FORECASTING NEW TECHNOLOGY IN CASE OF FOREX AND EQUITY MARKETS

Milorad Stamenović[1], Kristina Stamenović[2]
[1]**Senior Research Associate** at INC Research, m.stamenovic@rocketmail.com
[2]**Financial Manager** at Pierrel Research, v_kris08@yahoo.com

Abstract: *This paper deals with arising question "whether to build or buy a trading platform", which is a common question within brokers, dealers and traders at Forex and Equity markets. Speed of development and IT implementation costs together with critical analyses and market growth and IT spendings are described on hypothetic example of company "X" in order to exlain all difficulties that one brokerage company has at todays market. Downsides, strategy enablers and alternatives to traditional optimization have key role in further determination of decision-making process. This paper has value for brokerage companies, trading companies, IT sector and educational institutions.*

Keywords: *Forex market, Equities market, transfer technology, algoritmic trading, built or buy trading platforms*

1. INTRODUCTION

Forex is a type of OTC i.e. over counter market, which means that there is not precisely defined centralized market position. However, the largest share of money is transposing trough UBS bank of Switzerland. Genesis of Foreign exchange market show to us highly dependence of trading at FX market on one hand and developing of specific technology on the other. At the beginning of trading, no meter do we trade with equities, currencies, futures or any other financial instrument, there was wide usage of different technology. We can say that technology is essential for today trading possibilities. Historical turnover from phone and floor trading to the most sophisticated software and tools for trading lead us to conclusion that tools and instruments for trading are changeable category.

In the essence of FX market there is still supply and demand of currencies, but all the other tools for trading has been changed from technological aspect of view. In the late 20th century, with developing of world wide web, everybody has the opportunity to trade trough his/hers own personal computer. Traders all around the world have the newest information on price movement in a second. Also, information regarding fundamental analysis ,used in price forecasting are very accurate from time and expertise segment of information. Today, there are specific programs for FX trading which are available to wide specter of traders . We can say that there are highly specialized programs on market whit newest and already tested indicators for price/time forecasting. This specific kind of programs are adapted to on line trading. For instance, for small traders and individual traders there is Meta Quotes Language software i.e. MQL, the newest version is 5.0 [2] which has ability for real time information proceedings about price movement from one side, and from the other, there is exceptionally good visualization of specific graphic of movement.

Also, in MQL we can find numerous indicators for price/time forecasting and traders can use expert advisor panel for algorithmic trading whit C++. In case of expert advisors usage, anyone can invent and create specific indicator for self trade usage. This kind of possibility to invent new indicators is potentially the best option of MQL in terms of technology innovation. Generally, MQL as well as other commercial software for trading is available to anyone therefore it gives huge impulse to number of new transactions. From the other side of view, trading shares are significantly smaller.

From aspect of program visualization, commercial platforms have momentous technology progress, therefore today all participants, even small traders can enjoy in highly sophisticated graphics on its own personal computers.
Traders are using technical and fundamental analysis to reduce probability for losses. In terms of technology, we can say that both analysis (fundamental and technical) are highly dependent on technology innovations.

There is need related to market conditions which moves forward all techniques which can be used as trading tools. Institutional investors, software vendors, brokers and dealers, all of them have need for a better understanding of innovative enhancements which are in purpose of cutting transaction costs, minimizing human error, boosting trading efficiency, and supplementing general productivity. Regulatory and Economic pressures have an effect in technology progress. Algorithmic and Electronic trading is becoming increasingly a response to financial institutions and also investors need to shift blocks of shares i.e. money on FX market with lower transaction costs, insignificant market impact, and low level of information leaking. Constantly innovative products which are designed to cut costs and also to create more efficient security industry have implicated that banking firms , institutional investment advisors and other investors to rethink about their trading operations.

Algorithmic trading is cost-effective method for performing of low-maintenance equity trades. This kind of trading led to reductions in sales and also trading desks. The expansion of new technologies in algorithmic and electronic trading creates totally new industry for financial professionals.

The history of automated trading can be clearly traced in the trading process progressing to what it is today:

- High touch trading: Prices are quoted over the phone.
- Indicative prices: Prices are published but require manual confirmation.
- Screen-based-trading: Prices can be executed on a screen.
- Automated trading: Prices can be published and executed by a computer.
- Automated trading originated with vendors providing execution data on the exchange floors and other trading venues. Originally, vendors were simply data providers, but under competitive pressure, they were allowed to publish tradable prices on vendor quotation screens, and finally were enabled to engage in electronic automated trading. In the past couple of years, vendors such as Reuters, EBS, and Bloomberg have been trading across all the underlying instruments, which include equities, foreign exchange, and fixed-income instruments.

Table 1, Current market situation
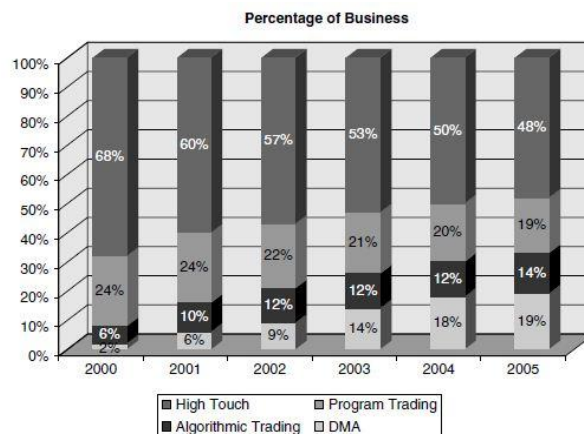
Infrastructure and fitting protocols are mandatory to help developing of this industry. Agency brokers , Investment banks, and investment managers need efficient   securities processing cycles to make this industry grow.

Algorithmic and Electronic trading has become a focus for securities regulators and financial institutions. Market developments in accordance with appropriate regulations have made equity trading less profitable and more complicated. New technologies and automation have influenced on the trading game in the past years. Financial information speed is   outpacing traders forecasting. Networking speeds are higher and through financial engineering there is demand for automated model-based trading from one side and lower commissions from the other. Also, there is present increase in competition which applies in lower transaction costs and which in finally forcing companies to invest more in their trading infrastructure. Electronic and algorithmic trading has been started on Wall Street.

1.1 Electronic Trading Networks

Trough its development, Algorithmic trading has become competent advantage in terms of enabling low-cost transaction executions. Algorithmic trading is originated on trading desks of investment banks.

Algorithmic trading began to expand because of new client needs and new demands of brokerage industry. Environment become more competitive and DMA i.e. Direct Market Access trough Internet began to use widely.

According to Manny Santayana, managing director at Credit Suisse's Advanced Execution Services Group (AES), "Algorithmic trading has created a level playing field which ultimately benefits shareholders with smarter, more efficient, and cheaper execution."

Electronic exchanges and NASDAQ have move forward the traditional model of the NYSE i.e. New York Stock Exchange from phone-based order, and floor brokers to technologically looking more sophisticated trading environment.

There are currently five major ECNs according to the TABB Group:

- Instinet (INET)
- Bloomberg (TradeBook)
- Archipelago (ArcaEx)
- SunGard (Brut)
- NASDAQ's own SuperMontage.

Each of these ECNs is a liquidity pool that houses its own order books.

2. PRESENTING A MAIN PROBLEM

Algorithmic trading system has into itself rules for entry to position and exit from position. Mentioned rules are set of mathematical and logical operations which are based on quantitative, qualitative or technical research.

Algorithmic trading is complex group of elements, in which main structure are following:

- hardware
- software
- clients
- servers
- networks
- databases
- calculation engines
- application programming interfaces
- real-time data feeds
- graphical user interfaces

Securities and Exchange Commission introduce decimalization in 2001.
This decision force market makers and relevant institutions to switch stocks value from traditional sixteenths i.e. \$.0625 to valuing them in penny spreads i.e. \$.01. Such decision enlarged price points from 6 per dollar to 100 (it was applicable to FX market in terms of Expanded Decimalization leads to smaller FX Spreads). As answer there was trading margin reduction by 84 %. Main idea for introducing decimalization was to make costs for transactions lower for specific target group of smaller investors and individuals from one side and from the other reduction of trading margin lead to smaller market share of big investors and their business reduction. The one who want to survive has to adopt new technology of trading.

Availability of FIX and Decimalization are the two main bearer of algorithmic trading The Financial Information Exchange Protocol (FIX) represents messaging specification for electronic communication protocol, which is produced by FIX Protocol Ltd.. Developers i.e. FIX Protocol Ltd. owns specification and maintains keeping it free and in public domain. FIX is not a software. Around FIX, software developers can create open source or commercial software. FIX is market leading protocol and is integrated to trading systems and further more to order management. According to Eric Goldberg, CEO of Portware, a global securitiesindustry's leading developer of broker-neutral trading software states, *"FIX as a standardized protocol has made it possible for independent software vendors to provide destination-neutral systems for electronic trading. As the proliferation of FIX continues to increase the use of electronic trading worldwide, algorithmic trading won't be far behind. As use of FIX grows, so will the use of algorithmic trading'.* As decimal pricing influence on price decreasing for penny, algorithmic trading was a reliable solution for

problem of market fragmentation and smaller spreads. Mentioned kind of specific algorithmic programs have that ability to slice large blocks of shares, ensuring that each order gets the best price.

Algorithmic trading does not replacing traders. Only way of proper use of algorithmic trading is by people who design it. From the other side traders population who will use algorithmic trading will replace traders population who do not have specific skills which are definitely competitive advantage. There are currently differentiation of execution choices that are available to traders. For some of them there is need for greater human intervention and others can be more automated. Algorithmic trading has not its focus on equity markets but also in futures, options , and foreign exchange which is mandatory for this assessment.

Brokerage firms developed algorithmic programs for Execution of transactions for their companies proprietary accounts. Originally, they were designed in-house, but outside sellers provide direct market management systems for clients trading and also provide a centralized processing and clearing system.

There is constantly upgrading and innovating of algorithms to be better and more competitive than peers . Basic sides of each new product are related to cutting costs of entering transaction from one side and have better flow of transactions from the other side. There is supply of algorithms produced in purpose of selling them to smaller companies. This kind of products are customized in certain level, and also, there is possibility of further customization by its clients i.e. own stylized versions.

Data reports of Post trade can lead clients with prompt data regarding executed transactions. Measuring effeciency is mandatory but in some cases it become difficult with customized order flow. Big brokerage companies are not alone in offering specific algorithm
Strategies. There are also agency brokers and other vendors which are providing these services (see Table 2).

Table 2, Algorithmic Trading Hype or Reality
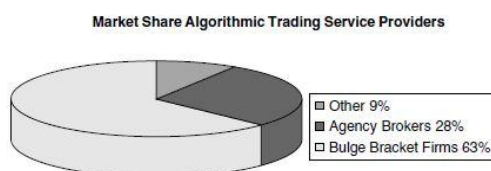
According to above mentioned situation which implicates more and more usage of algorithmic trading as a rising trend in financial instruments trading and especially currency trading, we can say that one of the main problem is related to implementation of such specific kind of algorithm trading in companies.
Further more, specific problem is related to time/cost optimization of implementation of new technologies. In bellow mentioned section 3. there is described case of company Putnam Investments Ltd. which is using Algorithmic trading. Second case example is related to company X which is passing trough process of making decision about algorithmic trading from aspect of time/cost preferences which could be a biggest problem to solve in terms of technology transfer.
` A successful innovation is one that returns the original investment in its development plus some additional returns'.
- Problem related to question whether to build or buy a trading platform.
- Problem related to technology licensing which bring with itself dilemma about weather to produce program buy your own capacities or in licensing agreements with partners.
- Market Growth and IT Spending
- Downsides of Program Trading

3. Example/case presentation of the problem

Algorithmic trading should have stabilizing effect on market. In future, natural language plus statistic analysis might create specific algorithms for analyzing news feed i.e. algorithmic trading in fundamental analysis. Broker dealers, software vendors, and now investment institutions are entering the algorithmic arms race. Since there are so many possible trading strategies, it is doubtful that there will turn out to be one single trading algorithm that outperforms all others.

3.1 Case of `Putnam Investments `

Putnam Investments is a company which is part of gigantic investments found which succedes to have more than 200 billion $ in active and use it in algorithmic trading in several past years. Approximatelly

5 % from trade are made by money of managers and are executed by in-house algoritam. There are expectations that this number will enlarge to 20% in following period of time. Algorithmic trading is one step forward and represents danger for unexperienced funds and traders. Algoritam Trading Strategies can become predictable and may lead to well known patterns of trading. Putnam investments are building its own algorithm trading platforms. Programs that are used in Putnam Investments aim to improve execution, with taking into account the most minute changes, brake trades into tiny pieces and searching for liquidity with a much higher speed than a human trader. With new interface anyone can use mentioned type of programs.

3.2 Speed of Development and IT implementation costs on case of company 'X'

One of main problems in new technology approach may be between the speed of development and speed of the system .'Fast systems that minimize slippage are more profitable than slower ones that may miss opportunities that exist for only milliseconds'. However, there is not need at same time for developing fast and slow speed systems. For fast system its need more time, also it may require expensive hardware and high wages for programmers and network administrators. Trading strategies that could be used only in period of several months because of its specific trading possibilities, may be more adaptable for slower systems and programming languages. In following lines we can see and example of such technology choosing decision in accordance with trading strategy:

Company X would like to buy high speed trading system therefore in their aspect of view, C++ on a Unix platform would be optimal decision   If there is estimation that specific trading system will be profitable only in following year, technology development on a Windows platform will be more reasonable decision. In case of developing system in Windows with C++ , it will take approximately 3 months, and developing in Unix will take for approximately 6 months. Estimation of costs implicates that Unix system administrators and Unix C++ programmers are far more expensive than Microsoft professionals, and in case of costs, estimation will cut into profitability of the trading system.

Unix implementation is preferable one, but maybe it is not feasible in terms of timeframes, ROI or strategy scalability.

Above mentioned case implicates that the world of automated trading systems will be dominated by Microsoft implementations. Integrated development environment .NET by the Windows provides many streamlines and tools and the development process is much easier therefore Unix is often take in consideration. Advantage on Unix is that technology professionals highly value Unix speed and stability.

4. CRITICAL ANALYSIS

Brokers, dealers and traders are under huge pressure to make streamlines for entire trading processes and to reduce costs of transactions. Also, there is need to limiting risks and improve quality of transaction execution. In the 1990s, there was assumption made by financial community that the only effective and efficient way to trade electronically with clients is by creating a proprietary trading platform.

In mentioned period of time, company need to produce its own product, to make better product differentiation which lead to wide dealing logic, customization of trading processes and off course further enhancements. In differentiation of product, outsourcing was not appropriate, therefore, outsourced vendors has lacked of organizational context and also personal relationships to bring complex business strategies. Brokerage firms spent huge amounts of money to invest in some product which is made after all deadlines and also it was outdated.

Trading companies today are always seeking for newer and faster technology. The adoption of such technology is rarely simple process. All costs are connected to
all the applications and technology infrastructure. Usually, licensing fees are just small amount of money in comparing with overall costs.

Question which is always on top is whether to buy or build a trading platform.

4.1 Market Growth and IT Spending

Sell-side and hedge funds drive the most changes in algorithmic trading.
Many hedge funds use growth based investing strategy, but there is also a numerous hedge funds that are using quantitative strategies. The second group of hedge funds use newest technology available such as

algorithmic trading. There is example of Aite Group estimation regarding measurable segments of usage of algorithmic trading:

- approximately 25% of total equities trading volume was driven by algorithmic trading
- 25%, the sell side was composed of 13% followed by hedge fund volume, which stood at 10% of the total
- Algorithmic trading volume initiated by traditional money managers was less than 3%.
- The popular use of algorithmic trading by hedge funds can also be attributable to the explosive growth in hedge funds within the last 15 years.

Trading related to Algorithmic trading services will keep rising. From the other side, costs for such IT developing will also rising. At the end of 2004, $200 million USD was spent on different IT components that make up algorithmic trading services, according to the Aite Group.

Table 3, Projected IT spending
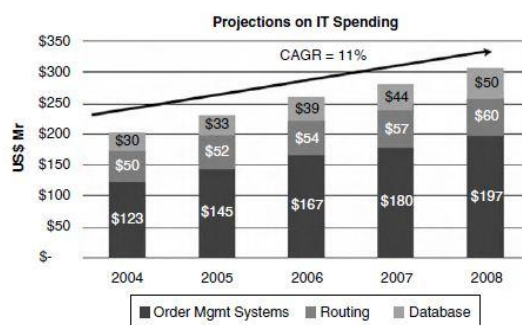
4.2 The Downside of Program Trading

Commission costs for automated trades execution through a broker or dealer are becoming increasingly cheaper. If we have a case in which some buy-side institution set a quote as a "blind bid" program trade , commission costs and quote are related to price and risk which is associated with the dealer or broker selling or buying the specific program to client. Here bellow is Table 4, which describes ratio between trading costs and opportunity costs in cost/time coordinates.

Table 4, Trading cost and opportunity cost [4]
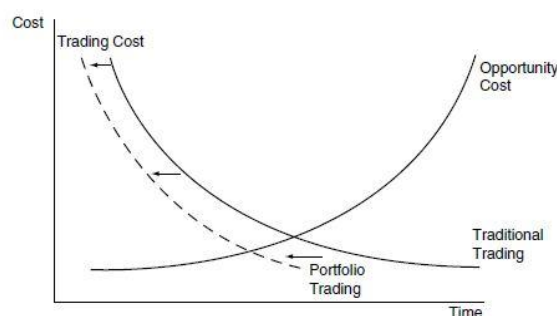
In table 5, are displayed specific downsides.

Table 5, Principal blind bid program trading

Principal Blind Bid Program Trading

How it's supposed to work	How it often works
Buy-side clients solicit bids on the program trade so that there is no leakage-based market impact	Broker can guess component stocks or highly correlated ones, based on the trade characteristic.
Strike time is meant to capture prices free of market impact. The trade is then executed at that contaminated price.	Strike time captures an adverse price that has the "imprint" of market impact from pre-hedging.
Broker's basis points (bps) quote is meant to fully compensate the broker for the risk involved in providing capital for the trade.	The broker can provide low bps quote, even a "net zero" trade because of pre-hedging.
The bps cost is a full reflection of the fees the customer pays to the broker.	The low bps cost makes the trade look like a "free lunch" but the true cost includes market impact from pre-hedging by the broker. Too often over-looked by the customer.

5. POSSIBLE SOLUTION/EVIDENCE

Electronic trading is important in inter-dealer spot FX market for over a decade. According to Bank of International Settlements , 20–30% of inter-bank trading in major currencies was executed electronically in 1995, rising to 50% in 1998 and estimated at over 90% by 2001.

Two systems are major:

- EBS and
- Reuters

In both systems, client/trader can see best ask/bid price, offers in the market. Electronic systems are now using in majority of spot inter-dealer trading.
This specific, highly flexible applications provide route of the trade, which calculates the market or direct rates to a trader. E-commerce environment is rapidly changing and that creates pressure on banks to creates better solutions for clients.
Automated or algorithmic trading i.e. FX robots, are beginning to surface in the FX markets. Specific opportunities for effective and fast trading at FX market results in over \$2 trillion in trades daily. Spot FX market is 100% traded electronically at inter-banking market.
Production of algorithmic trading platforms and strategies has resulted in switching from brokers and dealers to e-trading options.
From aspect of view of Brokerage company, one of potential ways to avoid huge investments and to finish projects in predicted timeframe is usage of strategy enablers.   Second potential solution could be related to better trading optimization differentiation. Both processes are described in short bellow.

5.1 Strategy Enablers

Technology enablers is invented to help in developing analytics. This technology helps clients to analyse huge amount of data and to develop new and change already existing algorithms. This platform is configured for development of pre trade and post trade analysis in real time and also historical data review. Following case presents several key functions in algoritham trading according to Aite group:

- Trade bloter - manage orders/lists, apply various benchmarks on the fly,
  and keep track of current positions, execution data, confirmations, and
  real-time P&L
- Prepackaged algorithms- designed to attract those smaller firms that lack algorithm-building capability. The key to prepackaged algorithms is to ensure that they are flexible enough to enable modification and customization by the clients.
- Pre- and post-trade analytics - Pre-trade analytics can help traders
  determine which algorithm is most suitable given a certain trading
  situation, as well as estimate cost for a given trade.
  Post-trade analytics in turn can be used to measure trading performance, benchmarks, and other firm-established trading parameters.

- FIX connectivity FIX is the lifeline of algorithmic trading systems as connectivity to various market participants and various market venues enables the system to make timely trading decisions driven by algorithms
- Handling multiple asset classes Algorithmic trading systems should be able to go beyond just equities in terms of financial products supported. A typical system currently handles fixed income, derivatives, FX
- Compliance and regulatory reporting.

5.2 Alternatives to traditional optimization

There are two major alternatives to traditional optimization:
- walk-forward optimization
- self-adaptive systems.

Advantages to this kind of alternatives are related to capabilities to run some inferential statistics, examine the performance data, plot the equity curve, after which system is ready to be traded. There are adapted corrections for shrinkage or for multiple tests and many of the other optimization methodologies. With today's modern and computer technology, walk-forward and self-adaptive models are practical and not even difficult to implement.

The principle behind walk-forward optimization (also known as walk-forward testing) is to emulate the steps involved in actually trading a system that requires periodic optimization.
- Optimize the system on the data points 1 through M.
- Then simulate trading on data points M + I through M + K.
- Re-optimize the system on data points K + 1 through K + M.
- Then simulate trading on points (K + M) + 1 through (K + M) + K.
- Advance through the data series in this fashion until no more data points are left to analyze.
- As should be evident, the system is optimized on a sample of historical data and then traded.
- After some period of time, the system is re-optimized and trading is resumed. The sequence of events guarantees that the data on which trades take place is always in the future relative to the optimization process; all trades occur on what is, essentially, out-of sample data.

In walk-forward testing, M is the look-back or optimization window and K the re-optimization interval.

Here above presented case lead us to consider, is it the most expensive solution always the best one? If company use presented mathematical model in accordance with rules of optimization of trading processes and with appropriate experts which are mandatory in terms of application of mathematical method of optimization, is it actually possible to avoid expensive and time over rated platforms?

6. CONCLUDING REMARKS

Algorithm trading is very suitable for capital and currency markets. There are less instruments for trading i.e. trading tools, prices are more transparent, focus-based liquidity, aviability of several transaction execution chanels etc.

Developing and increasing of usage of algorithmic trading is crucial in increasing investments and number of participants globally. Bariers between labor market and technology become more and more sofisticated and market send invitation for trading to everyone who is interested to participate. Sum of investment is not anymore crucial for becoming participant e.g. participant can trade trough applicable leverages with 100 $.
Specific development tools for trade analysis will bring to better understanding of algoritham trading and also to wide usage and more complex algoritm trading strategies and platforms.
Structure of the FX market was changed from fragmented telephone market to current modern trading platforms. Technology transferring is the key question in financial instruments markets. Companies are now using platforms in huge percentage of their business. Trade banks are executing transaction with automated trade which is increasing both by number of transactions as well as amount of money per transaction e.g. some banks made transactions with automated trades in more than a $100 million . Traders are now used to trade on line, so speed and efficiency of programs should follow their highest possible expectations. Number of portals and ECNs for FX execution is increasing dramatically. From side of banks, there is situation in which they are trying to make their business more productive and in that case underlying market

rates and executable client rates managing have its influence on number and satisfaction of clients. On buy-side there is need for increasing of education in terms of using algorithm trading possibilities. Increasing of such trading will also lead to cost-benefit for users. Analysis has to take in consideration quality and expanses and specific trading possibilities such as : anonimous trading, missed trading, quality of exectuon which leads to bigger trading expences. Long term increasing possibilities for implementing of algorithm trading are foreseen in Fx, Future, and other finantial interest markets.

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