

Emilija Vuksanović<sup>1</sup>, Jelena Purić<sup>2</sup>, Violeta Todorović<sup>3</sup>  
**THE FIX PROTOCOL IN THE FUNCTION  
OF IMPROVING BUSINESS OF BSE MEMBERS<sup>4</sup>**

*This paper is aimed at determining the business effectiveness and efficiency of BSE members after the introduction of the new trading system based on the FIX (financial information exchange) protocol. The research was based on the survey of the BSE (Belgrade Stock Exchange) members that are connected to the system via FIXAPI modules that allow their clients risk-free, electronic transmission of orders in real time. Implementation of the new system was carried out in April 2008, so the time taken into consideration is sufficient to confirm the hypotheses and conclusions. In addition to the discussed problem area, the focus of this work is the analysis of the factors influencing the development direction and acceptance of the new trading system during the foregoing period. What is also taken into account is the legal framework which is significant for the system implementation.*

**Keywords:** electronic trading, FIX protocol, BSE, broker dealers, banks.

**JEL codes:** G14, G20.

Емілія Вуксановић, Елена Пурић, Виолета Тодоровић  
**РОЛЬ FIX-ПРОТОКОЛУ В ПОКРАЩЕННІ  
БІЗНЕС-ПОКАЗНИКІВ ПІДПРИЄМСТВ  
НА БЕЛГРАДСЬКІЙ ФОНДОВІЙ БІРЖІ**

*У статті визначено результативність і ефективність роботи членів Белградської фондової біржі після введення нової торговельної системи, заснованої на FIX-протоколі (обміні фінансовою інформацією). Дослідження засновано на опитуванні учасників Белградської біржі, яких підключено до системи через модулі FIXAPI, що дозволяють без ризику проводити електронну передачу вказівок у реальному часі. Введення нової системи відбулося у квітні 2008 р., тому пройшло вже достатньо часу для підтвердження гіпотези і висновків. Проаналізовано фактори, що впливають на напрямок розвитку і прийняття нової торговельної системи протягом попереднього періоду. Для впровадження системи взято до уваги її правову основу.*

**Ключові слова:** електронні торги, FIX-протокол, Белградська фондова біржа, брокери-ділери, банки.

**Рис. 1. Літ. 19.**

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**РОЛЬ FIX-ПРОТОКОЛА В УЛУЧШЕННІ  
БІЗНЕС-ПОКАЗАТЕЛЕЙ ПРЕДПРИЯТИЙ  
НА БЕЛГРАДСКОЙ ФОНДОВОЙ БИРЖЕ**

*В статье определена результативность и эффективность работы членов Белградской фондовой биржи после введения новой торговой системы, основанной на FIX-протоколе (обмене финансовой информацией). Исследование основано на опросе участников Белградской биржи, которые подключены к системе через модули FIXAPI, позволяющие без риска проводить электронную передачу указаний в реальном времени. Введение новой системы состоялось в апреле 2008 г., так что уже прошло достаточно времени для подтверждения гипотезы и выводов. Проанализированы факторы, влияющие*

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*на направление развития и принятия новой торговой системы в течение предшествующего периода. Для внедрения системы принято во внимание правовую основу.*

*Ключевые слова:* электронные торги, FIX-протокол, Белградская фондовая биржа, брокеры-дилеры, банки.

**Introduction.** The development of electronic securities trading system at Serbian market started in 2004, when the phone system trading was ended. Through the implementation of FIX protocol, which represents a technical specification for electronic communication through messages related to trading of financial instruments, this system was brought to the level of the World Stock Exchanges. Considering the fact that the system has already been accepted by the participants of the leading world capital markets, it was logical to implement the same system at domestic market to become equal, at least according by a trading system, with developed ones. Since the focus of this paper is related to the BSE and its members, our further elaboration will entirely be concerned with their mutual communication.

The subject of this work is to prove the following hypotheses:

*H1:* The implementation of a new information technology at Serbian capital market, leading not only to an increase of the number of electronic trading service users, but of cost-effectiveness and efficiency of service providers business as well.

*H2:* The crisis of the world financial system drastically reduced the number of investors who used the electronic securities trading system.

*H3:* The FIX protocol implementation in Serbia increased the financial security of sending trade-related messages electronically.

**1. Implementation of FIX Protocol at Serbian Capital Market.** Electronic stock exchanges, as the most technologically advanced organization of this type of business, are based on the implementation of information technology, especially network economy with the Internet playing the key role of global multimedia network (Vuksanovic, 2006, p. 206). With the implementation of a new security trading system based on FIX protocol in 2008, the BSE has become one of them. FIX protocol represents a standard for communication before and during the securities trading process. Investors who want to buy shares of a particular issuer come into contact with them through mediation of broker-dealers licensed by the Securities Commission or banks authorized to operate as brokers. Electronic transmission of data is done via FIX API module which performs the conversion from internal to FIX format messages and vice versa. Its main functions are establishing connections, providing security, authentication and authorization (Eric, 2003, p. 434).

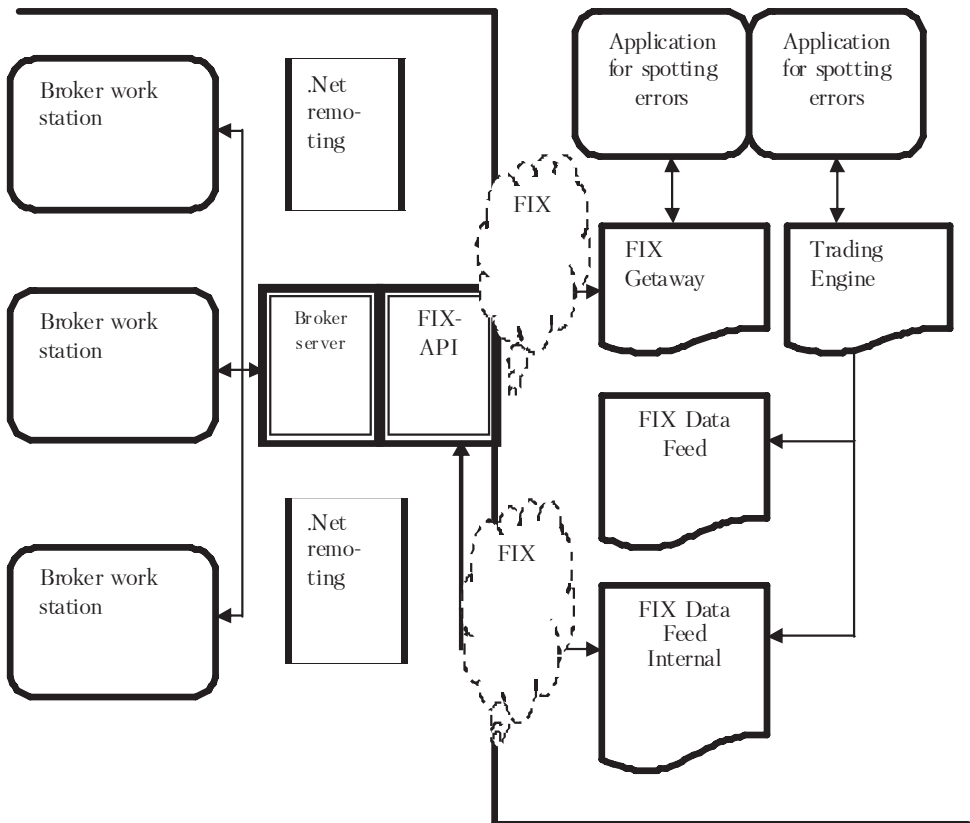
Following the experience of developed countries, the BSE management decided to develop a trading system with a unique protocol for exchange of information at financial markets, in order to ensure a safer and faster exchange of information. The trading system consists of interconnected modules, enabling all the BSE functionalities. We distinguish the following modules:

- The Listing Module, which is used for registration of market materials, their inclusion into the exchange market, trading suspensions, registration of exchange members etc.

- The Trading Module, which is the central part of the system, enables users to take over the basic data on market materials, authorized brokers and exchange members. For trading control and monitoring the Market Supervision module is used, which enables users to monitor the market both online and offline.

- The Information Module enables automatic generation of periodical reports and for this purpose is connected with the Exchange web site.

The new system enables the electronic entering of orders via the FIXAPI module. Members can connect their back-office applications thus enabling their clients fast order delivery to the trading system. In general, the implementation of new trading system means the improvement of system performances, speed and safety which are extremely important for all investors and participants of any local capital market. Figure 1 shows communication between the BSE and its members, after the implementation of the protocol.



Source: Miladinovic, R. & Begovic, N. & Markovic, M. (2007). Brokerage trading applications based on the FIX protocol. YU Info VIII Conference, Kopaonik, p. 3.

Figure 1. Brokerage applications for communication with the Belgrade Stock Exchange

Figure1 shows: 1. an application for brokerage houses, which enables the automatic performance of all listed activities, which is the standard practice in the world,

and 2. an application developed by the BSE, which includes those activities at a brokerage firm relating to securities trading. This concept of client applications development is implemented because brokerage trading applications development do not fall under the jurisdiction of the exchange, but it is the broker-dealers that develop it independently or in concert with independent software companies. Also, the broker-dealer firms that do business at the domestic market, but which have their seats in another country, develop the above mentioned applications in consultation with their core business centers. The jurisdiction of the exchange, in this case, is reduced to the verification of such applications, that is, verifying these applications meet the FIX specification and does not affect negatively on trading system of the exchange.

Broker server and the FIXAPI module constitute the main part of the brokerage application. Broker server module is the core of server applications at the brokerage side, and contains the collection of all relevant data, either for an entire brokerage house or individual stations, that is, brokers. These are various trading data, for example: order book, book sales agreement, market image (the main board), market depth, the list of securities, the data sent by brokers to the stock exchange for processing and the like (Miladinovic et al., 2007, p. 4).

The FIXAPI module functions as the gateway and performs the conversion of messages from the internal format to FIX format and vice versa. Messages sent in both directions represent the FIX protocol messages with main features: establishing the connection, providing security, authentication and authorization. Broker server is not directly related to FIX protocol, but the FIXAPI module represents a communication link with the stock exchange. Communication between clients' applications and servers of a brokerage house is made by using .Net Remoting technology that is applicable only to the Windows platforms. TCP/IP socket connection is used for data transfer at the lower level (Miladinovic et al., 2007, p. 4).

Also, it was necessary to create an adequate legal framework for the purpose of efficient operation of electronic trading systems. It was created through the Law on Electronic Signature, the Electronic Documents Law, the Electronic Commerce Act and related laws and regulations, but according to the members of the Exchange it is not adequately implemented in practice.

**2. Costs and benefits of the implementation of the FIX protocol.** Successful implementation of the FIX protocol required willingness of broker-dealer firms to accept it, because of needs for additional investment in new software and network services. Broker-dealers, which do business at the domestic market, were the first to recognize the benefits of protocol implementation. However, the costs, either in the period of the protocol implementation or during this particular analysis, presented a significant item.

During the implementation of the FIX protocol, it was necessary to allocate the resources to:

- develop a new information system for the FIX protocol implementation and broker application development;
- improve computer and telecommunications equipment, which is meant to supply the first server with appropriate options. These improvements are mainly related to broker-dealers, which bear the costs alone;
- the BSE members are, in addition to costs related to the protocol implementation, obliged to pay one-time, monthly and annual fees.

The above costs should be recovered from charging fees based on the provision of electronic securities trading, but it is not done due to many factors. In the empirical analysis, this statement will be confirmed on the basis of data obtained in the research. Users of electronic trading services can install a broker application in the form of web programs without additional costs. Securities trading costs are reflected in the opening of a securities account according to the tariff of the Central Register, as well as brokerage and bank provisions, the Central Securities Register and the Exchange Commission. Also, an innovation is the so-called live feed, which presents a display of securities prices and market depth in real time. This service has an additional cost.

FIX protocol brings the following benefits to the participants of a capital market (BSE, 2007, p. 20):

- safely data transfer between financial market participants, especially the issuance of the new version of FIX5.0.;
- creation of a global market on which players are gathering from all parts of the world;
- increasing the efficiency of communication between market participants;
- providing broad support and availability of software packages;
- simplicity and independence of trading platforms;
- adaptation to the needs of all users.

In addition, broker-dealers can extract the following individual benefits (BSE, 2007, p. 20):

- automatic electronic receipt of client orders, which significantly increases the reliability of trading process and reduces the possibility of errors;
- extra time for other activities;
- reducing the cost of operations in the trading process due to the reduction of manual work and errors on that basis;
- independent development of information systems adaptable to their needs;
- efficient distribution of commercial information to clients, enabling better monitoring of certain phases of trading.

The identified benefits are really used by capital market participants, because conducted research proves that implementation of the FIX protocol has raised the trading system to a higher level.

**3. Empirical Analysis.** For this study we sent surveys via e-mails to the BSE members connected to the electronic trading system of the exchange. 21 members are connected to that system, 15 of them responded to the survey, which is more than 71%. On the basis of the conducted survey, we can conclude that the results of our research are valid.

It's important to note that from 15 members, who have completed the survey, 6 are licensed bank members and 9 are broker-dealers. From the above we conclude that electronic trading securities services, provided by licensed banks, represent only one of banking services, as opposed to broker-dealer firms which represent their core activity. So it is understandable to get a greater number of filled surveys by broker-dealer firms.

The main goal of the conducted research is to collect data on the basis of which the response to the following questions may be formed:

1. How many members really provide service of electronic routing of orders?
2. In what percentage has the number of investors who are users of application for electronic transmission of orders declined/increased and which of these factors have the greatest influence on that?
3. Are the costs, which the BSE members had because of server acquisition and improvement of computer and telecommunications technology, recovered from the revenue generated from the provision of electronic trading services?
4. Is the security of sending data electronically at the higher level after implementation of the FIX protocol than before it?
5. Which mark was given for the BSE engagement for the introduction of a new trading system in comparison to the world stock exchanges?
6. What is the opinion of the BSE members on legislation, applied to electronic trading?

The results of the survey-based research and the surveyed BSE members connected to the BSE trading system, display that only 9 of 15 members of the BSE (consisting of 9 broker-dealers and 6 licensed banks) really offer electronic trading services.

As for those who were identified on the list of members in terms of being connected to the BSE system, 3 broker-dealers do not provide electronic trading services for technical reasons or because of a failure to comply with certain conditions. These are: 'Wise broker' JSC (joint-stock company) Belgrade, 'Energy broker' JSC Belgrade and 'East West Invest' JSC Belgrade.

Only 2 of the 6 licensed banks in the survey are connected to the BSE system and actually provide the foregoing services, and they are: Vojvodjanska Bank JSC Novi Sad and UniCredit Bank Serbia JSC Belgrade. The following banks do not provide this type of service: Erste Bank JSC Belgrade, Eurobank EFG JSC Belgrade, Development Bank of Vojvodina JSC Novi Sad, and neither does the Postal Savings Bank JSC Belgrade.

Therefore, it can be concluded that although the FIXAPI module enables the exchange members offer their clients electronic trading, they are not obligated to do it. In this sense, the decision to provide this type of service depends on the members of the exchange and their organizations.

Also, the main question raised refers to the cost recovery of the exchange members on the basis of the new technology introduction, new software solutions, which were inevitable for the efficient implementation of the protocol. After the analyses of the submitted surveys it is concluded that only two broker-dealer firms, InterCapital Securities JSC Belgrade and Ilirika Investments JSC Belgrade, were able to provide compensation costs by providing electronic securities trading services.

Some of these members such as the Postal Savings Bank JSC Belgrade, Development Bank of Vojvodina JSC Novi Sad, provided electronic trading services to interested clients before the outbreak of the crisis. The main reason for not supplying this kind of services is a drastic decline of the investors interested in using this service. The decline is ranging from 50 to 75%.

41% of the respondents singled out the illiquidity of the market material, before the outbreak of the crisis, as one of the main causes of decline in the number of investors. Another factor is the already mentioned global crisis of financial system, as

confirmed by 36.4% of the respondents. Also, 13.6% of them confirmed high state regulation on the capital market as one of the important factors of a decrease in the number of investors.

As regards the raised question: 'In what percentage has the number of investors who are users of applications for electronic transmission of orders declined/increased and which of these factors had the greatest influence on that?' the BSE members gave the following answers:

- A greater number of the exchange members who provide electronic sending payment services, recorded an average decline in the share of investors who use this service, by 61%.

- A smaller number, only 4 members of the broker-dealers, recorded an average growth of 22.5%.

98% of the respondents replying to the question on security of sending orders, or any other financial information, gave a negative response. This shows high performance of the protocol. With the development of new versions the new features were developed as well. It can be said that there is an increase of stability of growth rate of the protocol functionality through different versions, both horizontally and vertically. Horizontal extension of its functionality meant a lot for the development of applications supporting debt, foreign exchange and derivative markets, whereas the vertical extension of functionality meant expansion of its pre-trading and post-trading phase, which makes it possible to develop the STP approach (straight-through-processing) (Houstoun K., 2007, p. 14-36).

68.3% of the surveyed members of the BSE, that is, most of the broker-dealers providing electronic trading services, responded that the legal framework for e-commerce, especially in the part related to the securities trading, was not adequate.

**Conclusion.** The framework for embedded research in which an increase of the domestic capital market efficiency, and thus the entire financial market, has the function of improving the BSE information systems operation, raised many theoretical and practical issues. Illumination of the key aspects of complex problems of implementation and revival of the new trading system, based on the FIX protocol, confirms the complexity and importance of this issue.

The main purpose of the implementation of the FIX protocol at the capital market in Serbia is gradually adjusting to the world stock exchanges. Domestic investors are given the opportunity to trade in real time in numerous international markets, while foreign investors have been able to invest in domestic securities. In this manner, the BSE has become part of the idea of creating the global market, available to all, at any time.

In 2008, the BSE implemented a new information system based on the FIX protocol. At that point, it had a solid trading volume and high participation of foreign investors. At the end of this year and in early 2009 the first signs of the global crisis of the world financial system appeared. The exchange and its members were not able to predict its future course and invested funds in the new IT system and software solutions. Taking into consideration that, duration and critical number of customers are necessary for reimbursement of expenses and making profit from the new investment, the new system did not get a chance to show its efficacy. The crisis of the world financial system and the internal problems of the state discontinued the development of



the capital market, which was inevitable with the new trading system based on the FIX protocol.

The world financial system crisis is one of the most important factors affecting deterioration of the domestic capital market operations. The above mentioned statement was confirmed by 36.4% of the respondents. What is evident here is the influence of numerous, external and internal, economic and non-economic factors on the Belgrade Stock Exchange. According to the survey, 41% of the respondents singled out the illiquidity of the market material, even before the outbreak of the crisis, as one of the main causes of a decline in the number of investors. Also 13.6% confirmed high state regulation of the capital market as one of the important factors. These data show the real situation, since they are based on a comparative analysis of the number of issuers of securities, both before and after the crisis. Therefore, it can be concluded there has been a drastic decline. In addition to the aforesaid, it is important to emphasize that the number of issuers in the former OTC market was more than 2000 while today 978 shares are being traded on the multilateral trading platform, which is considered to be a replacement for the former OTC market, according to the economic analytics. When the Capital Market Law ('Official Gazette' no. 31/2011) coming into effect, with higher requirements for entering into the so-called regulated market or multilateral trading platform, the market was cleansed of illiquid shares, which will have a significant effect on attracting new investors.

One of the main benefits from the implementation of the FIX protocol is safely sending messages between the financial capital market participants. A very high level of security of sending messages through FIX protocol was thoroughly elaborated in the paper itself. The confirmation of the above statement lies in numerous versions of this protocol which complemented one another and each one of them provided higher level of security.

The drawn conclusion followed the results of the research, taking into account that even 98% of the respondents gave a positive response to the question whether they encountered any difficulties with their clients regarding the security of electronic information sending.

Also, the FIX protocol implementation created an opportunity for the implementation of Markets in Financial Instruments Directive 2004/39/EC (MiFID), which plays a key role in the creation of a more competitive and more efficient single (global) securities market, and its goal is an accelerated creation of the unique cross-border securities market (J. de Haan, Oosterloo & Schoenmaker, 2009, p. 52). Serbia, as a country with the candidate status, has accepted this recommendation.

Although the majority of the respondents agree that the lack of liquidity of securities traded on the BSE (41% of the respondents) and the world financial system crisis (36.4% of the respondents) present the main causes of poor functioning of the capital market in Serbia, it is certain that one of the deciding factors is insufficient education of the majority of population. For this reason, the BSE members, as intermediaries and carriers of electronic securities trading, should actively engage in training of their clients by inhibiting an opinion on the virtual stock market trading systems, as something strange and incomprehensible.

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