emerging markets has been assessed in a number of studies.<sup>3</sup> Normality has been rejected for most studies on emerging market indices.<sup>4</sup> This section examines the distribution properties of individual Russian equities. Table 4.1. indicates the rejection of the normality assumption for every security examined.<sup>5</sup> Excess positive kurtosis seems to prevail, and the leptokurtic state of the distribution indicates a slim or long tailed distribution. Most of the securities also display positive skewness, which implies a distribution to the right.

<sup>3</sup> Refer to the following two studies for further details: Geert Bekaert, "Market integration and investment barriers in emerging equity markets," *World Bank Economic Review* 9 (1995): 75-107.

Geert Bekaert and Campbell R. Harvey, "Emerging equity market volatility," forthcoming.

<sup>4</sup> For evidence of rejection of normality in emerging markets see Hakim (1992), Claessens, Dasgupta, Glen (1993). The likelihood that an index is more 'well-behaved' than individual securities further supports the notion that the normality assumption in individual emerging market securities can be rejected.

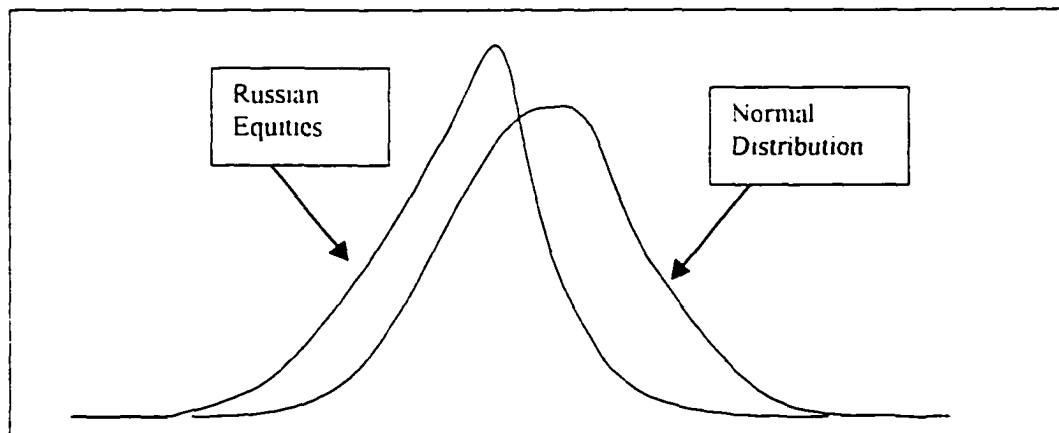
<sup>5</sup> The Jarque-Bera test statistic follows the chi-square distribution with 2 df. There are a number of reasons why normality can be rejected, refer to Black (1976), Christie (1982), Nelson(1991), and Brennan (1993) for detailed discussions of topics such as presence of limited liability in equity investments, option-like asymmetries in index returns, or conditional skewness -Harvey and Siddique (1995).

**Table 4.1. Descriptive Statistics (daily observations)**

Company	Mean	Std. Dev.	Sharpe Ratio	Kurtosis	Skewness	JB
EESR	0.41%	3.66%	0.107	5.72	0.62	245
LENE	0.42%	3.42%	0.117	18.99	2.03	7458
YFGA	0.15%	3.96%	0.032	9.90	1.15	1451
SNGS	0.34%	4.89%	0.065	8.53	0.99	944
PFGS	0.24%	3.82%	0.058	8.46	0.70	870
MFGS	0.27%	4.45%	0.057	6.26	0.56	325
NYGS	0.17%	3.67%	0.040	10.23	1.14	1578
TOMG	0.23%	3.82%	0.055	8.50	0.52	858
NZGZ	0.28%	5.41%	0.048	73.10	5.63	138210
CHGZ	0.18%	3.30%	0.047	15.82	0.86	4591
ORNB	0.35%	5.32%	0.061	12.12	0.85	2361
GAZP	0.42%	5.35%	0.075	12.57	1.01	2625
RTKM	0.34%	3.61%	0.087	7.83	0.90	728
SPTL	0.26%	2.82%	0.083	11.85	-0.11	2150
MGTS	0.43%	2.72%	0.149	62.23	4.56	98457
GUMM	0.16%	4.38%	0.031	269.72	-12.23	1966749
NKEL	0.09%	3.65%	0.018	8.04	0.73	756
KMAZ	0.20%	5.37%	0.034	15.45	0.86	4329
GAZA	0.61%	5.43%	0.108	21.27	1.49	9400
LKOH	0.25%	2.98%	0.077	7.62	0.86	665
IRGZ	0.44%	4.18%	0.100	7.27	0.81	573
MSNG	0.43%	3.34%	0.123	7.17	0.67	527
FESH	0.14%	5.08%	0.024	53.60	3.30	71383
AVERAGE	0.30%	4.11%	0.07	28.79	0.78	100749

The average returns distribution of those Russian equities presented above, can be graphically described as more peaked (leptocurtic) and more heavily clustered to the left of the mean (skewed to the right)

**Diagram 4.0. Graphical illustration of Russian equity returns distribution**



Particularly noteworthy is that those equities with the highest trading volume (Unified Energy Systems, Mosenergo, Irkutskenenergo, LUKoil, and Rostelekom) have comparatively the most 'well-behaved' Jarque-Bera normality scores. This could indicate that active trading fosters an increasingly normal distribution of returns.

Nevertheless, the conclusion from the fact that we observe deviation from the normal distribution, requires the application of a methodology which is robust to non-normality when measuring relative market efficiency in chapter 6. The safest method would be to simply use non-parametric methods. However, given the shortfalls of such tests (as discussed in chapter 2), the variance ratio test appears to be a sound choice. MacKinlay and Lo (1988) state in their original article on the variance ratio test, that this test is sensitive to correlated price changes, but otherwise robust to many forms of non-normality and heteroscedasticity and thus lends itself well to the analysis of financial time series which often deviate from normality.



**Box 5.0. Explanation of statistical measures**

**Mean:** The mean is calculated as the average daily USD return for the time period from January 1995 to September 1997.

**Standard deviation:** The standard deviation is calculated according to the conventional formula and represents the daily standard deviation (not annualized)

**Sharpe Ratio:** The Sharpe Ratio is computed in unconventional terms as the average daily risk free rate is subtracted from the average daily return before it is divided by the daily standard deviation (daily frequency).<sup>o</sup> The Sharpe ratio measures the risk premium earned per unit of risk exposure. Thus, a higher Sharpe ratio is preferable to a lower Sharpe ratio. This could be a result of lower volatility of the underlying asset, or higher return.

**Skewness and Kurtosis:** Skewness and Kurtosis measure the characteristics of the returns distribution. Positive skewness implies that the distribution is tilted to the right, negative skewness to the left, and 0 skewness implies symmetry about its mean, such as the normal distribution. Kurtosis provides a measure of the weight in the tail of a probability density function. For a normal distribution the population kurtosis is 3.

(Formulae 5.0. and 5.1.)

$$Skewness = \frac{\sum_{i=1}^n (X_i - \bar{X})^3 / n}{s^3} \quad Kurtosis = \frac{\sum_{i=1}^n (X_i - \bar{X})^4 / n}{s^4}$$

$\bar{X}$  = sample mean

$s$  = sample stdev.

**Jarque-Bera Normality Test:** The J.-B. test is an asymptotic (large sample) test, and as such it is based on OLS residuals. The J.-B. test statistic follows the chi-square distribution at 2 df. Thus if the J.B. value is lower than the test statistic one cannot reject the normality assumption.

(Formula 5.2.)

$$J.B. = m \left[ \frac{(Skewness)^2}{6} + \frac{(Kurtosis - 3)^2}{24} \right]$$

<sup>o</sup> The Sharpe ratio is conventionally calculated only for longer time periods, but for the sake of comparison the daily frequency is maintained. The risk-free rate used is the US rate because this study assumes the US investor's perspective.

<sup>1</sup> See M. Jarque and A.K. Bera. "A Test for Normality of Observations and Regression Residuals." *International Statistical Review*, vol. 55 (1987): 163-172.

#### IV.B. Mean-Variance Frontier

The mean-variance frontier serves to illustrate the trade-off between volatility and return. Traditionally, the mean-variance frontier reflects investors preference for lower volatility at the cost of lower return, or vice-versa. This is also one of the underlying premises of the Capital-Asset Pricing model (CAPM). Under CAPM the risk-adjusted expected returns of all securities are equal and any differences across assets in expected rates of return are due to unavoidable uncertainty which is captured in historical volatility of the asset versus its market portfolio.<sup>8</sup> While the CAPM uses the covariance of a security with the market portfolio (also called beta) as a risk measure, as opposed to simply using variance, the assumption remains the same: Higher expected returns require higher expected uncertainty. Therefore, we must assume that investors are concerned with the volatility of their assets. In developed markets this is fairly well presented. Simple examples such as semiconductor or biotechnology stocks as compared to the Mid-western sewage utility, serve as good examples of the high volatility and high return / low volatility and low return trade-off.

Pre-emerging market equities in the Russian market do not fit into this return/volatility school of thought. Chart 4.0 shows the mean-variance frontier for the time period between January 1995 and September 1997 for twenty-three of Russia's most liquid equities measured by their cumulative RTS trading volume between January and June of 1997. Chart 4.1 also depicts a mean-variance frontier for the same set of Russian

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<sup>8</sup> Robert A. Haugen, *Modern Investment Theory*, 4<sup>th</sup> ed. Upper Saddle River, NJ, Prentice Hall: 1997, chapter 7 passim.

equities, but the time interval measured is limited to the twelve months period ranging from September 1996 to September 1997. Chart 4.1. has been plotted to test for the possibility of the mean-variance frontier of a maturing Russian equity market approaching the traditional risk-return trade-off relationship observed in mature markets or other emerging markets.<sup>9</sup>

As one can see, however, the traditional risk-return trade-off does not hold true in Russia. The linear fit line does not exhibit an upward slope.<sup>10</sup> In fact, the slope is slightly negative. This leads to the realization that more volatile securities generate lower returns. Interestingly, the upper-left quarter (higher return/ lower volatility) of the chart has a fairly high concentration of the most liquid stocks (MSNG, UES-EESR, RTKM, MGTS). This is possibly an indicator that securities with lower liquidity, which attract less foreign investment, are less exposed to liquidity-surges in their stocks price (hence lower returns) and are more vulnerable to dramatic fluctuations (hence higher volatility) given a relatively lower liquidity

This somewhat forced argumentation tries to apply sense and reason to the observations in chart 4.0. A more reasonable interpretation of chart 4.0, however, is that investors are not concerned with volatility and the slightly negative slope is more coincidence than a reflection of some underlying mechanism prevailing. It must be asked whether investors in pre-emerging markets such as Russia are volatility sensitive given the fact that even the least volatile assets have an annualized standard deviation of 30%-40%. Furthermore, it can be safely assumed that foreign investors are far more

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<sup>9</sup> Stijn Claessens, Sasmita Dasgupta, and Jack Glen, "Stock Price Behavior in Emerging Markets," *World Bank Discussion Series on Emerging Stock Markets* (1996): 304.

<sup>10</sup> The linear fit was chosen as OLS (ordinary least squares) would not have been the most efficient representation due to the non-fulfillment of the normality assumption in the data set.

concerned with more fundamental risks such as political collapse or expropriation than short-term volatility.

The most recent twelve months time period does not exhibit a trend delineating a closer resemblance with a traditional risk-return trade-off assumption either, although the exclusion of the Far Eastern Shipping Company (FESH) and Trade House Gum (GUMM) would lead to a positive slope and thus would indicate a movement towards the more traditional risk-return trade off assumption. Nevertheless, it still can be concluded that the Russian market remains a stock pickers' market where risk and return are not providing an indifference curve, and where high risk is not necessarily associated with higher return or vice-versa.

**Chart 4.0. Mean Variance Frontier of Russian Equities (1995-1997)<sup>11</sup>**

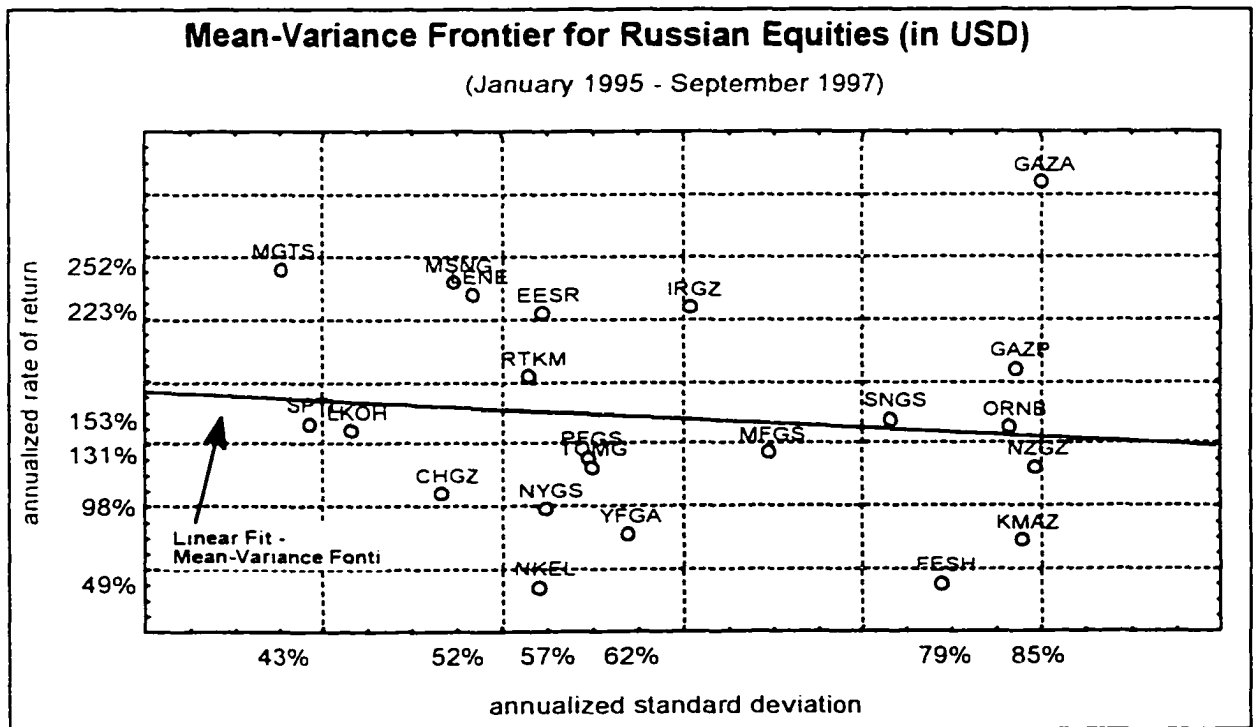
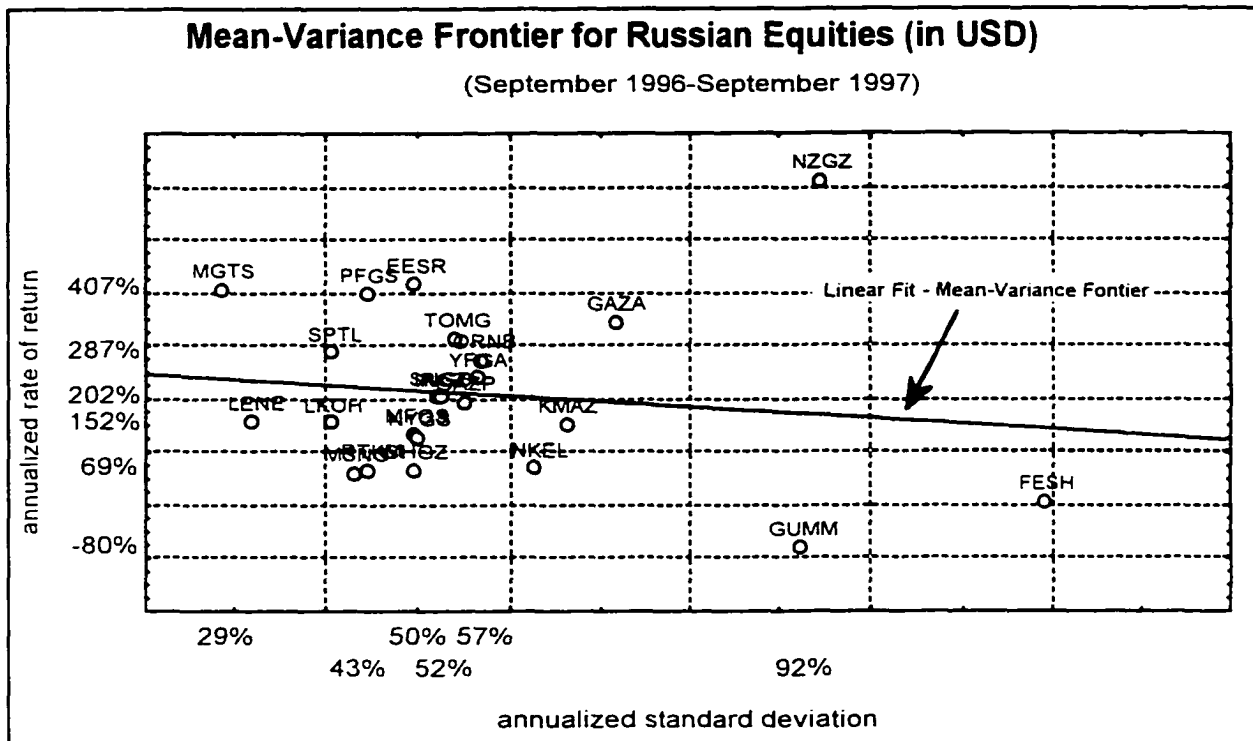
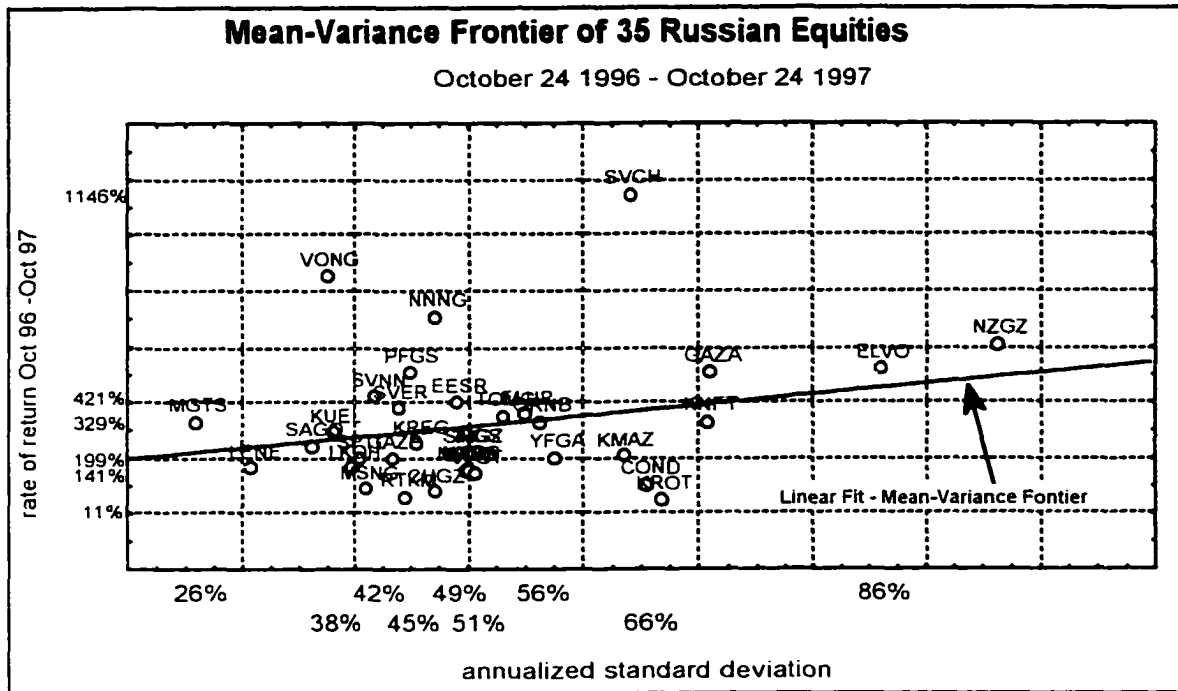


Chart 4.1. Mean Variance Frontier of Russian Equities (Sep 96 – Sep 97)



The rate of returns have been annualized from daily frequency observations and the daily standard deviation has been annualized by multiplying it by the square root of 245.

Chart 4.2. Mean-variance frontier of 35 Russian equities (Oct 96-Oct 97)



The most recent time period of chart 4.2. allows for analysis of a larger universe of Russian equities (35). Here one can see that volatility and return increasingly become positively correlated, thus contributing to the assumption that the Russian market is increasingly analyzed with volatility in mind and other risks are taking a less prevalent place in the hierarchy of measures. Hence, a closer integration of the Russian market in global capital markets could be inferred from such an observation. Furthermore, the overall volatility decreases in chart 4.2. compared to chart 4.0. which also points in the direction of Russia approaching gradually but steadily the volatility profile of more mature emerging markets.

## Chapter 5

### INFORMATION CHANNELS AND INFORMATIONAL EFFICIENCY OF RUSSIAN EQUITIES

Informational efficiency can only exist to the degree in which information about individual companies reaches the investor. This chapter starts out by asking the question: How do foreign investors learn about the pre-emerging stock market of Russia and its companies? Having established that the main channel of information is brokerage research reports, a more detailed analysis is conducted about individual companies and their transparency in light of this predominant information channel. Finally, three portfolios are created: (1) top transparency portfolio, (2) medium transparency portfolio, and (3) bottom transparency portfolio. The creation of the three portfolios is supported by the AKM survey which ranks companies on their degree of information disclosure. Those three portfolios will be used in chapter 7 as a prerequisite for the comparative analysis of relative market efficiency.

#### **V.A. Informational channels and brokerage research coverage index**

##### V.A.1 Information channels of security information on Russian equities.

Emerging markets are never as transparent as developed markets, and indeed, greater transparency is the hallmark of the emergence process. Information about securities in pre-emerging markets such as Russia, however, has been even less accessible to foreign investors. This is particularly true for the initial stages in the

development of a securities market. Financial statement projections, reliable audits, a clear overview of company operations and ownership structure, or strategic outlook are just a few of the desirable pieces of information that are often insufficiently addressed in pre-emerging markets. The question arises as to what information is used as a basis for investment decision-making.<sup>85</sup>

The purpose of this chapter is to assess what the main channels of information are and what the implications are for individual securities' transparency and investor appeal. Such a question could be considered unanswerable in any developed market where sector rotations and strategic outlook fine-tuning, to name just a few criteria, are continuously reshuffling the securities appeal profiles and their relative visibility levels on the investor radar screen. In young emerging markets, however, the question is quite simple: What information is available to the foreign investor and how can one measure the scarce and only information offered to foreign investors?

To gain an insight into the information channels of pre-emerging markets investors in the Russian equities market, the following three types of analyses will be shared

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<sup>85</sup> A good introduction to investment channel analysis for global equity markets is given by: W. Scott Bauman, "Channels used to research global equity investments," *The Journal of Investing*, vol. 5, no. 4 (Winter 1996): 37-46. In other pre-emerging markets, the channels of information are likely to be the same as in Russia. Some of the smaller pre-emerging markets, particularly in sub-Saharan Africa, however, cannot rely on brokerage research to the same extent as the resulting deal flow-in underwriting and trading- is not expected to be very large, consequently brokerage research resources are allocated to larger markets.



In 1996, the ICR Survey Research Group conducted a survey of 174 Western portfolio investors in Russia on behalf of the Federal Commission on the Russian Capital Market.<sup>86</sup> This survey, in addition to the AK&M quarterly surveys, dating back to 1994, conducted by questioning 400 market participants on issuers' information disclosure and general securities appeal, together complement the analysis of research coverage of individual Russian issuers conducted in this study.<sup>87</sup>

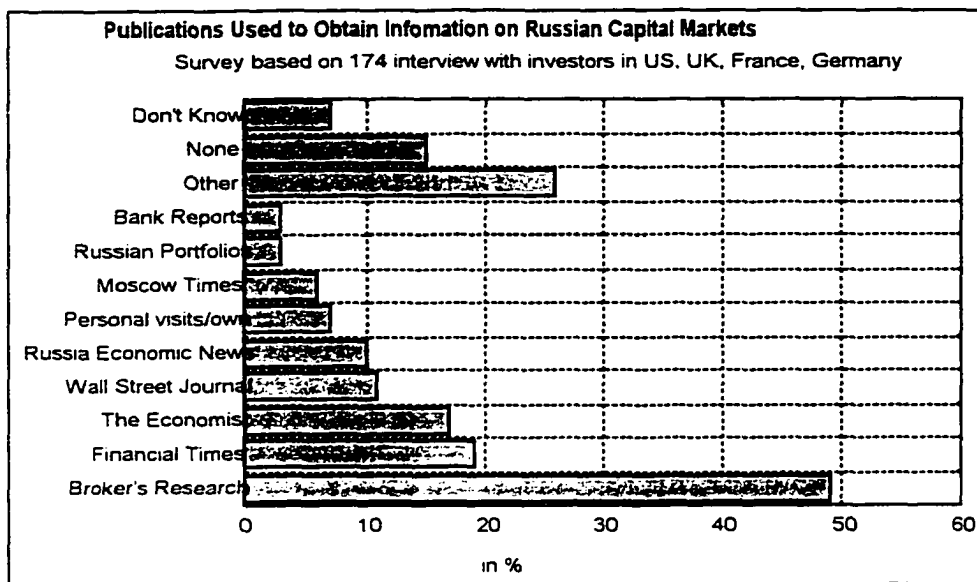
As one can see from the ICR survey results on chart 5.0. and chart 5.1., Western investors participating in the Russian equity market rely on broker's research reports (49%) as their main source of Russian capital market information. Other fairly unspecialized publications such as the Financial Times or The Economist also serve as an important source of information for Russian market participants, with 19% and 17% respectively. In the category 'other', the on-line information services Reuters and Bloomberg stand out as the most important sources of information. These results clearly indicate that broker's research reports should be the best indicator of individual company's visibility in the investment community. On-line information tends to be quite specific to events affecting a company, or fairly general when it pertains to overall

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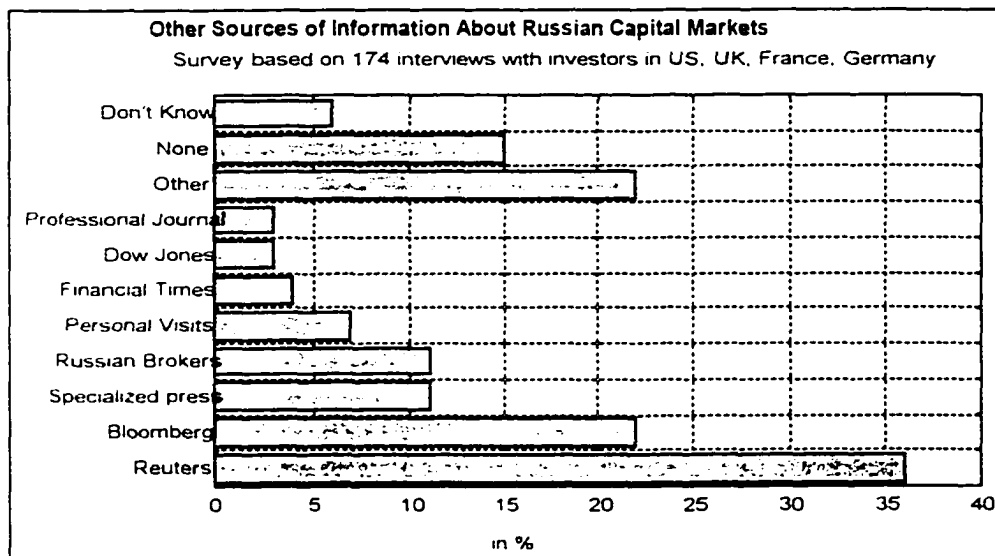
<sup>86</sup> Survey can be obtained from ICR Survey Research Group- AUS Consultants, Media, PA 195659280

<sup>87</sup> The AK&M quarterly survey can be retrieved from AK&M's web site ([www.akm.ru](http://www.akm.ru)). AK&M has established itself as one of the most authoritative firms delivering market quotes and industry indices in Russia-not unlike Standard & Poor's SP500, or Dow Jones & Co.'s DJIA in the US.

**Chart 5.0. Information channels for Russian investors**



**Chart 5.1. Other sources of information**



conditions in the country and investor sentiment. The same is valid for the Financial Times and The Economist, which both have ad-hoc journalistic coverage of an industry or a Russian political event, but do not display the continuity and detail investors need in order to make decisions. Hence, the best measure of transparency remains the traditional brokerage research report on companies.

V. A.2. Brokerage report coverage index

For this purpose a complete account of brokerage research has been established covering the time span between January 1995 and September 1997. The following brokerages have been included in establishing the transparency/investor appeal index:

**Table 5.0. Brokerage report survey**

<b>BROKERAGE NAME</b>	<b>BROKERAGE NAME</b>
Alfa Capital	Merrill Lynch
Aton	Morgan Stanley Dean Witter
Brunswick Brokerage	Paribas/United Financial Group
CentreInvest Securities	Pioneer Securities
Credit Suisse First Boston	Prospect Investment
Daiwa	Renaissance Capital
Deutsche Morgan Grenfell	Rinaco Plus
ING Barings	Rye, Man & Gore
Lentrometerialy	Salomon Brothers
MC-BBL	Sector Capital
MFK-Bank	Troika Dialog

The information obtained from each brokerage comprised the date, the company, and the recommendation of each report written on a Russian security, or an industry report comprising several securities. If the recommendation was positive, neutral or negative (many brokerages did not release recommendations in the first phase of their coverage), the coverage was counted as a one. Interestingly, there were not too many sell recommendations until the latter phase of the period observed. The total score per company was then cumulatively tracked on a monthly basis. Cumulative counting seems justifiable in light of the fact that buy-side analysts mostly receive a package containing all of the research that has been published by individual brokerages when inquiring for information on a specific company. Furthermore, cumulative counting supports the notion that analysts create a latent memory for the visibility of certain companies if research reports have come through their desks in the past.

The information was obtained via four main routes:

- (1) mail delivery of reports to buy-side analyst.
- (2) posting of reports on on-line database FirstCall Research Direct.
- (3) survey of brokerages sent out via e-mail.
- (4) Russia Portfolio publications prints research review in quarterly intervals including all of the above mentioned brokers.

**Table 5.1. Cumulative brokerage report coverage**

	GAZP	NZGZ	NYGS	MFGS	ORNB	TOMG	LKOH	CHGZ	YFGA	SNGS	PFGS	UES	LEN	MSG	IRGZ	MGTS	SPTL	RTKM	GUMM	KMAZ	GAZA	FESH	NKEL
35.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35.2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
35.3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
35.4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
35.5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
35.6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
35.7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
35.8	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
35.9	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
35.10	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
35.11	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
35.12	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
35.13	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
35.14	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
35.15	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
35.16	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
35.17	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
35.18	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
35.19	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
35.20	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
35.21	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
35.22	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
35.23	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
35.24	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23	23
35.25	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
35.26	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
35.27	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
35.28	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27	27
35.29	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
35.30	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29
35.31	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
35.32	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
35.33	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
35.34	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
35.35	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
35.36	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35	35
35.37	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36	36
35.38	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
35.39	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
35.40	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39

V.A.3. AK&M Survey

The AK&M Survey which polls over 400 market participants in quarterly intervals on their opinions about information disclosure of (a) individual securities and (b) appeal of individual securities, sharply confirms the results that have been obtained through the above depicted transparency analysis table 5.1. The top five portfolio is matched between 80%-100% by the quarterly survey results for the top five securities based on information disclosure. Furthermore, the information disclosure top five list is almost perfectly matched in each quarter by the same top five names in the 'securities appeal' poll. This means, (a) that the brokerage report analysis is confirmed and, (b) that the degree of information disclosure directly translates into the degree of appeal

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individual securities enjoy in the top ranking environment for the individual criteria. The same comparison could not be conducted for the low end of information disclosure, brokerage reports and securities appeal, as the universe used by AK&M differs since it includes more illiquid names with little price history available and thus was not considered for this analysis.

**Table 5.2. AK&M Survey -top five stocks based on information disclosure**

October 1, 1997	June 27, 1997	March 31, 1997	Decemb. 26, 1996	Sept 27, 1996
UES	UES	UES	UES	UES
LUKoil	LUKoil	LUKoil	LUKoil	LUKoil
Mosenergo	Mosenergo	Mosenergo	Mosenergo	Mosenergo
Rostelekom	Rostelekom	Rostelekom	Rostelekom	Rostelekom
Gazprom	Gazprom	Gazprom	Gazprom	Norilsk Nickel

June 28, 1996	Mar. 29, 1996	Dec. 29, 1995	Sept. 30, 1995	June 27, 1995
LUKoil	UES	UES	UES	UES
Mosenergo	LUKoil	Rostelekom	Rostelekom	Rostelekom
UES	Rostelekom	Norilsk Nickel	Norilsk Nickel	Norilsk Nickel
Rostelekom	Mosenergo	LUKoil	Yugansk.	Yugansk.
Norilsk Nickel	Norilsk Nickel	Mosenergo	LUKoil	LUKoil

### **V. B. Creation of top-, medium-, and bottom-transparency portfolios**

The top-, medium-, and bottom transparency portfolios for the full period (January 1995 – September 1997) have been created by bundling the top five stocks, the bottom five stocks, and the remainder in the middle, which accounts for thirteen stocks, into three portfolios. The reason why the top and the bottom portfolio are composed of only five securities is based on the fact that the top 'five group' has been quite consistent over the entire period. This could not be said for the top 'six' or 'seven' group. Since the measurement of the random walk relative to securities transparency is applied to the whole period (660 trading days), a consistent top transparency group is desirable. The reason why Gazprom is not in the top transparency portfolio can be explained by the fact that Gazprom was not a company in which foreigners could invest until the October 1996 ADR issue. For this reason international brokerages only took a marginal interest in the company and did not publish extensive research on the firm during the pre-ADR period.

As of June 1997, the market capitalization of the top transparency portfolio accounts for 45% (57% excluding Gazprom from total MSE market capitalization) of the total Moscow Stock Exchange (MSE) market capitalization<sup>88</sup>. This further supports the view that the top five selection is as reasonable choice as a sixth or seventh addition would only marginally increase the total market capitalization of the portfolio. A top five portfolio, on the other hand consists of a homogenous group of highly capitalized and consequently more liquid companies which share many characteristics, particularly with regard to appeal to foreign investors as a result of transparency.

**Table 5.3. Portfolio-transparency breakdown**

<b>Top Transparency</b>		<b>Bottom Transparency</b>	
LUKoil		Yuganskneftegas	
Rostelekom		Lenenergo	
Mosenergo		KAMAZ	
Surgutneftegas		Far Eastern Shipping Company	
Unified Energy Systems		Purneftegas	
<b>Medium Transparency</b>			
Gazprom		Chernogorneft	
St. Petersburg Telecom		Irkutskenergo	
MGTS (Telecom)		GUMM	
Megionneftegas		Nizhnevartovskneftegas	
Noyabrskneftegas		Norilsk Nickel	
Orenburgneft		Tomskneft	
Gaza Auto Plant			

Table 5.3 defines the three portfolios according to the transparency criteria of the companies composing the three portfolios. Securities in the top transparency portfolio are those which are on the forefront of information release to investors. This has two major implications: (1) investors know more about the company-specific details, and (2) more investors are aware of the existence of those securities than of those which belong to the other two portfolios. Accordingly, a double-edged sword situation may arise which is the consequence of market segmentation. Given the higher visibility of the top

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<sup>22</sup> Daiwa Securities. "Central/Eastern Europe-Moving in Different Orbits." *Daiwa Europe Limited Equity Strategy Quarterly* (June 1997): 30.



transparency portfolio, a specific investor group is likely to be more attracted to those securities than to securities in the other two portfolios. At the same time, those securities composing the top transparency portfolio are on the forefront of delivering transparency. What the implications are for relative market efficiency will be the topic of the chapter 7.

Chapter 7 which will examine whether the top transparency portfolio given its high information release characteristics will confirm the common notion that higher transparency generates a higher degree of relative market efficiency. Or whether precisely those characteristics lead to a type of investor segmentation which could override the benefits of transparency, which in theory should translate into greater informational efficiency and thus a higher degree of relative market efficiency, but possibly lead to lower relative market efficiency.

## Chapter 6

### METHODOLOGY

There are two main purposes in conducting tests of market efficiency: (1) to detect allocational inefficiencies in the market, and (2) to detect unexploited profit opportunities, which imply informational inefficiency. The first purpose can be viewed in a larger economic context, where allocational efficiency implies that capital resources are channeled to those firms which are most deserving of investment, as they are projected to create an economic benefit to society as a whole by developing those industries whose products or services enjoy a sufficient demand and which succeed in generating at least the minimum required rate of return for their shareholders. The second purpose, in reality, is simply a derivative of the first one. If market inefficiency is discovered by market participants, the first idea would be to exploit it until it would cease to exist. Strictly speaking, the sheer existence of informational market inefficiency implies that allocational inefficiency must have been in place as well, as the schedule of securities' price behavior, which theoretically should be dictated by fundamentals and all other information relevant to the asset, had not been reflected in the share price as quickly and accurately as market efficiency would demand. Therefore any profit opportunity on the basis of informational market inefficiency results from a lack of true representation of the fair demand schedule for an asset as it would be dictated by its characteristics.

The measurement of market efficiency has been a problem with which financial economists have dealt now for almost 100 years (given Bachelier's 1900 exploratory thesis of the subject.) Yet there has been little consensus so far. As already pointed out

in the literature review, there is an increasing number of tests which fill an exploding number of pages in journals dedicated to financial economics. However, as Eugene Fama, the pioneer of the efficient market hypothesis, pointed out in one of his early essays: "In an uncertain world, no amount of empirical testing is sufficient to establish the validity of [the random walk hypothesis or any alternative hypothesis] beyond any shadow of doubt."<sup>1</sup>

In this study, and specifically for the reasons mentioned above, the random walk model serves well to measure relative market efficiency as it captures the two dimensions of allocational market efficiency, and informational market efficiency.<sup>2</sup> While there is a growing number of new approaches dedicated to describing securities price behavior, ranging from models with time-varying parameters (such as models with GARCH components) to models based on neural networks, the variance ratio test of the random walk model seems the most intuitive. Even though subject to criticism, the variance ratio test is a fairly robust model which has been broadly defended in academic research dedicated to securities price behavior.<sup>3</sup> Furthermore, its robustness to many forms of non-normality and heteroscedasticity in the data qualify the variance ratio test to the special case of non-normally distributed, possibly heteroscedasticity-exhibiting returns of Russian equities.

If a new model were found to fully describe the process of securities price behavior, a case could be made for rather adapting such methodology over variance ratio or other random walk-based approaches. The creator of such a model, however, would

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Eugene F. Fama. "Random Walks in Stock Prices." *Financial Analysts Journal* (September/October 1965), 55-59

do well by not publishing it but instead applying it to proprietary trading and reaping its rewards. Therefore, for the time being, for the non-measurability of a possible superiority of alternative models, and, above all, for the primary purpose of measuring relative as opposed to absolute market efficiency, tests of the random walk model, and specifically via the conduit of variance ratio tests, shall serve best to describe relative market efficiency.

#### **VI.A. From random walk to relative market efficiency**

##### VI.A.1. The random walk model as a tool to measure market efficiency

The connection between the efficient market hypothesis (EMH) and the random walk as a measurement tool has been elaborately established by many researchers over time.<sup>4</sup> The following paragraphs shall serve to summarize the most important technical assumptions underlying the random walk model as a tool for measuring relative market efficiency

One of the fundamental premises of EMH is that the price of an actively traded asset reflects an optimal use of all available information. This general condition can be illustrated by assuming that the market participant can think of each sequence of events affecting the asset as a “state-of-the-world.” The number of different “states-of-the-world” is infinite [state-of-the-world  $s=(1,2,3,\dots,N)$ ]. Further, suppose that the aggregated set of all information available at time  $t$  is denoted by  $\Omega_t$  and that  $\pi(s | \Omega_t)$  is

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<sup>2</sup> In this dual-purpose context, the random walk model is superior to cointegration-based tests which primarily focus on the relationship of two or more assets, and thus allow to draw conclusions about the predictability of at least one of them.

<sup>4</sup> The variance-ratio test will be described in detail in a later section in the chapter.

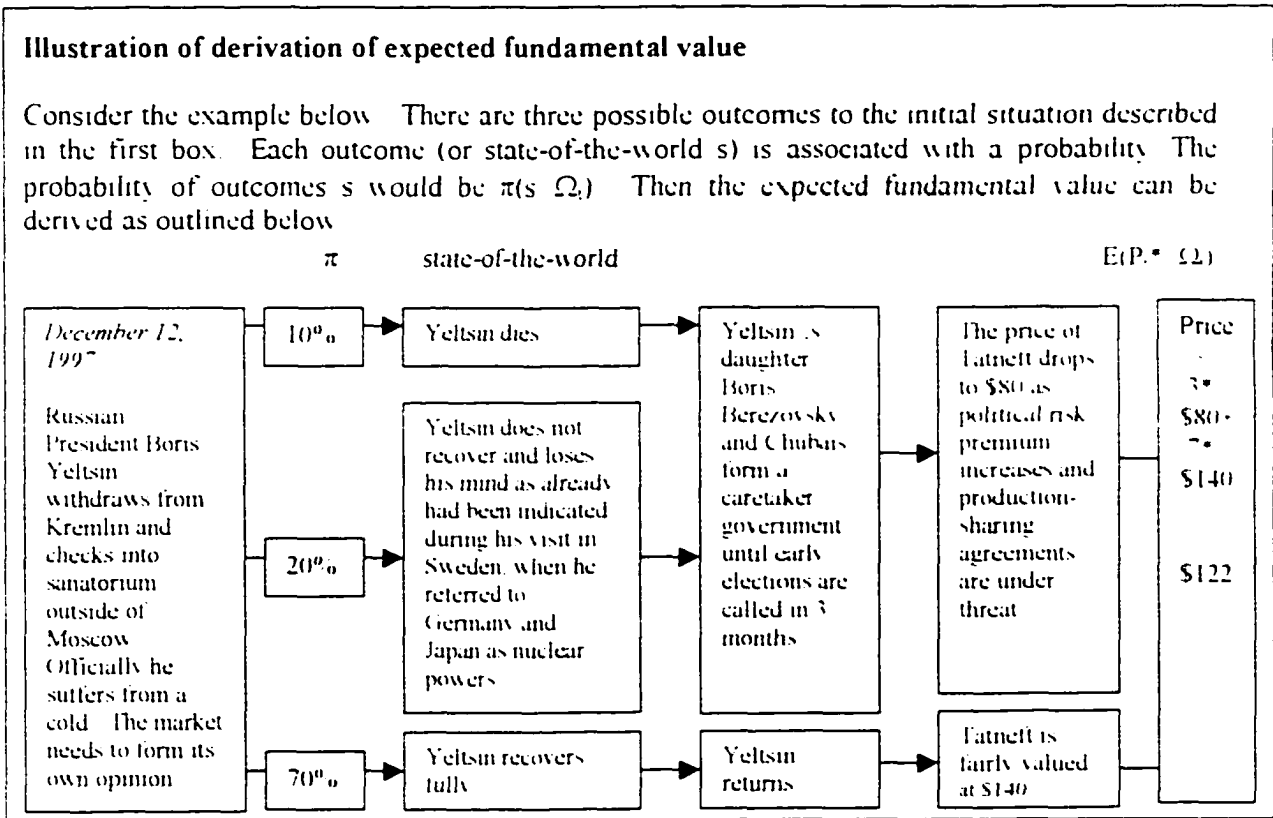
the probability that state  $s$  will occur, conditional on the total information available at time  $t$ .

Based on this premise, for each state-of-the-world, a fundamental value of the asset can be derived, which can be denoted as  $P^*(s)$ . Accordingly, there are  $N$  fundamental values. If  $P_t$  is the current market price and the *expected* fundamental value is  $E(P_t^* | \Omega_t) = \sum_s P^*(s) \pi(s | \Omega_t)$ , then the EMH is embodied in the equation,

$$P_t = E(P_t^* | \Omega_t) \quad (1)$$

which states that the current price of an asset is the best estimate of its fundamental value

**Box 6.0. Illustration of derivation of best estimate of fundamental value**



<sup>1</sup> For a recent enlightening discussion on the random walk see: Peter Fortune, "Stock Market Efficiency: An Autopsy?" *The New England Economic Review* (March/April 1991): 19-20.

Another strong implication of the EMH can be derived from the fact that  $\Omega_t$  contains all relevant information at time  $t$ . Accordingly, the unanticipated component of the market price would be uncorrelated with any relevant information available at time  $t$ , which includes past price behavior, current fundamental data and all future projections relevant to the security, industry, or market. A test of this proposition would be to run a regression of  $P_t$  on a measure of the optimal forecast  $E(P_t^* | \Omega_t)$  and also on any information which might be in  $\Omega_t$  (for example the history of stock prices or any other historical information on the stock). The result should indicate a correlation coefficient of 1 for  $E(P_t^* | \Omega_t)$  and a correlation coefficient of 0 for  $\Omega_t$  which then would suggest that all information (such as historical stock prices) has been embedded in the fundamental value.

The second implication of the EMH describes the price development sequence over time. In order to forecast the asset price at time  $t+1$ , the forecast would be ideally derived from  $E(P_{t+1}^* | \Omega_{t+1})$ . Given, however, that at time  $t$ , the information available at  $t+1$  is not known, the information contained in  $\Omega_t$  is all the information available to forecast the price at time  $t$ . Hence, the best forecast would be  $E(P_{t+1}^* | \Omega_t)$ . Furthermore, the investor may know the required rate of return of the asset, which can be denoted as  $r^s$ . From this logic and equation (1), the optimal forecast definition, the EMH implies the following sequence of price development:

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In this demonstration the dividend is ignored as it contains little relevance for the Russian market or any other pre-emerging market. The required rate of return is also highly dynamic in the Russian context and the same logical steps could be applied to it as have been applied to the price formation mechanism

$$P_{t-1} = (1+r)P_t + \varepsilon_{t-1}, \quad \text{where } E(\varepsilon_{t-1})=0 \quad (2)$$

From equation (2) one can derive that any new information between time  $t$  and  $t+1$  is random, thus, by definition, the change between  $P_{t-1}$  and the best forecast is random.<sup>6</sup>

Following from this, equation (2) describes a random walk with drift where prices will vary randomly around a rising trend. This is the basis for using the random walk as a tool to test for EMH by examining price series for correlated increments.

#### VI.A.2. Practical implications of deviation from the random walk

On a more practical note the concept of predictable markets would imply that investors who are aware of it can profit at the expense of those who are not.<sup>7</sup> Then it may be just a matter of time until less “informed” investors no longer participate in such a market, thus reducing liquidity, resilience and depth of the market. In a mature market, investors may not give up so easily as they would possibly try to become “informed” investors and work towards positioning themselves on the other side of the uneven playing field. In pre-emerging markets, where insider trading and corporate decisions are often only shared among the country’s political/business elites before foreigners are informed, the likelihood of foreigners withdrawing because they cannot realistically assume to become part of the “information elite” in a pre-emerging market, is considerably higher. Therefore, gross departures from random walk behavior and price predictability is one thing a pre-emerging market cannot afford if its policy makers have

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<sup>6</sup>  $\varepsilon_{t-1}$  has a zero mean and no serial correlation.

<sup>7</sup> In this context, Fama notes that weak-form market efficiency can be rejected if past behavior in a securities price series reveals patterns which can be identified and turned into a profit through application of a pattern-exploiting trading strategy.

any intentions of positioning their market on the map of global finance and investment. The alternative is to remain a predictable securities market enhancing the wealth of the local informed insiders at the cost of a few “cowboy closed-end funds” which remain dedicated to the market, regardless of the uneven playing field.

## **VI.B. Three types of random walks and the variance ratio tests**

### **VI.B.1. Random Walk 1 (RW1), RW2, and RW3**

As already outlined in chapter 2, there are three types of random walks.<sup>8</sup> The explanation for choosing RW3 given in chapter 2 will be reiterated at this point for reasons of comprehension.

Campbell, Lo and MacKinlay define three types of the random walk (RW): RW1 assumes identically and independently distributed increments (IID), RW2 assumes independently and not identically distributed increments (INID), and RW3 assumes uncorrelated increments. RW1 can be tested with sequences and reversals, and runs tests. RW2 can be tested with filter rules. RW3, the random walk assumption used in this study, can be tested with autocorrelation tests and variance ratio tests. The notion of the three different random walk assumptions carries a particular weight in the context of emerging markets. There are at least two reasons why the assumption of RW3 in emerging markets appears more optimal than RW1 or RW2: Firstly, RW1 assumes IID and RW2 assumes INID. Both assumptions are relatively less representative for emerging markets price behavior where heteroscedasticity and non-normality can be



common characteristics. Although RW2 allows for unconditional heteroscedasticity, RW3 remains a safer assumption over RW2 for it does allow some transformation of future price increments to be forecastable using some transformation of past price increments. This RW3 assumption can be defined as:

$$\text{Cov}[\varepsilon_t, \varepsilon_{t-k}] = 0 \text{ for all } k \neq 0, \text{ but where } \text{Cov}[\varepsilon_t^2, \varepsilon_{t-k}^2] \neq 0 \text{ for some } k \neq 0$$

Accordingly, as opposed to RW1 or RW2, this process has uncorrelated increments but is not independent since its squared increments are correlated in some cases.

Secondly, RW2-based methodologies, such as filter rules or trading rules seem less optimal in the pre-emerging market environment where paper trading simulations (or filter rules based on trading simulations) are difficult if not impossible to conduct given the often opaque trading environment where bid/ask quotes may not reflect the real execution price at all times and transaction costs may vary considerably, and thus would render a simulation-based test practically meaningless.

#### VI B 2 Test of the Random Walk 3 (RW3) with the variance ratio test

To test for the random walk, the variance ratio test proposed by Lo and MacKinlay (1988) is applied<sup>9</sup>. The methodology follows Lo and MacKinlay (1988) conceptually, and Liu and He (1991) in its mechanical application for testing the random walk. Hence, it is based on Liu and He's focus on the uncorrelated increments

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<sup>9</sup> Please refer to the following literature for a detailed description of the three types of random walk hypotheses. (RW1, RW2, and RW3) John Y. Campbell, Andrew W. Lo, and A. Craig MacKinlay, *Econometrics of Financial Markets* (Princeton, N.J. Princeton University Press: 1997): 28-33.

<sup>10</sup> John Y. Campbell, Andrew W. Lo, and A. Craig MacKinlay, *Econometrics of Financial Markets* (Princeton, N.J. Princeton University Press: 1997): 66-74.

A. W. Lo and A. MacKinlay, "Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test." *The Review of Financial Studies*, vol. 1, no. 1 (1988):41-66.

aspect.<sup>10</sup> As other variance ratio tests, Lo and MacKinlay's variance ratio test exploits the fact that the variance of the increments in a random walk is linear in the sampling interval. This implies that the natural logarithm of a price series can be described by the random walk process, if the variance of its  $q$ -differences is  $q$  times the variance of its first differences. For example, the variance measured over weekly intervals would be  $1/4$  of the variance measured over monthly intervals. Therefore, with  $nq - 1$  stock price observations  $S_0, S_1, S_2, \dots, S_{nq}$  at equally spaced intervals ( $q$  is an integer greater than one), the ratio of  $1/q$  of the variance  $S_t - S_{t,q}$  to the variance of  $S_t - S_{t,1}$  would be equal to one.<sup>11</sup>

As Liu and He (1991) point out, the variance ratio test is unique for the following reasons. A standard normal test statistic for the variance ratio is derived by first forming an asymptotic distribution of the variance ratio.<sup>12</sup> The  $Z$ -statistic is then calculated by comparing the sample variance ratio with the asymptotic variance of the variance ratio. Furthermore, a refined, heteroscedasticity-consistent,  $Z^*$ -statistic is developed. The heteroscedasticity-consistent test statistic meets a growing consensus among financial economists that financial time series are often not normally distributed and that volatility changes over time. For that reason, a simple rejection of the random walk model due to heteroscedasticity would be of little interest. In addition, the deviation from normality observed in Russian equity returns requires a test which is robust to many forms of non-normality. The variance ratio test of RW3 meets this requirement.

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<sup>10</sup> Liu and He acknowledge that the random walk has two implications: the unit root and uncorrelated increments. The focus on uncorrelated increments is based on the notion that there are some important departures from the random walk that unit root tests cannot detect (refer to Liu and He (1991)).

<sup>11</sup> Strictly speaking the condition of equally spaced intervals cannot be met in the test on hand as there consecutive trading days are observed as opposed to consecutive calendar days.

<sup>12</sup> Christina Y. Lu and Jia He, "A Variance-Ratio Test of the Random Walks in Foreign Exchange Rates," *Journal of Finance*, vol. 46, no. 2 (June 1991): 773-785.

MacKinlay and Lo (1989) prove with a Monte Carlo experiment that under a heteroscedasticity random walk, the variance ratio test is more reliable than the Box-Pierce Q-test.<sup>13</sup> Furthermore, the variance ratio test is as or more powerful than the Box-Pierce or Dickey Fuller test against various alternative hypotheses, including an AR(1), an ARIMA(1,1,1), and an ARIMA(1,1,0).

VI.B.3. Computation of the variance ratio test (for example see appendix to chapter 6)

Henceforth the calculation of the variance ratio, and the variance ratio test statistics are presented. The variance ratio, VR(q):

(1)

$$VR(q) = \frac{\sigma_c^2(q)}{\sigma_d^2(q)},$$

Variance of q-differences of a log time series

Variance of first differences of a log time series

where  $\sigma_c^2(q)$  is an unbiased estimator of  $1/q$  of the variance of the qth difference of the natural log of the price series  $S_t$ , and  $\sigma_d^2(q)$  is an unbiased estimator of the variance of the first difference of  $S_t$ . The formulas for calculating  $\sigma_c^2(q)$  and  $\sigma_d^2(q)$  are given below in equations (2) and (3):

<sup>13</sup> Andrew W. Lo and Craig MacKinlay, "The Size and Power of the Variance Ratio Test in Finite Samples. A Monte Carlo Investigation." *Journal of Econometrics*, 40 (1989): 203-238.

(2)

$$\sigma_c^2(q) = \frac{1}{m} \sum_{t=q}^{nq} (S_t - S_{t-q} - q\hat{\mu})^2,$$

with  $\mu$  defined as

$$\hat{\mu} = \frac{1}{nq} (S_{nq} - S_0)$$

where  $m = (nq - q - 1)(1 - q/nq)$ , and where

(3)

$$\sigma_{\hat{\mu}}^2(q) = \frac{1}{nq - 1} \sum_{t=1}^{nq} (S_t - S_{t-1} - \hat{\mu})^2.$$

The asymptotic variance of the variance-ratio under homoscedasticity,  $\phi(q)$ , is then

(4)

$$\phi(q) = \frac{2(2q - 1)(q - 1)}{3q(nq)}$$

The standard normal test statistic under homoscedasticity,  $Z(q)$ , is then

(5)

$$Z(q) = \frac{VR(q) - 1}{[\phi(q)]^{1/2}} \approx N(0,1)$$

The heteroscedasticity-consistent asymptotic variance of the variance-ratio,  $\phi^*(q)$ :

(6)

$$\phi^*(q) = \sum_{j=1}^{q-1} \left[ \frac{2(q-j)}{q} \right]^2 \hat{\delta}(j)$$

where

(7)

$$\hat{\delta}(j) = \frac{\sum_{k=1}^{n_j} (S_{t+k} - S_{t+k-j} - \hat{\mu})^2 (S_{t+k} - S_{t+k-j} - \hat{\mu})^2}{\left[ \sum_{k=1}^{n_j} (S_{t+k} - S_{t+k-j} - \hat{\mu})^2 \right]^2}$$

The heteroscedasticity-consistent standard normal test-statistic,  $Z^*(q)$  then follows below:

(8)

$$Z^*(q) = \frac{IR(q) - 1}{[\hat{\phi}^*(q)]^{1/2}} \approx N(0,1)$$

The first-order autocorrelation coefficient can be approximately estimated from the following equations. The population properties of variance ratios are described by Campbell, Lo and MacKinlay (1997) as follows:

$r_t(2) \equiv r_t + r_{t-1}$  (a two-period return)

$r_t$  (a one-period return)

This describes the variance of a two-period return divided by two times the variance of a one period return

$$IR(2) = \frac{\text{Var}[r_t(2)]}{2\text{Var}[r_t]} = \frac{\text{Var}[r_t + r_{t-1}]}{2\text{Var}[r_t]} = \frac{2\text{Var}[r_t] + 2\text{Cov}[r_t, r_{t-1}]}{2\text{Var}[r_t]}$$

which can be re-written as

$$IR(2) = 1 + 2\rho(1)$$

where  $\rho(1)$  is the first-order autocorrelation coefficient for of returns  $r_t$

Specifically, the tests are conducted by analyzing the full time period for all securities for which sufficient data is available, which accounts for 660 observations per security. Additionally, in order to capture the changing degree of support or rejection of the random walk over time, nine equal-spaced intervals, each comprising 73 observations are analyzed with the same tests.<sup>14</sup>

For previous applications of the variance ratio test, refer to studies on the Korean securities market, various Latin American equity markets, a sample of the IFC emerging equity markets universe, as well as to random walk studies on the US equity market, and several pairs of G-7 exchange rates.<sup>15</sup>

#### **VI.C. The variance test applied to the pre-emerging equity market of Russia**

It must be noted that the rejection of the random walk model may not necessarily imply inefficiency of the Russian equity market, or that prices are not derived from rational assessments of all the news available. The implications of a rejection of the random walk are not to disprove market efficiency – although some equilibrium pricing models can be rejected – but to show the changing nature of the relative strength of the random walk model for individual and groups of Russian securities. From this follows

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<sup>14</sup> Based on Monte Carlo experiments performed by Lo and MacKinlay (1989), the empirical two-sided five percent variance-ratio tests are close to their nominal values for sample sizes greater than 32. As Liu and He (1991) point out, the conclusion has been obtained in their work under the null hypothesis of random walks, with either homoscedastic or heteroscedastic disturbances. Since the sample size for the subperiods is 73, the adoption of the Z- and Z\* -statistic seems justifiable.

<sup>15</sup> Ayadi and Pyun (1994), Urratia (1995), Claessens, Dasgupta and Glen (1993), Campbell, MacKinlay and Lo (1997), Liu and He (1991)

that relative market inefficiency cannot necessarily be translated into trading gains. It is, however, applicable to a comparative analysis of securities, or of portfolios with specific characteristics, which display relative signs of market efficiency and inefficiency vis-à-vis each other. The comparative analysis resulting from such testing methodology is possibly significant, for it will be those results which can create a blue-print for action to change those characteristics which can be related to securities which exhibit a lower degree of relative market efficiency.

In defense of the notion of relative market efficiency and as an indication of idealism in purpose but failed realism in method, a measure of absolute market efficiency, which would *optimally* capture the price behavior process is unlikely to exist. Methods including time-varying parameters such as changing volatility, changing risk premia or by adding Bayesian components and neural networks to the model, should be applied to investing money in a profit-seeking way. This would be more meaningful, if any value could be derived from such a model, than filling pages in academic journals<sup>16</sup> This, probably serves as the strongest argument for the measurement of relative market efficiency as opposed to absolute market efficiency, and for the harsh reality that price behavior cannot be captured simply by econometric models

In addition, the concept of market efficiency takes on a new meaning in a market such as Russia, where the premises of the EMH, as outlined in chapter 2, partially do not hold<sup>17</sup> Therefore, strict adherence to any absolute measure of EMH derived from the

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<sup>16</sup> Indeed, this would add more value as those market inefficiencies that have been discovered could at least be eliminated via some type of arbitrage based on a superior model.

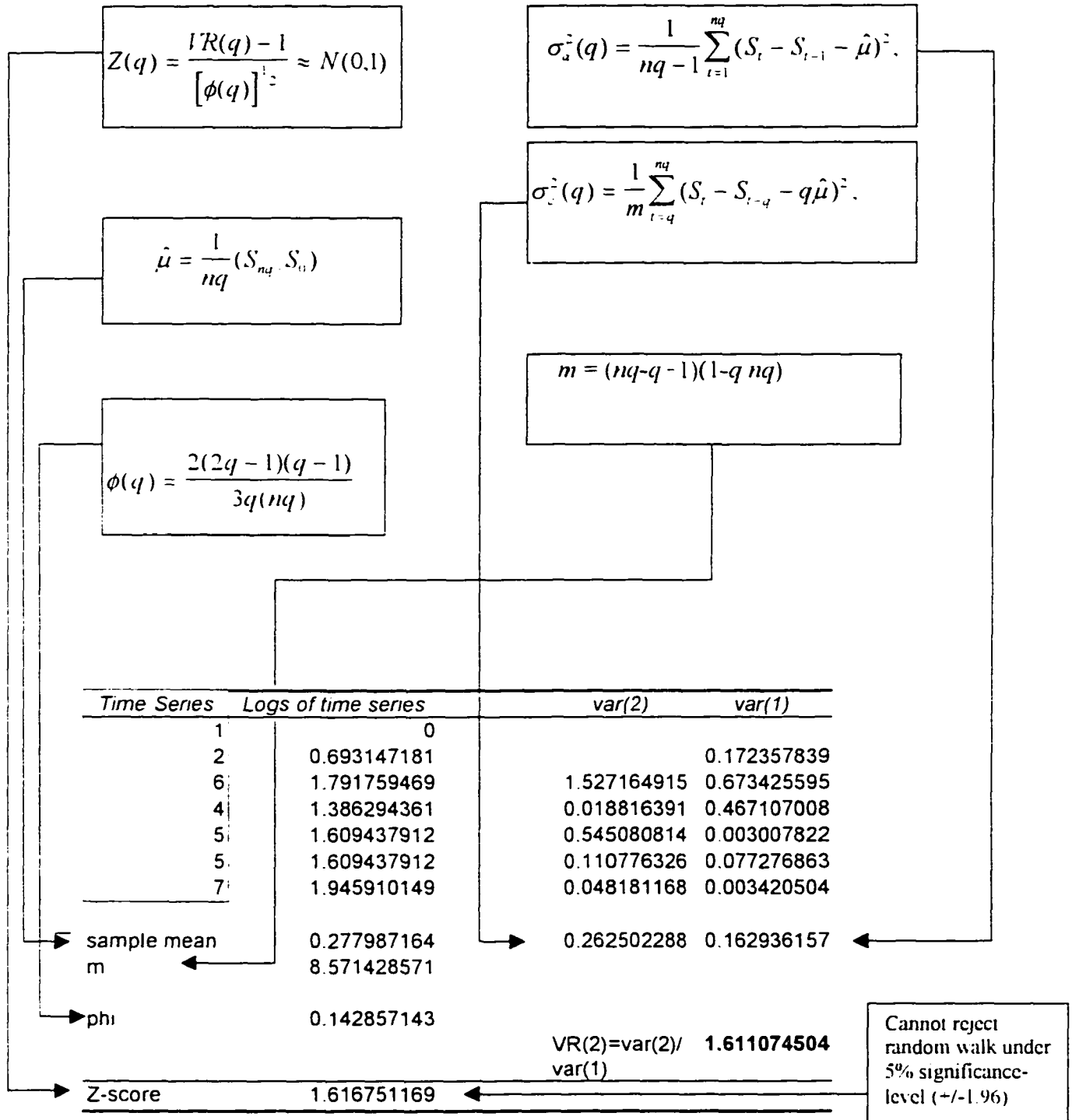
<sup>17</sup> The assumption of large number of rational and profit-maximizing investors is violated. Prices are often a function of accumulating ownership share, as opposed to seeking profit. Price-taking behavior is questionable, as the analogy of the roach motel frequently holds: "You can buy shares but you cannot sell them without problems as the brokers' quote will fall on the indication of a sell intention."



five assumptions, would logically be destined to fail and hence be a misdirected attempt on the subject, particular with reference to the Russian equity market.

APPENDIX to chapter 6

Example of computation of variance ratio test (homoscedasticity assumption):



## Chapter 7

### EMPIRICAL FINDINGS – TESTS OF RELATIVE MARKET EFFICIENCY

In Chapter 5 the discussion was concluded by creating three different portfolios according to individual securities' transparency - the top-, medium-, and bottom-transparency portfolio. This chapter will use those three portfolios and apply to them the variance ratio test discussed in chapter 6 for the purpose of measuring relative market efficiency.

In the second section of this chapter, evolving relative market efficiency over time will be examined by applying the variance ratio test to the Russian market index between January 1995 and September 1997.

#### VII.A. Relative market efficiency and security transparency

##### VII A 1 Presentation of results

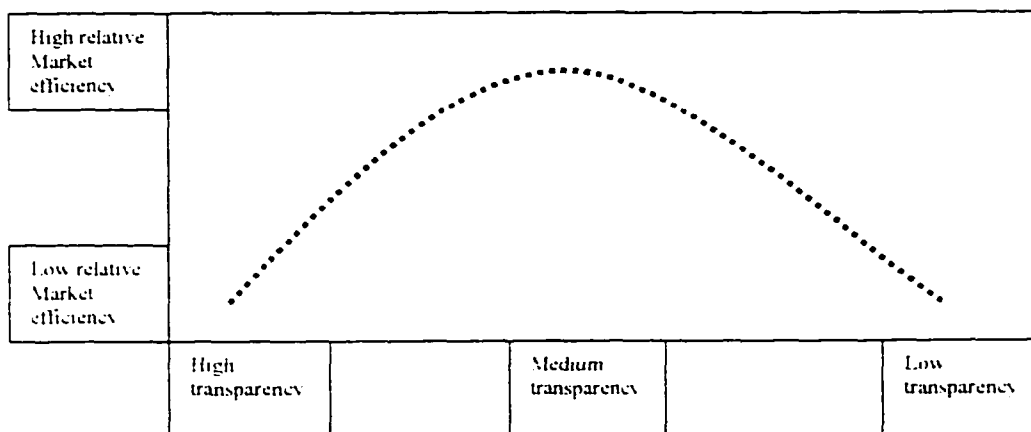
The plausible notion that higher transparency and a higher degree of information release about a company translates into higher informational efficiency and thus a higher degree of relative market efficiency as market participants will be able to react more quickly and accurately to news information on their stocks, has been tested.

The results of table 7.0. which presents the homoscedasticity-and heteroscedasticity-robust test scores of the variance ratio test show that the top transparency portfolio defeats the random walk in 100% of all cases, the bottom transparency portfolio defeats the random walk in 80% of all cases, and the medium-

transparency portfolio defeats the random walk in only 46% of all cases.<sup>1</sup> Diagram 7.0 illustrates these findings.

These results suggest that mechanisms are at work in the highly-transparent blue-chip stocks, which translate into the same effect as the one we observe in the low-transparency portfolio where the returns process can be described in a more predictable, less random fashion than in the medium transparency portfolio. It also implies that the effects of higher transparency are possibly outweighed by another factor which comes into play. This other factor is market segmentation, and will be discussed in section VII.A.2.

**Diagram 7.0. Relative market efficiency and securities transparency**



The rationale why the low-transparency portfolio defeats the random walk is easily explained by the commonly accepted notion that a lack of information does not allow investors to quickly and accurately act upon fundamental news of the company.

<sup>1</sup> The more conservative heteroscedasticity-robust z\*-scores are used.

In such a situation investors learn about news gradually and the returns process is described by autocorrelated increments.

The medium-transparency portfolio, which to a larger degree can be described by a random walk, even under the assumption of heteroscedasticity in the data, is better researched and enjoys better information dissemination to investors than the low-transparency portfolio. Thus the closer adherence to the random walk process seems plausible, as investors can react more quickly and accurately to new information.

The initially counterintuitive finding about the top transparency portfolio, leaves some room for speculation at first. However, when considering the unique environment of the Russian equity market and its foreign participants, reason can be prudently applied and a plausible explanation can be formulated.

#### VII.A.2 Relative market inefficiency - a case of market segmentation

Samuelson cites substantial evidence that prices are most likely predictable under circumstances when there are no high-powered “analyst-whizzes” following a company, or only a few, than when there are many.<sup>2</sup> This view is based on the fact that well-informed analysts will act more cohesively than a group of “low-powered” analysts in reacting to news about a security. The less dedicated analysts are more likely to pick up the relevant news pieces gradually and consequently act upon the news information less instantaneously, thus introducing autocorrelation to price series.

This leads to the first argument creating a reasonable basis for understanding the defiance of the random walk when examining Russian blue-chips enjoying transparency.

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<sup>2</sup> Peter L. Bernstein, *Capital Ideas*, (New York: The Free Press, 1993): 123.

liquidity and investment channels unparalleled in the other two portfolios. While the high powered “analyst whizzes” of the medium-sized portfolio are to some degree involved in stocks composing the top-transparency portfolio, (a) they count less in number than in the medium-sized portfolio, and (b) they are ‘swamped’ by “low-powered” general international equity analysts.<sup>3</sup>

Since investing in Russia has become more than a passing fancy and an increasing number of foreign investors entered the market tempted by the worlds largest returns over the past three years, an increasing number of their less astute brethren-mainly non-dedicated international mutual funds-followed in their footsteps, often as a result of peer performance pressure. This frequently meant the very first Russia exposure of main stream investment funds managing substantial amounts of assets. For those participants an average position would at least amount to between \$4-\$15 million, for it to be significant in the portfolio. However, in building their positions, liquidity was required. The only stocks that offered such liquidity throughout the time span examined, were the top-transparency blue chips. Furthermore, Russia-inexperienced sector analysts needed research so they had some basic reason to justify their decision during investment decision meetings. The stocks which offered the most reliable continuous coverage were in the top-transparency portfolio. This finally led to a swamping effect in the top-transparency portfolio where relatively unsophisticated investors in the context of Russian equities outnumbered the few Russia-dedicated pioneers.<sup>4</sup> This interpretation

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<sup>3</sup> Dedicated Russia analysts often refer to the stocks in the top-transparency portfolio as “no-brainers” indicating that less time is spent on their analysis than on medium-transparency stocks. Further, the law of the marginal bidder setting the price does not hold in this situation due to segmented on-shore and off-shore trading activity which implies that foreigners are trading among each other in large volumes via Western brokers (market makers in the stock), and small dedicated funds are trading among each other.

<sup>4</sup> On the subject of unsophisticated market participants: Fischer Black, “Noise,” *The Journal of Finance*, vol 41, no 3 (1986): 529-543

has also been adapted by the IMF which observed positive autocorrelation as a result of uninformed foreign institutional investors.<sup>5</sup>

The most comprehensive explanation of this phenomenon, however, is presented by adherents of a theory which has become known as ‘noise trading’. Noise trading falls in the general framework of market segmentation theory. A simple model of noise trading was presented by DeLong, Shleifer, Summers and Waldmann (1990).<sup>6</sup> This model assumes that sophisticated investors (dedicated emerging markets funds in our case) form optimal forecasts of the future price, and unsophisticated investors (general international equity funds in our case), also called “noise traders,” form biased forecasts. The question why sophisticated investors do not dominate the market by forcing the market price to equal its fundamental value via arbitrage, is a function of the risk aversion of sophisticated investors. According to the “noise trader model,” sophisticated investors are risk averse. A potential arbitrage is considered too risky as sophisticated investors are never sure as to when and in what direction noise traders’ price misperception changes. Thus the impact of noise traders can never be fully arbitrated away. Relative market inefficiencies therefore become visible in those securities which are dominated by a larger percentage of unsophisticated investors, or noise traders. This model applied to the above referred ‘swamping’ effect of dedicated Russia analysts by non-dedicated general international equity analysts in the top-transparency portfolio, explains the lower degree of relative market efficiency in the top-transparency portfolio.

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<sup>5</sup> Anthony J. Richards, “Volatility and Predictability in National Stock Markets,” *IMF Staff Papers*, vol. 43, no. 3 (September 1996): 461-501.

<sup>6</sup> DeLong, J. Bradford; Andrei Shleifer; Lawrence H. Summers and Robert J. Waldmann, “Noise Trader Risk in Financial Markets,” *Journal of Political Economy* (August 1990): 703-738.

This effect did not take place in the medium-transparency portfolio, which remains to be dominated by smaller, more dedicated emerging markets investors, which are less constrained by their compliance departments to invest freely in Russian equities.

The difference resulting from compliance departments affecting large non-specialized international mutual funds, plays another role in building the rationale for the effect we are observing. Once compliance has conceded to investing in Russia, mutual fund managers are not likely to become ‘flippers’ in a market that is not in their investment mandate in the first place.<sup>7</sup> Hence one finds a larger number of buy-and-hold strategies than rational expectations theory would allow in the context of market efficiency. Lastly, non-dedicated foreign investors also face higher transaction costs than their local Moscow-based counterparts. Although net prices are mostly quoted by brokers, international investors incur the premium created by Western brokerages’ profit margins in addition to the local brokerages’ profit margins. This higher transaction costs-based situation, allows for another argument in the direction of buy-and-hold strategy over a strategy which would allow action whenever new information enters the market.<sup>8</sup>

Finally, to recapitulate, there are three main reasons why the efficient market hypothesis is violated in the top transparency portfolio (1) less dedicated investors are acting less quickly and accurately upon new information because Russia is only a marginal concern in their portfolio and they lack the resources to have staff fully committed to feeling the pulse of the market on a daily basis, (2) a large number of noise traders is present in the top-transparency portfolio, and (3) less dedicated investors are

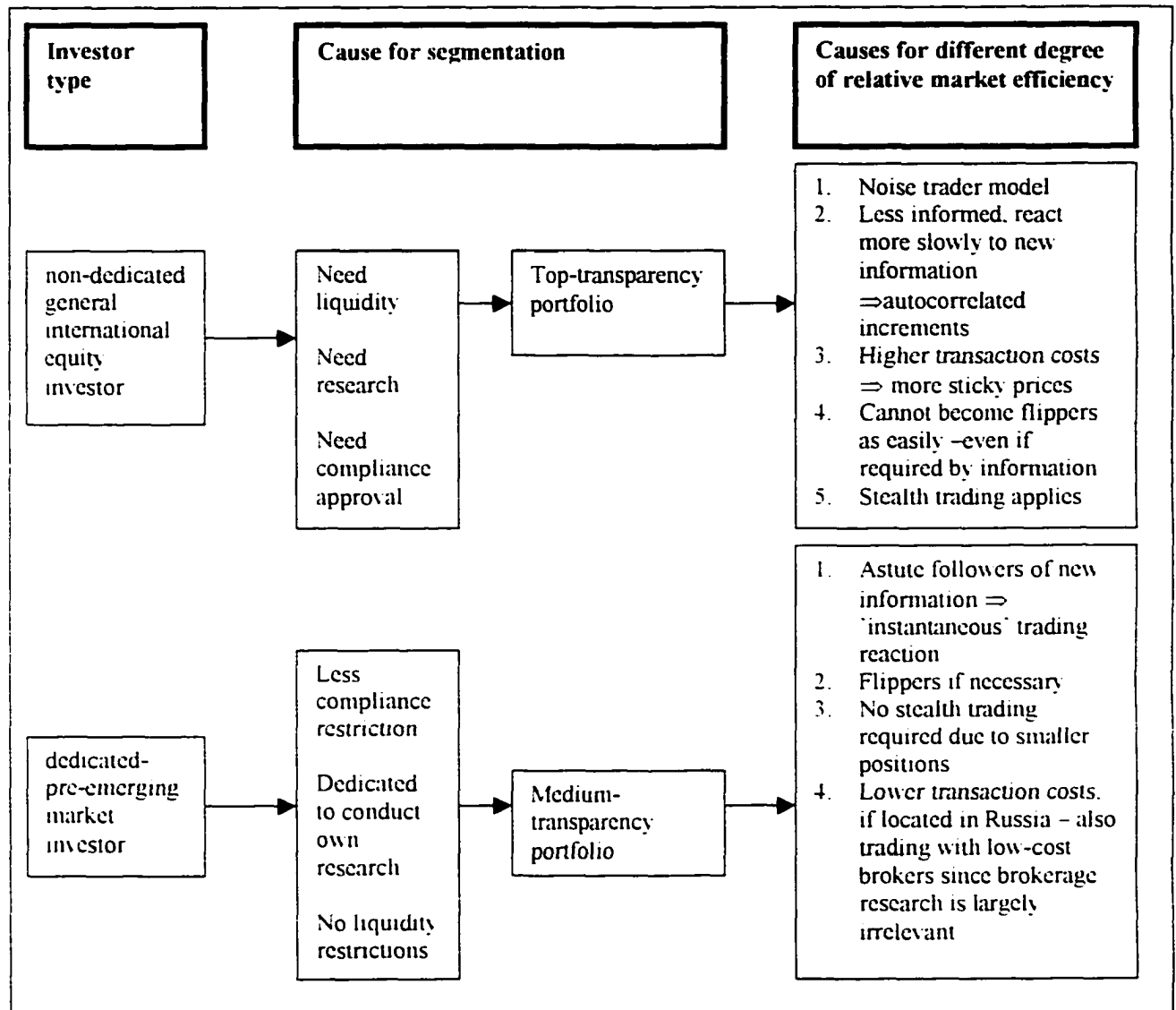
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<sup>7</sup> ‘Flippers’ refers to investors that buy securities and sell them quickly thereafter, often in connection with IPOs



acting less quickly and less accurately because of institutional-, infrastructure-, and transaction cost-based reasons.<sup>9</sup> All arguments support the finding that the top-transparency portfolio displays more signs of defiance of the random walk than the medium-transparency portfolio. This discussion is graphically displayed in diagram 7.1.

**Diagram 7.1. Market segmentation causes different degrees of relative market efficiency**



<sup>9</sup> A buy-and-hold behavior does not necessarily lead to autocorrelated prices, but it does if foreigners, which is the case in Russia, often unload securities in herd-like fashions once the top-down outlook of a pre-emerging market changes.

<sup>10</sup> In the context of noise traders’ vs smart money’s impact on financial markets also refer to: Morgan Kelly, “Do Noise Traders Influence Stock Prices,” *Money, Credit and Banking* (1991): 351-363.

FRONTIER EQUITY MARKET VALUATION  
 Chapter 7 Empirical Findings – Tests of Relative Market Efficiency

**Table 7.0. Heteroscedasticity/homoscedasticity-consistent variance-ratio test statistics**

Full period	86-1-18/86-4-29	86-4-21/86-8-11	86-8-14/86-11-22	86-11-23/86-2-14	86-2-16/86-5-20	86-5-23/86-8-18	86-8-21/86-11-24	87-1-27/87-5-13	87-5-16/87-8-27
SMGS									
z*	3.98	3.76	3.24	3.13	0.03	2.60	1.63	0.62	2.63
z	5.25	3.76	3.27	3.16	0.04	2.71	1.94	0.74	3.12
MMAS									
z*	3.11	1.26	3.16	1.99	0.11	0.33	1.36	2.05	1.02
z	4.21	1.30	3.27	2.30	0.13	0.39	2.28	2.33	1.22
YFGA									
z*	4.73	4.71	2.36	1.37	0.59	2.65	1.66	0.09	0.13
z	5.45	5.49	2.46	2.39	1.23	2.41	1.97	0.11	0.16
MFGS									
z*	3.11	2.82	2.74	0.54	0.52	0.29	2.35	1.36	0.66
z	4.21	3.96	3.90	0.57	0.64	0.32	2.44	1.80	0.67
NYGS									
z*	2.87	2.52	2.10	1.10	1.69	1.68	1.13	0.57	0.50
z	3.64	2.99	2.11	1.17	1.98	1.98	1.32	0.67	0.58
TOMG									
z*	1.71	1.18	1.72	0.51	0.64	0.73	0.35	0.66	1.41
z	2.22	2.22	1.75	0.70	0.71	0.80	1.29	0.69	1.54
NGZ									
z*	1.15	1.25	1.69	0.74	1.37	0.34	0.59	0.23	0.05
z	1.57	1.26	1.82	0.79	1.71	0.41	0.68	0.41	0.06
CHGZ									
z*	0.72	0.18	0.20	0.34	0.35	1.79	0.14	0.69	0.57
z	0.95	4.15	1.21	0.39	0.45	2.12	0.15	0.73	0.63
ORNB									
z*	0.81	0.78	0.78	0.70	1.45	1.65	0.17	0.42	1.13
z	1.03	1.17	1.17	0.74	1.63	1.83	0.23	0.47	1.00
GAZP									
z*	1.4	1.37	1.42	2.10	1.93	4.40	0.53	4.11	1.25
z	1.4	1.49	1.48	2.11	2.41	5.27	0.64	4.11	1.41
HIRM									
z*	2.58	2.37	1.46	0.35	0.23	0.07	1.43	1.09	1.13
z	3.47	2.76	1.51	1.11	0.27	0.27	1.62	1.24	1.19
SPIL									
z*	2.83	0.37	0.57	0.74	1.69	1.69	1.87	3.69	0.65
z	3.62	1.29	0.61	0.79	2.35	1.27	2.24	4.03	1.02
MGTS									
z*	2.31	1.37	1.78	0.74	1.71	0.02	1.35	1.82	1.03
z	3.03	2.45	1.16	0.79	1.23	0.03	2.47	3.35	1.41
GMM									
z*	1.1	0.7	1.54	1.25	1.14	1.1	1.1	1.1	1.1
z	1.17	0.8	1.1	1.1	1.17	4.04	1.12	1.14	1.14
NKEL									
z*	2.26	1.92	1.22	0.42	0.22	1.25	4.11	1.12	0.14
z	3.02	1.97	1.26	0.49	0.29	1.69	4.24	1.59	0.22
GAZL									
z*	1.1	1.27	1.17	0.52	0.2	1.09	0.22	1.1	0.03
z	1.22	1.30	1.16	0.56	0.26	1.33	0.27	1.4	0.03
GAZA									
z*	2.45	1.72	1.54	0.18	2.15	1.64	0.65	4.62	0.6
z	3.24	1.95	1.51	0.19	2.62	1.95	1.09	4.63	0.71
IKOH									
z*	4.16	4.27	1.17	1.32	1.1	2.48	1.23	2.15	4.1
z	5.1	5.12	1.2	1.42	1.25	2.91	1.4	2.92	4.2
IRGZ									
z*	1.17	1.1	1.4	1.1	1.14	1.12	1.14	1.1	1.1
z	1.14	1.17	1.1	1.1	1.1	2.11	1.14	1.1	1.1
MSNo									
z*	1.92	1.1	1.1	1.1	4.05	1.64	0.21	1.04	1.12
z	5.1	1.1	1.1	1.1	5.04	1.99	0.16	2.42	1.46
ESM									
z*	6.32	1.70	2.37	1.57	0.03	1.63	0.67	2.95	2.13
z	8.72	1.90	1.32	1.75	0.65	1.87	0.4	3.67	3.33
FFSH									
z*	2.82	1.43	1.37	0.21	0.21	0.63	0.45	1.03	1.12
z	3.64	1.78	1.37	0.22	0.25	0.66	0.57	1.25	1.15
EXX									
z*	4.21	1.1	1.54	1.22	1.1	1.21	1.15	1.12	1.11
z	5.1	1.1	1.4	1.1	1.1	1.41	1.26	1.11	1.12
Index									
z*	0.4	4.1	1.22	1.31	1.42	2.49	1.27	1.49	2.49
z	1.4	5.12	1.25	1.31	1.2	2.69	1.33	1.62	2.59

z indicates the homoscedasticity-consistent z-test, z\* indicates the heteroscedasticity-consistent z\*-test, at the 5% significance level scores exceeding + -1.96 are significantly different from 1 and thus indicate the rejection of the random walk. All tests are based on first-order differences

## VII.B. Evolving relative market efficiency over time

Besides analyzing the relationship between relative market efficiency and transparency of securities, it appears to be useful to look at how relative market efficiency behaves over time in the Russian equity market. As indicated in chapter 5, price predictability is often a sign of an uneven playing field, where informed local investors profit at the expense of uninformed foreign investors. Eventually those uninformed foreign investors may decide to abstain from such a market and thus reduce liquidity and depth. In this section it will be assessed whether Russia is moving in such a direction, or whether relative market efficiency is actually improving.

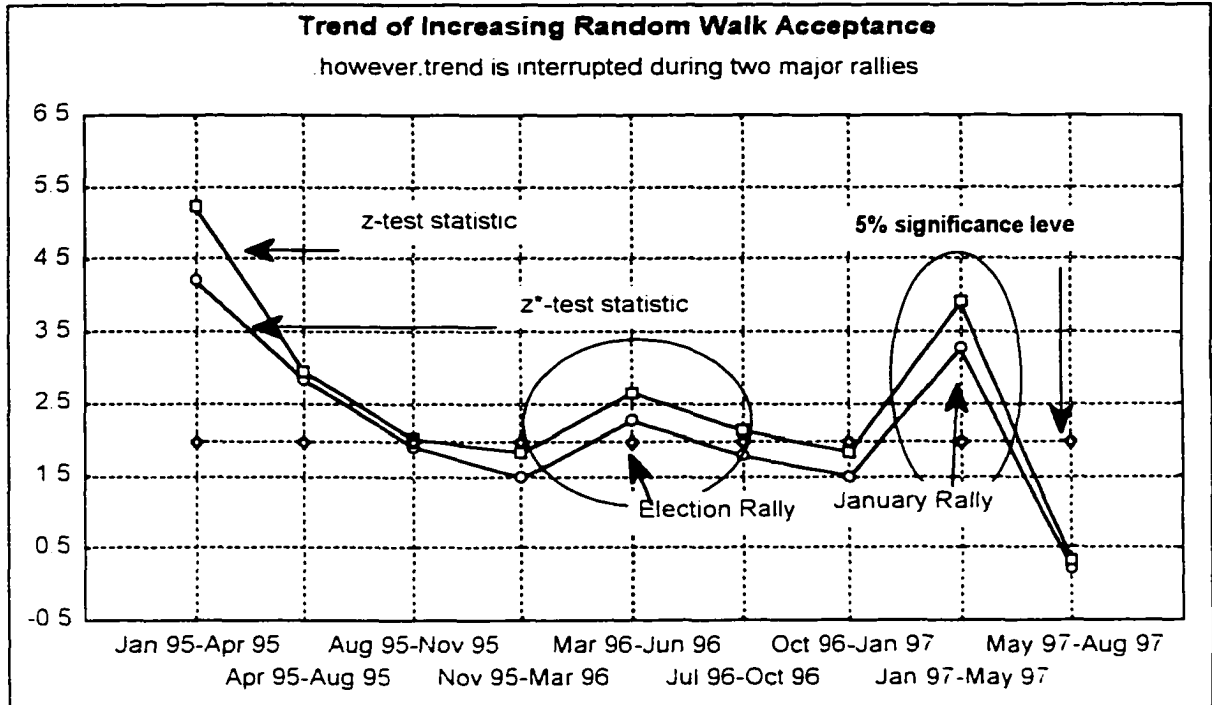
### VII.B.1 Results confirming improving relative market efficiency over time

Graph 7.0, which depicts both the homoscedasticity- and the heteroscedasticity consistent z-test statistics ( $z^*$ -test statistics) of the Rinaco Plus USD Russian equity index measured in equal-spaced time periods of 73 trading days resulting in nine periods, indicates a growing acceptance of the random walk over time. This trend, however, is sharply interrupted during the two major rallies (election rally and January rally in the Russian equity market).<sup>11</sup>

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<sup>11</sup> Please refer to chart 3.0 in chapter 3, which depicts the Russian equity index.

**Chart 7.0. Variance ratio test statistics of USD Russian Equity Index (Rinaco Plus) measured over nine equal-spaced time periods from January 1995 to September 1997**



During the time of the two rallies, the Russian equity market was overwhelmingly driven by foreign investors. This fact in itself can lead to a similar argumentation as in part VII A, and thus would contribute to an explanation why the random walk is assaulted. There is however, a second argument which was expressed by New York-based brokerages dealing in Russian equities. During the post-rally phases, or alternatively expressed, during market corrections (which have succeeded both the election- and the January rally), many Moscow-based brokers and virtually all smaller brokerages are avoided in transactions as their counterparty risk is deemed too high when the market retreats excessively, and the option of pre-payment is generally not available

or not practiced. As long as there will be no central clearing mechanism in place, this situation is not expected to change.<sup>11</sup> This situation hinders the quick and accurate price creation process and transactions that would or should take place and for which there are bids and asks quotes, are not conducted for counterparty risk-based reasons. Consequently, prices remain sticky at an artificial level for some time.

A last, and somewhat weaker argument could be made on the basis of so-called stealth trading. Stealth trading implies that large funds need several days when liquidating positions in thin markets (hence autocorrelated moments would be introduced), without risking to drive down the price. This situation normally does not arise when purchasing, as purchases are often done after brokers suggest they have a substantial block of shares available.<sup>12</sup>

In conclusion of the results presented in VII.A. and VII.B., it can be said that (a) less dedicated investors currently face a market which is characterized by a lower degree of relative market efficiency in those securities in which they participate, and (b) the overall Russian equity market displays a degree of improving relative market efficiency

The risk of foreign main stream investors retreating from Russia because of such reasons, therefore does not seem justifiable. Main stream investors are still trading the Russian market and will eventually broaden their exposure as liquidity and transparency will rise and promote more securities into the universe of investable equities for a larger segment of the market. This development will dilute the market segmentation which still prevails and overall gradually shift the Russian market bit by bit to the level where it

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<sup>11</sup> Harvey Sawikin, "The Russian Stock Market: First-Rank or Second-Rate?" *The Russian* (December/January 1998): 24.

<sup>12</sup> Richard W. Sias and Laura T. Starks, "Return autocorrelation and institutional investors," *Journal of Financial Economics* 46 (1997): 103-131.

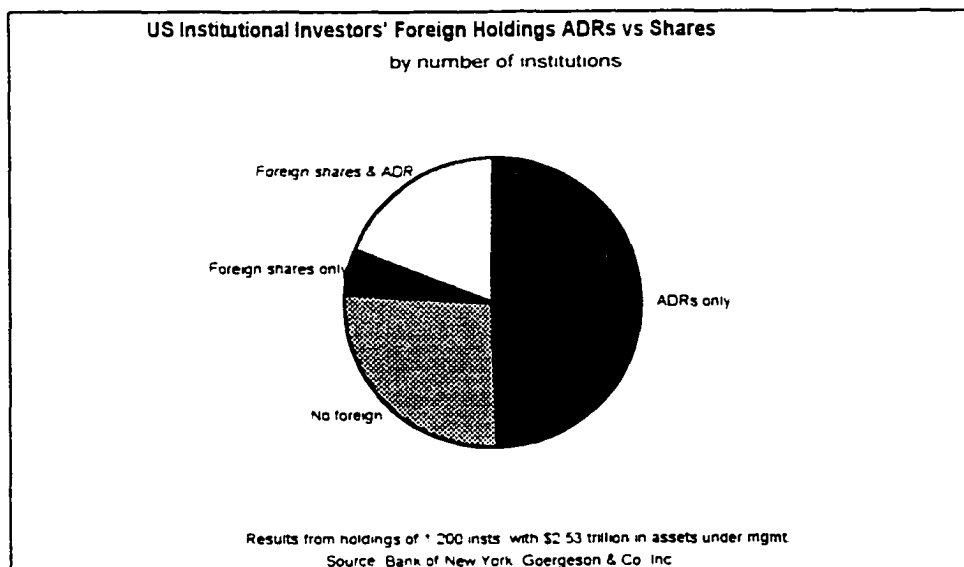
becomes economical to specialize in this market and hire dedicated Russia analysts - even for general international equity funds. Finally, Russia should rival such large, deep, resilient, liquid and mature emerging markets such as Mexico.

## Chapter 8

### INTERNATIONAL DEPOSITARY RECEIPTS – ADRs / GDRs

The rise of depository receipt programs has affected both local emerging markets and international investors. Local emerging market issuers have found a quick and painless entry into the investable universe of global equities, and therewith absorbed many of the benefits, such as higher liquidity and thinner spreads, which are characteristic of widely traded instruments. On the side of the investor, depository receipt program-sponsors have rolled out the red carpet to less dedicated international fund managers, who in pre-depository receipt times, would not have ventured into many countries' markets of which their portfolios now contain depository receipts backed by local shares (see chart 8.0.).<sup>1</sup>

**Chart 8.0. Holdings of ADRs vs Local Shares 1996**



In 1996, 38% of all new forms of ADRs came from emerging markets.

In the context of this study, depositary receipts form a well-suited transition from the questions related to evolving relative market efficiency of the preceding chapters to the topic of the next chapter which will address methods of valuing pre-emerging markets equities in Russia. The relevance of depositary receipts can be fittingly categorized in this dual context: Do depositary receipts affect the relative efficiency of the local equity market, and to what extent do depositary receipt programs display a new dimension of informational inefficiency which could be profitably exploited by the investor who precisely times purchases of underlying shares according to the schedule of depositary receipts?

The first question of whether increased relative market efficiency can be attributed to the rise of depositary receipt programs cannot be unambiguously answered in the affirmative. As we have seen in the previous chapter, the top transparency portfolio, which largely consists of shares with depositary receipts programs in place, does not fare well on the score of relative market efficiency. On the other hand, shares with global depositary receipts in place clearly have shown the thinnest bid/ask spreads (see table 8.8).

The second question relating to the investor and unexploited profit-making opportunities, as well opens a more complex view than often assumed by foreign investors who claim to profitably “ride the ADR wave,” or “play the ADR game.” Although the tests conducted in this chapter reveal that investors can benefit by buying local shares into the fledgling depositary receipt rumor, a closer examination on the other hand suggests that there are sizable differences among underlying shares and their reaction to impending depositary receipt facilities. Thus a more inquisitive approach



questioning the reasons motivating the issuance of depositary receipt programs is always adequate and prudent.

#### VIII.A. Definition and benefits of ADRs and GDRs

American Depositary Receipts (ADRs) are US dollar-denominated negotiable instruments issued in the US by a depositary bank.<sup>2</sup> The holder of an ADR enjoys ownership of non-US securities. Those securities are normally referred to as the local or underlying shares. ADRs and Global Depositary Receipts (GDRs) are identical from a legal, technical and administrative point of view. The word “Global” is occasionally preferred for marketing reasons.

In mid-1997, approximately 1,600 depositary receipt programs existed for companies from over 60 countries.<sup>3</sup> While many depositary receipts are listed in the US, UK or Germany, the cross-listing of shares is practiced virtually across the globe. The non-native market often takes on the primary role in trading specific securities if the company’s home country does not fashion a liquid or well-organized exchange. In this context, many Chinese (mainland) companies were traded in Hong Kong (when it was still under British auspices), some Estonian shares trade in Finland, some Russian shares trade in Latvia, and many African shares trade at regional ‘pooled’ exchanges that are more active than their national exchanges. Of the emerging markets, no other region has taken ADR issuance to the same extreme as Latin America. In March 1995, 87%, 54%,

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<sup>2</sup> For Russian depositary receipts, The Bank of New York has the clear monopoly as it has structured virtually every Russian depositary receipts program.

<sup>3</sup> Source: The Bank of New York

62%, and 71% of the domestic indices in Mexico, Argentina, Chile, and Brazil respectively, could be traded as ADRs in the US.<sup>4</sup>

Depositary receipts programs offer several attractive characteristics for the issuing company and the investor.

The main benefits to the company are:

- Creation of a larger market for its shares and a more diversified shareholder base, which both should stabilize the share price and provide additional liquidity, which in turn decreases the illiquidity discount for many companies.
- Enhancement of the company's image in the international market place. A process which feeds back into marketing of its products and its attractiveness as a workplace. More importantly, depending on the specific type of depositary receipt program (unsponsored, Level 1, 2, or 3), the company is obliged to disclose a degree of financial information which it would not have to disclose in its local market. This benefits the company as it often requires professional audits, professional corporate finance intermediaries (such as a Western investment bank), and generally a higher degree of reporting and shareholder information transparency, which raises the profile and the attractiveness of the company from the investors' perspective.
- A mechanism for raising additional capital if the local market cannot absorb a new, or a secondary equity issue. This is often the case in emerging markets where equity distribution infrastructure is in an infant stage on the institutional as well as on the

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<sup>4</sup> Kent Hargis, "The Globalization of Trading and Issuance of Equities from Emerging Markets," *The Journal of Emerging Market*, vol 2, no 1 (Spring 1997): 5-21.

retail side, or where fixed income markets exhibit a relatively more attractive investment profile than the local equity market.

The main benefits to the investor are equally important. Obstacles such as unreliable custody and settlement in a foreign country (particularly emerging markets), costly currency conversions, and opaque tax conventions may all impose barriers to investing in international securities.

Specifically the main benefits of depositary receipts to investors are:

- Depositary receipts are usually quoted in dollars (or in DM and sterling if issued as GDRs in Europe). Dividends (or interest in the case of bonds) are paid in dollars.
- Depositary receipts serve as the best way to overcome burdens imposed by compliance departments in investment management institutions which may have restrictions on the purchase of securities outside their domestic market.
- Global custody safekeeping charges are eliminated, thus saving depositary receipts holders between 10 to 40 basis points annually.
- Depositary receipts are as liquid as the underlying shares since the two are interchangeable (two-way fungibility)

VIII.A.1 Four types of depositary receipt programs:

A company can choose among four types of depositary receipt programs: an unsponsored depositary receipt program, and three types of sponsored depositary receipt programs. Unsponsored programs have become less popular as the company lacks

control over the facility and there are numerous hidden costs associated with such programs. Unsponsored facilities are created as a reaction to market demand. In such a case one or several depositary banks decide to purchase securities and issue depositary receipts against them. Unsponsored receipts are not accompanied by a formal agreement with the company. As an increasing number of companies for which there is demand for depositary receipts, issues sponsored receipt facilities in pursuance of some of the above mentioned goals (raise new capital, transparency, liquidity), the potential number of companies qualifying for unsponsored receipt facilities is dwindling rapidly.

#### VIII.A.2. Sponsored Level-I depositary receipts

A sponsored Level-I depositary receipt facility is usually the first and easiest way for any company to access the international capital markets. In the U.S. Level-I depositary receipts are traded over-the-counter (OTC) and cannot be listed on a national exchange such as AMEX, NYSE, or NASDAQ. Outside the U.S. they are occasionally traded OTC and on some exchanges (e.g. Berlin, LSE, OTC bulletin board)

What makes Level-I depositary receipt programs attractive entry vehicles are the lax disclosure requirements. The company does not need to comply with US Generally Accepted Accounting Principles (US GAAP) or full Securities and Exchange Commission (SEC) disclosure. Hence, the company benefits from access to international capital markets without having to change its reporting standards.

When entering into a depositary agreement with a depositary bank in the U.S., the responsibilities of the depositary bank include mailing annual reports, maintaining shareholder records, and responding to investor inquiries.<sup>5</sup>

**Table 8.0. Sponsored Level-I Depositary Receipts**

SEC Registration	Form F-6 (1933 Securities Act) 12g3-(b) exemption (1934 Exchange Act)
Advantages	Build core group of investors/no SEC disclosure/easy/low cost/control
Disadvantages	Limited visibility/cannot raise capital or list on a national exchange
Investors	All US investors and non-US investors
Listing	OTC 'pink sheet' and electronic bulleting board
Settlement	T+3, DTC, Euroclear, CEDEL
Cost	\$25,000 or less
Application	Non US companies wishing to develop foreign shareholder base w/out significant cost or SEC involvement

Source: The Bank of New York and Brunswick Brokerage

<sup>5</sup> Kent Hargis. "The Globalization of Trading and Issuance of Equities from Emerging Markets." *The Journal of Emerging Market*, vol 2, no 1 (Spring 1997): 5-21.

Further information on depositary receipt programs can be obtained from:  
 The Bank of New York, *Global Offering of Depositary Receipts-A Transaction Guide*  
 Corporate Trust & Agency Group-Bankers Trust Company – *Depositary Receipts*

VIII.A.3. Sponsored Level-II depositary receipts

The sponsored Level-II depositary receipt program differs from sponsored Level-I programs as it allows the company to list its depositary receipts on an exchange in the U.S. and on some exchanges outside the U.S. A public offering is not permitted under the Level-II program. The company must comply with all the SEC registration and reporting requirements, including the submission of annual reports in accordance with GAAP.

**Table 8.1. Sponsored Level-II Depositary Receipts**

SEC Registration	Form F-6 (1933 Securities Act) Forms 20-F and 6K (1934 Exchange Act)
Advantages	Listing/High visibility/Liquidity
Disadvantages	Full SEC disclosure/Continuous reporting cost
Investors	All US investors and non-US investors
Listing	NASDAQ, AMEX, NYSE, Non-US exchanges
Settlement	T+3, DTC, Euroclear, CEDEL
Cost	\$200,000-\$700,000
Application	Non US companies wishing to raise the visibility and enhance the liquidity of their shares without public offering

Source: The Bank of New York and Brunswick Brokerage

VIII.A.4. Sponsored Level-III depositary receipts

While Level-I and Level-II depositary receipts use existing shares to enhance the shareholder base, Level-III depositary receipts issuers can raise capital through public placement. As with Level-II and III facilities institutional and retail investors can participate in these programs. Moreover, a three-year history of GAAP compliant accounts is required in order to file Form 20-F. In young emerging markets, Level-III depositary facilities have been less numerous as the three-year GAAP accounts requirement remains the main obstacle. However, Level-I and II issuers are frequently inclined to upgrade to a Level-III facility.

**Table 8.2. Sponsored Level-III Depositary Receipts**

SEC Registration	Form F-1 and F-6 (1933 Securities Act) Forms 20-F and 6 K (1934 Exchange Act)
Advantages	Raise capital/Listing/Maximum visibility and liquidity
Disadvantages	Full SEC disclosure/Continuous reporting cost
Investors	All US investors and non-US investors
Listing	NASDAQ, AMEX, NYSE, Non-US exchanges
Settlement	T+3, DTC, Euroclear, CEDEL
Cost	\$500,000-\$2,000,000, plus underwriter's margin
Application	Non-US companies wishing to raise capital (from \$40,000,000 for countries with few or no regulations preventing foreign investment)

Source: The Bank of New York and Brunswick Brokerage

VIII.A.5. Private placements – 144A and Reg S

Rule 144A depositary receipts are privately placed receipts which are issued and traded in accordance with Rule 144A. Reg S depositary receipts can convert to Level-I facilities after 40 days. The major advantages are<sup>6</sup>:

- More cost effective than an exchange listing when raising capital
- Minimized SEC reporting (utilizing the reporting exemption under 12g3-2(b) and 144(d))
- Over 4,000 qualified institutional buyers (QIBs) and other institutional buyers permitted to trade these securities
- GAAP reconciliation of financial statements not required

The main disadvantages are:

- Rule 144A depositary receipts cannot be created for classes of shares already listed on a U.S. exchange
- Rule 144A depositary receipts can only be sold in the US to other QIBs. The QIB market is not as liquid as the public US equity market

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<sup>6</sup> Source: Bankers Trust Company – Corporate Trust & Agency Group marketing presentation



**Table 8.3. Private Placements 144A and Regulation “S”**

Description	Private placement in the US to QIBs <sup>7</sup>
Purpose	Sell shares to raise capital through private placement: Reg S can convert to Level-I after 40 days
Customers	144A: Institutional only (QIB) Reg S: Institutional and retail
Trading	OTC
SEC Registration	None
US Reporting	Need comprehensive offering memorandum
Other Requirements	Exemption under Rule 12g3-2(b), or Rule 144A (d4)

Source: The Bank of New York and Brunswick Brokerage

### VIII.B. The Russian case of depositary receipt facilities

#### VIII.B.1 Description of Russian depositary receipt facilities

Table 8.4 depicts Russian depositary receipts analyzed in this study. While there is a small number of banks which have sponsored depositary programs, those are not considered for this study as sufficient data are not publicly available for the relevant time periods, and foreign investors faced investment barriers which did not allow them to

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<sup>7</sup> A QIB is currently defined as an institution which owns and invests on a discretionary basis at least US\$ 100 million (or, in the case of registered broker-dealers, US\$ 10 million) in securities of an unaffiliated entity. At present there are in excess of 4000 QIBs but the SEC may decide to broaden the definition of a QIB to allow a larger number to participate in the Rule 144A market. Non-US companies now have easy access to the US equity private placement market and may thus raise capital through the issue of restricted ADRs without conforming to the full SEC registration and reporting requirements. Additionally, the cost of issuing 144As is considerably less than the cost of initiating a Sponsored Level III ADR program. (source: Deutsche Morgan Grenfell).

invest in Russian financial institutions until recently. The commonly accepted explanation why Russian financial institution sponsored depository programs revolves primarily around marketing-related reasons.<sup>8</sup>

**Table 8.4. Russian depository receipt programs<sup>9</sup>**

Company	Sector	Type of ADR	Issue date	Exchange/Listing
Chernogomeft	Oil/gas	Level 1	3/22/96	Berlin/OTC
Gazprom	Oil/gas	144A/Reg S	10/24/96	Berlin/LSE/Portal
GUM	Retail	Level 1	6/7/96	Berlin/OTC
Irkutskenergo	Utility	Level 1	1/23/97	Berlin/OTC
LUKoil (common)	Oil/gas	Level 1	12/31/95	Berlin/OTC
Mosenergo	Utility	144A/Reg S	10/13/95	Berlin/Portal
Surgutneftegas	Oil/gas	Level 1	12/30/96	Berlin/OTC
Tatneft	Oil/gas	144A/Reg S	11/29/96	Berlin/LSE/Portal

Source: Salomon Brothers

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<sup>8</sup> Inkombank, Bank Menatep, and Bank Vozrozhdeniye have sponsored Level-I ADRs in 1996. The issue of Seversky Tube Works and Vimpelcom are not considered for data non-availability reasons and nature of the firm reasons (Vimpelcom had an initial public offering at the NYSE and was by many not considered a genuine Russian company-due to valuation and management), respectively.

<sup>9</sup> Data as of early 1997. The total number of Russian depository receipts more than doubled during 1997.

In May 1997, three companies - LUKoil, Mosenergo, and Gazprom - represented almost 84% of the total capitalization of all Russian ADRs. At the same time, total Russian ADR market capitalization represented 7% of the Russian market's total capitalization.<sup>10</sup> As a comparison, in Mexico, one of the leading ADR issuers in emerging markets, ADRs accounted for 14.1% of total market capitalization in 1996. This demonstrated a rapid increase from only 1.8% in 1989.<sup>11</sup> In 1996, Russia (5.23%) followed Brazil (7.3%) , Hong Kong (11.64%) and the UK (16.75%) in the top list of new sponsored depository receipts issued by country.<sup>12</sup>

Except for Gazprom depository receipts, there are no restrictions imposed on converting local shares into ADRs.<sup>13</sup> In the case of Gazprom, the company's charter limits the amount of shares to be held by foreigners in ADR form to 9%. Currently, after the first international depository receipt issue, about 2% is held by foreigners.

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<sup>10</sup> Salomon Brothers

<sup>11</sup> Bank of New York

<sup>12</sup> Bank of New York

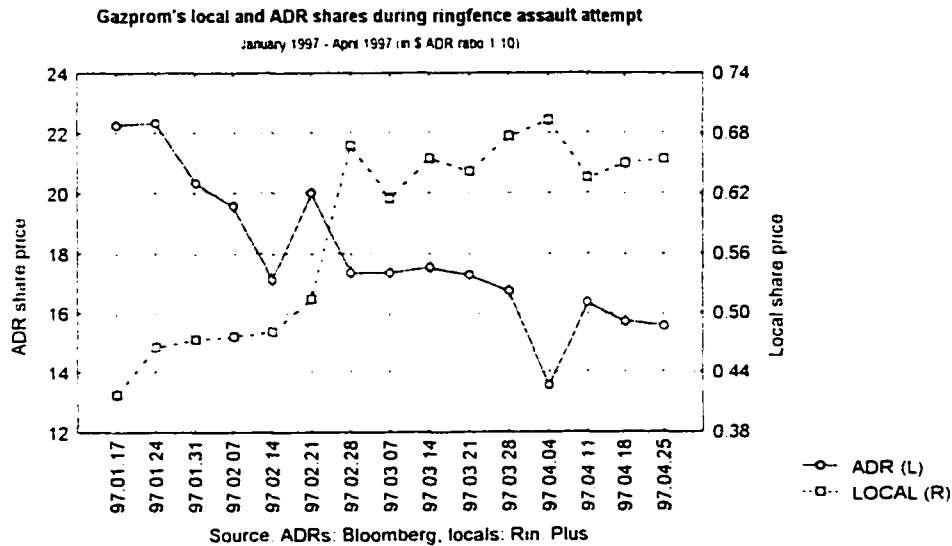
<sup>13</sup> During 1996, arbitrage trading between Mexico's five largest ADRs and their underlying shares accounted for between 10%-15% of the total value traded in those firms shares. Numbers for Russia are not available but there is no reason why they should not be of a similar magnitude. This reflects the interdependence of underlying shares and ADR shares.

**Box 8.0. Gazprom – a case of market segmentation**

**Gazprom – attempted ringfence assault**

The case of Gazprom has come under close international scrutiny when foreign arbitrageurs in February 1997 intended to assault the ringfence by accumulating local stock which then synthetically was to be transformed into ADR equivalents. Due to the company's charters which prohibited foreigners from buying local Gazprom shares, the ADRs traded at up to a 75% premium to the local shares. The synthetic ADR creation by the arbitrageurs, especially by the Hong Kong-based Regent Pacific, which intended to use \$200 million worth of local Gazprom stock as collateral for shares in the specially created Russian legal entity "Regent Gaz Fund", would have been a source of fabulous profits if the Gazprom management with full backing of the Russian government had not deterred, via some opaque measures, the arbitrage from continuing. In the meantime, the local share price appreciated rapidly narrowing the ADR premium, and indicating that at least in the minds of market participants, the arbitrage was on.

Analysts are still speculating why foreign arbitrageurs were tacitly allowed to pursue their agenda to a degree that helped the local share price to appreciate and thus enrich holders of the local shares, which among others were managers of Gazprom itself. The other lesson which somewhat defeats traditional finance theory is that Gazprom actually managed to charge foreign shareholder three times as much for its shares as the local price dictated at the time-and still achieved a massive oversubscription of the ADR offering.

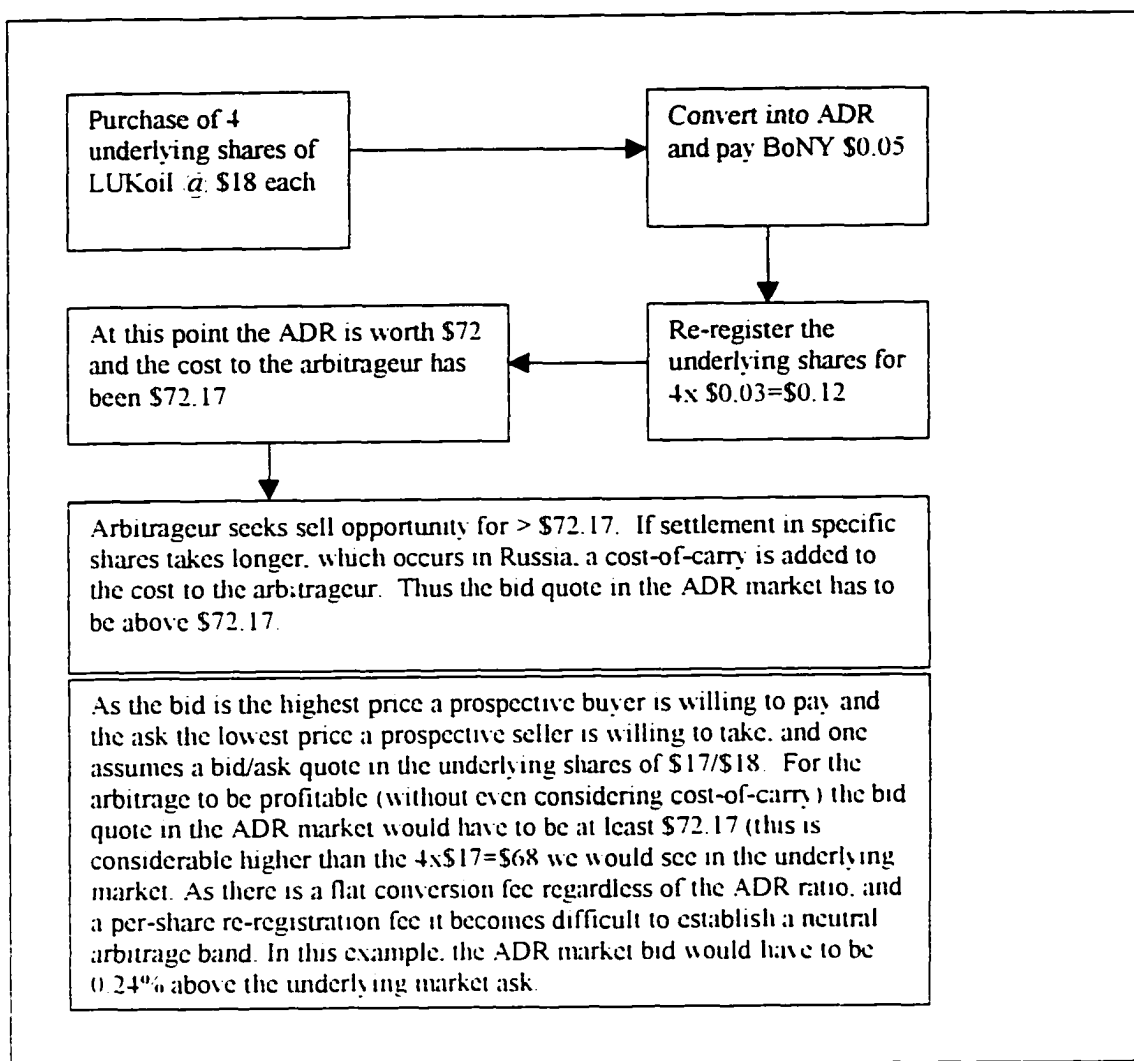


*For further information refer to Financial Times and Wall Street Journal during February 1997, both fashioned explicit and frequent coverage of the case.*

In order to understand the relationship between ADRs and underlying shares it helps to demonstrate in simplified terms how ADR arbitrage is executed. Box 8.1. describes a plain-vanilla ADR arbitrage with the example of LUKoil shares. The ratio of underlying shares to ADRs is 4:1 (referred to as ADR ratio). It must be noted that the cost items in Russian ADR arbitrage are (1) a conversion charge of 5 cents per ADR, which is charged by the Bank of New York, which has a monopoly on Russian ADRs, and (2) a re-registration fee of 3 cents per share, which has to be paid if the arbitrage executing institution does not source from and does not feed back the shares into its own books

To initiate a plain-vanilla arbitrage, a trader could purchase 4 underlying shares of LUKoil common stock. For purposes of illustration the price the trader pays would be \$18. At this point the trader owns 4 shares of LUKoil common stock. The next step would be to convert the 4 shares into 1 ADR (remember, the ADR ratio was 4:1). The depositary bank would charge a fee of \$0.05 per conversion. Following the conversion, a re-registration has to take place if the shares are not coming and going back to the institutions own books, in other words, if a client is involved. After this transaction, the trader owns one share of LUKoil ADR which has an implicit cost attached to it of \$72.17. In order to make a profit, the trader now has to find someone to quote a bid of more than \$72.17 per LUKoil ADR. If an arbitrage was at place, this bid had been quoted prior to the first action commencing the arbitrage (this is why *arbitrage*  $\approx$  riskless profit).

**Box 8.1 Simplified mechanism of ADR/underlying share arbitrage**



VIII.B.2 Trading trends in Russian ADRs

Table 8.5 shows the process of transformation of local shares into ADR form subsequent to the issuance of ADRs. The longer the ADR has been in place, the higher

the share of free float in ADR form.<sup>14</sup> For issues with 12 months history of ADRs, the amount of free floating stock in ADR form is between 20% and 58%. For more recent ADRs such as Surgutneftegas and Irkutskenergo, which issued ADRs in December 1996 and January 1997, respectively, the ADRs comprise between 10% and 16% of total free float. This trend clearly indicates the strong foreign influence on shares with depositary receipt facilities in place.

**Table 8.5. Percentage of shares outstanding in ADRs and free float**

Percentage of shares in ADRs and free float (Dec 95- March 97) in %							
	Dec 95	March 96	June 96	Sep 96	Dec 96	Mar 96	Free float
Mosenergo	4.0	23.1	25.0	28.0	28.0	28.6	49.0
LUKoil		20.6	21.0	22.7	22.7	22.7	77.5
Chernogorneft		14.7	17.2	10.9	10.9	12.8	62.3
GUM		3.1	15.3	20.9	20.9	27.4	100.0
Tatneft			0.8	13.9	13.9	17.8	36.4
Gazprom				2.0	2.0	2.0	51.9
Surgutneftegaz						7.49	49.0
Irkutskenergo						5.92	60.0

Source: Salomon Brothers

As foreign participation increases when issuing ADRs, trading volume rises and liquidity is equally enhanced (see table 8.6.) This in turn translates into tighter bid/ask spreads of the local (or underlying) shares which make profit-generating arbitrage between differing quotes by different brokers increasingly difficult(see table 8.7.).

<sup>14</sup> Free float counts the number of shares of a corporation that are outstanding and available for trading by the public. A small free float number usually implies more volatility in the share price since a large buy/sell order can have a dramatic impact on the share price.

**Table 8.6. Trading volumes for Russian ADRs and local shares in 1996**

	ADR market (USD)	Local market (USD)	ADR % of local market
Mosenergo	235,947,517	545,471,865	43
LUKoil	897,998,092	347,671,311	258
Chemogorneft	82,792,755	34,270,652	242
GUM	17,391,315	48,872,230	36
Gazprom	446,891,580	110,123,900	406
Seversky Tube Works	19,524,361	13,731,395	142
Tatneft	35,586,523	20,871,332	171
TOTAL	1,736,132,143	1,121,012,684	155

Source: Salomon Brothers and RTS, NASD, NYSE, LSE, and BSE. The reported ADR volumes may only represent a small share of total ADR trading; nevertheless, they still outweigh trading volume in local shares.

**Table 8.7. Average bid/ask spread on local Russian shares with ADRs in 1996**

ADR issuer	1 Qtr	2 Qtr	3 Qtr	4 Qtr
Chemogorneft	15.2%	10.6%	26.1%	9.7%
Gazprom	126.2%	327.5%	36.2%	6.1%
GUM	29.6%	10.6%	9.9%	10.2%
Irkutskenergo	9.6%	5.3%	5.8%	4.1%
LUKoil	3.0%	2.4%	1.9%	1.0%
Mosenergo	1.3%	1.7%	1.1%	0.6%
Seversky Tube	64.1%	54.2%	36.1%	17.4%
Surgutneftegas	15.8%	10.8%	3.4%	1.5%
Tatneft	126.8%	82.0%	72.3%	7.6%

Source: Salomon Brothers, spreads are calculated by taking the difference between the bid and offer price and dividing it by the mean of the bid and offer price



While table 8.7. demonstrates the dynamic aspect of spread tightening of local shares with ADRs, table 8.8. clearly shows that ADRs' bid/ask spreads are considerably tighter than those of shares without depositary receipts facilities in place. The exceptions are UES and Rostelekom, which as Russia's 'blue chips' trade at comparable spreads to the shares with depositary receipts.

**Table 8.8. Average bid/ask spread November 1997**

Company (ADRs bold)	November 1997 average bid/ask spread in %	Company (ADRs bold)	November 1997 average bid/ask spread in %
Aeroflot	13.1	Norilsk Nickel	7.2
Bashkirenergo	12.1	Novolipetsk Fer.Metal	0.0
Chelyabenergo	29.2	Novorossiysk Sea Shipping	22.2
Chelyabinsksviazinform	10.5	Noyabrskneftegaz	7.8
Chernogorneft	22.4	Orenburgneft	18.2
Condpetroleum	82.1	Permenergo	34.0
Far Eastern Shipping	88.1	Primorsk Sea Shipping	63.3
GAZ Auto Plant	5.7	Purneftegaz	7.3
Inkombank	15.9	Rostelecom	1.1
<b>Irkutskenergo</b>	<b>3.6</b>	Sakhalinmomeftegas	17.7
KamAZ	18.5	Samaraenergo	26.1
Komineft	45.5	Samaraneftegaz	93.0
Krasnoyarskenergo	21.3	Samarasvyasinform	34.3
Krasny Octyabr	35.6	<b>Sberbank of Russia</b>	<b>2.1</b>
Kubanelektrosvyaz	16.9	Severstal	51.8
Kuzbasenergo	8.9	St.Pb. Telephone	23.6
Lenenergo	17.0	<b>Surgutneftegaz</b>	<b>2.5</b>
<b>LUKoil</b>	<b>0.4</b>	Sverdlovskenergo	19.3
Megionneftegaz	8.8	<b>Tatneft</b>	<b>2.0</b>
Moscow Telephone	10.3	Tomskneft	14.8
<b>Mosenergo</b>	<b>0.5</b>	<b>Trade House GUM</b>	<b>11.3</b>
Nizhneartovskneftegaz	62.0	Unified Energy System	0.3
Nizhniy Tagil Fer.Metal	26.5	Uralsviazinform	27.8
Nizhnovsvyazinform	24.9	Vareganneftegaz	123.1
YUKOS	10.0	Yuganskneftegaz	10.9

Source: Skatepress, Russia

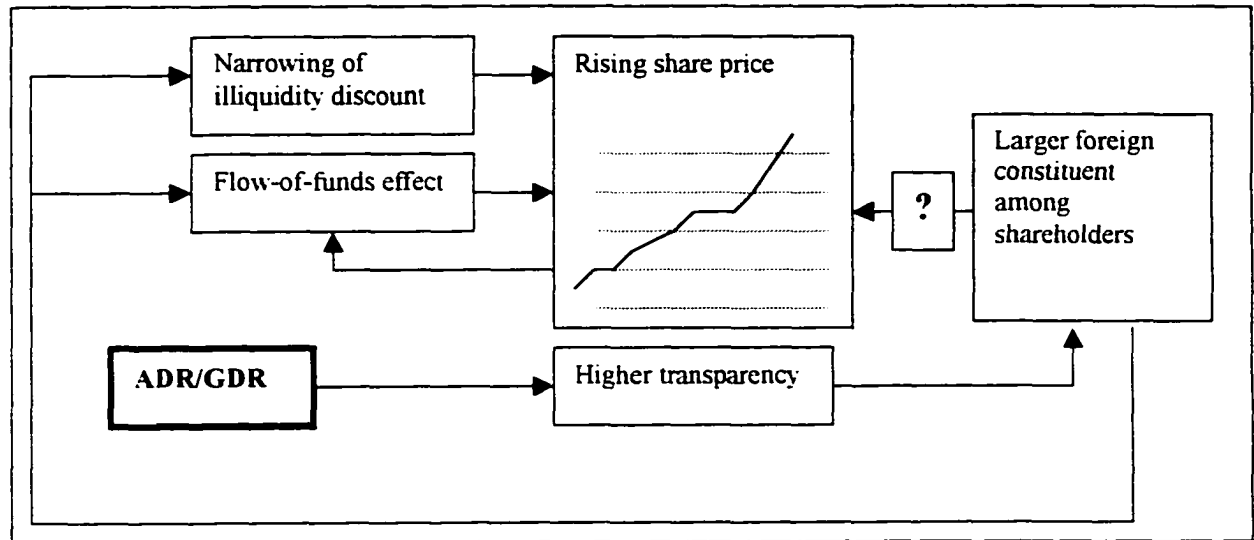
### VIII.B.3. Post-ADR issuance performance of underlying shares

A notorious trick, if one believes most brokers of Russian equities, has been to buy the underlying, or local, shares just before the ADR is issued, or officially announced. This would enable the investor to benefit from the liquidity enhancement that is attributed to the issuance of international depositary receipts, which in turn would narrow the illiquidity discount and thus increase the price of underlying shares.

This mechanism is logical as it relates to fundamental issues of share price formation. The decrease of the illiquidity discount, the diversification of the shareholder base, and the increased transparency which accompanies the regulatory requirements of international depositary receipt programs, are all factors which in theory should help to enhance the intrinsic value of the underlying shares.

Finally, the issuance of depositary receipts opens the market for a wider pool of investors and hence a deeper pool of capital. This translates directly into a flow-of-funds arguments which also should drive up the underlying shares' price (see diagram 8 0.)

**Diagram 8.0. Effect of international depository receipt on local share price**



It is still open to discussion of whether a larger international investor base, which supposedly purchases the international depository receipts, necessarily implies a rise in the share price. An argument which is based on the belief that increased foreign ownership may expose the share price to sudden fluctuations as the top-down perception of a country demands rapid asset withdrawals or allocations, may be a valid one. Following such argumentation, the above mentioned trick may not necessarily be as plausibly explained as previously indicated. There have arguably been cases where foreign investors over time have become the dominant force in trading the shares of a company which has issued ADRs, and where foreign investors have applied different-often less optimistic-valuation criteria to companies than the local shareholder base.

In order to shed light upon what really happens in the pre- and post-depository receipt issuance phase, a simple analysis has been conducted.

#### VIII.B.4. Methodology for measuring performance of pre-and post-ADR issuance in Russia

Ideally, the measurement of abnormal return is conducted with an event-study methodology. Such an approach could be described by the following methodology:<sup>15</sup>

The event day zero is the ADR issue date and would be denoted as t=0. Common stock average abnormal returns are analyzed sixty days prior and sixty days post announcement date. The sixty day period is used as it reflects a fair forward-looking horizon for pre-emerging market investors. This means that even such ADR information which relates to ADR plans in the distant future, will in most cases not appear repeatedly in research reports as a buying flag until the more immediate time-horizon of approximately two months has been reached.

The daily stock returns used in the formula would then be defined as

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}$$

Where  $P_{i,t}$  is the closing price on stock  $i$  at time  $t$ . In order to measure abnormal return betas are computed. The beta reflects the covariance of the stock with an index. In this case it would be a Russian equity index. In addition to betas, alphas have to be

computed. Alphas reflect the coefficient measuring the portion of a stock's return arising from specific, or non-market, risk. Betas of common stock are defined as

$$\beta_i \equiv \frac{\sum_{t=1}^n (R_{i,t} - \bar{R}_i)(R_{M,t} - \bar{R}_M)}{\sum_{t=1}^n (R_{M,t} - \bar{R}_M)^2}$$

and alphas of common stocks are defined as

$$\alpha_i \equiv \bar{R}_i - \beta_i \bar{R}_M$$

The alphas and betas are calculated from the stock and market index returns for the period 120 days to sixty days before the issuing date (i.e., from day -120 to day -60).

The abnormal return for a depositary receipt issuing firm is the deviation of its common stock's actual return from its predicted daily return. Abnormal returns are computed as follows:

$$AR_{i,t} \equiv R_{i,t} - (\alpha_i + \beta_{iR} R_{M,t})$$

The cumulative abnormal daily rate of return (CAR) from the beginning of the event period, day -60, to day 0 and is defined as:

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<sup>15</sup> M. Ray, D. Thurston, and P. Dheeriyaa, "Effects of Seasoned Equity Issues in Emerging Markets: An Investigation in the Thai Stock Market." *The Journal of Emerging Markets*, vol. 1, no. 3 (Fall/Winter 1996), 22-34.

$$C A R_{-6,0}^0 \equiv \sum_{t=-6,0}^0 A R_t$$

This methodology, which has been successfully applied to other markets, fails in the context of the Russian equity market. The beta, which is required for the calculation of the abnormal rate of return is non-stationary.<sup>16</sup> This means that the beta, which would be computed for the test period preceding the immediate pre-ADR issuance period, never remains close to the beta which can be calculated for the pre-ADR issuance, or post ADR issuance period. This raises the question of whether the beta itself becomes a function of the impending ADR issue. To answer this question, however, would be only of marginal interest to the practitioner of portfolio investment or the policy maker in Russian capital markets. Alternative methods to adjust for the risk of the underlying assets when measuring its performance turn out to be equally futile.<sup>17</sup> Harvey (1995) and Bekaert (1995), in studies analyzing emerging market returns behavior, find that higher betas are often associated with lower returns. These findings reject traditional finance theory, but

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<sup>16</sup> The problem of non-stationarity of betas has been known in emerging markets for many years, in one of his early articles, V.R. Errunza (V.H. Errunza, "Efficiency and the Brazilian Capital Market," *Journal of Banking and Finance*, 3 (1979): 355-382.) points out the problem of non-stationary betas, and mitigates the effects by building portfolios of securities. Such an approach, which would increase the correlation over time for betas and thus establish quasi stationarity, is not applicable in this context as individual securities (ADRs) are the focus of interest.

<sup>17</sup> In the chapter "Data and descriptive features of the Russian equity market" the analysis of mean-variance frontiers results in inconclusive results as to whether securities with higher volatility generate higher returns. Therefore, adjusting for variance or standard deviation will not serve any purpose.

can be explained on the basis of market segmentation theory.<sup>18</sup> Furthermore, such results underline the futility of betas as risk-adjustment measures to compute abnormal return.

On a simpler note, the idea of CAPM and abnormal return is highly susceptible to criticism in young emerging markets. Methods intending to measure abnormal return, be it via a CAPM approach, or a regression against the index must at a minimum be based on the assumption that a *normal* return exists (we need a normal return in order to compute abnormal return). The fact that the Russian equity market, and for that matter, most young emerging markets, are characterized by only one constant and that would be 'change.' Whether it be in market segmentation dynamics, macro-economics, industry regulation changes, fiscal policy, etc., the end result remains always that the outlook on equities and the universe of investors participating in the particular market or sector changes as well. This directly leads to the realization that a normal return, or alpha, cannot be reliably computed as the assumption that equities display a stationary volatility versus their index cannot be held.

More importantly, however, an alternative methodology has to be found in order to assess the effect of issuance of depositary receipts on local share prices. While noting that a CAPM approach is not viable due to the previously mentioned reasons, the following methodology seems functional and robust for assessing the above mentioned effect:

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<sup>18</sup> Geert Bekaert and Campbell R. Harvey. "Time-varying world market integration." *Journal of Finance*, vol 50 (1995): 403-444.

$$PIR = \frac{\sum_{i=1}^{60} P_i}{\sum_{i=1}^{60} I_i}$$

The price/index ratio is denoted by *PIR*, the absolute share price is denoted by *P*, and the absolute value of the index is denoted by *I*. Therefore, the average absolute price of the share is divided by the average absolute value of the index during the same time period. The above defined formula describes the computation of the ratio during the 60 day post-ADR issuance period. The same ratio can be calculated according to the same method by merely replacing the time period for the pre-ADR issuance period and the period preceding the immediate pre-ADR issuance period. By comparing the ratios of the individual time periods, an indication of relative performance can be computed.

The share prices and the index prices are taken from the RinacoPlus brokerage in Moscow.<sup>19</sup>

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<sup>19</sup> Composition and creation of Rinaco Plus Index:

The index is comprised of shares which are considered highly liquid on the Russian market. The composition and calculation of the index rely heavily on expert estimations by the RINACO Plus staff. The methodology is not completely transparent, however, the RINACO Plus research team exercises its best efforts to obtain timely, correct and consistent data. It is RINACO's belief that the RES index, together with indices calculated by other parties, will provide an accurate benchmark for the evaluation of market conditions. The exact and updated composition of the index and the share prices can be downloaded on a daily basis from the following web site:

<http://www.fe.msk.ru/infomarket/rinacoplus/indicat/metod.html#3>



VIII.B.5. Results of effects of depositary receipts on share price in Russia

Table 8.9. displays the absolute results obtained by applying the above mentioned methodology to the test time period (-120 to –60 days), the pre-ADR-period (-60 to 0 days), and the post-ADR period (0 to 60 days).

**Table 8.9. Relative performance of local shares before and after ADR issuance**

	SNGS	CHGZ	GAZP	GUMM	TATN	LKOH	IRGZ	Average
pre-ADR -60 to -120 days	0.00297	0.074181	0.000988	0.096163	0.165647	0.053832	1.000818	0.19923
pre- ADR 60 days	0.00313	0.074717	0.003148	0.094151	0.279394	0.047634	1.000986	0.21474
Post-ADR 60 days	0.00349	0.074377	0.002718	0.143245	0.362437	0.058359	1.00124	0.23512

Table 8.10. shows the relative performance in % terms of the 60-day time periods immediately preceding and following the issuance date versus the 60-day “test” period. Here one can see that post-issuance periods show a stronger performance (average 18.02%) relative to the test period, than the time period immediately preceding the ADR issuance (average 7.78%). The fact that both periods, the pre-ADR and the post ADR period, outperform the test period in most cases, could be interpreted as the ADR having an economic effect on the security which is reflected in its price behavior during this time. Furthermore, the fact that the post-ADR period shows stronger performance than the pre-ADR period, suggests that the market prices the ADR characteristics into the local share price more aggressively after the announcement of the depositary receipt

program, than in the run-up phase leading to it. For investors this implies that although it generally pays off to keep the ADR watch bases on alert in order to be ready to launch investments on the basis of ADR rumors, it is not too late to enter the market once the announcement has been made and the depositary receipts have started trading.

**Table 8.10. Relative performance of local shares before and after ADR issuance (in %) vs index**

	SNGS	CHGZ	GAZP	GUMM	TATN	LKOH	IRGZ	Average
pre-ADR 60 days	5.35%	0.72%	218.65%	-2.09%	68.67%	-11.51%	0.02%	7.78%
Post- ADR 60 days	17.43%	0.26%	175.13%	48.96%	118.80%	8.41%	0.04%	18.02%

When interpreting these results one must keep in mind that, although a degree of informational inefficiency can be attributed to these findings, the prudent investor should be careful in extending these findings to economic inefficiency which could be profitably exploited. The sheer heterogeneity of companies issuing ADRs does not allow for a general framework of “playing the ADR game” in Russia. Some companies let it be known to investors 12-15 months prior to their actual issuing depositary receipts. Others move swiftly within one month or less to issuing the liquidity-enhancement instruments, and officially announce the ADR only days prior to their initial trading day. Some companies use the ADR primarily for marketing reasons and have little or no intention of upgrading a private placement or Level -1 program to a Level -2 or Level -3. Thus the transparency benefits are capped and some of the virtues of ADR programs never come to work. Therefore, ADR-based investments in local shares, despite their higher returns immediately before and after the issuance, must be analyzed one at a time and without relying to heavily on the mechanisms that are commonly called ‘playing the ADR game.’”

The following guidelines may help to understand the impact of ADRs on the local share price better:

- What time line is the company envisioning for the issuance process?
- What is the purpose of the ADR (larger shareholder base, higher transparency, pure marketing, eventual upgrade to Level-3 in order to raise capital abroad)?
- What type of investor relations program is in place?

#### VIII.B.6. Assessing the future of Russian ADRs for the investor

As more ADRs will be launched in the Russian market (by the end of 1997 the number had doubled from 1996), the novelty may wear off and investors will increasingly assess ADRs according to the realization potential of the virtues that ADR programs possess. Thus, companies which seek transparency, liquidity and access to foreign capital raising venues (via the Level-3 ADR), will most likely fare better than those that think ADRs help to boost the share price for the short term. In addition, the ADR factor will decreasingly take priority over the fundamentals of the company, as has happened in a number of cases in the past (see Gazprom example). Moreover, ADR-sponsoring companies must increasingly be aware of the costs associated with ADRs. ADRs can become a painful burden if the pre-ADR shares were trading on the basis of benign local investor perceptions of the company. With a larger foreign constituent among shareholders, which in most cases has a substantially wider investment universe from which to select stocks, companies' assessment will increasingly become a function of (a) their local market outlook versus other markets, and (b) their valuation versus their international peer groups.

Accordingly, depositary receipt programs have to be critically assessed from the standpoint of the issuer and the standpoint of the investor. If the short-term goal of issuers is to boost the share price by adding ADRs to the stock's features, as it has been the case in Russia in not only one occasion, such an action would fall in the larger sphere of the 'greater fool' theory, for there may be investors out there who are tantalized by the glossy announcements of ADRs (*those are the greater fools*). At the same time, however, there will now be more investors who will 'x-ray' the company behind it and possibly conclude that the upgrade to the international investment level requires operating efficiencies comparable to ADRs from other countries. Hence, the issuer and the investor will have to decide about the company's ADR-fitness before proceeding to this step.

## Chapter 9

### DYNAMIC VALUATION TOOLS FOR ASSESSING PRE-EMERGING MARKET EQUITIES

Pre-emerging equity markets mostly do not enjoy the benefit of being thoroughly covered by a large number of security analysts. Moreover, security analysts covering pre-emerging markets may not be as experienced as their colleagues covering more mature emerging markets. Their learning experience, in many cases, is a direct function of the age and maturing process of the market itself.<sup>1</sup> In addition to the lack or relative unreliability of equity coverage during the initial stages of the transformation from a pre-emerging market to a mature emerging market, accounting standards and audits can be characterized as having severe shortfalls of accuracy and standardization. During this time, despite the partial presence of Western auditing firms, financial statements are still incompletely audited, and for the most part are neither restated nor consolidated.<sup>2</sup> This situation raises the question: does fundamental company data have any real value to the investor in the early stage of an equity market and how does informational inefficiency affect valuation?

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<sup>1</sup> This is particularly well demonstrated in chapter 1, chart 1.0.

<sup>2</sup> Please refer to the description of Russian accounting peculiarities in chapter 3.

**IX.A. Gauging the future performance of Russian equities during the early phase of the pre-emerging market life-cycle**

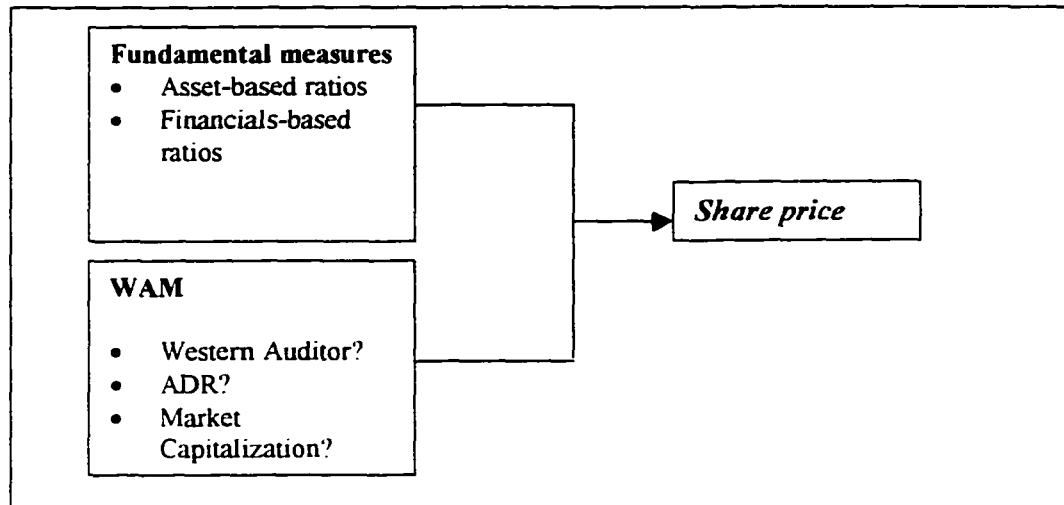
**IX.A.1. Description of the model**

This chapter attempts to shed light upon the dynamic process of equity valuation in the Russian equity market by testing a differentiated transparency-dynamic equity valuation approach over two time periods: the initial phase of the Russian equity market between mid-1995 to mid-1996, and the follow-up time period ranging from mid-1996 to mid-1997. The primary goal of the model is to test the viability of specific valuation measures, ranging from asset-based valuation ratios such as market capitalization over reserves, market capitalization over production, market capitalization over capacity installed, or market capitalization over access lines, to financials-based measures such as market capitalization over sales and earnings. Furthermore, a third measure is introduced: it will be called the technical parameter. The technical parameter indicator-WAM- comprises less tangible but important characteristics of equities (see diagram 9.0.) WAM stands for equity assessment in three categories: (1) Western auditor, (2) American depositary receipt program (ADR), and (3) Market capitalization. Fundamental measures and the technical indicator WAM are applied to both the early period and the later period. The later period (ranging from mid-1996 to mid-1997) differs from the earlier period in that the coverage and transparency has dramatically improved.<sup>3</sup>

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<sup>3</sup> See table 5.1. in chapter 5 for the cumulative broker report coverage of the most liquid companies. Table 5.1. shows the rapid rise in equity coverage during the period mid-1996 to mid-1997.

**Diagram 9.0. Structure of transparency-dynamic valuation model**



While this model will clarify aspects related to the choice of valuation measures as far as fundamental or technical parameters are concerned, it will not try to be conclusive about the valuation of equity securities in emerging markets. The findings, thus will serve as a pre-screening tool which may help the investor to weed out the most unattractive securities, and select the group with the highest scores for further analysis. As timely decision-making in investment management is crucial, especially in markets where dramatic rallies sometimes last no longer than a few days, the pre-screening methodology can serve the investment professional well. The next step that will have to be taken is to analyze the securities, which have passed the screening test with the best results, according to the relevant measures and approaches for the specific industry.

### IX.A.2. Data description

Table 9.0. below describes the ratios of fundamental criteria which were available to the investor during the period from mid-1995 to mid-1996. The accounting data is from the year 1994, which for many companies was the first year of available accounting data. While there possibly was fragmented data available for individual companies for an earlier period, the small number in the individual sectors would not have allowed for any meaningful statistical analysis. Furthermore, the analysis had to be limited to the three main sectors: oil/gas, electric utilities, and telecoms. It was only in those sectors where a meaningful number of companies with accounting data for 1994 could be found. The sector limitation, however, does not impose a problem as those sectors were the ones attracting investors' main interest. Table 9.1. is composed according to the same methodology but uses 1995 accounting data. The universe of companies is somewhat larger as 1995 data was available for more companies than 1994 data

The most notable observation from the valuation tables 9.0 and 9.1 are captured in chart 9.0. Chart 9.0. depicts the magnitude and dispersion of the individual valuation measures from the two time periods (mid 95 to mid 96 and mid-96 to mid-97). The degree of dispersion and the magnitude of asset-based measures (such as market capitalization/production, market cap /reserves, market cap cap/MW installed, or market cap./access lines) rises in the later time period. The larger values simply reflect higher valuations during the later period. However, the larger degree of dispersion of asset-based measures suggests more discriminate application of asset-based measures. This can be explained on the basis of investors learning about individual companies and can



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rely to a larger degree on financial ratios during the later phase. This means that investors are applying increasingly financials-based measures, such as P/E, P/Sales, and P/Book value, which would render some of the asset-based measures less relevant and thus prone to a high degree of dispersion.

**Table 9.0. Fundamental data 1994**

Company	Mkt cap in \$ mill	P/E	P/Sales	P/BV	\$/bbl of production	Cents/bbl reserves	Return. 7/95- 7/96
<b>Oil/Gas</b>							
Chernogorneft	187	12.49	1.17	0.25	3.8	7.2	7%
Komineft	135	-7.12	0.43	0.23	3.7	6.2	-41%
Kondpetroleum	86	-0.78	0.21	0.13	1.8	1.4	-29%
LUKoil	2948	14.5	0.88	1.3	8.4	26.7	41%
Megionneftegaz	185	4.17	0.58	0.15	1.9	7.7	71%
Nizhnevartovskneftegaz	136	-1.08	0.17	0.45	0.7	1.5	-43%
Noyabrskneftegaz	392	16.86	0.32	0.08	2.3	7.7	-18%
Orenburgneft	131	26.35	0.49	0.12	2.4	5.9	27%
Purneftegaz	264	20.04	0.95	0.46	3.8	4.9	-37%
Samaraneftegaz	186	36.4	0.58	0.35	2.9	9.1	-9%
Surgutneftegaz	703	4.74	0.58	0.26	2.8	6.5	74%
Tatneft	232	0.53	0.12	0.3	1.4	4.1	145%
Tomskneft	153	13.67	0.41	0.07	1.7	4.3	-5%
Yuganskneftegaz	534	61.2	0.87	0.45	2.8	5	-32%
<b>Utility</b>							
					\$/MW installed '000 \$		
Irkutskenergo	197	4.26	0.53	0.09	15.1		59%
Krasnoyarskenergo	59	0.71	0.18	0.16	7.22		111%
Lenenergo	97	9.75	0.24	0.32	19.3		159%
Mosenergo	717	1.88	0.39	0.64	49.6		147%
Samarenergo	81	2.07	0.14	0.12	23.1		53%
Sverdlovenergo	61	0.87	0.1	0.25	7.03		96%
UES	1078	2.53	11.2	1.56	0.06		103%
<b>Telecom</b>							
					\$/Access Line		
Kubanelectrosviaz	70	4.22	1	0.45	132		17%
MGTS	300	10.5	1.39	0.38	80		62%
Nizhny Novgorod Sviazinform	78	5.56	1.39	2.24	154		56%
Samarassviasinform	31	3.9	0.6	0.9	76		30%
St Petersburg Public Network	210	14.99	3.13	1.52	124		25%

Source: Brunswick Brokerage, mkt cap as of Nov. 3, 1995.

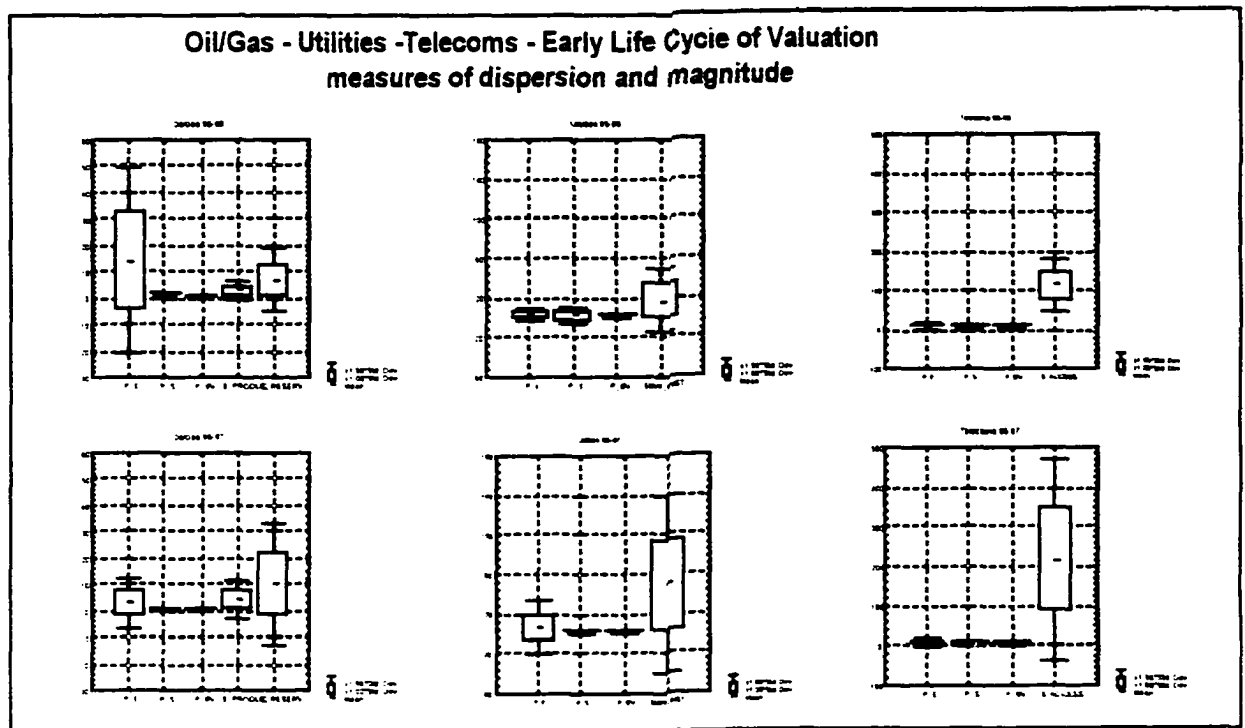
FRONTIER EQUITY MARKET VALUATION  
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Table 9.1. Fundamental data 1995

Company	Mkt cap in \$ mill	P/E	P/Sales	P/BV	\$/bbl of production	Cents/bbl reserves	Return 7/96-7/97
<b>Oil/Gas</b>							
LUKoil	6735	12.8	1.21	0.94	15.9	47	101%
Surgutneftegas	2090	2.6	0.66	0.33	8.6	19.2	187%
Yuganskneftegas	428	4.1	0.19	0.16	2.2	3.5	246%
Samarneftegas	145	1.6	0.25	0.21	2.2	6.9	246%
Noyabrskneftegas	452	10	0.24	0.16	3	9.1	152%
Megionneftegas	472	3.9	0.57	0.47	5	20	186%
Nizhnevartovskneftegas	114	-4.7	0.07	0.04	0.74	1.3	486%
Chernogomeft	216	7.9	0.53	0.42	4.8	8.2	17%
Varyeganneftegas	60	-2	0.36	0.09	3.6	1.3	145%
Kondpetroleum	85	-1.2	0.2	0.07	2.3	1.4	183%
Udmurneft	93	0.9	0.21	0.16	2.1	4.4	385%
Tomskneft	203	2.5	0.28	0.11	2.5	6.2	326%
Komineft	88	-3.3	0.2	0.06	2.7	4	329%
Purneftegas	256	5.3	0.46	0.26	4.2	5.3	199%
Tatneft	651	1.8	0.29	0.28	3.6	12.5	158%
<b>Utility</b>							
					<b>\$/MW installed '000 \$</b>		
UES(level 3 consolid.)	3385	1.1	0.13	0.09	34		499%
Mosenergo	2483	4.6	0.82	0.73	172		108%
Irkutskenergo	512	7.9	1.05	0.29	39		231%
Lenenergo	390	45.4	0.52	0.49	73		328%
Bashkimergo	180	2.7	0.19	0.21	35.4		482%
Samarenergo	153	2.4	0.18	0.29	44		238%
Sverdlovenergo	143	0.8	0.11	0.19	17.1		640%
Krasnoyarskenergo	117	1.5	0.2	0.12	22.9		290%
Permenergo	79	0.7	0.08	0.14	38		582%
Nizhnovenergo	34	0.9	0.06	0.09	23.9		967%
<b>Telecom</b>							
					<b>\$/Access line</b>		
Rostelekom	2386	9.7	1.34	1.02			
MGTS	664	18.3	2.38	1.05	170		581%
PTS	319	9.6	2.83	0.91	182		408%
Perm Uralsviazinform	164	11.5	2.07	1.84	498		384%
Niz Novgorod Sviazinform	117	4.3	1.59	1.08	230		531%
Kubanelectrosviaz	106	5.3	1.04	0.72	199		516%
Samara Sviazinform	48	3	0.68	0.53	116		1085%
Irkutsk Elektrosviaz	34	5.7	0.56	0.46	129		698%

Source Brunswick Brokerage, mkt cap as of Sep. 6, 1996.

**Chart 9.0. Early life cycle of valuation –From asset-based to financials-based valuation**



IX.A.3 Western Auditor, ADR, and Market Capitalization (WAM) –Dynamic measures of early market segmentation

The three factors composing the WAM score allow for an analysis of dynamic market segmentation and its effects on security pricing. While the subject of market segmentation is often referred to in the context of cost of capital of firms, the linkage between capital raising efforts and portfolio investors can easily be established.<sup>4</sup> In our context the meaning of market segmentation is derived from firms possessing special characteristics which allow their equity to compete for international portfolio investment

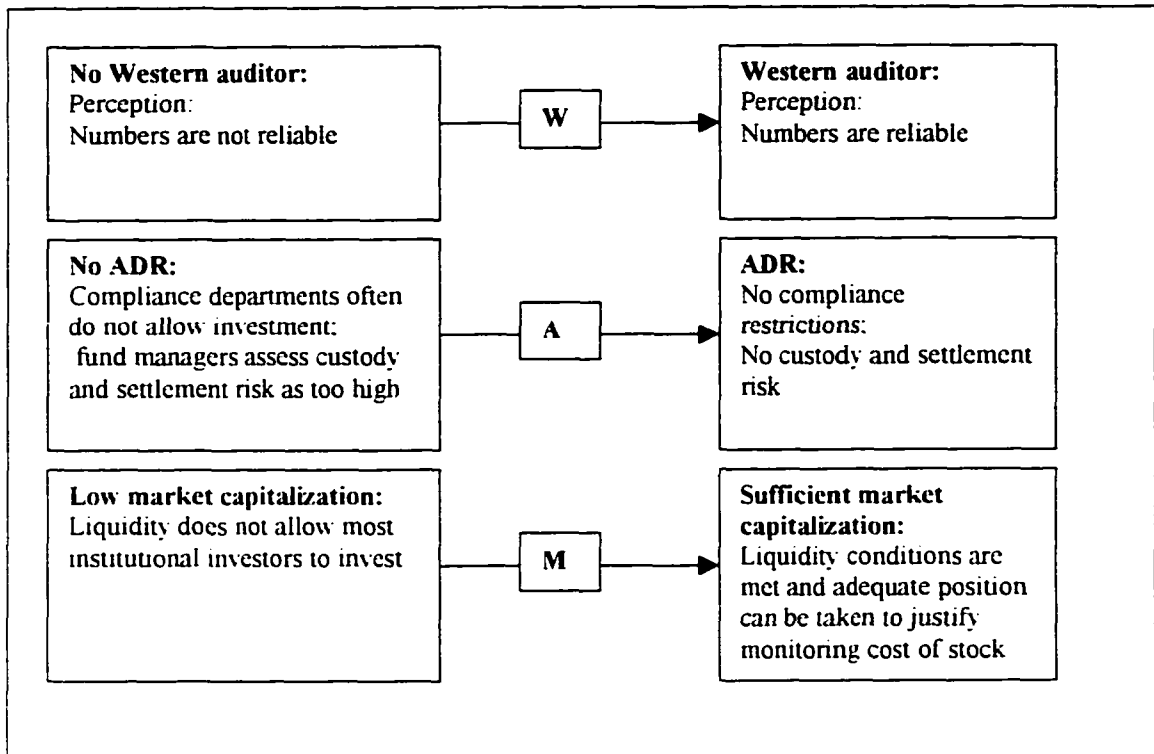
allocations. Hence, segmentation prevails when specific characteristics such as depicted in diagram 9.1. prohibit foreign investors (or in some cases specific and large segments of foreign investors) from purchasing securities. While the factors of Western auditors and the issuance of depositary receipts are practically characteristics that are often within management's reach, market capitalization (which serves in the absence of reliable free float numbers as the best proxy for liquidity) seems to be less comparable to the other two market segmentation factors. Nevertheless, it is a *de facto* criterion which can exclude a large segment of investors. Furthermore, as the origins of the Brazilian equity market have proven, liquidity is a factor which can also fall in the skill-will matrix of management. The example of the Brazilian market during the early 1970s has shown that government policies can stimulate higher free float by giving tax incentives to companies with free float above 30%. This finally led to more companies having a more diversified shareholder base and higher free floats.<sup>5</sup> Moreover, in Russia it is often a function of the government's willingness to sell its stakes in many companies-an action which automatically would enhance liquidity.

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<sup>4</sup> A good paper on market segmentation as a result of share ownership restrictions in Mexico: Ian Domowitz, Jack Glen, and Anath Madhavan. "Market Segmentation and Stock Prices: Evidence from an Emerging Market." *Journal of Finance*, vol. 52, no 3 (July 1997): 1059-1085.

<sup>5</sup> V.H. Errunza. "Efficiency and the Brazilian Capital Market." *Journal of Banking and Finance*, 3 (1979): 355-382.

**Diagram 9.1. WAM factors of market segmentation**



The following three charts display the WAM factor which is used to measure the security's attractiveness in terms of transparency, investability and liquidity. The three measures of Western auditor, depository receipt programs (ADRs), and market capitalization are used to proxy a score representing transparency and liquidity of the security. The aggregate WAM score is computed as the arithmetic average of the individual W-A-M scores for each security as shown in table 9.2.

**Table 9.2. WAM computation**

Characteristic/Score	1	2	3
<b>Western auditor</b>	No Western Auditor	Western Audit Planned	Existing Western Auditor
<b>ADR program</b>	No ADR Program	ADR Program Planned	Existing ADR Program
<b>Market capitalization</b>	Bottom 25% in Sector	Mid-50% in Sector	Top 25% in Sector

Chart 9.1. WAM factor oil/gas 95-96

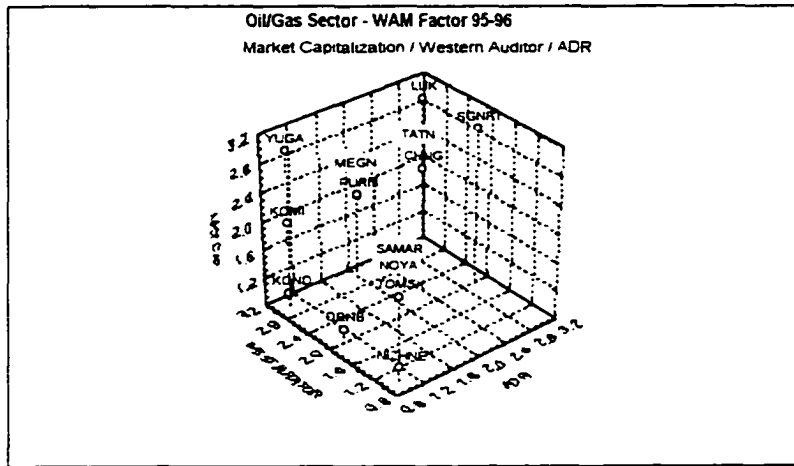
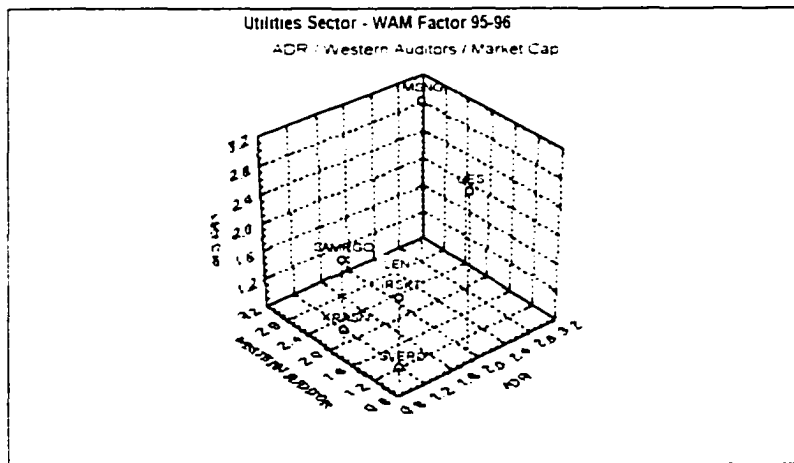
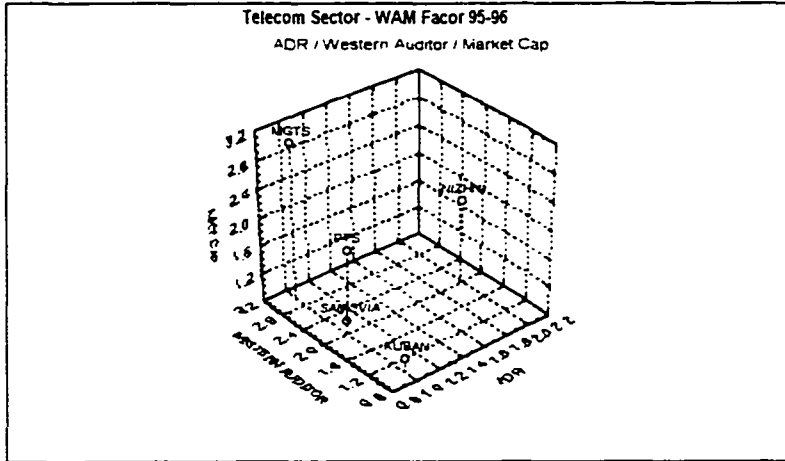


Chart 9.2. WAM factor utilities 95-96



**Chart 9.3. WAM factor telecoms 95-96**



The same method of WAM illustration has been applied for the period from mid-96 to mid-97. The following three charts display the WAM results for the later period.<sup>o</sup>

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<sup>o</sup> The reason why market capitalization was used for both periods instead of free float is the result of free float data being less precise and therefore not an adequate tool for statistical analysis. Moreover, liquidity is fairly well approximated by market capitalization.

Chart 9.4. WAM factor oil/gas 96-97

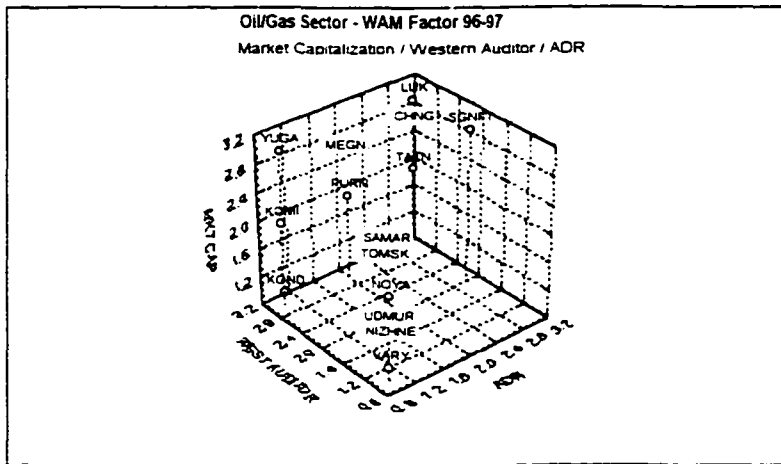
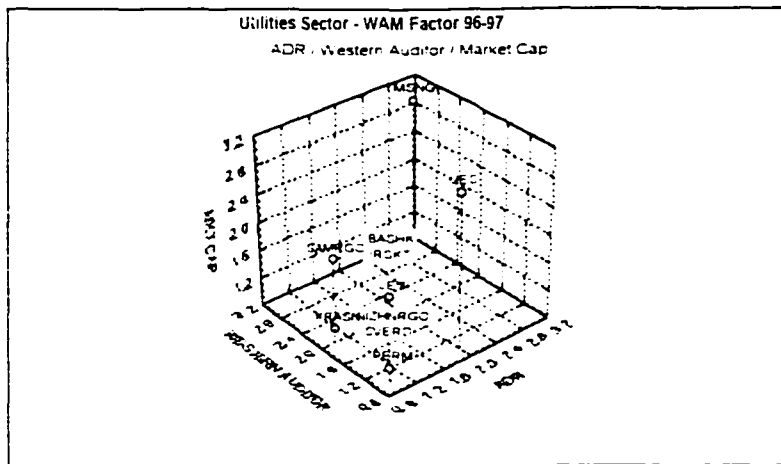
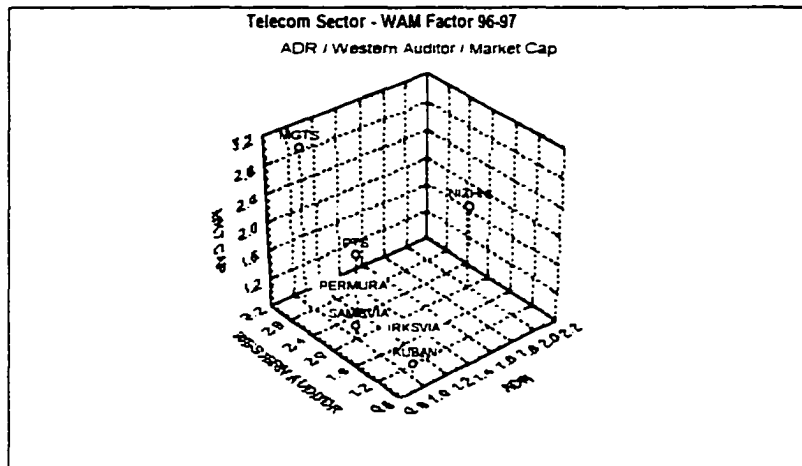


Chart 9.5. WAM factor utilities 96-97





**Chart 9.6. WAM factor telecoms 96-97**



#### IX.A.4 Methodology

In order to determine which factors are most relevant in predicting securities' price performance, each security has been ranked by each individual fundamental ratio according to attractiveness versus its peers during the same time period. Intra-sector rankings have been applied, as different sectors mostly differ in their valuation ratios for basic economic reasons.

For example, a low Price/Sales ratio received a higher ranking than a high Price/Sales ratio, a low Price/Earnings ratio received a higher ranking than a high Price/Earnings ratio. The same concept is applied to asset-based ratios such as Market Capitalization/Reserves, where the lower Mkt Cap/Reserves receives the higher ranking, etc.<sup>7</sup> Therefore, the concept is simply based on the valuation of securities according to

<sup>7</sup> The higher/lower ratios have been assigned in order to later compute the Spearman correlation coefficient with returns.

the various criteria. The underlying logic is that - *ceteris paribus* - assets should become fairly valued over time, which would imply that they sell at similar price/asset and price/financials ratios within each industry.

One may argue that there are other fundamental criteria at play which demand deep discounts or steep premia for specific securities. This is certainly true, but for the purposes of a pre-screening tool, which intends to recommend a specific group of favorably scoring securities for further analysis, it is not relevant as it will be discovered at a later point. Furthermore, the scarcity of information on Russian equities in the initial stages of the equity market may not have provided much additional information to most investors.

The same scoring method is applied to the WAM factor, where a lower WAM factor would receive a lower ranking, reflecting the underlying logic that less transparent and less liquid assets appear less favorably in the investment universe. Finally, the returns for period 1 (mid-95 to mid-96) and for period 2 (mid-96 to mid-97) are ranked. Higher returns would receive a higher ranking. After completion of the ranking exercise, a correlation test can be conducted within each sector and time period between the fundamental variables' ranks and the return ranks, and between the WAM factor ranks and the return ranks.

The methodology used to establish statistical significance is Spearman's rank correlation coefficient. Spearman's rho is very similar to the ordinary correlation coefficient with one of the exceptions that ranks are used as opposed to ordinary

numbers.<sup>8</sup> Spearman's rho, as a non-parametric test which can be adjusted to observations under 20 ( $n < 20$ ), lends itself well to this exercise.

The computation formula is defined as follows:

$$\bar{r}_s = 1 - \frac{\sum d^2}{(1/6)[n(n^2 - 1)] + 1}$$

where  $d$  is calculated as follows: assume  $x$  is the rank of security  $i$  according to criterion  $X$ , and  $y$  is the rank of the same security according to criterion  $Y$ . Then  $d$  can be defined as  $d = y - x$ . The number of observations is defined by  $n$ . Accordingly, the computation involves the essential step of measuring the differences of the ranks for each security under both criteria. For example, suppose one company with a very low P/E receives a P/E rank of 10 (which would be one of the highest). Further assume that the return of the same security achieved is the highest in its industry group during the 12 months period following the initial availability of accounting data for a specific year, and the ranking would be accordingly high (around 10). Then the difference in ranks which is measured would be small. The numerator in the formula defined above, which sums up the squared rank differences, would be small. Since the product of the division by a function of the sample size would afterwards be deducted from 1, such a scenario would, as expected, result in a high correlation coefficient.

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<sup>8</sup> Damodar N. Gujarati, *Basic Econometrics*, 3<sup>rd</sup> ed. (New York, NY: McGraw-Hill, 1995), 372.

To test for the statistical significance of Spearman's rho, the following t-test is used:

$$t = \frac{r_s \sqrt{n-2}}{\sqrt{1-r^2}}$$

with  $\delta = n-2$

The upper critical value of t for  $\alpha=0.05$

#### IX.A.5. Results

The results for the Spearman's rho analysis can be found in table 9.3, where one can find the Spearman correlation coefficient, the test statistic, and the significance level (under  $\alpha=0.05$ ).

**Table 9.3. Spearman's rho analysis results**

***PERIOD 1 (mid-1995 to mid-1996)***

Oil/Gas 95-96	mkt cap	P/E	P/Sales	P/BV	\$/bbl of production	cents/bbl reserves	WAM
Spearman's rho	0.316	0.873	-0.057	0.162	0.083	-0.364	0.555
t-test	1.153	6.195	-0.198	0.570	0.290	-1.354	2.310
Significance level	2.179	2.179	2.179	2.179	2.179	2.179	2.179

Utility 95-96	mkt cap	P/E	P/Sales	P/BV	\$/MW installed '000 \$	WAM
Spearman's rho	0.158	-0.053	-0.193	-0.614	-0.123	0.272
t-test	0.358	-0.118	-0.440	-1.740	-0.277	0.632
Significance level	2.571	2.571	2.571	2.571	2.571	2.571

Telecom 95-96	mkt cap	P/E	P/Sales	P/BV	\$/Access lines	WAM
Spearman's rho	0.238	-0.143	-0.048	0.143	-0.143	0.905
t-test	0.425	-0.250	-0.083	0.250	-0.250	3.679
Significance level	3.182	3.182	3.182	3.182	3.182	3.182

**PERIOD 2 (mid-1996 to mid-1997)**

Oil/Gas 96-97	mkt cap	P/E	P/Sales	P/BV	\$/bbl of production	cents/bbl reserves	WAM
Spearman's rho	-0.162	-0.123	0.480	0.522	0.426	0.348	-0.212
t-test	-0.593	-0.447	1.970	2.208	1.698	1.337	-0.783
Significance level	2.160	2.160	2.160	2.160	2.160	2.160	2.160

Utility 96-97	mkt cap	P/E	P/Sales	P/BV	\$/MW installed '000 \$	WAM
Spearman's rho	-0.566	0.759	0.892	0.711	0.388	-0.651
t-test	-1.943	3.298	5.568	2.859	1.192	-2.423
Significance level	2.306	2.306	2.306	2.306	2.306	2.306

Telecom 96-97	mkt cap	P/E	P/Sales	P/BV	\$/Access lines	WAM
Spearman's rho	-0.509	0.474	0.649	0.684	0.860	-0.018
t-test	-1.321	1.203	1.908	2.098	3.763	-0.039
Significance level	2.571	2.571	2.571	2.571	2.571	2.571

The results of table 9.3 allow to draw the following conclusions:

- The WAM factor is more important than fundamental valuation during the initial phase of the Russian equity market. The WAM factor is significant in the oil/gas sector and the telecom sector for period 1. During the first phase of the market development, none of the fundamental ratios are significant except for P/E in the oil and gas sector<sup>9</sup>.
- Fundamental valuation becomes significant in the follow-up period when more research is at hand and investors are looking at companies more thoroughly. This is the time when the strict flow-of-funds type analysis subsides to an increasingly value-based analysis. During this period, fundamental ratios are significant in all sectors.

<sup>9</sup> The P/E in the oil/gas sector during period 1 may in reality be less significant than it appears as the ranking procedure of the P/E had to make a relatively arbitrary judgment whether the highest P/E or a very low, but negative P/E would take a lower rank. Finally the decision was made that a low, but negative P/E is less attractive than a very high, but positive P/E. The investor may have assessed the situation differently.

$\$/\text{Access Lines}$  is significant in telecoms ( $\text{P}/\text{Sales}$  and  $\text{P}/\text{BV}$  are only marginally non-significant).  $\text{Price}/\text{BV}$  is significant in oil/gas, while  $\text{P}/\text{Sales}$  and  $\$/\text{bbl}$  of production are missing the significance level by only a small margin (compare to period 1, where both measures do not come close to the significance level). In utilities,  $\text{P}/\text{E}$ ,  $\text{P}/\text{BV}$ , and  $\text{P}/\text{Sales}$  are all significant ratios for predicting returns for the next 12 months.

- The WAM factor ceases to be significant during period 2. The exception are utilities where the WAM factor takes on a negatively significant value. This implies that during period 2, investors are looking aggressively for undervalued securities on fundamental measures (see significance of fundamental ratios), and securities with low WAM scores. This means that investors are moving down the liquidity-transparency spectrum in search for more undervalued utilities. In fact, this development was supported by brokerages aggressively pitching the 'regional energos' or those utilities that are less known and located in one of the many regions of Russia.
- At this point it must also be noted that this life-cycle of securities valuation in pre-emerging markets can be interrupted by external shocks (such as the Asian crisis). In such a situation a flight to quality is likely to take place and thus second and third tier stock selection is postponed to a later date. The initial concept regains the upper-hand and high WAM scores serve again as a good indicator of future performance. The transition from stage 1 to stage 2 is crucial for the timing of investment decisions and the best indicator is a large amount of research being dedicated to second and third tier stocks.

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as a low, but negative  $\text{P}/\text{E}$  may foreshadow a turnaround, and a high  $\text{P}/\text{E}$  simply an expensive and fairly valued stock.

**Diagram 9.2. Dynamic assessment model of pre-emerging equity market**

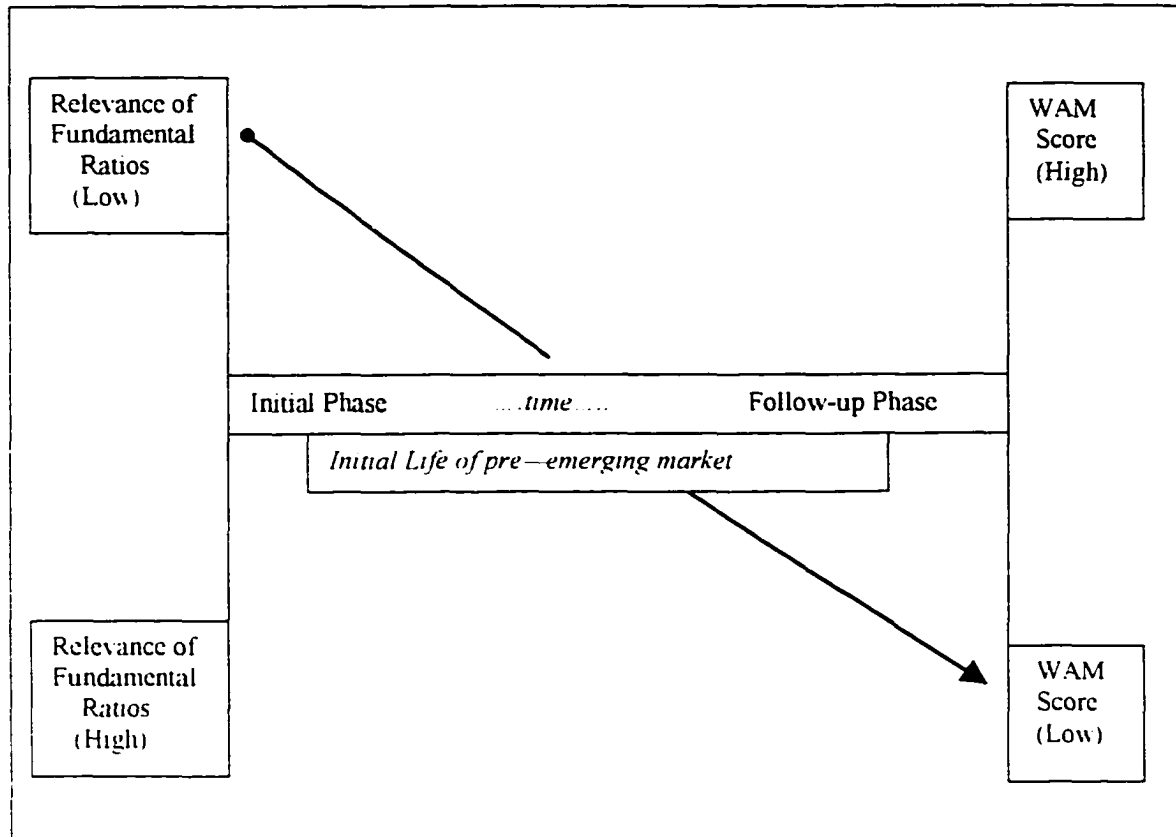


Diagram 9.2 graphically illustrates the results of above described analysis and incorporates them into a general framework. The model describes the changing relevance of fundamental ratios and the WAM factor. The WAM score initially suggests strong relevance for predicting securities' return and later again, becomes relevant as its negative score seems to filter securities that are on the value-chasing horizon of investors moving down the liquidity-transparency spectrum in search undiscovered value. Fundamental ratios rise to relevance as soon as solely WAM-initiated investments have

been explored and more research enters the stage helping to educate investors about individual securities beyond their WAM characteristics.

## **IX.B. Screening framework for pre-emerging market securities valuation**

### **IX.B.1. Four 'top-down' layers and one double-shelled nucleus of analysis**

The previous section gave some evidence of the changing nature of valuation measures during the early phases of the Russian equity market. This section will try to round up the discussion on valuation of pre-emerging market equities by building on the previous section and at the same time creating a larger framework for the valuation of pre-emerging equity markets throughout the early life-cycle.

While it is helpful to understand the dynamics of WAM valuation and fundamental valuation, and while it is important to appropriately use the WAM or the fundamental set of valuation criteria when the decision to enter a particular emerging market has been made, it is at least as important to monitor some key indicators which can allow the analyst to draw more general allocation decisions. In some cases this means that security-level analysis should be completely superseded by 'top-down' factors<sup>10</sup>

In the case of pre-emerging markets, top-down analysis should always precede bottom-up analysis as overall market corrections mostly affect all stocks in thinly capitalized markets which are prone to quick capital withdrawal. The common lack of a strong domestic investor base and the relatively small number of dedicated country funds



is usually not sufficient to provide a stabilizing momentum and resilience in case of top-down pessimism. Thus, during an unfavorable top-down outlook, international investors can choose to completely ignore the market and re-allocate investments to other markets.<sup>11</sup>

From this follows that the above mentioned WAM/fundamental criteria analysis merely forms the nucleus of pre-emerging equity market analysis. Around this nucleus are at least three layers of analysis. The first layer is political risk. This is a topic which generally is discussed at length in non-financial publications. At this point it would explode the frame of this study to engage in detailed discussion of political risk analysis in emerging markets. There are a number of basic guidelines that should be followed, and those are depicted in table 9.4.

#### IX.B 2 Political risk check list

Among the many political risk indicators it appears to be reasonable to single out the following

The composition of parliament and the reliance on one leading political figure is well demonstrated in the case of Romania and the Czech Republic, where parliament is split over economic reform and the minority coalition partner or the opposition will not forgo any opportunity to discredit the ruling faction. Such a situation often occurs in newly democratic countries where no single party could win majority support during the

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<sup>11</sup> Macro/political factors and market valuation and earnings growth are commonly referred to as 'top-down' factors, whereas 'bottom-up' factors relate to the company level, or micro-analysis

<sup>12</sup> The case of the Czech Republic comes to mind, when during 1997 the overall outlook had the effect that most investors completely avoided allocations to this market.

elections and consequently must rely on compromise partnerships with less desirable and less reform-minded political entities.

The threat of military coups or fundamentalists harassing the civilian population and foreigners, is given in those countries, such as Turkey and Algeria, where secularism has not ended the battle against religious hard-liners, which more often than not, have a manifest interest in preserving the status quo or regressing to undemocratic or vulgarly populist concepts. Necessary and revenue-creating privatization and deregulation are often sacrificed on the altar of political appeasement with such forces.

The rise in unemployment and wage arrears can culminate in civil unrest. Ukraine has had its share of miner strikes over the past two years, and so may Russia if public wages remain unpaid. This type of financing "wage-arrears-budget-deficit-financing" by taking credit from public employees is not uncommon in transitional economies which are adhering to IMF/World Bank austerity programs which, among other things, require low inflation and low budget deficits. It can be a destabilizing factor if this credit-creating financing by building up wage arrears lasts too long, or if workers simply do not have alternative income sources.

Nepotism and crony-capitalism exists in virtually every country. If it exists to such a large degree as in Indonesia where tremendous amounts of public funds are channeled into economic value-destroying firms, it can create a disaster. A good indicator is to frequently monitor to what extent the financial system fulfills its role as an intermediary of capital. If loans are given on the basis of names as opposed to credit-worthiness, a red flag should be raised. The absence or inadequacy of bankruptcy laws

often contributes to the opaque nature of the real economic and financial status of companies and their creditors.

Corruption and crime, may affect the transparency of the companies listed on the stock exchange. Investors should be aware that company property and funds may be diverted into bribery fees and security payments. Most emerging market firms are not bound by the Foreign Corrupt Practices Act, which prohibits US firms from paying bribes, mainly for shareholder value protection. In addition to robbing potential dividend payments from the shareholders, corruption and crime cast a dark shadow over the securities market infrastructure as a whole, which will affect overall valuation.

In practical terms, the problems of no legal recourse can be a serious one. While most nations will give evidence of some type of legal recourse, in practice the cost and chance of success will outweigh the possible benefit from taking legal action. This can affect minority shareholder rights and any type of contractual agreements which has been signed and not abided by

Unresolved superregional conflicts, such as Chechnya, Taiwan, the Ukrainian submarine port of Sevastopol, etc. can at any time take on the center stage of news. While they often may have a marginal immediate effect on the market, the sheer complexity, as they are often ill-defined by mainstream journalists, and scope of such conflicts can create devastating consequences. Pipeline-cracking terrorism in the Caspian region, and cut-off from gas supply to Ukraine by Russia are just two to be mentioned. It is a quintessential task for the astute pre-emerging market analyst to keep the fingers on the pulse of such developments. There are several regional reports issued on a weekly

basis, and many more web sites which cover local tensions beyond CNN headline material, which are all helpful, accessible, and inexpensive.<sup>12</sup>

Finally, the popularity and sustainability of current reforms is as important a checkpoint as all others. Reforms which are not backed by the population are to die at a young age. Romania is the best example at hand. It has been almost eight years that reformers have struggled simply to get defeated by reactionary forces in the political spectrum which exploited any form of hardship programs as a fertile ground to launch a populist campaign which eventually would slow down economic reform.

**Table 9.4. Political risk checkpoints for pre-emerging markets**

Political risk check points	Case examples
Composition of parliament? Reliance on one leader?	Romania, Czech Rep.
Strength of military / Fundamentalists? Possibility of coup?	Turkey, Algeria
Rise in unemployment/Wage arrears/Civil unrest?	Russia, Ukraine
Nepotism-and crony-capitalism-based trade regime?	Indonesia
Corruption/crime?	Nigeria, Slovakia
No legal recourse?	Nigeria, Slovakia
Latent and unresolved superregional conflicts?	Russia (Chechnya), China (Taiwan)
Popularity and sustainability of reforms?	Romania, Turkey

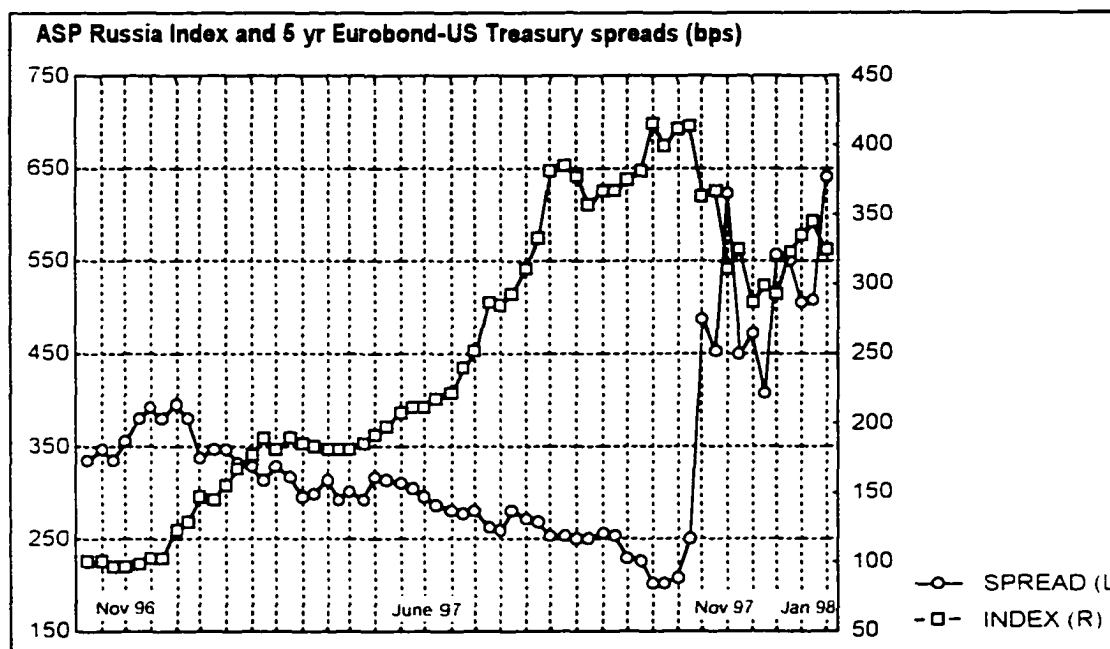
### IX.B 3. Macro screening tool

The second of layer of analysis is the overall macro-situation of the country. Again a topic which could fill volumes and which still would fall short of completeness. The engaged pre-emerging markets analyst who cannot dedicate all effort to macro-

<sup>12</sup> Particularly useful are reports emanating from the New York-based East-West Institute which e-mails

analysis is advised to use the Eurobond-US-Treasury spread as a proxy for the macro-outlook of the country. While fixed income default risk is not necessarily a substitute for more comprehensive analysis, and while the willingness and ability to service and repay sovereign debt is not necessarily the most conclusive indicator of macro risks affecting the equity market, the rudimentary stages of pre-emerging equity market index performance have revealed a strong negative correlation with the sovereign spread developments. (see chart 9.7.)

**Chart 9.7. Russian Index and Russian Eurobond spreads over US treasuries (bps) 1996-1998**



Source: Bloomberg

Naturally, Eurobond-spreads cannot substitute for a more formal approach to macro-analysis, which would have to include public finances, economic growth, inflation, interest rates, privatization, debt burden, deregulation and all matters pertaining

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regional reports to subscribers.

to the viability and sustainability of the currency regime. However, for the purpose of this study which attempts to provide pre-screening tools using the Eurobond-spread as a proxy variable for macro-economic outlook is helpful.<sup>13</sup> The continuous assessment of the macro-outlook which is captured in just one number can be a highly effective tool to make cross-pre-emerging market comparisons. Furthermore, the fixed income yield can also be used to assess the attractiveness of competing investment alternatives (such as equity vs bonds). Turkey provides a striking example of this.

#### IX.B 4. Equity infrastructure assessment

The third layer of analysis has already been discussed at the end of the chapter on equity market infrastructure. It revolves around the question of whether the equity market infrastructure improvement allows for closing of valuation gaps with other markets. In Russia the question has often arisen as to why the best Russian telecoms still trade at a significant discount to comparable firms such as Telebras in Brazil. The answer is simply found in the second-rate nature of Russian equity market infrastructure.<sup>14</sup> The re-rating process takes place when investors collectively agree that a trading system, settlement system, clearing house, custody, shareholder rights legislation, stock market supervision, etc has improved and created a safer investment environment. Hence, continuously monitoring of such developments, becomes as important a task for valuation as the top-down and the micro-valuation (WAM/fundamental) analysis

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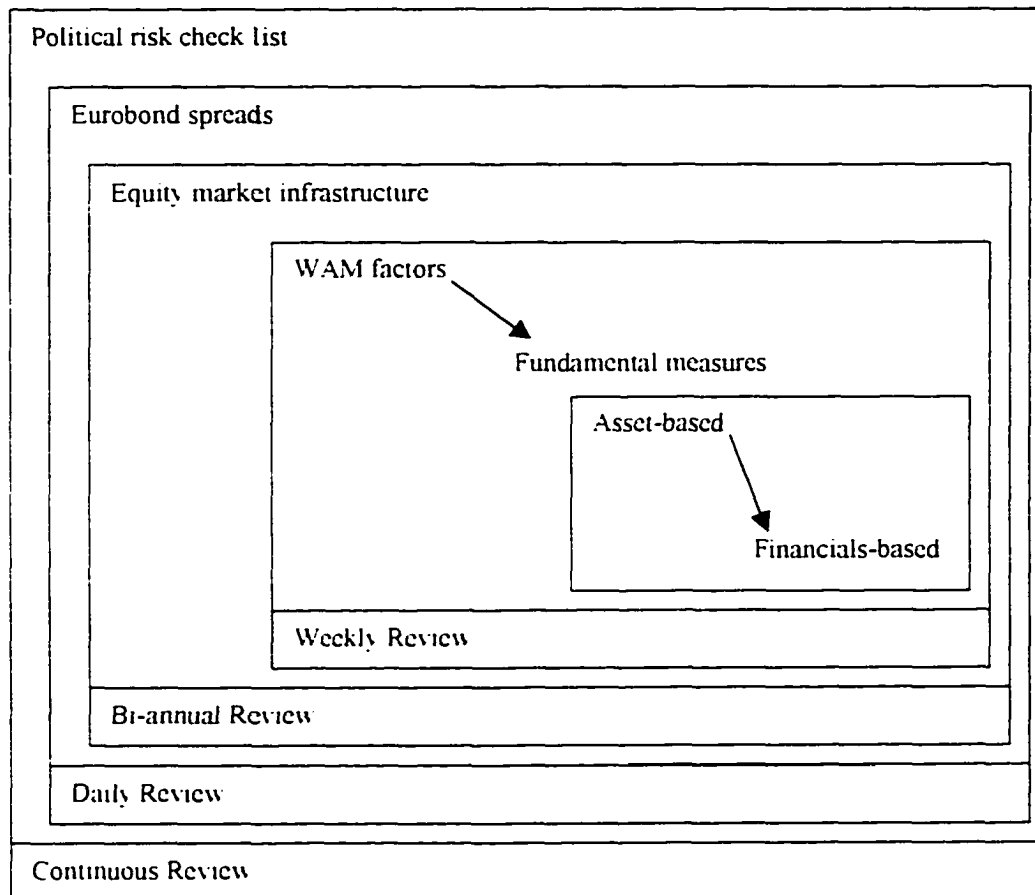
<sup>13</sup> The Eurobond spread qualifies equally well for a 'rough' assessment of the political climate, as the ability and willingness to service and repay debt is also a function of the political situation in a country.

<sup>14</sup> For details on what implies second-rate equity market infrastructure, please refer to the chapter on the Russian equity market infrastructure and particularly the section where the valuation context is discussed.

IX.B.5. Overview of screening framework

Diagram 9.3. illustrates the three main layers of pre-emerging market equity screening and the suggested time intervals in which a review appears adequate.<sup>15</sup> Furthermore, once the WAM/fundamental level of analysis has been reached, an even more precise tool, which suggests the timely switching from the primary usage of asset-based measures to the primary usage of financials-based measures, can enhance performance.<sup>16</sup>

**Diagram 9.3. Three layers and a double nucleus of pre-emerging market equity screening**



<sup>15</sup> For further reference on time-series/cross-sectional studies of political and economic risk variables and their predictability of valuations and future returns, see also: C. B. Erb; C.R. Harvey and T.E. Viskanta. "Political Risk, Economic Risk, and Financial Risk." *Financial Analysts Journal* (Nov/Dec 1996): 29-46.  
<sup>16</sup> As indicated in discussion accompanying chart 9.0.

## Chapter 10

### CONCLUSION

In chapter 1, this study pointed out the high degree of dispersion among brokerage earnings estimates of Russian stocks compared to blue chip stocks in other, more mature emerging markets. This gave rise to the notion of gross informational inefficiencies prevailing when research analysts are making their assumptions about financial projections of Russian firms.

The topic of informational efficiency surfaces again in chapter 3, where equity market infrastructure describes not only deficiencies generating operational inefficiencies, but also the opaque state of rules and disclosure requirements, leading to informational inefficiency.

In chapter 7, informational efficiency is examined in the context of relative market efficiency. It is shown that the transparency-upgrade from the bottom- to the medium-transparency portfolio in fact leads to a higher degree of relative market efficiency. This proves the hypothesis that higher transparency – or higher informational efficiency – generates a higher degree of relative market efficiency. The higher degree of informational inefficiency in the top-transparency portfolio, however, introduces a model of investor segmentation whose effects override the process of higher transparency translating into a higher degree of relative market efficiency. This type of lower relative market efficiency is caused by a segment of investors which can be broadly defined as main stream international equity funds with less dedicated resources to the Russian pre-emerging market and more institutional restrictions imposed upon them than it is the case



with dedicated emerging markets funds which represent a larger share in the medium-transparency portfolio. Among other causes, the theory of noise traders offers a plausible explanation for the lower degree of relative market efficiency in the top-transparency portfolio.

It is also established in chapter 7 that the Russian equity market exhibits a trend towards higher efficiency between January 1995 and the end of 1997. This process underlines the fact that observed relative inefficiencies in the top-transparency segment of the market will eventually level-off. The threat of the perception of an uneven playing field deterring foreign investors will increasingly cease to exist as the currently observed concentration of non-dedicated funds in the top-transparency segment of the market will be diluted as higher informational efficiencies will emerge and a surge of more dedicated and highly-trained pre-emerging market analysts will fill the rows of many international equity funds.

In chapter 8, evolving informational efficiency associated with the issuance of ADRs is assessed. Here it becomes visible that ADRs generate higher informational efficiency by requiring higher standards of accounting disclosure and in most cases some sort of investor relations program which keeps investors better informed. Furthermore, trading trends in underlying shares with depositary receipt facilities in place exhibit lower spreads than shares without ADRs. This in itself is a dimension of higher relative market efficiency as trading becomes more fine-tuned to new information disclosure, as opposed to trading which only takes place when information is dramatic enough to justify buy/sell action despite large spreads.

Chapter 8 also addresses the valuation dimension of ADRs and the underlying shares. It is established that there in fact are economic effects associated with issuing ADRs which translate into a higher share price of the underlying shares around the issuance date. Common pitfalls are described which may lead the unsuspecting investor to purchase ADRs when the true motivation of the issuer are not congruent with the real informational efficiency and liquidity benefits of an ADRs program. Further, the often ignored peer valuation dimension of ADRs is described. Issuing an ADR, especially when there is no longer a scarcity premium attached to it (as increasingly is the case with Russian ADRs flooding the market) means that those companies are carefully valued against their international peers in terms of operating efficiencies. If ADR issuers do not live up to the international ADR-fitness criteria and can compete head-to-head with ADRs in a similar industry from other emerging market, the share price-boost effect may very well not take place. Thus, ADR issuance implies that companies must be willing to be valued to a lesser degree as a function of their particular home-markets, but to a larger degree according to international benchmarks

The valuation framework presented in chapter 9 is based upon the availability of only scarce information during the early phase of a pre-emerging equity market. The results of the analysis suggest that investors participating in the early phase of an equity market, use a different set of valuation parameters to make their investment decisions. This set of parameters which serves well to assess future performance of equities during the early phase of the market, is defined as WAM. WAM is a proxy variable reflecting the degree to which firms have Western auditors, depositary receipt facilities, and

sufficient liquidity. In other words, WAM indicates to what extent informational efficiency is present and to what extent foreigners can participate in such stocks.

Accordingly, informational inefficiency creates the basis for a new screening tool for pre-emerging market equities in the early phase of the market life-cycle. During the later phase, when more research becomes available and a higher degree of informational efficiency prevails, the valuation screen switches from the WAM factor to more fundamental measures. An even higher degree of valuation fine-tuning is presented with the switching from asset-based to financials-based measures during the second phase of the early pre-emerging equity market. This is a result of financial information becoming more reliable and accessible, and consequently investors becoming increasingly discriminate versus asset-based measures. Chapter 9 concludes by offering a comprehensive screening framework for pre-emerging market equities based on political, macro-economic, equity infrastructure, and WAM/fundamental factors

Overall, this study explores the relationship between informational efficiency, relative market efficiency, and valuation of pre-emerging market equities in Russia. Informational efficiency and valuation are closely linked as will be shown in the next paragraph. Relative market efficiency, a result of informational efficiency in most cases, is an indicator of level playing field conditions. Severe forms of relative market inefficiency can lead to foreign investors abandoning the market (as described in VI A 2 )

The main drivers of informational efficiency examined in this study are: (1) equity market infrastructure and rules, (2) transparency of securities, and (3) liquidity-transparency enhancement factors (such as ADRs/GDRs).

X.A. The valuation dimension of informational efficiency

The valuation dimension of informational efficiency is best illustrated with an analogy to the natural sciences. As economics borrows most of its terminology from the physical sciences, the more human-controlled discipline of financial valuation seems to present a case where molecular biology provides useful terminology and examples of the dynamic mechanisms to describing the relationships.<sup>1</sup>

X.A.1 Valuation and informational efficiency in pre-emerging markets – an analogy

In this analogy investors' *valuation framework* can be described as an *attack cell*, or a *free radical* which floats around the *pre-emerging market and its companies* which can be described as a *cell* with its cell profile defined by *informational efficiency relationships* presented by equity market infrastructure, liquidity, and securities' transparency. *Informational efficiency enhancement-factors* are (1) higher transparency (brokerage research), (2) improving equity infrastructure, and (3) ADRs. All of which can be described as *anti-oxidants* which neutralize currently floating free radicals in

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Common economics terms such as equilibrium, elasticity, depression, deflation, deadweight loss, worker collusion are all rooted in the physical sciences.

search of cell attack (and exploitation of mispricing resulting from informational inefficiency).

In order to become effective the tools of the free radicals have to change. Free radicals are highly flexible and imaginative molecules which need to adjust to the new set of cell profiles in order to pursue their goal of attacking the cell and reaping its rewards. In this sense, a dynamic process is created where free radical attack cells continuously challenge existing cells. Anti-oxidants (informational efficiency-enhancement factors) continuously adjust their profiles to neutralize free radicals.

It is this virtuous cycle which induces all market participants to play the game of pre-emerging markets. Information is crucial and imagination is indispensable when modification and switching of valuation frameworks is continuously required. Rapid modifications and adjustments on both sides, therefore become mutually rewarding in an upward-spiraling process of evolving informational efficiency, which after all, represents the hallmark of the emergence process.

X.B Who benefits?

The question now arises: Who benefits from the results presented in this study? The answer is clear. There are three main beneficiaries, (1) the portfolio manager, (2) the policy maker and (3) the welfare of all those whose lives are a function of economic growth and welfare related to the pre-emerging market.

The pre-emerging market portfolio managers defines informational inefficiencies and devises her valuation screens accordingly. This way, companies and markets are

rewarded for showing the potential of being able to alleviate informational inefficiencies (as demonstrated in the WAM framework) before the often cumbersome steps are actually taken. This type of valuing on the basis of 'potential' introduces provisional credit into the pre-emerging market and thus provides incentives to create higher informational efficiencies for those companies, or those pre-emerging markets that are less developed.

The portfolio manager in turn is rewarded for making a fundamentally sound judgement during a situation where a vacuum of conventional financial data prevails. The soundness of a valuation screen based on potential for informational transparency is recognized by other investors and securities returns are commensurate with this consensus recognition (as demonstrated in chapter 8. WAM does work!).

The policy maker benefits by being able to target transparency-enhancement factors directly. Statutes on disclosure requirements and minority shareholder rights will decrease the valuation discount to other markets and reward the companies with higher market capitalization and therefore a lower cost of capital.<sup>2</sup> The same goal can be reached for a target program requiring companies to have sufficient transparency and liquidity<sup>3</sup>

Finally, all people, whether they are investors, Russian factory workers, tourists, or citizens of trading partners with the pre-emerging market nation, will benefit. Economic growth, technology transfer and professional management will all be tertiary.

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<sup>2</sup> A company with a P/E of 3 has a cost of equity capital of 33%, a company with a P/E of 10 has a cost of equity capital of only 10% - it needs to pay shareholders 1 dollar in earnings for 10 dollars in equity capital as opposed to the first company which needs to pay 1 dollar for only 3 dollars in capital (simplified illustration!).

<sup>3</sup> Higher liquidity can be achieved if the government stops being a "share hog" and sells off its stakes in order to increase the free float of the stock.

or higher order effects of the actions conducted by market participants and regulators *who are aware* of the crucial importance of informational efficiency.

To other researchers in this area it can be suggested that a more comprehensive study is undertaken looking at the same relationships as soon as more data on other pre-emerging markets becomes available, particularly for countries such as Ukraine, Romania, Bulgaria, the central Asian republics, sub-Saharan Africa and the Maghreb region. This would establish a higher degree of external validity for the findings presented in this study.

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**II. Annotated websites on the Russian equity market**

Historical archive of Russian equity prices used for analysis:

**<http://www.fe.msk.ru/infomarket/rinacoplus/indicat/metod.html#3>**

Life price information on RTS-1 and RTS-2 stocks

**<http://www.rtsnet.ru/rts/lasthour.htm>**

The homepage of the Federal Commission for the Russian Securities Market (FCSM):

**<http://www.msk.ru/lat/win/infomarket/fedcom/>**

Updates on regulatory issues and general market analysis.

**<http://www.skate.ru>**

**III. Brokerages included in survey**

Alfa Capital	Merrill Lynch
Aton	Morgan Stanley Dean Witter
Brunswick Brokerage	Paribas/United Financial Group
CentreInvest Securities	Pioneer Securities
Credit Suisse First Boston	Prospect Investment
Daiwa	Renaissance Capital
Deutsche Morgan Grenfell	Rinaco Plus
ING Barings	Rye, Man & Gore
Lentrometerialy	Salomon Brothers
MC-BBL	Sector Capital
MFK-Bank	Troika Dialog



#### **IV, AKM Indices methodology and quarterly returns of AKM Industrial Index**

This index is used for purposes of demonstrating the development of the Russian equity market in chapter 3 only. For time series analyses the RinacoPlus equity prices and index are used (see website)

Methods for AK&M Indices calculation  
effective from April 15, 1997

##### **I. AK&M Indices calculation**

AK&M Stock Indices include AK&M Composite Index, Industrial Companies Stock Index and Branch Stock Indices.

For indices calculation the companies listings are used. The listing is compiled according to the principles described in part III of these methods. The listing is determined by the stock market of the branch of industry for which the index is calculated (if it is a branch index) or by the stock market as a whole (if it is AK&M Composite Index).

All AK&M Indices are computed by the same scheme. It is based on determining the relative change of listed companies total market capitalization. The quotation prices (see part II) are used to calculate capitalization.

Any AK&M stock index is calculated only in case if there no less than 3 stocks in the corresponding index listing, for which the quotation prices are available. If this condition is not observed the index value remains unchanged.

The value of the Index for the current date is calculated according to the following formula:

$$IC = IP * (S F[I] N[I] QPC[I]) / S F[I] N[I] QPP[I],$$

where

IC - is the value of the Index for the current date;

IP - is the previous value of the Index;

I - is the number of particular stock in the listing;

F(I) - is the flag whether the stock No I has the quotation price for the previous date and for the current date (0 or 1);

N(I) - is the number of the stocks No I outstanding;

QPC[I] - is the quotation price of the stock No I for the current date;

QPP[I] - is the previous quotation price of the stock No I.

S F[I] N[I] QPC[I] - is the total capitalization for the current date for all the stocks in the listing which have the quotation prices for the current date;

S F[I] N[I] QPP[I] - is the total capitalization for the current date for all the stocks in the listing which have quotation prices for the previous date.

The weight of the stock is calculated by the following formula:

$$W[I] = (F[I] * N[I] * QPC[I] / S F[I] * N[I] * QPC[I]) * 100 \%$$

The weight shows the extent to which the change in the price rate of the stock effects the change of the Index.

##### **II. The quotation price**

## FRONTIER EQUITY MARKET VALUATION

### Bibliography

The quotation price of a stock is a synthesized price calculated using Russian OTC bid and asked prices and the prices in Russian operating trading systems. If the stocks of the company from the listing are regularly traded in any trading systems the calculation of the quotation price involves the best bid and asked prices in these systems. The trade system for each company is defined quarterly by AK&M expert council, the opinion of issuers' specialists and current market infrastructure being taken into consideration as well. The source for OTC prices is AK&M - List Database, encompassing more than 10000 daily bid and ask quotes from more than 500 Russian broker/dealer companies.

The quotation price is calculated only for liquid stocks. Liquidity criterion is availability in AK&M - List database no less than 3 bid and 3 asked quotes for the stock on the given date.

The quotation price involves the trade system price if the number of transactions with the corresponding stock in the appropriate trade system is more than 3 on the given date. To exclude the distorting effects of non-relevant occasional transactions (the price of which differs essentially from the market) the average of closing cap bid (HighBid) and floor asked (LowAsk) quotes are used as a trade system price.

The price of a stock in the trade system is included into the calculation of the quotation price with the weight (P) corresponding to a trade system turnover share in the total market operations. The weight (P) is determined once a quarter as follows:

$$P = \text{SUM}(P_i) / 3, i=1..3.$$

where

i - number of the month in a quarter

P<sub>i</sub> - the weight of the trading system in month i.

$$P_i = \text{Sum} (K_{ij} * \text{NUMTS}_{ij} / \text{NUMTOTAL}_{ij}) / \text{Sum} (K_{ij}).$$

j = 1..k.

where

j - number of the company listed in the trading system and for which information from the registrar on the total market transaction volume in a previous quarter is available.

NUMTS<sub>ij</sub> - number of stocks of the company j, traded in a

trading system in month i. NUMTOTAL<sub>ij</sub> - number of stocks of the company j

re-registered in month i.

K<sub>ij</sub> - market cap for the company j at the last working day of the month i.

k - number of stocks traded in the trading system and for which data from a registrar on total market volume is available.

Finally the quotation price formula is as follows:

$$QP = (1-P)(\text{AvgBBid} + \text{AvgBAsk})/2 + P * (\text{HighBid} + \text{LowAsk})/2$$

Where average best bid (AvgBBid) is an average of 25% of best (maximum) bid quotes, and average best ask (AvgBAsk) is an average of 25% of best (minimum) ask quotes in AK&M -List database.

### III. The principles of compiling and changing the stocks listings for AK&M Indices calculation

The stocks listings on which the AK&M Indices are calculated are compiled taking to account the impact of a stock on the situation at the stock market. Capitalization and sufficient liquidity of the particular stocks at the market are considered as the main factors.

The listings are revised once a quarter. The changes in the listings and the date of change are published in Finansovyje Izvestija, Moskovskije Novosti (Moscow News), Delovoj Mir, Delovoj Ekspres and other newspapers, and transmitted by Business-TASS, Reuters and other agencies.

For calculating the AK&M indices the capitalization is determined for each of the stocks in the listing on the basis of the number of common stocks outstanding. Only already allocated issues of common stocks are taken in account, preferred stocks are not taken in account at all.

The number of stocks at the market is calculated on the basis of the state registration documents for the issue, issue prospectus and the report on the results of shares placement. The stocks of privatized companies in the state's possession, or those owned by holdings, are considered as allocated.

The decision to take into account new issues for the indices calculation is made after their allocations are officially accounted for. The date is determined when the new issues should start to be taken in account.

If there is an increase in the issuer's Charter capital that resulted from revaluation of its fixed assets, by its stocks par value increase, the number of stocks used for the indices calculation remains the same.

**FRONTIER EQUITY MARKET VALUATION**  
**Bibliography**

If there is an increase in the issuer's Charter capital that resulted from revaluation of its fixed assets, and new stocks are issued and proportionally allocated to the shareholders of that company, the stocks number used for indices calculation is changed after the company passes the decision to increase the Charter capital and registers officially the additional issue.

If the stocks number is increased due to split, without the change in the company's Charter capital, the number of stocks is changed after the company passes the decision to split the stocks and registers it officially.

If the Charter capital is decreased by reducing the number of circulating stocks and by the company's redeeming a part of them, the stocks number is changed after the redemption and the cancellation is officially registered by the state.

**Quarterly Returns of AKM Industrial Index**

Return Last day of Quarter	
31%	12/01/94
11%	28/03/94
136%	29/06/94
607%	29/09/94
-16%	29/12/94
2%	31/03/95
7%	30/06/95
-13%	29/09/95
-9%	29/12/95
-2%	29/03/96
183%	28/06/96
-17%	30/09/96
19%	30/12/96
64%	31/03/97
29%	30/06/97
45%	30/09/97
-14%	30/12/97

### ABSTRACT

This study explores the question of market segmentation affecting securities behavior from the perspective of relative market efficiency and pre-emerging market equity valuation in the Russian equity market.

Relative market efficiency is found to be a function of securities transparency, with top-, medium-, and bottom-transparency portfolios displaying different degrees of relative market efficiency. This is primarily a function of such features as segmented investor categories trading securities with different characteristics, and institutional barriers which deter large segments of foreign investors to participate in less transparent issues. Concisely, it is established that highly transparent securities can be described by a lower degree of relative market efficiency, medium-transparency securities are characterized by a higher degree of relative market efficiency, and low-transparency securities again display a lower degree of relative market efficiency. Furthermore, it is established that the Russian equity market displays a trend of rising relative market efficiency over time, which for market infrastructure-related reasons lapses back into lower relative market efficiency during times of market corrections.

The general role of American depositary receipts (ADRs) in pre-emerging equity markets is examined in the context of informational efficiency. ADRs in the Russian equity market affect returns of underlying shares. The results of an event-study test confirm the conventional wisdom that buying underlying shares around the ADR issuance date can be a lucrative investment. Common pitfalls and trends are outlined and serve the analyst as a guideline to the future of the market for underlying shares of future Russian ADRs.

A dynamic valuation model for pre-emerging market equities is established: the factor (WAM) composed of (1) Western auditor, (2) ADRs, and (3) Market capitalization. WAM scores are more meaningful for assessing future equity performance during the initial "genesis" period of the equity market. Later, when more information becomes available, more fundamentally-oriented measures become better indicators of future equity performance.

This study concludes by taking a look at the nucleus and three surrounding layers of pre-emerging market equity analysis: (1) political risks, (2) macro-risks, (3) equity market infrastructure valuation, and (nucleus) WAM/fundamental analysis.

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## EDUCATION

### **The Fletcher School**

**Medford, MA**

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Comprehensive Ph.D. examination passed with distinction in the fields of International Finance and Banking, International Manufacturing Industry and European Diplomacy.

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### **The Fletcher School**

**Medford, MA**

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### **Harvard Business School**

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Team leader during Spring 1995 business simulation course.

### **Harvard Ukrainian Research Institute**

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Intensive (Ukrainian language) courses (1994) GPA 4.0

### **Tufts University**

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International Relations/Development Economics, *magna cum laude*.

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---

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Intern. Financial Institutions Group (Summer 1995)

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Intern. Global custody risk management department (Spring 1995)

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### **Languages:**

**German** (fluent)

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**French** (advanced)

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**Ukrainian** (basic)

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Website design

Statistica

MS Excel, Word, Power Point

Factset, Bloomberg, Datastream

Lipper Analysis

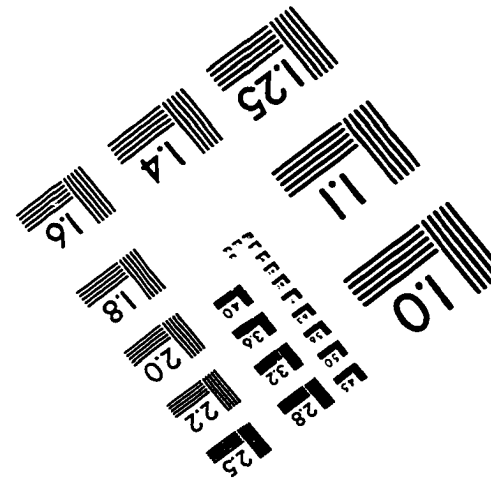
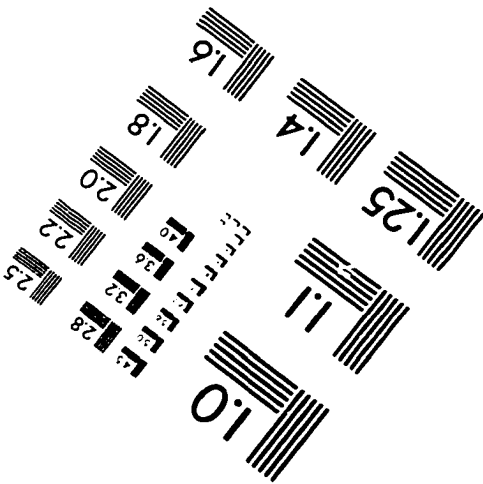
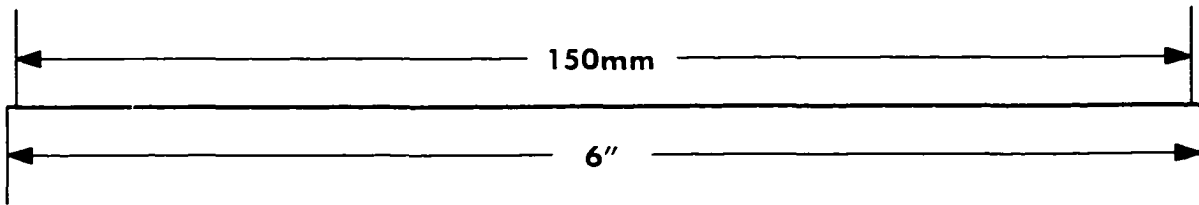
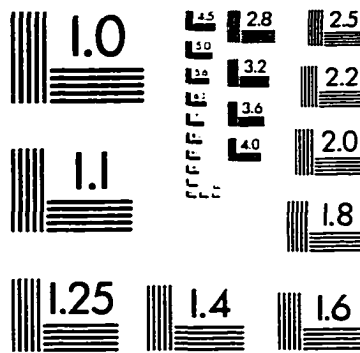
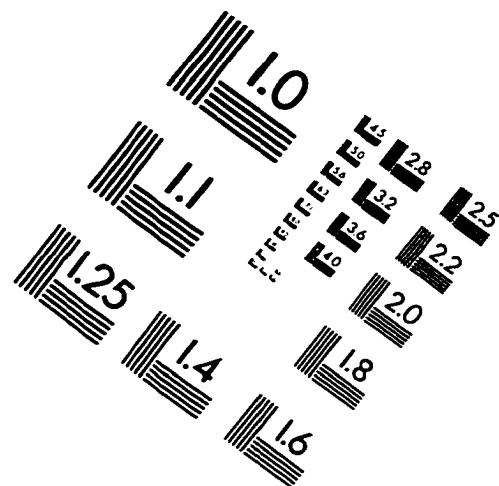
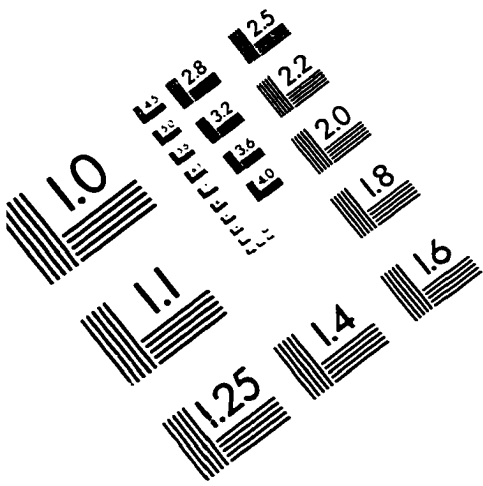
### **Publications:**

“Die neuen Masterminds.”

Frankfurter Allgemeine Zeitung, Feb. 6, 1996

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