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Regulation, Ownership and Liquidity on the Serbian Stock Market

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Executive Summary

We study the legal framework, ownership structure and liquidity in the Serbian stock market. Disclosure requirements and liability rules provide a qualitative assessment of the legal framework. Our analysis suggests that the legal framework is formally close to the Anglo-Saxon world. This is because the specification and standardization of the contracting framework is fairly high and the supervisor is legally independent with strong investigative powers. The question remains to what extent is the law practically implemented. In the next step, we use prospectus data for 15 companies in the BELEX15 index to calculate an ownership concentration index. Data availability is the main reason of why we focus only on the 15 companies. The data restriction limits the scope of our analysis since there are as many as 1,800 companies in Serbia though a majority of their stock is traded infrequently and their market capitalization is not large. Ownership concentration in our sample of firms is low and it is not related to stock returns. Presence of foreign owners is slightly correlated with greater stock market returns. We proceed to assess the level of liquidity of the Serbian stock market using standard measures and daily stock market data. The market appears to be liquid and efficient. The number of transactions affects volatility but arrival of new publicly available information does not affect trading frequency. Both volatility and a newly constructed summary indicator of liquidity change over time and are related to the political cycle in Serbia. Finally, we analyze intraday transactions data and conclude that the number of transactions lowered as compared to the same period a year ago. Our results are representative for the Serbian stock market only to the extent, to which our sample of corporations reflects the overall trends for Serbian firms.

1. Introduction

The Serbian financial markets have not been studied as thoroughly as other emerging European markets. The only exception known to us is our report on the Serbian bond market (see Jefferson Institute 2005) followed by a research paper Hanousek, Kočenda, and Zemčík (2007). This study focuses mainly on the market for stocks. Serbian financial markets and a corporate sector are still in formation. The Securities Law was introduced only in 2004. It established a securities commission and a central depository and share registry. In the same year, the Company Law and the Privatization Law were substantially revised and amended and the National Bank of Serbia decided to improve quality of major corporate shareholders. However, the report of the European Bank for Reconstruction and Development (2004) assigned rating 2 to Serbia (the maximum is 4+) which is low as compared with the Czech Republic or Poland (both 3+). The present report analyzes the legal framework in Serbia, the ownership structure, and liquidity. The parts of the legal system relevant to securities' trading are examined from both the perspective of the written law as well as from the perspective of its actual implementation. The ownership structure is examined using prospectuses of traded companies and linked to stock returns in these companies. Liquidity of the market is analyzed using both daily and intraday data. The scope of our analysis is limited to companies, which are in the BELEX15 index. The number of traded companies in Serbia is much higher as an outcome of the privatization process though these companies are mostly small and their shares are not often traded. Therefore, we believe that some of our conclusions are applicable more broadly, especially the ones based on the examination of the legal system.

The qualitative analysis of the legal framework is based on La Porta, Lopez-de-Silanes, and Shleifer (2003, LLS henceforth) who characterize a legal environment by disclosure requirements and a liability regime. Their benchmark hypothesis is that a general legal framework is sufficient and there is no need for a specific securities law. In such environment, reputational and legal reasons are enough for issuers, auditors, and underwriters to provide an accurate assessment of securities offered to investors. Investors are informed and prefer to purchase financial assets from reputable firms.

There are two alternative hypotheses that differ based on to what extent the law matters. A milder theory suggests that the specific securities law can be beneficial for the market. Specification and standardization of the contracting framework can reduce costs of trading in financial markets. This theory is labeled as a private enforcement hypothesis. A stronger version of this theory claims that the securities law is still

insufficient for proper functioning of the financial market. The trading should be supported by a public independent enforcer such as a Securities and Exchange Commission that has powers to impose sanctions. This is the public a public enforcement hypothesis. LLS test the theories using data for 49 markets (not including Serbia) and find in favor of the private enforcement hypothesis.

LLS capture the private enforcement hypothesis by six variables for disclosure requirements and by three variables for a liability regime. The disclosure requirements include a variable prospectus which is unity if the securities law allows for financial assets to be traded without delivering the prospectus to the investors. Similar variables are constructed for rules for publication of compensation of directors and key officers in the prospectus, for disclosure requirements regarding the equity ownership structure, inside ownership, irregular contracts, and transactions between an issuer and involved parties. The six variables are aggregated in a disclosure index. The liability regime is characterized by what a plaintiff needs to demonstrate in a court to show that the issuer is liable for experienced losses. The base case is negligence defined by omitting information from the prospectus. The burden of the proof can be higher if the plaintiff also has to demonstrate reliance on information in the prospectus, which caused her damages. Sometimes there is reliance and causality but not negligence, or so called gross negligence. The exact specification of the burden of proof for directors, distributors and accounts is combined in a burden-of-proof index that is then aggregated with the disclosure index.

The public enforcement hypothesis is characterized by four attributes of the regulator/supervisor. These are its independence, its investigative powers, and the right to impose criminal and non-criminal sanctions. The independence is captured for example by how the members of the supervisor are appointed and dismissed or by whether the supervisor remains with the legislature of the Ministry of Finance. Investigative powers can include the right to request documents from issuers, distributors, and auditors. Non-criminal sanctions may include enforcement of institutional changes or rectification of non-compliance with disclosure requirements. Criminal sanctions are described by whether they are applicable, to whom they apply, and what kind of conduct triggers them. All four main attributes of the regulator are combined in an index of public enforcement.

In the present study, we construct the private and public enforcement indices proposed by LLS.

Implications of the ownership structure have been thoroughly studied in emerging markets, which provide a natural experiment of a transition from state ownership to various ownership types. For example, Djankov (1999), Lízal and Švejnar (2002), and Cull, Matesova, and Shirley (2002) investigate effects of ownership concentration on performance while controlling for various types of owners in newly privatized firms. Makhija and Spiro (2000) and Pajuste (2002) consider the impact of the

ownership structure on stock prices (i.e. the firm's market value). Makhija and Spiro (2000) find that share values are positively related to the ownership stakes of foreigners. Other research studies indicate that performance of firms improves with the presence of foreigners among owners. Lízal and Švejnar (2002) conclude based on a number of performance indicators that the long-term performance of former state enterprises is better if foreign owners are present. Lízal (2002) shows that foreign controlled enterprises have a smaller probability of bankruptcy and superior financial indicators as compared to those of firms with no foreign involvement. Sabirianova-Peter, Švejnar, and Terrell (2005) find that the top deciles of overall efficiency are typically occupied by foreign-owned firms. Corporate governance is also studied using a qualitative approach based on a detailed analysis of dividend policies that often serve as a tool to abuse of minority shareholders. A simple comparison of dividend yield across companies (see Dragota 2006 for a similar study for Romania) is followed by a regression analysis using a two-step model from Bena and Hanousek (2006). The survey of literature indicates importance of ownership concentration, presence of foreign owners, and dividend policies. Our sample size is limited to BELEX15 companies, which excludes the possibility of advanced econometric analysis. However, we are able to characterize the ownership concentration using the Herfindahl-Hirschman Index and link it to stock returns. Similarly, we relate foreign ownership to these returns.

Liquidity is perceived as a positive attribute of a financial market. Its benefits are numerous. Liquid markets make it possible for central banks to use open market operations to conduct the monetary policy. Asset-liability mismatches regarding maturity and currency are easier to handle in liquid markets. Finally, liquid assets are more attractive for investors. On the other hand, the lack of liquidity creates two main types of risk. Funding liquidity risk refers to the situation when a firm is cannot finance its cash-flow needs. Market liquidity risk occurs if a firm is not able to close its position without affecting the market price. This report focuses on stock market liquidity in Serbia. We first follow methodology suggested in Sarr and Lybek (2002) and calculate some basic measures of liquidity. These measures characterize features of liquidity such as tightness, depth and breadth, and resiliency (see Section 5 for details). We calculate average daily liquidity measures such as absolute change in prices, the number of transactions, the turnover, bid-ask spreads, and the variance ratio.

We continue our analysis by studying the relationship between number of transactions and volatility, and between trading frequency and publicly available information. The used model specifications are taken from Gopinath and Krishnamurti (2001). Volatility is then modeled separately. We focus on the time-varying volatility of the returns on the BELEX15 index. Since it is not constant over time we use the Generalized Autoregressive Conditional Heteroskedasticity model of Bollerslev (1986). We relate the changes in conditional volatility to political events. The next step is to construct a time-varying measure of liquidity as well. Liquidity of a financial market can be described by the bid-ask spreads and return-to-volume ratios. We define a new liquidity premium as the difference between returns on stocks with high bid-ask-spreads

and high return to volume ratios and returns on stocks with low bid-ask-spreads and low return to volume ratios. We combine bid-ask spreads, return-to-volume ratios and the liquidity premium in one summary indicator for the market liquidity. Finally, high frequency data are used to gain yet another perspective on liquidity. Both liquidity and volatility follow the political cycle, which is consistent with findings in Bialkowski, Gottschalk, and Wisniewski (2006). Using 27 OECD countries, they conclude that elections do increase volatility of stock markets.

The rest of the report is organized as follows. Section 2 assesses the properties of the legal framework for functioning of a stock market in Serbia. Section 3 links ownership concentration to stock returns and foreign ownership to stock returns, respectively. Section 4 provides in-depth examination of liquidity attributes of the Belgrade stock market. Section 5 concentrates on liquidity and intraday data. Section 6 concludes.

2. Law on Securities in Serbia

The basic regulatory framework of the securities market in Serbia consists of the Law on the Market of Securities and Other Financial Instruments published in the Official Gazette of the Republic of Serbia No. 47/06, June 02, 2006 (hereafter: the Law), officially applied since December 2006, and bylaws adopted by the Securities Commission (hereafter: the Commission). The Law regulates the issues such as: process of issuing securities by public offering and requirements concerning the preparation and approval of the Prospectus for issuing securities by public offering (hereafter: Issuing Prospectus); obligation of trading in securities issued by public offering through the organized market; types of the organized market; reporting obligation for public companies; organization of the Commission and its role on the securities market.

In order to comprehend the application of existing regulations, it is necessary to understand the way of how the market is organized. The only market operator in Serbia is the Belgrade Stock Exchange. The Law determines the obligation of trading in securities issued by public offering through the organized market. This obligation exists for all open joint stock companies. Transitional regulation of the Law (article No. 262) defines which shares issued before the beginning of the Law's application are to be considered as securities issued by public offering, with the obligation to be included in the organized market. This obligation recognizes the Law on Privatization according to which trading with shares from privatization is conducted via BSE.

There are two kinds of organized securities markets – Unregulated and Regulated markets, respectively. Both markets are run by BSE. In order to participate in the unregulated market, the securities must only meet standard requirements determined by the Law and supervised by the SEC. On the other hand, entering the Regulated market is not obligatory but there are some additional conditions determined by the Exchange regulations. These special conditions differ for entering listing A (Prime Market) or listing B (Standard Market) of the Regulated market. Supervisory process regarding securities on the Prime and Standard Markets onvolves the BSE and focuses on the continuous meeting of prescribed listing requirements. There are approximately 1,800 stocks in the Unregulated market. Only three stocks have been admitted to the Prime Market. The remaining 12 of the Belex 15 stocks are traded on the Unregulated market and hence are regulated by the SEC.

2.1. Issuing Prospectus

Issuing Prospectus previously approved by the Securities Commission has to be a part of any initial public offering. However, the Commission is not responsible for the data in the Prospectus to be true and complete. Important segments of the Prospectus are the ones that include obligatory information about issuer's ownership structure, and members of the managerial and supervisory bodies. The required part consists of data on shareholders who possess more than 5% of voting share, i.e. data on 10 biggest shareholders with voting rights. Prospectus has to also include data on legal entities with more than 10% of participation in the issuer's capital, as well as data on the number and percentage of shares possessed by issuer himself, including data on time and reason of acquiring shares. The Prospectus also has to contain data on managerial and supervisory board members' and other employees' holdings in the issuer's capital. Issuer is obligated to publish his own policy towards employees' participation in its' capital. All of the data on open joint stock companies shareholders registered in Central Registry of Securities are published on Internet page and hence available to all interested parties.

As far as the data on governing bodies' members are concerned obligatory information in the Issuing Prospectus include data on the members of the board of directors and supervisory board, their remunerations and direct or indirect business transactions between them and the issuer. In that sense, beside basic data on the members of the board of directors and supervisory board it is necessary to provide data on their remunerations for previous three years. Beside the total amounts paid for salaries and other compensations (given for each year separately) these data should include amount of credits or loans approved to board members, as well as specific rights and benefits used by the board members. It is also required to publish in Prospectus information on major business transactions concluded between issuer and board members, or related persons, in the last year.

The Serbian capital market consists of shares which initially appeared during privatization process and which were issued under special regulations specific to the privatization, mostly before the application of the Law. These kinds of shares did not go through the procedure of primary public offer as prescribed by the Law, and preparation of the prospectus in cases like this was connected to the realization of the legal obligation of their inclusion into organized market. The main difference is that in cases like this the prospectus is not subject to the Commissions' prior approval. Essentially, it is up to the issuer to ensure that the Prospectus is prepared with all prescribed data, and published on the issuer's web site. Another important piece of information is that the Law allows every shareholder to submit a request for inclusion of securities on the organized market by himself (if the issuer didn't already do that), with the market operator's obligation to organize trading with those shares on the Unregulated market. In cases like this the Exchange Rules determine that trading with such shares should be organized on the Unregulated market with a mark "without prospectus".

2.2. Reporting Obligations of Public Companies

Public companies are required to publish annual financial and audit reports, annual reports on business activities, as well as a statement regarding a semi-annual business plan. These obligations include the obligation to update the issuer's prospectus which is available on the organized market. Public companies are also required to disclose, without delay, information about circumstances which could seriously affect the public company business and price of securities, if they are not generally available (reports on material events). Public companies are required to comply with the disclosure regulations in the way that provides an equitable treatment of all investors. The Rulebook on reporting regulates that material events include:

- Convocation and holding of the assembly meeting of the company;
- Decision of the Board of Directors on the dividend day;
- Capital enlargement on the basis of private placement of shares;
- Significant changes in the assets value on which depends the price of securities issued by that public company, if those data were not published in another way;
- Acquiring own shares (above 10%);
- Every business account blockage in a period of 8 days continuously;
- Valid decisions of authorized Courts and administrative bodies whose execution significantly influence public company financial status;
- Other important facts and circumstances that have influence on objective estimation of company's standing in regard of yield, finances and legislation, and assessment of the securities issued by the company.

The Law requires that the person/entity acquiring or disposing of voting shares of the same company (alone or together with related persons) so that his participation in the total voting rights reaches, exceeds or falls below 5%, 10%, 25%, 33%, 50%, 66%, 75% or 95%, shall within three days inform about the change the issuer, the Commission and Competition Protection Commission. If the person/entity does not act in compliance with these regulations, he shall lose the voting rights on the acquired shares that exceed the limits determined by the Law. Specific reporting obligations exist for becoming or ceasing to be a controlling shareholder in that company. A controlling shareholder has voting rights with more than 50% of ordinary shares (major shareholding), or has a controlling influence on the company's management in some other way based on its shareholders or contractual status.

2.3. Responsibility for True and Complete data in the Prospectus and other forms of Public Disclosure

According to the Law the issuer is responsible for true and complete data published in the Issuing Prospectus, summary prospectus, and in any other form of public reports regarding issuing of and trading in securities, as well as for damage done by publishing untrue and incomplete data. The Law recognizes joint responsibility for the damage done by auditors and other persons that have been included into preparation of these documents – if they were aware or they had to be aware, due to the nature of the activities they perform, that the data are untrue or incomplete.

Disregard of regulations referring to the Prospectus and other forms of public reports is sanctioned as a criminal offence. The Law regulates penalty measures for the responsible person – a fine or up to three years imprisonment - for publishing untrue or incomplete data relevant for making investment decisions, as well as for not publishing the required Prospectus additions or report on a material event within the period of three days from the moment when circumstances relevant for making the investment decision occurred. Furthermore, if the mentioned activities caused disturbances on the securities market, the sanctions prescribed are stricter and stipulate imprisonment from 1 to 5 years.

Beside penalties, company can be sanctioned for economic felony if it doesn't report in a proper way to the public and the Commission about company business. In this case, beside fines determined by the Law, protective measure - prohibition of fulfilling certain duties in duration from 1 to 5 years and protective measure - public announcement of the sentence can be stated for the issuer and its authorized person.

2.4. Privileged (Inside) Information

In order to control and protect privileged information some obligations are determined both for the securities' issuer and for persons/entities that can be considered as insiders. The Law determines that nobody can acquire, buy, sell or dispose of securities in some other way by using privileged information. The Law recognizes as insiders all persons/entities that know or must have known that they are in possession of privileged information. Furthermore the Law emphasizes those ones which due to their special position in the company, function or relationship with the issuer, come into possession of privileged information, such as:

- Employees in the company;
- Members of the managerial and supervisory bodies;
- Auditor, portfolio manager, investment adviser, financial analyst, accountant, bookkeeper, attorney and others;

- Subsidiary company of the issuer;
- Shareholders with at least 10% share in the issuer's capital;
- All other entities that obtained privileged information and know or had to know they had obtained it from the cited persons.

By the Law securities issuers have an obligation to make a list of persons that can be categorized as insiders according to above mentioned criteria, and to update the list regularly if any change occurs. The issuer also has the obligation to inform all persons from the list about the obligation of maintaining confidentiality of privileged information and consequences of breaking their confidentiality. The persons considered as insiders have to report to the issuer, the Commission and organized market about transactions with securities that privileged (inside) information relates to, in the form and content defined in the Commission's bylaw. This bylaw (Rules on sale of securities involving privileged information) regulates content and way of providing information on any buying or selling of securities the privileged information refer to, as well as detailed conditions and the process of supervision carried out by the Commission in order to prevent misuse of privileged information. Insiders have an obligation to keep privileged information as a business secret. Misuse of privileged information is recognized as a criminal offence. In order to prevent misuse of privileged (inside) information the Commission can demand additional information and if during the supervision it determines the misuse of privileged information, criminal charges will be initiated before the competent bodies.

2.5. Securities Commission

The Securities Commission is an independent organization of the Republic of Serbia and it is responsible to Serbian National Assembly. The Commission has 5 members (including the chairman). The chairman and members are elected and relieved by the Serbian National Assembly at the proposal of its competent working body for finance operations.

The Law defines conditions under which members of the Commission can lose their positions before the end of their term (at personal request or due to termination of employment), as well as reasons for their being relieved of their functions. According to the Law the Commission member can be released from his duty if:

- He/ she is convicted for a criminal offence with an unconditional sentence of at least 6 months in prison, or if it was a criminal offence against the labour relations, commerce, property, judicial system, money laundering, public law order and legal transactions, and line of duty;
- It is concluded that he/she permanently lost the capacity of performing their functions according to the authorized health commission;

- It is concluded that he/she works in an unprofessional and unconscientious manner;
- It is concluded that there are one or more circumstances from Article 231 of the Law

Authorization for establishing mentioned conditions under which a member can be released from the job has an authorized body of the National Assembly of Serbia which, if the conditions are fulfilled, within 60 days initiates a releasing procedure in the National Assembly of Serbia.

The Chairman (president) of the Commission represents the Securities Commission and manages its activities.

The Securities Commission is the main regulatory-supervisory body on the Serbian capital market, which within its competencies (defined in Article 220 of the Law) performs the following:

- Adopts bylaws for the implementation of the Law;
- Grant licenses to professional participants on the capital market;
- Supervises Law's implementation and professional participants' business, as well as business of other participants in the part of operations they conduct on the securities market;
- Organizes, undertakes and controls the implementation of measures that provide efficient functioning of the organized market and investors protection;
- Monitors situation and trends in the organized market and undertakes measures to eliminate market disturbance;
- Files a charge to the authorized body against supervised participants in the securities business if the elements of criminal offence, commercial violation or infraction and or tax criminal offence or invasion have been discovered;
- Performs other duties in accordance with the Law.

The Commission has a special role and competences in supervising the implementation of the Law. According to the Law the Commission supervises all entities in the part of operations they perform on the organized securities market in compliance with the Law, the Law on takeover of joint stock companies, the Law on investment funds and all bylaws related to these laws, as well as other laws regulating these issues.

The widest scope of supervising authority of the Commission refer to entities that within the scope of their registered activity professionally perform operations on the organized securities market such as: broker/dealer companies, authorized banks, market operator (the Exchange), Central registry, custody banks, companies for managing investment funds and investment funds. The other segment of the Commission's supervisory authority includes the authority over issuers, investors and all

other entities. The Law particularly emphasized its' supervisory authority over reporting of public companies (Article 70).

Detailed conditions and procedures of supervision are determined in the Commission's bylaws - Rules on conditions and manner of carrying out supervision of financial market participants (hereafter: Rules on supervision). Supervision is done by authorized persons from the Commission (inspectors), in the following way:

- Indirect supervision – by analysis of reports, statements, information and other documents delivered to the Commission;
- Direct supervision – by insight and review of documents (such as bylaws, business registers and other) in the offices of the supervised person or legal entity that supervised person is relate to directly or indirectly, professionally, through management or capital, and by taking statements from responsible persons and other employees in the supervised office, as well as other persons who possess knowledge relevant to the supervision process.

Chairman of the Commission can authorize a special firm or another person to conduct specific professional work, if it is needed.

In case of detected illegality or irregularity during the process of supervision the Commission will undertake measures to reestablish legality and bring the business in line with the Law and other regulations, and establish time lines for implementing those measures. At the same time the Commission can undertake one or more measures provided by the Law. According to the Law, measures that could be undertaken can refer to two categories of the supervised person/entity: licensed market participants – whose business requires the Commission's license or approval (Broker-dealer companies, market operator and others); or other persons/entities.

With respect to the licensed market participants, some of the more important measures include: public warning, temporary prohibition of performing work or managing funds and property, and possibility of revoking the license. Furthermore, as far as the market operator is concerned, the undertaken measures may also include: temporary suspension of trading or exclusion of certain securities from the securities market.

With respect to other persons/entities (that don't fall under Commission's licensing process), the Commission can apply general supervising measures determined by the Law, which include public warning and a fine. Therefore, in this segment the Commission's authority to file charges against participants in the securities business if the elements of criminal offence, commercial violation or infraction, and tax criminal offence or invasion have been discovered is of particular importance.

2.6. Indices of Regulation of Securities Market in Serbia

We now follow LLS and attempt to quantify some aspects of the Serbian legal framework for securities trading.

Disclosure requirements

(1) Prospectus

The variable is 1 i.e. the prospectus is required for trading (the only exception is that no prospectus is required when shareholders request inclusion of a security to the organized market and not the issuer – see Section 2.1 for details).

(2) Compensation

The variable is 0.5 i.e. only the aggregate compensation of directors and key officers has to be reported.

(3) Shareholders

The variable is 1. All transactions regarding ownership over 5% have to be reported.

(4) Inside ownership

The ownership structure is published in a detailed manner so this information is contained in the prospectus. Hence the score is 1.

(5) Irregular Contracts

There is no mandatory explicit reporting of business activities not related to the main business of the issuer. Hence the variable here is 0.

(6) Transactions

Reporting obligations in Section 2.2 require publication of matters affecting but do not explicitly mention transactions between the issuer and its directors. Hence the score is 0.

Disclosure Index is defined as 1/6 [(1)+(2)+…+(6)]=1/6(1+0.5+1+1+0+0)=0.58. LLS report higher indeces for anglo-saxon countries, 1.00 for the United States, 0.83 for United Kingdom, and 0.92 for Canada. Scandinavian countries have all 0.58 (except Finland with 0.50) and Germany and Austria have 0.42, and 0.25, respectively. However,

the number for Serbia only serves as a raw illustration as no attempt is made to analyze to what extent the law is followed.

Burden of Proof Index

This variable equals one if proving that there is a misleading statement either in the Prospectus or elsewhere in relevant documents. Since reporting false information is a criminal offense (see Section 2.3) for anybody involved the variables *(1) Burden director, (2) Burden distributor,* and *(3) Burden accountant* are all 1 and the Burden of proof index =1/3[(1)+(2)+(3)] is 1. This is again similar to the United States and Canada (both 1) and higher than Austria's 0.11 or Germany's 0. Note that 1 is an upper bound as the number may be lower if one interprets the Law differently.

Characteristics of the Supervisor of Securities Markets

(1) Appointment

The members are appointed by the Parliament i.e. not by an executive branch of government as required by LLS. However, they are appointed unilaterally, as defined by the LLS. We set the variable to 0.5.

(2) Tenure

The members of the supervisor can be dismissed by the appointing authority i.e. the Parliament but a majority of votes is needed. This is more difficult than being dismissed by the government and hence we give this variable a value of 0.5.

(3) Focus

Equals 1 since the National Bankof Serbia regulates commercial banks and SEC stock trading.

(4) Rules

This variable is 1 since no approval is needed from the Parliament for issuing various regulations.

The supervisor characteristics index is defined as 1/4[(1)+…+(4)]=3.5/4=0.875. United States and United Kingdom have this index 1 and 0.25, respectively. No other country from LLS has a higher index than 0.875. This might be partly due to a broad interpretation of Appointment and Tenure. Strict adherence to definitions in LLS would result in the index of 0.625, also fairly high.

Investigative Powers of the Supervisor of the Securities Markets

(1) Documents

SEC can request documents of persons and legal entities under its supervision. We set this variable equal to 0.5 (it would be 1 if documents from ALL persons could be requested).

(2) Witness

It does not seem that SEC can subpoena a witness and hence this variable is 0.

The Investigative powers index=1/2[(1)+(2)]=0.5. This compares to 1 in many countries – again USA and UK. On the other hand the index is 0 for Austria and 0.25 for Germany.

Orders

Equals 1 if the SEC can issue stop and do orders in case of a defective prospectus for *(1) issuer, (2) distributor, (3) accountant.* The SEC can issue such orders for the licensed market participants. This excludes accountants.

Orders index=1/3[(1)+…+(3)]=1/3[1+1+0]=0.67, compare with 1 for the USA and UK, and 0 for Austria and Germany.

Criminal

Omitting material information from the prospectus is a criminal offense for anybody involved, including *(1) director or officer, (2) distributor, (3) accountant.* Therefore, the Criminal index=1/3[(1)+..+(3)]=1.

Summary Indices of Enforcement

Private enforcement index=1/2[Disclosure index+ Burden of proof index]=1/2[0.58+1]=0.79

Public enforcement index=1/4[Supervisor characteristics index+Investigative powers index+Orders Index+Criminal index]=1/4[0.875+1+0.67+1]=0.89

The private and public enforcement indexes are very high, the corresponding numbers are 1 and 0.88 for the United States, respectively, and 0.21 and 0.25 for Germany, respectively. Therefore, it seems that the legal framework in Serbia is at least

formally fairly similar to Anglo-Saxon countries. The question remains to what extent is the law, or will be, implemented.

3. Ownership Structure and Performance

Our quantitative analysis of corporate governance focuses on characterization of the ownership structure and its impact on the performance of companies measured by stock returns. Initially, our intention was to investigate dividend policies of companies in our sample using a simple comparison of dividends across various group of companies as in Dragota (2006) or a more formal regression model from Bena and Hanousek (2006). However, this proved to be problematic since our dataset contains only 15 companies and dividends are rarely paid (and if they are, they tend to be relatively small). Therefore we opt for a somewhat different approach, which characterizes ownership concentration and links it to stock returns. We also comment on foreign vs. domestic ownership of Serbian companies.

Our dataset consists of 15 most traded Serbian companies, which together form one of the major stock market indexes in Serbia, the BELEX15. The list of these companies together with their corresponding symbols and weights in the BELEX15 is in Exhibit 3.1. The prospectuses of the corporations contain information regarding the top 10-15 according to the percentage of the total number of shares. We collect this information to calculate the Herfindahl-Hirschman Concentration Ownership Index, which is defined as

$$HHI = 10{,}000 * \sum_{i=1}^{N} w_i^2$$

where w_i is an ownership share for an owner i. N is the number of owners listed in a given prospectus. HHI lies between 0 and 10,000, with larger values indicating a greater concentration of ownership. HHI for companies in our sample is reported in Exhibit 3.2. The largest HHI by far is 6,731 for Messer Tehnogas a.d. Beograd, where the foreign based Messer group GMBH owns 82% of the company. On the other hand, the smallest HHI is 5 for Imlek a.d. Beograd (0 for SJPT is apparently due to missing data in the company's prospectus). Here, the top owner is Imlek, which owns only 1.05% of the company. Overall, the ownership of concentration is fairly small, with the average HHI being only 1,150.

We investigate whether there is an empirical relationship between performance and the ownership concentration by estimating a simple regression equation

$$\bar{R}_{it} = \lambda_0 + \lambda_1 * HHI + \phi_{it}$$

where the left-hand-side variable is the mean daily return on each stock (see Section 4 and Exhibit 4.1 below for a detailed discussion of the data) and the right-hand-side variable is HHI. Clearly, a standard causal interpretation of this equation where HHI determines profitability is problematic but the regression results will be sufficiently informative about potential correlation between the two variables. The OLS estimates for λ_0 and λ_1 are 0.000959 and 9.97E-08, respectively. The t-statistics are 3.04 and 0.65, respectively. Therefore, the HHI coefficient is not significant and the ownership concentration appears not to affect stock market performance of companies in our sample. $R^2 = 0.03$ in the regression, which also supports our conclusion.

We also examine the possibility that foreign owned firm may be more profitable then domestic firms. Exhibit 3.3 shows ownership in traded companies by origin. Summing up percentages across the tables for Domestic and Foreign owners gives 100%. A more detailed look at these tables confirms low ownership concentration, mainly due to the fact the on average 47% of the corporations are owned by small domestic owners whose share in the companies is less then 5%. There is only one company where foreign investors hold more then 50%, TGAS. Hence we look at companies with more then 20% foreign-owned stocks. These are AIKB, BMBI, JMBN, MTBN, and the above mentioned TGAS. The average annualized daily stock return for these companies is 30% while it is 24% for the other companies. It seems that the corporations with a greater share of foreign owners earn investors greater rates of return – however, this interpretation needs to bo considered with caution due to the small sample size.

4. Liquidity of the Serbian Stock Market

In part following Sarr and Lybek (2002) and/or Kyle (1985) and taking into account data availability restrictions, we characterize three main dimensions of the market liquidity:

(i) *Tightness* is the cost of reversing a position on the stock market, e.g. selling a stock and buying it back in a short period of time. This cost can be measured by transaction costs, e.g. bid-ask spreads.

(ii) *Depth* and *Breadth*. *Depth* quantifies what is the trade volume needed to affect the market prices. A market is deep if there are abundant orders above and below the currently traded price. *Breadth* is given by the number of existing orders at a given price. Hence, a market can be deep (there are orders for prices above and below the current market price) and wide (i.e. with numerous orders at each price).

(iii) *Resiliency* is the time it takes for a market correction due to a random shock. In other words, it indicates how fast a market converges back to its equilibrium characterized by its fundamentals.

In this section, we use daily data on our 15 stocks from the Belgrade Stock of Exchange. Most of the daily series for stock prices start on September 9, 2006 and end on January 31, 2008. The summary statistics are in Exhibit 4.1. The daily average returns are between -0.05% (-12% annually) for TIGR to 0.27% (64.8%) for JMBN. The greatest daily standard deviation is 4.56% for TLFN and the smallest is 1.04% for AIKB. Skewness is close to zero, with signs alternating, which indicates symmetry of the daily distributions. Kurtosis is greater then 3 in all cases, indicating so called fat tails as compared with the normal distribution. The null hypothesis of a unit root is strongly rejected using the augmented Dickey-Fuller test. This suggests that the daily returns for Serbian stocks do not follow a random walk and there is tendency towards the mean (mean reversion). The summary statistics document that the daily stock returns behavior is broadly consistent with stylized facts regarding developed financial market returns.

Transactions costs measures of tightness are mainly the absolute difference between bid and ask prices or can be defined in the terms of percentages. The former measure can be expressed as

$$S = (P_A - P_B)$$

where P_A is the ask price and P_B is the bid price. The latter measure is given by

$$S = (P_A - P_B)/((P_A + P_B)/2).$$

Exhibit 4.2. reports these and other liquidity measures. The greatest daily bid-ask spread in absolute terms is 26,023 dinars for ENHL. The greatest relative bid-ask spread can be seen for TIGR. The relative price difference is relatively high and close to 1% of the average price in many cases. We characterize the depth and breadth by the number of transactions, which we refer to as volume in Exhibit 4.2. and by the dollar value of these transactions, which we denote as turnover. Based on both measures, AIKB is the most traded stock i.e. its market is the deepest and widest. The turnover for AGBN is second by turnover but with only 944 transactions.

To characterize resiliency of the Serbian market, we use a price-based measure called the Market-Efficiency Coefficient (MEC), which is defined as

$$Var(R_k)/(k * Var(R_1))$$

where R_k is a rate of return for k periods. The purpose of the MEC is to distinguish long-term price changes from short term price changes. The long-term changes are given by the variance of R_k and the short-term changes by the variance of R_1. The MEC is also known as the variance ratio statistic and a formal test can be constructed, which is robust to heteroskedasticity (see Lo and MacKinlay 1988). If a stock return follows a random walk, then the long-term variance is proportional to the short-term variance and the MEC is equal to 1. The ratio is typically somewhat below one in resilient markets since some short-term volatility is often present. We calculate the ratio for the Serbian market for k=5 days. The results are reported in Exhibit 4.2. Clearly, this statistic suggests that the Serbian market is quite resilient.

We also investigate if the capital market model can be used in the context of the Belgrade stock of exchange. The daily risk free rate is not available since the auctions of the Treasury bills issued by the National Bank of Serbia are organized less frequently. Therefore we estimate the following simple regression:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}.$$

The dependent variable is a daily return on a given stock and the explanatory variable is the market return, in this case the return on BELEX15. The results are again in Exhibit 4.2. If the Capital Asset Market Model holds then the constant in this model is equal to $E[R_{ft} - \beta_i R_{ft}]$ with R_{ft} being the risk free rate. With the exceptions of JMBN, TLFN, and TIGR, the betas are all significantly different from zero and hence the model

does account for cross-sectional variation in returns. However, the low R^2 indicates less of a success with respect to explaining the time-series properties of the returns.

We further investigate the issue of the market liquidity and its relationship to volatility and newly available information. Gopinath and Krishnamurti (2001) provide a survey of theoretical models which imply a relationship between the number of transactions and volatility, and trading frequency and information. They empirically test the theoretical predictions using high-frequency Nasdaq data. We implement similar methodology in our study. First, we estimate the following regression equation:

$$r_{it} = a + bN_{it} + \eta_{it},$$

where r_{it} is the absolute value of closing-price returns of stock i on date t, which measures volatility. N_{it} is the number of daily transactions for stock i on date t. The average values of these two variables for our 15 stocks are in Exhibit 4.2 under headings Absolute daily change and Traded volume, respectively. η_{it} is an error term. Significant *b* implies a volatility effect (typically positive) of the number of transactions. The regression model serves as a diagnostic for volatility. Lower volatility than average often occurs before a market correction downward. Exhibit 4.3 shows estimates of a and b. The b estimate is positively significant in eight cases out of fifteen. For the other stocks, the coefficient is either positive or negative and insignificant. We conclude that there is strong evidence documenting that the number of transactions is positively related to volatility of returns, consistent with stylized facts for established markets.

The relationship between trading frequency and information can be studied using the model:

$$N_{it} = c + d \mid R_{mt} \mid + \varepsilon_{it.}$$

R_{mt} is the market return, which serves here as a proxy for publicly available information. ε_{it} is an error term. *d* is likely to be significant for large stocks and not significant for small stocks. In this case, the large stock movements would be mostly caused by a market-wide information while the small stock would be mostly traded due to firm-specific information. We test this hypothesis for the Serbian securities and report our estimates of c and d in Exhibit 4.4. Here we cannot confirm our prior since d is only significant in five cases and it is not significant for the largest companies. This outcome is consistent with our previous results regarding the market model. It seems that the returns on BELEX15 do not influence individual stock returns and trading frequency as much as in other markets. This may be caused by the fact that the index only contains a small portion of all stocks existing on the Serbian market.

In addition to illustrating the relationship between liquidity and volatility captured in Exhibit 4.3 we also model volatility separately to characterize its time-varying nature. We use the Generalized Conditional Autoregressive Heteroskedasticity (GARCH) model of Bollerslev (1986). The mean equation for returns is an autoregressive model with one lagged return (AR(1))

$$R_t = a_0 + a_1 R_{t-1} + \theta_t$$

where the error term is given by $\theta_t = v_t \sqrt{h_t}$. v_t is white noise with mean zero and variance 1 and

$$h_t = \alpha_0 + \alpha_1 \theta_{t-1}^2 + \lambda_1 h_{t-1} .$$

This is a standard GARCH(1,1) model often employed in the context of financial markets. We estimate the model using the method of maximum likelihood and the returns on BELEX15. We plot the conditional variance h_t in Exhibit 4.5. The volatility increases for example in May 2007 when a new government was formed or in January 2008, prior to presidential elections and in anticipation of Kosovo declaring its independence. Similarly, there is a temporary increase around the time of voting for a new constitution in November 2006. GARCH(1,1) hence seems an appropriate modeling tool for conditional volatility that reflects the Serbian political cycle. The volatility can be thought of as a measure of risk in the Belgrade stock of exchange, which tends to rise in turbulent times.

We also want to examine how liquidity conditions change over time. For this purpose, we first plot the median bid-ask spread in Exhibit 4.6. In face of rising liquidity risk, the bid-ask spread is likely to increase. This is a compensation for potential inability to sell stocks readily if needed. We make two observations based on the red line in Exhibit 4.6. First, prior to the end of 2006, the bid-ask spread is higher as compared to the subsequent period. This is likely due to structural reasons since this was the time of establishing rules of operation and the legal framework for the Serbian financial markets. Second, the bid-ask spread tends to follow the political cycle in a way resembling the conditional volatility pattern since the end of 2006. As expected, the spread is somewhat higher in unstable periods. Depth and resiliency are well captured by the ratio of absolute asset returns to corresponding trading volume. The return to volume ratio is likely to be higher in illiquid conditions. The pattern is similar to the dynamics of the bid-ask spread – see the green line in Exhibit 4.6.

We propose a new definition of the so called liquidity premium, which we intend to apply on the Serbian stock market. This stock liquidity premium is inspired by a liquidity premium for corporate bonds, for which it can be defined as the difference between the observed and estimated credit spreads (see De Jong and Driessen 2005). We calculate the bid-ask spreads and return to volume ratios for all 15 stocks at the

Belgrade Stock Exchange. We divide them in four groups based on medians of the previous two liquidity measures: a low bid-ask-spread combined with a low return to volume ratio, a low bid-ask-spread combined with a high return to volume ratio, etc. Our measure of the stock liquidity premium is the difference between returns on stocks from the group with high bid-ask-spreads and high return to volume ratios and the group with low bid-ask-spreads and low return to volume ratios. The former group represents stocks, which are relatively illiquid as compared to the latter group. Therefore, the difference between returns on stocks in these two groups can be interpreted as a compensation for holding illiquid assets. The blue line in Exhibit 4.6.illustrates that the stock liquidity premium follows closely the bid-ask spread and the return to volume ratio.

Finally, we follow the Bank of England Stability Report (2007) and combine all three liquidity measures in one summary indicator for market liquidity. We simply normalize them, calculate their simple average and plot the results in a graph. A high indicator is equivalent to high illiquidity and vice versa. The graph in Exhibit 4.7 confirms our previous observations and makes them more pronounced.

5. Analysis of High Frequency Data

We complement our study with a thorough analysis of intraday data. For the sake of comparison, we choose the same time period in two subsequent years to find any potential differences. Any such difference could be an indicator of development in a certain direction and could provide additional perspective on the Serbian stock market. The selected sub-periods are December 2006 and December 2007, respectively. Trading starts at 10:00 and ends at 13:00 on business days. We have data on prices, the number of transactions for all 15 BELEX stocks and the exact time of the day when the transactions occurred.

Transactions data differ from data with regular frequencies since the time intervals between transactions are unequally spaced and there is a daily periodic pattern. We follow a common practice (see for example Tsay 2005, Ch. 5) and organize our data in five-minute intervals. There are 60 such intervals on each trading day. We first characterize the data by the frequency of price changes in percentages depicted in Exhibit 5.1. Inspection of the frequencies for December 2006 reveals several patterns. First, in about two thirds of the five-minute intervals, there is no price change. In some cases, it is almost 75% of intervals. Otherwise, there is a large percentage of negative price changes by a magnitude of 80 dinars and more and similarly for positive changes greater than 120 dinars. On the other hand, the negative changes over 120 dinars are very rare. This pattern of “fat tails” becomes much stronger in 2007, also accompanied by a smaller percentage of intervals with no changes.

In the next step, we look at the number of transactions over time – see Exhibit 5.2, which plots five-minute intervals in December 2006 and December 2007, respectively. The breaks are weekends, and we do not show breaks in-between trading days. Comparing the two time periods shows that trading became less frequent in December 2007. Since larger price changes (i.e. returns) from Exhibit 5.1 come together with smaller number of transactions in December 2007 as compared with December 2006, the return to volume ratio is smaller. This means the market became less liquid. To investigate this issue further, we calculate an average of the number of transactions for each company in a given five-minute time interval and plot the results in Exhibit 5.3. The low numbers are caused by the fact that in some days there may not be a single transaction for a given company and a given time interval. First, a standard U-shape emerges with a greater number of trades in the morning and then before the closing time. Second, our previous finding is confirmed since the peaks for average number of transactions decrease from being above 0.15 in December 2006 to below 0.14 in December 2007.

To gain more insight, we also randomly select an individual stock, AGNB, which we analyze separately. Exhibit 5.4 documents that the number of transactions decreased for this stock – the number of transactions was over 20 in 2006 on many occasions while no five-minute interval had over 14 transactions in 2007. The average number of transactions for AGBN in Exhibit 5.5 broadly confirms the U-shape and the decrease in the number of transactions. We also provide a two-way classification of price movements in consecutive intraday trades for AGBN stock in Exhibit 5.6. The first row of the tables corresponds to a decrease in price in an interval (i-1), the second to no change and the third to an increase. Similarly, columns correspond to a decrease, no change, and an increase in price in the i-th interval. The frequencies confirm patterns from Exhibit 5.1. First, the number of changes is smaller in December 2007. The total drops from 1906 to 823. Also, the count for no change decreases from 726 to 165, a drop from 38 to 20% of total. Finally, there is a greater number of decreases in either the i-1 th trade or the i-th trade. Similarly for the increases. Again, we can conclude that the tails of the return distribution became “heavy”, in part creating a situation with less liquidity.

6. Conclusion

Our research study addresses important questions regarding the legal environment, ownership structure, and liquidity of the Serbian stock market. We find that both private and public enforcement are formally very high. The ownership in the 15 BELEX companies is highly dispersed. There seems to be no relationship between ownership concentration and stock returns. The presence of foreign ownership only slightly increases observed stock returns. Calculating basic liquidity measures using the daily data indicates that the Serbian stock market is fairly liquid and efficient. The volatility and liquidity are time-varying and related to the political events in Serbia. Intraday transactions data show a decrease between level of liquidity in December 2007 as compared with December 2006. Our results need to be viewed with caution since we only concentrate on the members of BELEX15. A detailed econometric study using cross-sectional or panel firm-level data is necessary to validate that our conclusions hold for the entire Serbian stock market.

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Exhibit 3.1: Corporations in the BELEX15

	Symbol	Weight
AIK banka a.d. Niš	AIKB	20,00 %
Komercijalna banka a.d. Beograd	KMBN	15,88 %
Energoprojekt holding a.d. Beograd	ENHL	13,18 %
Agrobanka a.d. Beograd	AGBN	8,29 %
Soja protein a.d. Bečej	SJPT	8,24 %
Univerzal banka a.d. Beograd	UNBN	6,80 %
Metals banka a.d. Novi Sad	MTBN	6,61 %
Imlek a.d. Beograd	IMLK	3,60 %
Privredna banka a.d. Beograd	PRBN	3,56 %
Jubmes banka a.d. Beograd	JMBN	3,00 %
Bambi Banat a.d. Beograd	BMBI	2,25 %
Messer Tehnogas a.d. Beograd	TGAS	2,20 %
Tigar a.d. Pirot	TIGR	2,17 %
Metalac a.d. Gornji Milanovac	MTLC	2,12 %
Telefonija a.d. Beograd	TLFN	2,11 %

Exhibit 3.2: Herfindahl-Hirschman Concentration Ownership Index

	AGBN	AIKB	BMBI	ENHL	IMLK	JMBN	KMBN	MTBN	MTLC	PRBN	SJPT	TGAS	TGIR	TLFN	UNBN	AVERAGE HHI
HHI	495.90	969.38	2 212.65	758.97	5.01	762.96	2 332.89	360.92	306.20	553.88	0.00	6 731.17	819.15	422.55	525.57	1 150.48

Exhibit 3.3: Ownership Structure by Origin

Domestic Owners

	AGBN	AIKB	BMBI	ENHL	IMLK	JMBN	KMBN	MTBN	MTLC	PRBN	SJPT	TGAS	TGIR	TLFN	UNBN	AVERAGE
0-0.05	57.59	40.89	29.44	47.67	100	36.18	32.38	63.04	64.96	59.2	0	13.8	49.39	57.3	48.36	46.68
0.05-0.1	6.27	11.24	0	14.45	0	14.39	0	0	18.53	8.95	0	0	22.89	5.47	30.84	8.87
0.1-0.25	20.07	22.86	0	24.14	0	21.11	0	15.13	0	19.4	0	0	24.99	21.51	0	11.28
0.25-0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.33-0.5	0	0	0	0	0	0	40.31	0	0	0	0	0	0	0	0	2.69
0.5-0.66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.66-0.]75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.75-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Foreign Owners

	AGBN	AIKB	BMBI	ENHL	IMLK	JMBN	KMBN	MTBN	MTLC	PRBN	SJPT	TGAS	TGIR	TLFN	UNBN	AVERAGE
0-0.05	16.07	7.79	7.17	8.51	0.02	16.58	2.31	21.83	2.88	12.48	0	4.27	2.73	1.43	5.81	7.33
0.05-0.1	0	0	5.07	5.23	0	0	0	0	13.62	0	0	0	0	14.29	0	2.55
0.1-0.25	0	17.21	14.23	0	0	11.74	25	0	0	0	0	0	0	0	15	5.55
0.25-0.33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.33-0.5	0	0	44.09	0	0	0	0	0	0	0	0	0	0	0	0	2.94
0.5-0.66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.66-0.]75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0.75-1	0	0	0	0	0	0	0	0	0	0	0	81.94	0	0	0	5.46

Exhibit 4.1: Summary Statistics for Daily Returns

Firm Code	size	average of returns	stdev of return	skewness	kurtosis	min	max	Return unit root test ADF	Sig level
AIKB	518	0.001	0.0104	0.3	4.79	-0.04	0.05	-17.134	***
KMBN	367	0.001	0.0286	0.58	13.57	-0.16	0.16	-12.248	***
ENHL	518	0.002	0.028	1.14	6.3	-0.12	0.18	-18.273	***
SJPT	513	0.0006	0.028	-1.59	17.86	-0.22	0.13	-20.723	***
UNBN	518	0.0022	0.0269	0.94	10.1	-0.16	0.16	-19.384	***
AGBN	518	0.0011	0.0262	0.24	3.23	-0.1	0.12	-17.199	***
MTBN	278	-0.0001	0.0218	0.43	5.23	-0.11	0.1	-12.474	***
PRBN	401	0.0004	0.0292	-0.98	11.96	-0.22	0.13	-18.143	***
JMBN	513	0.0027	0.0354	-0.17	7.59	-0.2	0.17	-19.686	***
IMLK	518	0.0008	0.0286	0.43	8.68	-0.18	0.18	-18.549	***
MTLC	518	0.0001	0.0222	-0.09	7.48	-0.14	0.1	-17.949	***
TGAS	518	0.0017	0.0256	0.02	4.64	-0.13	0.11	-20.269	***
TLFN	513	0.0018	0.0465	0.27	8.38	-0.22	0.18	-16.321	***
BMBI	518	0.0009	0.0245	0.19	6.2	-0.14	0.11	-21.295	***
TIGR	514	-0.0005	0.0251	-0.09	6.27	-0.13	0.13	-21.599	***
BELEX(15)	518	0.0013	0.0143	0.79	11.3	-0.08	0.09	-15.345	***

Exhibit 4.2: Average Daily Liquidity Measures

Share	Absolute daily change	Traded Volume	Turnover	Bid-Ask Spread 1[1]	Bid-Ask Spread 2	MEC	alpha	Sig lev	t	beta	Sig lev	t	R_sq
AIKB	1.54	13311	81 404 282	15 228	0.66	0.99	0	-	1.58	0.25	***	8.33	0.12
KMBN	1.4	208	17 624 167	322	0.54	0.85	0	-	0.15	0.64	***	7.17	0.12
ENHL	1.79	9091	17 892 934	26 023	0.99	0.89	0	-	1.1	0.49	***	5.9	0.06
SJPT	1.7	4612	17 952 516	6 516	0.7	0.89	0	-	0.08	0.35	***	4.16	0.03
UNBN	1.5	429	10 851 017	975	0.84	0.82	0	-	1.39	0.45	***	5.61	0.06
AGBN	1.75	944	30 220 534	947	0.44	0.95	0	-	0.49	0.44	***	5.65	0.06
MTBN	1.41	533	28 900 828	759	0.66	0.94	0	-	-0.42	0.47	***	6.62	0.14
PRBN	1.95	4589	16 667 487	9 524	0.95	0.98	0	-	0.05	0.2	**	2.07	0.01
JMBN	2.11	76	4 683 068	147	0.66	0.88	0	-	1.77	-0.04	-	-0.41	0
IMLK	1.67	1888	3 645 109	6 029	0.97	0.89	0	-	0.27	0.38	***	4.38	0.04
MTLC	1.3	936	4 076 990	7 670	1.28	0.83	0	-	-0.42	0.39	***	5.91	0.06
TGAS	1.53	234	2 940 209	896	0.94	0.78	0	-	0.9	0.54	***	7.15	0.09
TLFN	2.39	268	3 392 062	1 210	1.02	1.05	0	-	0.8	0.11	-	0.8	0
BMBI	1.39	206	3 305 564	989	1.07	0.6	0	-	0.62	0.22	***	2.9	0.02
TIGR	1.74	2533	5 156 709	15 743	1.14	0.75	0	-	-0.55	0.06	-	0.72	0

Footnote: 1. Bid-Ask Spread 1 is defined as $S_1 = P_A - P_B$. Similarly we define Bid-Ask Spread 2 as $S_2 = (P_A - P_B)/ ((P_A + P_B)/2)$

Exhibit 4.3: Number of Transactions and Volatility

Firm Code	a	t-stat	Significance	b	t-stat	Significance
aikb	13 064	5.35	***	263 993	1.13	-
kmbn	206	5.62	***	418	0.33	-
enhl	8 898	9.8	***	107 770	3.33	***
sjpt	4 632	9.83	***	-19 181	-1.14	-
unbn	432	9.05	***	-871	-0.49	-
agbn	945	16.55	***	-403	-0.19	-
mtbn	532	13.46	***	7 172	3.95	***
prbn	4 589	10.67	***	26 443	1.79	*
jmbn	76	10.18	***	-40	-0.19	-
imlk	1 880	5.99	***	8 767	0.8	-
mtlc	936	12.69	***	14 156	4.25	***
tgas	227	9.61	***	3 944	4.27	***
tlfn	265	10.56	***	2 223	4.12	***
bmbi	203	6.35	***	3 614	2.77	**
tigr	2 556	9.98	***	36 807	3.6	***
belex_15_	108 609	10.87	***	1 457 302	1.87	*

Exhibit 4.4.Trading Frequency and Information

	c	t-stat	Significance	d	t-stat	Significance
aikb	12 064	3.69	***	147 644	0.58	-
kmbn	248	5.05	***	-4 263	-1.24	-
enhl	7 716	6.29	***	162 469	1.7	*
sjpt	3 178	5.06	***	168 978	3.43	***
unbn	402	6.3	***	3 203	0.65	-
agbn	783	10.3	***	18 868	3.19	***
mtbn	424	8.01	***	10 579	3.11	***
prbn	4 449	7.62	***	15 063	0.36	-
jmbn	80	7.94	***	-429	-0.55	-
imlk	1 893	4.49	***	-708	-0.02	-
mtlc	797	7.94	***	16 324	2.09	**
tgas	235	7.28	***	-140	-0.06	-
tlfn	237	6.93	***	3 689	1.37	-
bmbi	183	4.24	***	2 729	0.81	-
tigr	2 280	6.54	***	30 063	1.1	-

Exhibit 4.5: Volatility

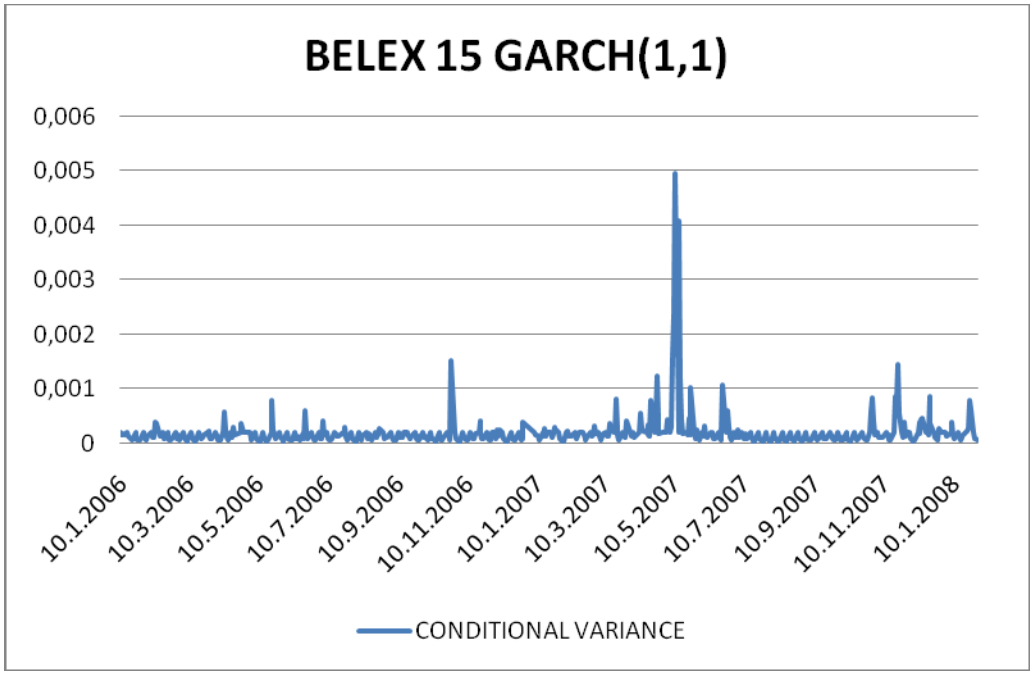


Exhibit 4.6: Liquidity Indexes

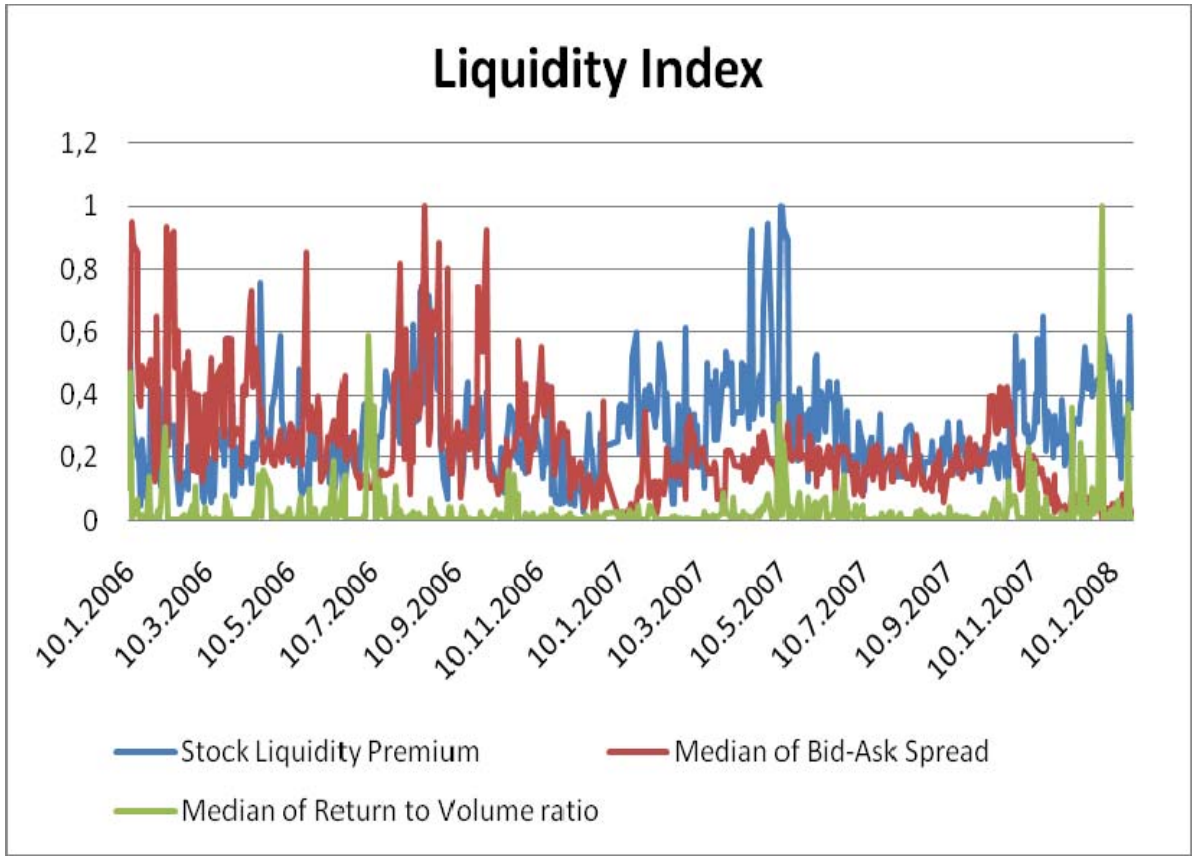


Exhibit 4.7: A Combined Liquidity Measure

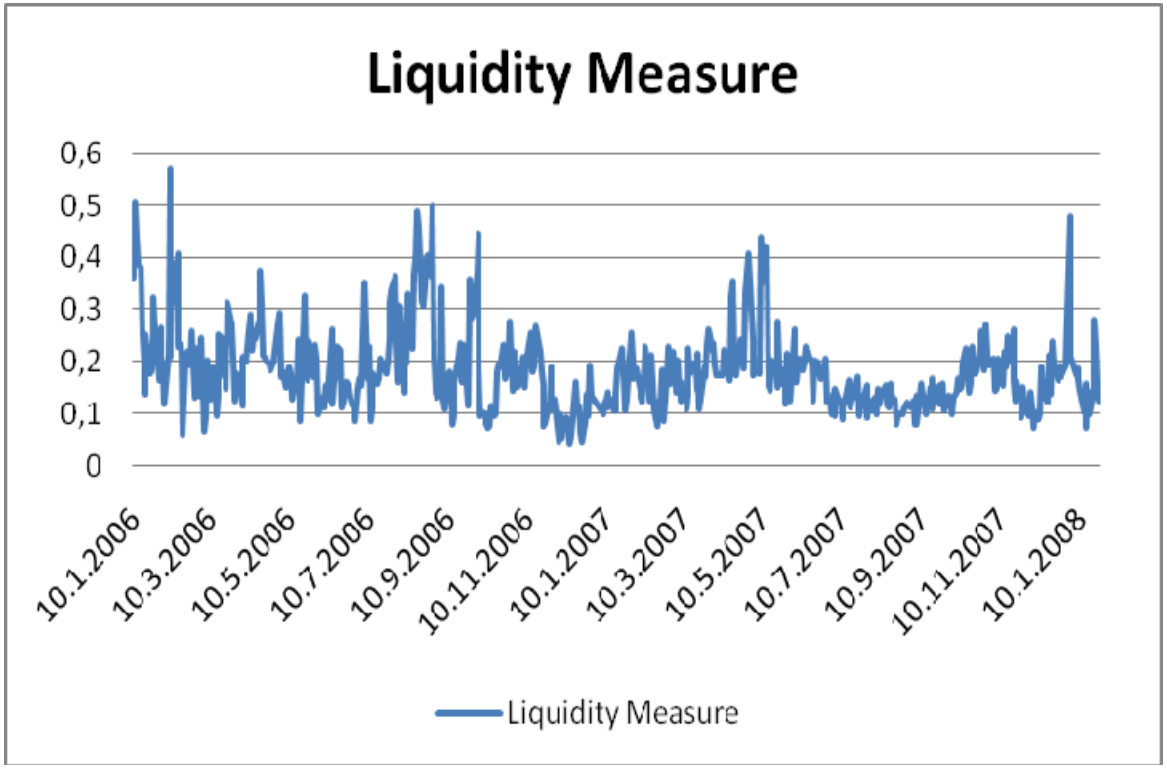


Exhibit 5.1: Frequencies of Price Changes

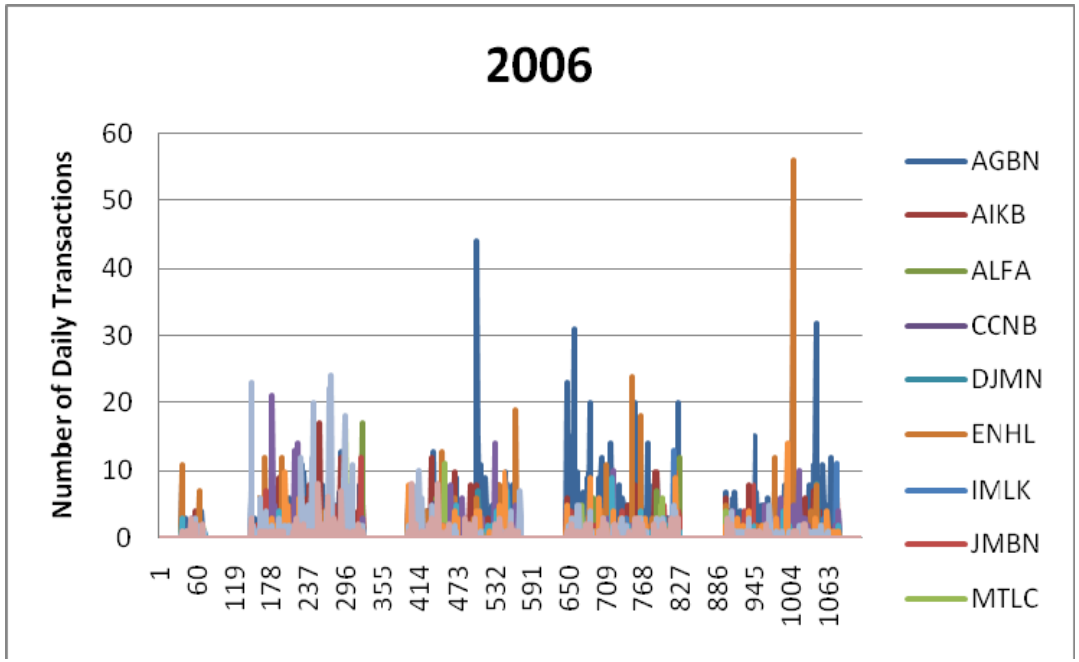
December 2006

	<=-120	-80.00	-40.00	0.00	40.00	80.00	>=120
AGBN	0.12	25.12	3.20	44.55	5.33	2.73	18.96
AIKB	0.11	8.94	4.41	71.61	6.22	2.15	6.56
BMBI	0.93	24.07	0.93	42.59	5.56	0.00	25.93
ENHL	0.16	15.15	2.93	54.72	7.33	4.40	15.31
IMLK	0.77	11.54	1.54	58.46	10.00	3.85	13.85
JMBN	1.25	25.00	1.25	46.25	6.25	0.00	20.00
KMBN	1.67	26.67	0.00	35.00	1.67	1.67	33.33
MTBN	0.32	23.81	2.86	40.95	7.30	1.27	23.49
MTLC	0.41	19.92	3.25	56.91	4.07	2.44	13.01
PRBN	0.46	17.97	2.30	54.84	5.53	4.61	14.29
SJPT	1.00	10.45	4.21	55.56	12.29	4.88	11.62
TGAS	0.89	19.64	0.00	43.75	5.36	1.79	28.57
TIGR	0.93	14.95	3.74	51.40	11.21	4.21	13.55
TLFN	0.69	18.75	1.39	40.28	6.25	1.39	31.25
UNBN	0.75	20.15	0.00	44.78	2.24	2.24	29.85

December 2007

	<=-120	-80.00	-40.00	0.00	40.00	80.00	>=120
AGBN	0.05	16.19	1.25	63.31	5.24	1.04	12.92
AIKB	0.09	14.18	2.05	61.06	7.77	1.96	12.89
ALFA	0.71	8.57	0.71	63.57	7.86	2.14	16.43
CCNB	1.32	11.84	0.00	67.11	3.95	0.00	15.79
DJMN	2.94	20.59	0.00	38.24	5.88	5.88	26.47
ENHL	0.20	7.94	1.59	66.47	9.92	6.15	7.74
IMLK	0.69	6.94	2.78	66.67	11.11	6.94	4.86
JMBN	0.47	15.81	0.93	60.00	3.26	1.40	18.14
MTLC	0.66	11.18	2.63	59.87	9.21	3.95	12.50
PRGS	0.25	0.75	3.73	74.63	18.66	1.49	0.50
SJPT	0.53	12.70	3.17	48.68	11.64	9.52	13.76
TGAS	0.33	6.64	1.33	67.77	6.98	3.65	13.29
TIGR	0.22	7.33	3.45	74.57	5.82	3.45	5.17
UNBN	0.41	14.94	1.66	66.80	3.73	1.24	11.20

Exhibit 5.2: Number of Trades



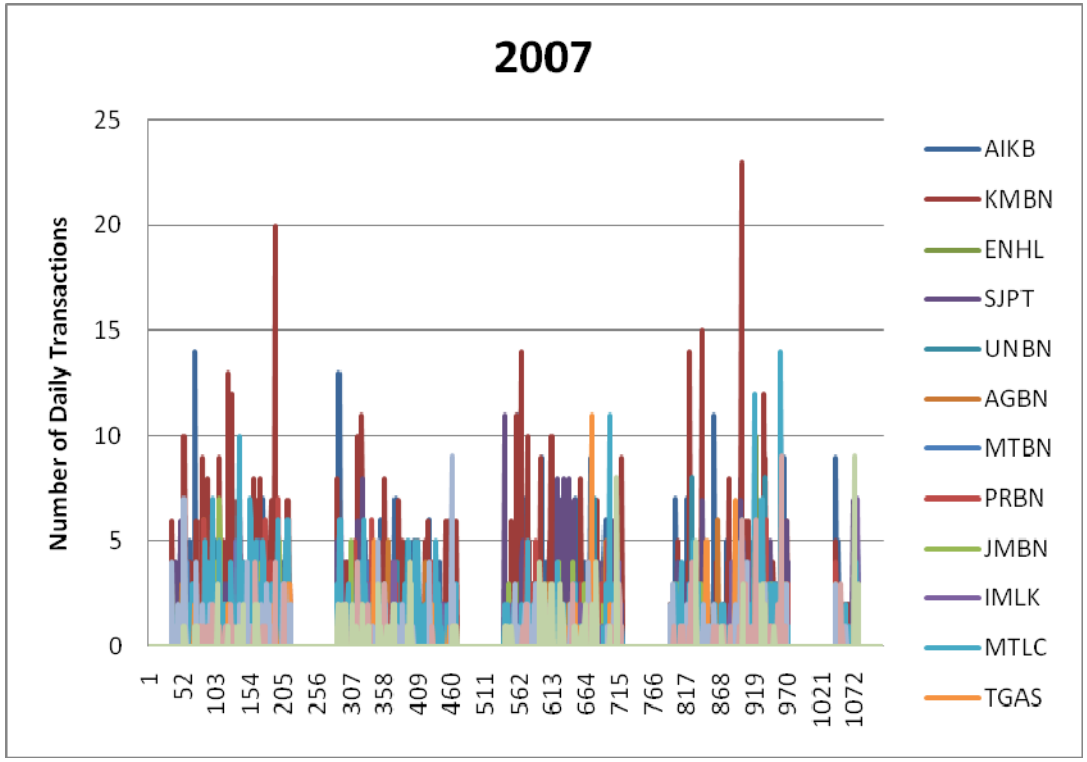
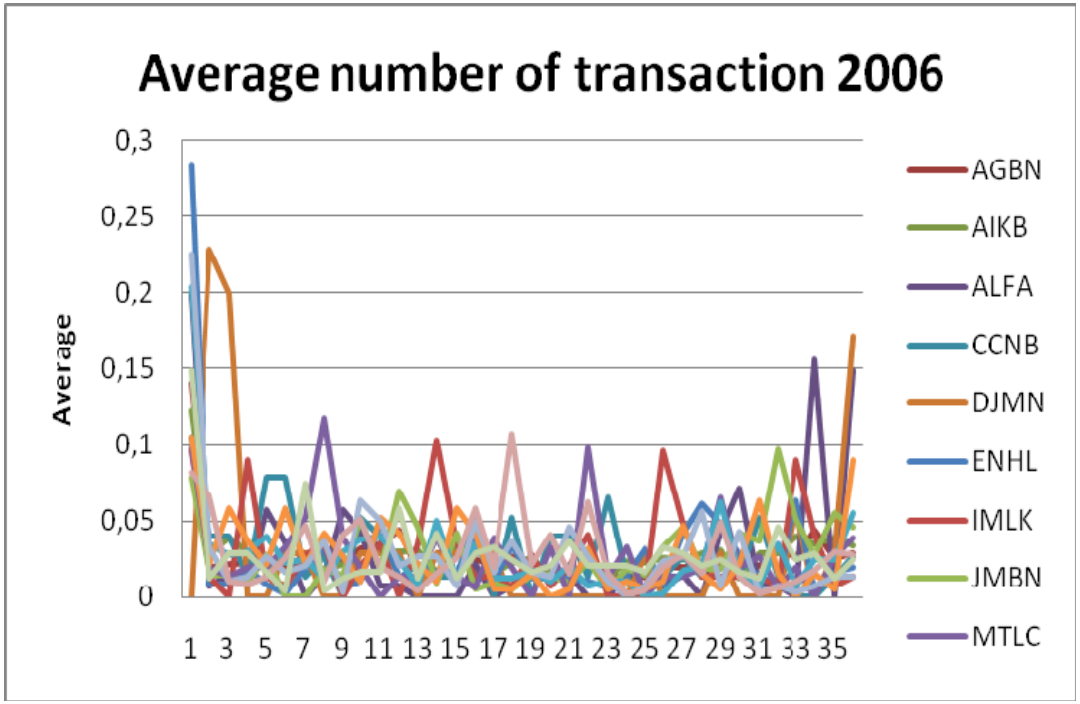

2007
Number of Daily Transactions
25
20
15
10
5
0
1
52
103
154
205
256
307
358
409
460
511
562
613
664
715
766
817
868
919
970
1021
1072
AIKB
KMBN
ENHL
SJPT
UNBN
AGBN
MTBN
PRBN
JMBN
IMLK
MTLC
TGAS

Exhibit 5.3: Average Number of Transactions in 5 Minute Intervals During a Day



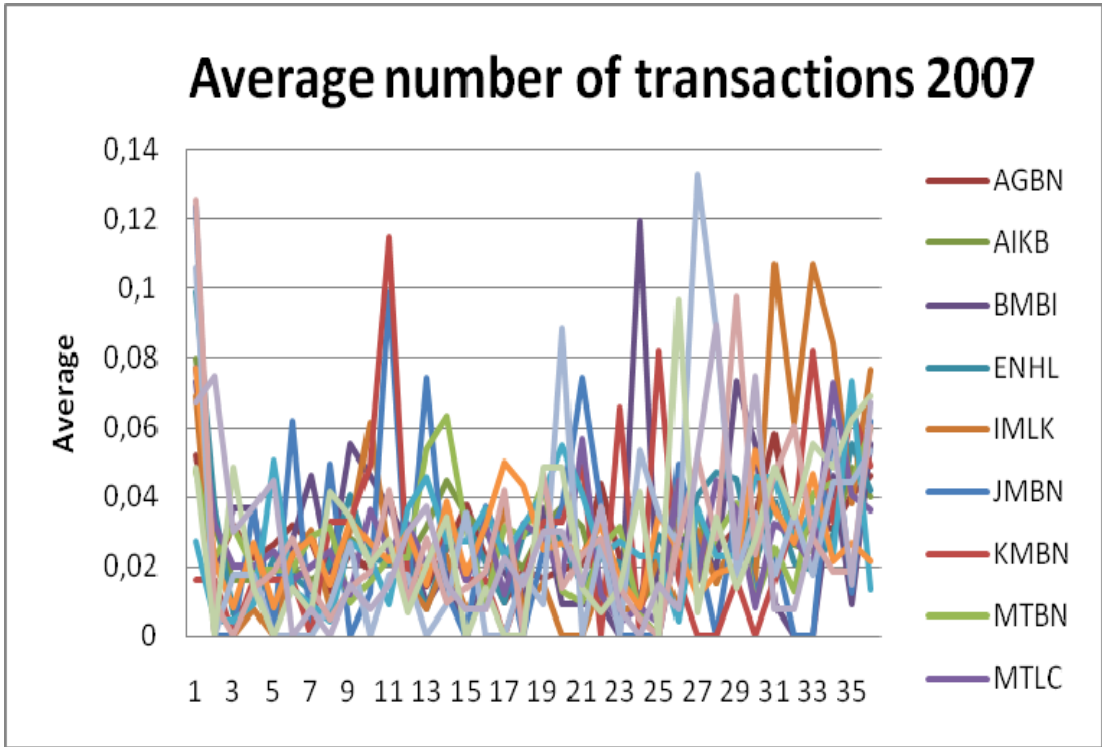
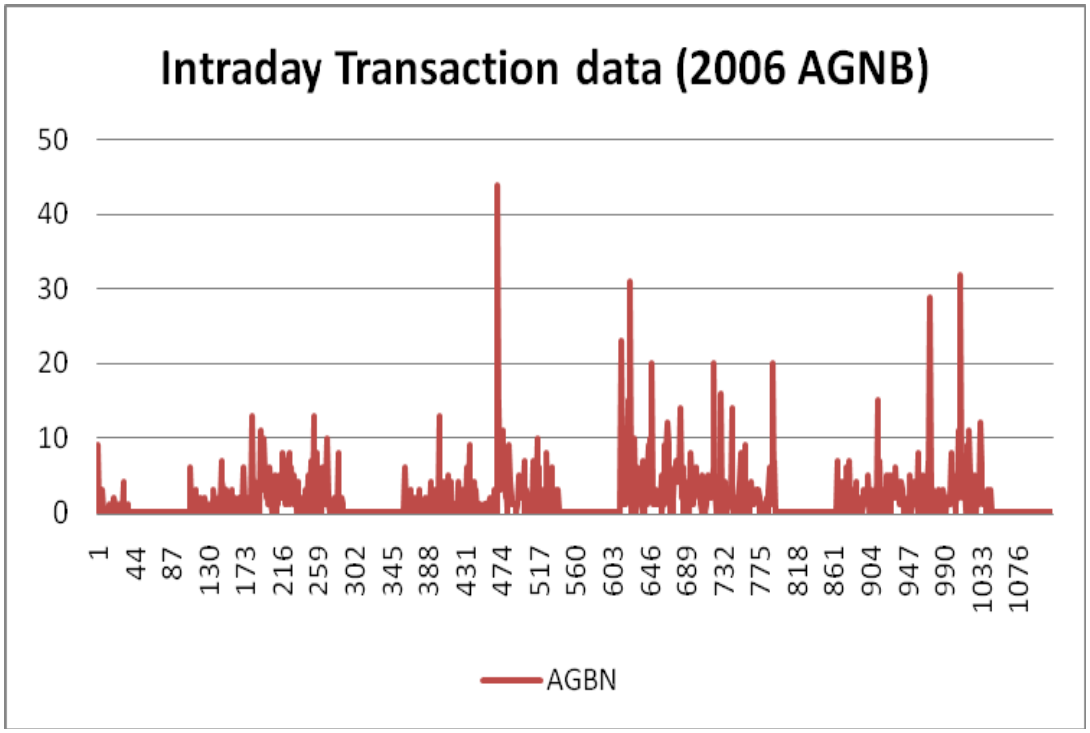

Average number of transactions 2007
Average
0,14
0,12
0,1
0,08
0,06
0,04
0,02
0
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35
AGBN
AIKB
BMBI
ENHL
IMLK
JMBN
KMBN
MTBN
MTLC

Exhibit 5.4: Number of Trades, AGNB



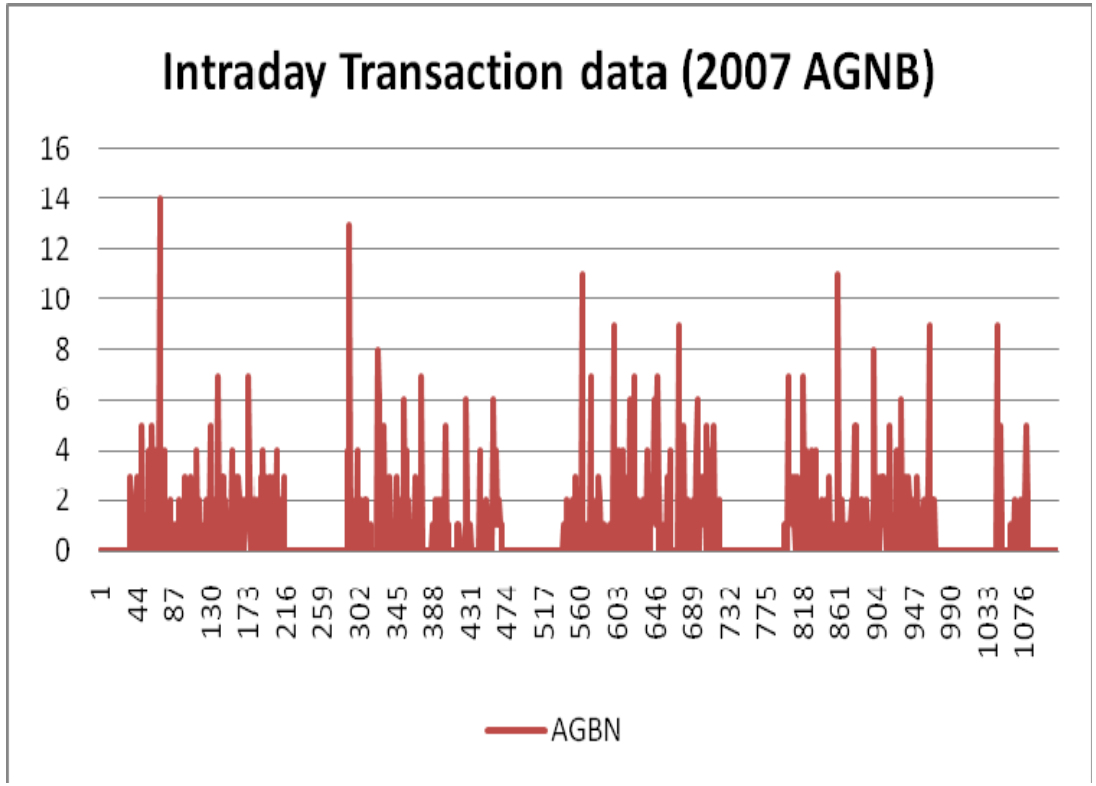
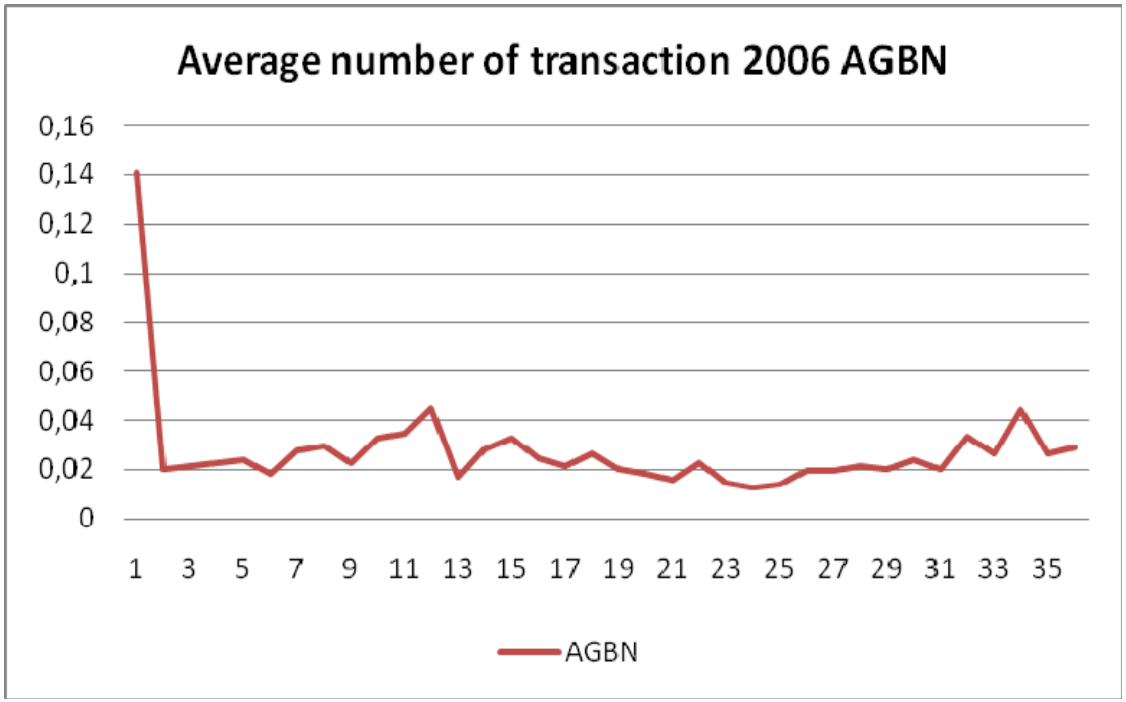

Intraday Transaction data (2007 AGNB)
16
14
12
10
8
6
4
2
0
1
44
87
130
173
216
259
302
345
388
431
474
517
560
603
646
689
732
775
818
861
904
947
990
1033
1076
AGBN

Exhibit 5.5: Average Number of Transactions in 5 Minute Intervals During a Day, AGBN



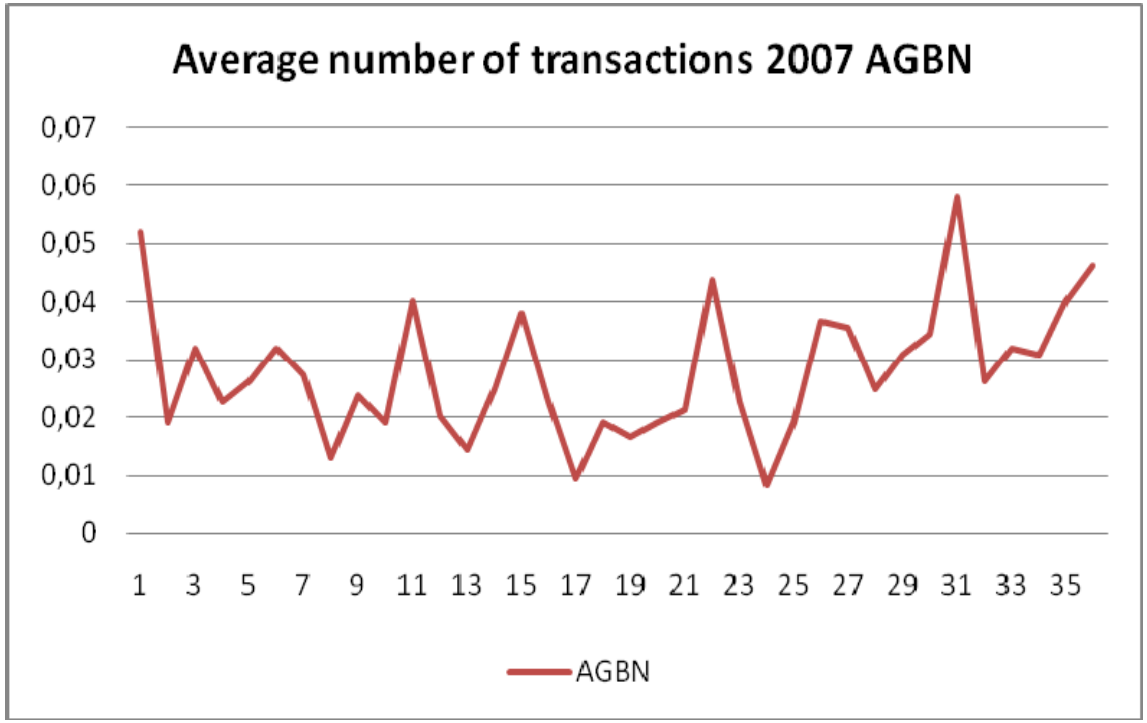


Exhibit 5.6: Two-Way Clasification of Price Movements in Consecutive Intraday Trades for AGBN stock

AGBN	2006			2007		
	i-th trade			i-th trade		
(i-1)-th trade	185	170	119	108	95	61
	188	726	164	86	165	90
	105	176	73	79	69	70

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