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INVESTMENT PLANNING IN THE CONTEXT OF VOLATILE BUSINESS CYCLES

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Abstract. The research "Investment planning in the context of volatile business cycles" describes stock market activity – related efficient decision making and portfolio structure optimisation methods, innovatively integrated into a single analytical framework, capable of providing applicable solutions for the topical economic challenges and capital flow generation issues. The newly developed forecasting and decision-making model, based on classic and time – proven methodologies, was created in order to simultaneously preserve and thrive on the existing expertise and acquired knowledge, while enhancing the existing paradigm capabilities with the main goal of creating a scientifically justified, risk – wise and reasonably easy to use equity management method, thus ensuring the appropriate financing of coherent and consistent economic development, based on sustainable long – term growth. The efficiency of the model had been quantitatively verified in terms of both empirical and applicable employability and the acquired results of the conducted experimental implementation were compared with the previously gained data form applying classic singular analytical approaches in the broader context of the proposed research hypothesis verification. The main research question had been provided with a scientifically rational answer, while solving the problem of making a choice over the preferred strategy of stock market behaviour, adapting to the existing investment environment and portfolio structure analysis and evaluation.
Keywords: technical analysis, fundamental analysis, stock analysis, decision-making models, forecasting models, investment portfolio.

JEL code: G11, G17.

Introduction

Investing has always been a risky business, but obtaining from investing may cause an even greater negative effect of financial asset liquidity and debt solvency, thus market actors seek alternative methods of investment management in order to insure their capital and financial reserve consistent, continuous and consequent growth. Stock markets provide significant earning and finance allocation opportunity, which is the main reason for considering

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the relevant activities an attractive concept of capital placing, despite the high risks involved and being caused by unpredicted stock quote fluctuations and high price volatility. In order to avoid the above mentioned risk of investment environment rapid changeability, investors use various methods of analysis, forecasting and strategic decision-making, the most common being fundamental and technical analysis.

Fundamental analysis provides an opportunity to analyse and forecast security price dynamics caused by objective reasons, such as conditions of the macroeconomic environment, sectors of the national economy or the intrinsic value of stock. The founders of the fundamental analysis are David Dodd and Benjamin Graham, who were first to describe principles of that methodology in their research called "Stock Analysis" in early 1934. But this method is still popular among the investors who prefer it to other forecasting and analysis methods.

Technical analysis – contrariwise, provides an opportunity to analyse and forecast security price dynamics caused by subjective, sometimes even logically inexplicable, reasons, such as mood and expectations of the market participants. The founder of Technical analysis was Charles Dow, who was first to describe the method of forecasting stock price fluctuations by using historical data and its graphical interpretation. Charles Dow described his method in the "Wall Street" journal in the beginning of the 18th century. Even though this method turns out to be even older, it still remains a topical issue and becomes more and more popular nowadays (CEAE, 2012). It is used by such successful traders as Larry Williams (Williams, 2012).

The research goal of the current study was to determine which of the described above methods turns out to be more precise and to find the way to combine them into one forecasting and decision-making model in order to get better (more precise) results.

1. Used research methods and analytical techniques

As it was previously mentioned, the current research is focused on the forecasting, analysis and decision-making models used in modern stock market. It means that it was necessary to collect information about the main methods of security evaluation and analysis, ways of constructing forecasting and decision-making models for investment projects and portfolio structure. It was planned to try already existing classical methods in order to compare the outputs with the results of the new offered model.

During the research the new stock quote forecasting combined stochastic model was created and tested on the example of selected stocks in order to determine the synergetic effect, caused by the merge of different instruments into one that is being an essence of the developed model. It has been chosen as the most effective and efficient variation of the offered model, in order to achieve better and more precise results in stock analysis, its future price forecasting, linked with the investment process decision-making and optimization of the investment portfolio. Taking into account the specifics of the conducted research, the following methods were acknowledged being the most relevant for sustainable and transparent result

acquisition: monographic method, primary data analysis, secondary data analysis, graphical analysis; mathematical analysis, econometric modelling, regression analysis and the case study method.

2. Summary of the existing theoretical basis and review of the conducted research

The main focus area of the current research is that combination method of both forecasting and analytical methodologies outperforms their parallel usage. The purpose of the treatise is the experimental research of relevant forecasting techniques related to both fundamental and technical analysis in order to work out the more optimal analysis and forecasting algorithm and to create a stock quote forecasting combined stochastic model, achieving a positive synergetic effect by simultaneous usage of the both approaches, quite different in their nature.

The creation of such a methodology will lead to the minimization of the risk that turns out to be more and more significant nowadays (Cumov, 2005) of the forecasting error, easement of the decision-making process, minimization of the role of subjectivity in a decision-making process, more versatile analysis, more precise forecast, more effective investment portfolio structure and maximization of income. A lot of various researches of the stock market mechanisms and its forecasting instruments have been held, but since already 1934 experts argue about which of the two forecasting and analysis methodologies is better: fundamental or technical analysis.

Fundamental analysis is used to examine and evaluate the situation on the stock market through the prism of political decisions, economic processes, financial and credit policy, to analyse such events and processes as capital flows, production and trade dynamics, level of inflation. Fundamental analysis school was funded by the Americans David Dodd and Benjamin Graham in the scientific research "Securities Analysis", which was published in the 1934.

The second method is technical analysis, which is based on graphical techniques and its mathematical interpretation methods. The first person who discovered the method of forecasting of stock price future volatility based on historical price dynamics and fluctuations was Charles Dow – describing this idea in the "Wall Street" magazine already in the 1790s.

Many researches, dedicated to the possibilities of parallel use of fundamental and technical analysis instruments in a single decision-making model, were conducted and are being considered quite efficient and applicably effective, for example, Tony Coopers' research "Optimal Rotational Strategies, using Combined Technical and Fundamental Analysis" (Cooper, 2011). Despite all known and discovered methods of forecasting and decision-making in the stock market, economists, investors, traders and other experts continue searching some new, more advanced techniques and methodologies.

The research "Investment planning in the context of volatile business cycles" provides solutions for making the stock quote dynamics analysis, forecasting and linked with it decision-making process much easier and precise and offers the ways of optimization of the process of calculation of investment portfolio structure as well. The described research provides an

absolutely new way of forecasting and decision-making, by creating a generalizing complex-weighted forecasting model that aids the application of a unified forecasting and decision making system.

The efficiency of the model was applicably verified with the use of experimental modelling approach and the results of the new model were compared with previous ones, using classical models, in order to check the hypothesis. The research subject is classical analysis and widely used decision-making models. During the research, new stock quote forecasting model was created and tested on the example of selected stocks "Johnson & Johnson" USA (JNJ), "Grindex" Latvian (GRD) and "Hoffmann La Roche" Swiss (ROC) enterprise stock price and other financial ratio fluctuation statistics in a period of 10 years) in order to determine the synergetic effect, caused by the merge of different instruments into one, that is being an essence of the developed model.

Consequentially, the most effective and efficient variation of the offered model das been chosen in order to achieve better and more precise results in stock analysis, its future price forecasting, linked with the investment process decision-making and optimization of the investment portfolio.

3. Analytical summary of the conducted research's results

After studying the theoretical aspects of creation of forecasting, decision-making and investment portfolios structures determining models, described in the theoretical part instruments and methodologies were implemented in practice. The two following types of analysis (fundamental and technical) had been used to analyse the available data, while providing alternative price forecasts.

During the performance of the fundamental analysis the following steps had been made (Forex Educational Portal, 2012): investment spheres' and environments' evaluation (PwC, 2013), (PwC: Russia, 2013); analysis of enterprise activity and ratios (BeInTrend, 2012), (EF, 2012); correlation analysis of macroeconomic factors and stock quote dynamics (WB, 2012), (Latvian Central Statistical Bureau, 2012); regression analysis of macroeconomic factors and stock quote dynamics (Freinats, 2008); single factor forecasting models' implementation.

During conduction of the technical analysis the following steps had been made (Investment Portal: Technical Analysis, 2013): implementation of the instruments of technical analysis: analysis of the classical graphical shapes; analysis of the moving average dynamics and performance of complex trading rules based on moving averages over longer horizons than those usually considered (Isakov, Marti, 2011); analysis of the Bollinger Bounds (Naiman, 2009); analysis of the CCI oscillator (Kann, 2005), (Investment Portal „Bull&Bear", 2012) was used in order to analyse less volatile markets, because it is known that technical trading rules are most (least) profitable during the period with the highest (lowest) volatility levels (Kazyra, Lento, 2011); fractal analysis: Hurst coefficient and its interpretation (CTWM, 2012).

After the analysis of the selected stocks and their respected dynamics the structure of the investment portfolio was determined, using various quantitatively – econometrical methods, such as the implementation of the Harry Markowitz model (Markowitz, 1952), which the acquired results being as follows: it has been offered to buy (so called "Bull" strategy) USA enterprise "Johnson & Johnson" stocks that weight in the portfolio would be 63%; it has been offered to buy (so called "Bull" strategy) Swiss enterprise „Hoffmann La Roche" stocks that weight in the portfolio would be 29%; it has been offered to sell (so called "Bear" strategy) Latvian enterprise „Grindex" stocks weight in the portfolio would be 8%.

All the forecasts were made for a yearlong period (12.2011 – 12.2012) and each of instruments provided its own forecast.

The real (actual) prices in the twelfth month of 2012 were retrieved, analysed and found to be accurately reflected in the following manner: "Johnson & Johnson" (JNJ) stock price was USD 70.10 (Yahoo, 2012), (NASDAQ, 2012), (Johnson&Jonhson, 2013); „Grindex" (GRD) stock price was USD 6.55; (Grindeks, 2013), (NASDAQ.OMX Baltics, 2012); „Hoffmann La Roche" (ROC) stock price was USD 186.90. (Swiss Stock Exchange, 2012), (Hoffmann-La-Roche, 2013). The cumulative results of the analysed company price forecasting, using various analytical approaches, are summarised in Table 1.

Table 1

Stock Future Value Forecasts

Stocks	Forecast [USD]		
	JNJ	GRD	ROC
Fundamental analysis instruments			
Trend determination by using correlative macroeconomic ratio methodology	74.45	6.59	169.30
Single factor regression forecasting model	67.11	6.55	173.79
Technical analysis instruments			
Analysis of the classical graphical shapes	74.88	7.30	179.19
Analysis of the moving average dynamics	72.56	6.31	179.19
Analysis of the Bollinger Bounds	72.56	6.31	168.78
Fractal analysis: Hurst coefficient	75.15	7.90	194.64

Source: author's construction based on official statistical data (Johnson$Jonhson, 2013), (Grindeks, 2013), (Hoffmann-La-Roche, 2013), (NASDAQ.OMX Baltics, 2012), (Swiss Stock Exchange, 2012)

The next step after finishing the analytical part was the creation of the generalizing table, which contributed to the evaluation of the preciseness of the forecasts by comparing dispersion – forecasted price deviation from the actual one.

4. The layout and the result of the conducted empirical modelling experiment

The main research goal of the current research was the creation of unified forecasting and decision-making combined stochastic model in order to achieve the positive synergetic effect,

which would provide an opportunity of making more precise forecasts, calculating more optimal investment portfolio structure and facilitating the decision-making process by minimizing the influence of the subjective judgments thereby levelling the risk.

The draft of the models' graphical interpretation can be seen in Figure 1, where P stands for "Price" and R is "Forecasting instrument rang". The left part of the model combines different forecasting instruments of the fundamental analysis but the right side - different forecasting instruments of the technical analysis.

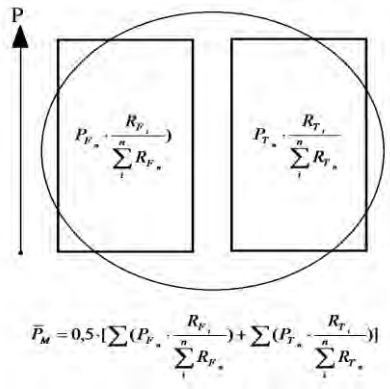

Fig. 1. **The Empirically – functional framework of the developed model**

The model in general enables the calculation of single forecasted value, which is being more precise than the result of the classical model because of the positive synergetic effect caused by the specific calculated combination of different methodologies. All the formulas are simultaneously reflected in Figure1.

In order to create the mentioned above model, it was crucial to fulfil all of the below listed steps: ranging of the used forecasting instruments within each of the analysis groups; calculation of scales; creation of the forecasting model and its different variations; model implementation - forecasting; defining the models' optimal variant; calculation of the investment portfolios' structure; comparison and interpretation of the results; defining the applicably – effective and generated result – efficient methodology; developing a conclusive summary.

As it was mentioned previously, the first step was to rank all used forecasting and analysis instruments from 1 to n (n being number of instruments and maximal rank). The most precise instrument was ranked with the highest rank n, and the less precise with the lowest rank 1. The results are as following.

Within the group of fundamental analysis instruments rank 1 was assigned to correlation analysis of macroeconomic factors and stock quote dynamics (average forecasting error 5%) and rang 2 - regression analysis of macroeconomic factors and stock quote dynamics (average forecasting error 4%).

Within the group of technical analysis instruments maximal rang 4 was assigned to analysis of the moving average dynamics (average forecasting error 6%); rang 3 - analysis of the

classical graphical shapes (average forecasting error 7%); rang 2 - analysis of the Bollinger Bounds (average forecasting error 11% with minimal deviation) and minimal rang 1 - fractal analysis: Hurst coefficient and its interpretation (average forecasting error 11% with high deviation).

It means that both analysis and forecasting techniques will be equally represented in a model but fundamental analysis may be represented, using two instruments (correlation analysis of macroeconomic factors and stock quote dynamics with weights 33% and regression analysis of macroeconomic factors and stock quote dynamics with weights 67%) and technical – with four instruments (analysis of the moving average dynamics with weights 40%, analysis of the classical graphical shapes 30%, analysis of the Bollinger Bounds 20% and fractal analysis: Hurst coefficient and its interpretation 10%).

However, in order to minimize an average forecasting error among the instruments used in the model it was qualitatively proved that exist more effective complex-weighted forecasting models' variation incorporated the above mentioned instruments within a single sliding – weight framework or a broader econometrical calculation system of simultaneous indicator analysis and generalizing current experimental modelling results may be summarised in the following manner:

- complex-weighted forecasting model consists of two equal parts. Each element's weight is 50%, i.e. final forecast will be calculated by using the average method;
- the first part of the model represents fundamental analysis as a technique which allows predicting the future prices by analysing quotation fluctuations caused by objective factors (for example changes in economic or political environment) and the second part of the model represents technical analysis as a technique which allows predicting the future prices by analysing quotation fluctuations caused by subjective factors (for example traders' expectations, mood, etc.);
- the first part includes two fundamental analysis forecasting instruments: correlation analysis of macroeconomic factors and stock quote dynamics with weights 33% and regression analysis of macroeconomic factors and stock quote dynamics with weights 67% and the second part includes two technical analysis forecasting instruments: analysis of the moving average dynamics with weights 55% and analysis of the classical graphical shapes 45%;
- nevertheless both fundamental and technical analysis are considered as equal, technical analysis results turned out to be less precise, that is why the difference of weights is more "smoothed".

After getting the forecasted values for each stock, the structure of the investment portfolio was determined by using special calculating table.

Mentioned investment portfolio structures' determination instrument can be considered more precise than classical ones, because it is based on the results of all previous analysis and forecasting activities. Consequentially, it is worth mentioning that: "Johnson & Johnson" USA enterprise forecasted future price is USD 71.46; "Hoffmann La Roche" Swiss enterprise

forecasted future price is USD 172.59; "Grindex" Latvian enterprise forecasted future price is USD 6.71.

While comparing the acquired results, it can be verified that the newly developed methodology had created a more efficient analytical system, which provided a more favourable outcome of USD 96 570.33 total profit against the USD 10 445.99, generated by the classically used singularized, mutually non – compliant methods, thus creating a scientifically rationalized model of simultaneous precise forecasting and risk evasion investment portfolio structuring.

Conclusions and proposals

Summarizing the structural layout of the conducted research, the acquired results and their applicable feasibility, the following **conclusions** can be made:

1. The research hypothesis had been positively verified via conduction of the described research. The results of the carried out experimental modelling turned out to be positive, thus confirming the research hypothesis and in addition demonstrating the logics of regional diversification presumption, even despite the fact that the basic objective of the outlined research was not the creation of an ideal investment portfolio;
2. The conducted analysis confirmed the adequacy of the forecasted growth of the selected stock quotes (period: end of 2011 – end of 2012).
3. The conducted research had determinedly confirmed the general noting that the Markowitz model is much more suitable for the existing situation than for example mentioned Sharp's or Tobin's models, due to the fact that Markowitz model can be used for composing structuring of an investment portfolio consisting of regionally different enterprise stocks (JNJ – USA, GRD – Latvia and ROC - Swiss).
4. It had been proven that parallel use of various analytical methods in practice turns out to be less efficient and precise than it's combining technique.
5. The developed methodology in a functioning analytical algorithm that enables a more precise forecasting instrument implementation, consequentially enhancing applicability of the relevant decision-making process.
6. The use of both the complex-weighted forecasting model and the investment portfolio calculation instrument, based on the developed model's empirical derivative enables the possibility of making a more lucrative decision.
7. The newly created model and its deriving working algorithm were implemented in a practical experiment and proven the newly created methodology's efficiency, thus raising the maximum earning potential of the initially available financial basis, while simultaneously meeting the crucial requirements of risk minimization and profit maximization.

Summarizing the conducted research, the acquired qualitative and quantitative analytical results, the following **proposals** can be made:

1. It is offered to use the new complex-weighted stochastic forecasting model as well as investment portfolio structures' calculation table and offered working step-by-step algorithm.
2. It is offered to use in a model following components: fundamental and technical analysis techniques.
3. Fundamental analysis techniques, enabling the prediction the future prices by analysing quotation fluctuations caused by objective factors will be presented in the developed model with 33% and 67% weights.
4. Technical analysis enabling the prediction the future prices by analysing quotation fluctuations caused by objective factors will be presented in the developed model with 45% and 55% weights.
5. After the implementation of the developed investment portfolio structure determining instrument, it had proven optimal to propose the following financial resource allocation structure: 47% "Johnson & Johnson" USA enterprise stocks, 5% "Grindex" Latvian enterprise stocks and 48% "Hoffmann La Roche" Swiss enterprise stocks.

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