

Some Double Trump Model Characteristics and Experimental Applying Results

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The main aim of the paper is to analyze theoretical aspects of development preconditions of original decision management in global currency market FOREX system and to analyze experimental results of decision management in currency market models, offered earlier by other authors. The greater attention is paid to so called double trump model of decision management in currency market (Rutkauskas, 2005), experimental implementation of which indicates the development possibilities of investment strategies, allowing to make better investment decisions than those that are dictated by the market. Along with the examination of the selected model characteristics, which in authors opinion allowed to reveal the existence of such strategies, principles of comparison of investment decisions' and strategy efficiency with the efficiency of the market were formulated. Furthermore, it is important to pay attention to one important factor of the implementation of the research, results of which are presented in this work and other works of such direction published earlier by other authors. Wide-range experiment is carried out for the examination of expressed thesis and for the verification of the developed original system of decision management in global currency and capital markets. Hypothesis of market efficiency, formulated for the financial markets, and the random movement assumption of the price variation of financial assets contradict any possibility to create, using only historical data, such investment strategies, which allow to increase the investment effect, generated by the corresponding market, in a long-run period. However, the results, received by the authors, argue that such strategies are possible. Twofold trump model of decision management in the global currency market FOREX, that was offered earlier by one of the authors and analysed in the paper, allows to form, leaning only on historical information, practically nonrisky investment strategies, allowing to gain higher investment effect than the effect, insured by the market investment instruments of the corresponding term. Single experiments to find the strategy of decision management in the currency market FOREX at any point of time were successful; however the authors carry out the long-term experiment to prove that in the currency market there are always "nonefficiency shoals". The results of the experiment can be observed on the following web page: <http://www.vgtu.lt/usr/rutkauskas/en/eksperimentas.html>.

The results witness that the twofold trump model can be already used as the effective tool for the invest-

ment in the currency market in pursuance of certain personal, company or Treasury goals.

Keywords: exchange market, decision management in the global exchange and capital markets, adequate portfolio for the investment decisions reliability assessment, stochastic programming.

Introduction

Appropriate multi currency cash flow management in multinational corporations becomes one of the key success guarantees of these corporations. Currency exchange rate fluctuations greatly influence not only corporation activity intensiveness and efficiency, but also intensiveness and efficiency of the separate countries international economic relations. Exchange rate risk management becomes more and more important intensiveness and efficiency management mean a lot for separate business subjects, as well as for international economic relations.

In turn, discovering and forecasting of the exchange rates behavior, as well as market efficiency understanding and measurement development principles are the fundamental scientific issues. Fuller understanding and at least partial decision deep depends on application power and efficiency of economics.

Investment decisions are impossible without unification of the present and future cash flows efficiency. However, the hypothesis of the market efficiency states that efficient market is when all the information about stocks and currency value is accumulated in these assets price, and that this price is independent of the historical prices, and cannot be forecasted on the basis of historical prices. There is no doubt that this statement has evidence, when the "distance" between present and past is long enough, but in case of continuous time an attempt to reflect simultaneous supply, demand and price indices unambiguous dependence requires some effort. This could hardly be a worthy business, and it does not have crucial impact on the investment process.

Investment decisions have advantages in order to show their excellence over the market decisions. The new investment decision should be considered superior to market decisions if it is more efficient than any ever developed investment means (instruments) of the respective duration and riskiness in the appropriate market.

The mentioned paper "Double trump decision man-

agement model in the exchange market” is developed for the solution of both problems mentioned above. First, it attempts to broaden the discussion about financial market efficiency testing market efficiency hypothesis not through the attempt to defeat the market, but by testifying market unhomogeneity, i.e. proving that there are always non-efficiency shoals in the market. Market inefficiency exists when there is a possible decision formation strategy, which allows to have an advantage over such market dictated decision effect in rather long time period, i.e. the strategy, which is more efficient than present investment means, e.g. the exchange market.

Second, the paper attempts to develop an operative decision management in the exchange market system, which would allow in any time, maybe, except crises periods, to select such decision management strategies, which would be superior to any other existing investment means of the particular period and riskiness. The development and implementation of such strategies would become efficient means of exchange rate risk management for separate business subjects, as well as for the state Exchequer in general. The broad experiment (<http://www.vgtu.lt/usr/rutkauskas>) allows to state that such strategies exist.

Double trump portfolio model idea is based on adequate investment profitability possibilities reliability assessment portfolio analyses, which are presented in the papers by Rutkauskas (2000), Rutkauskas, Stankevičienė, (2003) and in some other papers. The adequate model itself is based on earlier performed risk quantitative measurement and economic evaluation papers (Balabanov, 1996; Kofi Asante-Duah, 1998; Environmental monitoring, 1996; Grabovski, 1994; Risk management, 1999; Rutkauskas, Miečinskienė, 2003; Vaughan, 1997).

The structure of the means of the Double trump model and efficient investment decisions strategies implementation

Efficient investment decisions in the exchange market strategy will further be perceived as such mix of the actions and means, which would allow to select such invested or speculative capital management, which would guarantee advantage over all the existing investment means of respective duration and risk in the market.

Double trump model, as investment possibilities analysis, goals formation and decision making means has an adequate structure:

- exchange rates forecasting subsystem;
- goals formation and their achievement means subsystem;
- decision making in the exchange market models system characteristic identification and its quantitative decision making methods subsystem;
- efficiency evaluation of the decisions being made and efficient decisions possibilities and conditions assessment.

Short comparison of proposed forecasting system and methods of technical analysis

The efficiency of the decisions management strategy greatly depends on the exchange rates forecasting system

adequacy. Whatever perfect decisions search criteria and possibilities restrictions are, decision making still depends on the forecast reliability and accuracy.

As it could be seen from the presented model structure, the preparation of our system of decision making in exchange markets formally begins with selecting the methods of currency rate forecast. Since in this system, as in technical analysis, a particular research object is historical currency rate indices, the suggested methods of forecast should be compared with the forecasting methods already in use in technical analysis, which are numerous and various. Here, next to traditional methods of forecast used in all areas of activities (various traditional models, regression models, moving averages models, etc.), the principle of pattern identification is also intensively used. The essence of the latter method is that particular patterns are being tried to identify, according to which the changes of future indices should repeat changes of historical data.

Knowing that the set of technical analysis forecasting models is wide and diverse, it would be negligent to specify the summarized characteristics of this set. Therefore, even though many technical analysis forecasting methods are theoretically suitable for currency rate and stock price forecast and have a long-time practice of utilization not only in this area, we have to admit that they do not satisfy all the main attributes necessary for forecasting methods:

- a currency rate forecasting method must be adaptive, i.e. it should help in considering that in each point of variation of currency rate both the set and importance of the factors and the functional dependence of currency rates on the factors that modify them and the forms of interdependence of the factors;
- the forecasting methods of currency rates and stock prices must be flexible, i.e. they must be applicable in every forecasting system, be it a complex system of mathematical models or subjective experimental decisions;
- in the forecasting method, actions and results must be clearly separated, i. e. it must be consistent. It is very important when determining and using the analytical interrelation between the result and the factor as well as among the factors themselves;
- employment of one or another method of forecast should allow to quantitatively measure the reliability of the obtained results;
- forecasting methods must be constructive, i.e. allowing to select the most probable values of forecast variables or processes.

The main principles of an adequate forecasting system

Further the main utilization principles of a one-step currency rate and stock price forecasting system will be illustrated. The core of the forecasting system consists in the probability distribution selected parameter regression dependence of the forecasted index value at a (t+1) moment on the probability distribution certain parameters

value of the index under analysis at a t-th and previous moments:

$$y^{-t+1} = f\left(\begin{matrix} -t \\ x_1, x_2, \dots, x_n \end{matrix}; \Theta(0, t)\right) \quad (1)$$

where in general we can say that:

- y^{-t+1} – probability distributions of the forecasted currency rate or stock price possible values at (t+1) moment;
- x_i^{-t} – i-th factor's possible values probability distribution's vector at a t-th and previous moments;
- $\Theta(0, t)$ – the resultant of the influence of the other factors on the factor under analysis at (t+1)-th moment;
- f – regression.

Practical results of the forecasting system application

In the experiment performed dependency (1) was used to determine the (t+1) day currency rate value possibility distribution when in the [1, t] period the currency rate values are known. So, the (t+1) day forecast becomes the most important information while choosing the optimal portfolio for the (t+1) step (day). Its efficiency, i.e. the efficiency of the relevant decision, becomes clear as the real data of (t+1) day appear. In its turn, the data of (t+1) day become the basic forecasting data, and on the basis of [2, (t+1)] interval day data we forecast a possible value distribution for (t+1) day currency rate. By this method author of double trump model (<http://www.vgtu.lt/usr/rutkauskas/en/eksperimentas.html>) “covered” the distance from 11 December 2004 to 10 October 2005. The first 40 days of this period were used as the initial forecasting base, while the first day for which currency rate probability distribution was evalua-

ted was 27 January 2005. The process was repeated till 1 October 2005. These prognoses as well as correlation prognoses between separate currency rates were used for portfolio rebalancing, or simply for selecting the optimal hypothetical portfolio for that day. The most likely values of the historical and hypothetical (prognostic) data are presented in Figure 3, a section. In the experiment performed the strategy covers different time periods, but everywhere there are decisions of the current step.

Received forecasting data was used in the double trump model, which, in turn, was used in decision management in the exchange market strategy formation. The essence of the double trump model is that the two currencies were selected as the basic – EUR and USD, while in general there were analysed 7 currencies: EUR, USD, GBP, CHF, CAD, AUD, JPY.

The rebalancing of the portfolio, i. e. the selection of an optimal portfolio, is carried out step by step. The scheme of every step of portfolio management strategy looks like this:

- we choose EUR and USD as trump currencies;
- make prognoses of the EUR/USD, EUR/GBP, EUR/CHF, EUR/CAD, EUR/AUD, EUR/JPY or USD/GBP, USD/CHF, USD/CAD, USD/AUD, USD/JPY rates, or evaluate them on the basis of gathered FOREX historical data;
- If the EUR exchange rate increases (>>), then EUR is considered to be the trump currency, the diversification of a portfolio is performed on the basis of prognoses of EUR and exchange rates of other currencies. If EUR<<USD, the USD is chosen as the trump currency.
- After having chosen the trump currency, it is possible to choose the currency portfolio which allows to maximize the profitability of the subject at the end of each step, in the concrete case – which makes it possible to maximize the purchasing power of the portfolio both in euros and dollars (Figure 1).

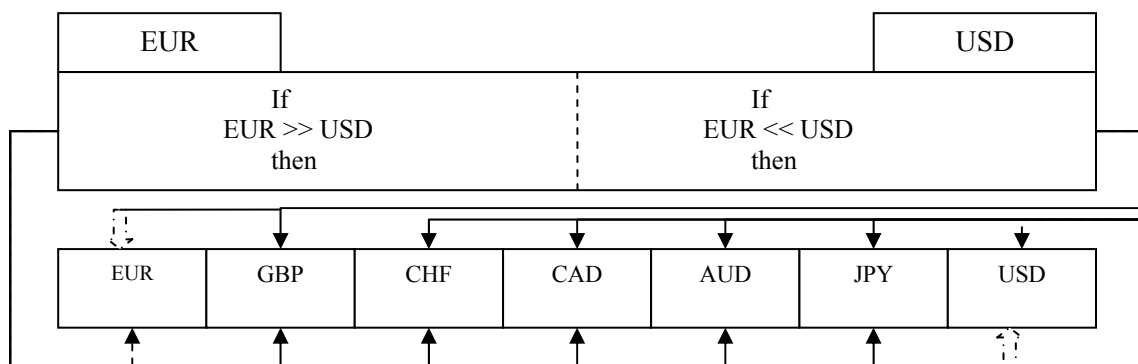


Figure 1. Double trump (EUR and USD) portfolio decision management in currency (EUR, GBP, CHF, CAD, AUD, JPY, USD) market model

Peculiarities of the proposed forecasting system

Before describing the possibilities of the proposed method of forecasting, let's have a look at Figure 2, because it will be the base for empirical conclusions. In this figure, empirical historical data and the forecasted

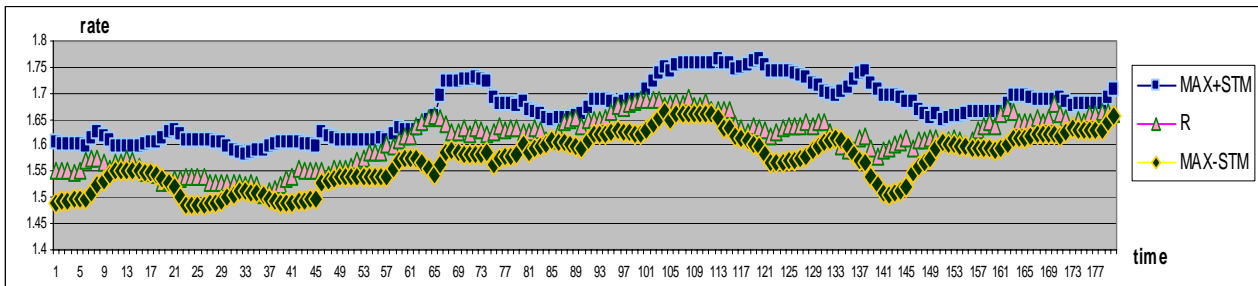
EUR/CHF rate change probability distributions of 68,3% level reliability confidence intervals are presented. In section a of Figure 2, the upper and bottom lines of the reliability zones are identified, with forecasted probability distribution average \pm standard deviation with the corresponding values. In section b, these lines are identified

by mode \pm standard deviation from the mode's corresponding values. In section *c*, maxima of the lines analyzed in sections *a* and *b* are taken for the bottom line and the minima for the upper line.

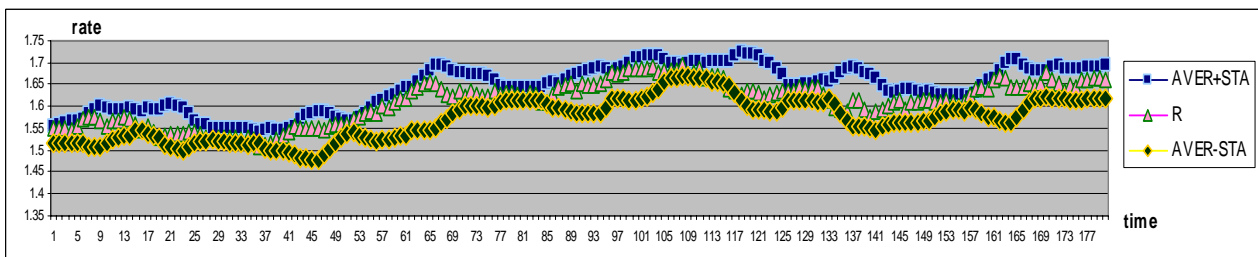
Accuracy and reliability of the forecast

Speaking about the accuracy and reliability of the currency rate and stock price forecast, it is possible to use Figure 2 with the diagrams of the limit zones of currency rate variation, which we shall call confidence zones of currency rate variance. These are analogues of confidence zones or confidence intervals of stochastic processes or random variables, if to assume that a fore-

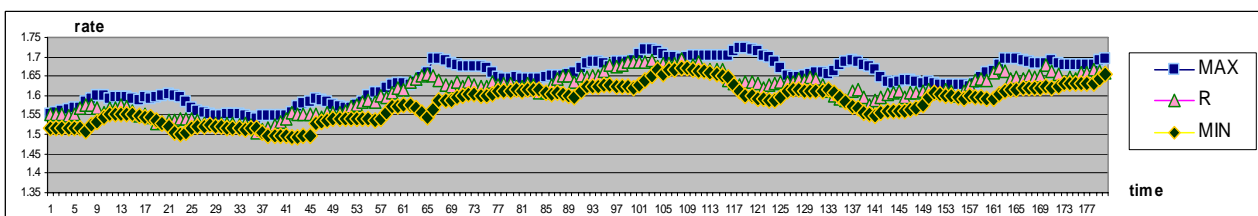
casted currency rate or stock price is a stochastic value whose forecast is obtained using only historical data. In the diagrams, together with forecasted confidence zones, inside the zones the corresponding historical data are presented. The dislocation of these historical parameters in confidence zones indicates that the behavior of the currency rates and stock prices not only is compatible with the consistent patterns of the behavior of stochastic variables in their confidence intervals, but also $\pm\sigma$, $\pm2\sigma$ and $\pm3\sigma$ confidence intervals have much greater confidence levels than 68,3%, 95,4% ir 99,7%. Examination of the corresponding stochastic hypotheses completely confirms it.



a. Mode (M) \pm standard deviation of mode (STM), it is the confidence interval in respect of the mode



b. Average (AVER) \pm standard deviation of average (STA), it is the confidence interval in respect of the average



c. MAX = min (MAX+STM; AVER+STA), MIN = max (MAX+STM; AVER+STA), see section a. and b.

Figure 2. EUR/CHF rate empirical-historical data and forecasted confidence intervals comparison

Thus, if we rank the proposed method among the technical analysis methods, we may consider the possibility of quantitative assessment of technical analysis methods and an interpretation of the conditionality of random step theory. It hardly follows from the diagrams of reliability zones that price movements are equally conditioned for the states in the centre or on the edge of a zone, what should be the case if we presume changes of the behavior of a price to be a chaotically random value. So, price behavior is a stochastic process, but not chaotically stochastic.

Constructiveness of the forecasting methods

The constructiveness of the forecasting method has been denoted as its ability to foresee in each step the most

probable value of all possible ones. That is why, while speaking about formation of reliability zones, it is necessary to remember the circumstance that the zone presented in Figure 2 section *a* is formed by using the medium value of the forecast, at each step selecting the most probable value from those forecasted, and as a standard deviation the standard deviation of the most likely value is used. In Figure 2 section *b*, the traditional reliability zone is the average value while choosing the mathematical average, and the average standard deviation from the mean value is used as a standard deviation. In Figure 2 section *c*, the maximum of the lowest levels in sections *a* and *b* is chosen as the lowest level of the reliability zone, and the minimum of the upper levels in sections *a* and *b* is used as the upper level. Historical data distribution

consistency in comparably long confidence intervals zone assuredly verifies that historical data available is one of the many stochastic processes realization. This allows to state that selected forecasting method not only ensures high forecasting precision, but also reveals the motives of market behavior, i.e. determines what possibility is given priority.

On the basis of empirical observations it is possible to assert that the market, from a set of possibilities, is oriented towards the most possible value, if the latter does exist. As a result, on the currency and capital market it is likely to speak not about the “invisible hand”, but about the “invisible brain”. Thus, speaking about the distinctive features of currency rates and capital market, the epithets of intellectual market should be used to describe their behavior and development.

Accuracy, flexibility and adaptability of the forecasting methods

The diagrams of reliability zones could be a good illustration to explain the correctness of the models. The employment of the cause and effect relations is not as easy as it looks on the face of it. We shall try to understand why at such a high currency rate variation, the historical data under analysis do not drop out of a rather small reliability zone shown in Figure 2 section c, which is formed consid-

ering only the historical data of the market.

There should be real reasons behind, which are hidden in the structure of a zone, and the search of primary causes would not be purposeful and constructive. Therefore, among the factors of regressive (stochastic) dependence, $\bar{x}_1, \bar{x}_2, \dots, \bar{x}_n$, there are certain structural parameters of reliability zones.

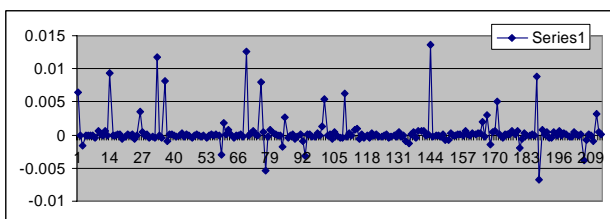
The requirement of flexibility and adaptability of forecasting methods is obvious from Figure 2. Changes of conditions, i.e. directions of movement from the point which is on the edge of the reliability zones, their motives and factors should strongly differ from those that define the direction of movement on the most possible events or similar lines.

Portfolio decision management in currency market subsystem and its practical implementation results

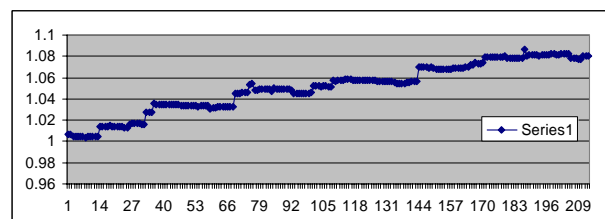
Portfolio adequate decision possibilities reliability assessment analyses were based on the classic investment portfolio formation papers (Vaughan, 1997; Tobin, 1965; Sharpe, 1963; Sharpe, 1964; Markovitz, 1952; Lintner, 1965), as well as on the modern researches of this kind (Benth, Karlsen, Reikvam, 2001; Browne, 1999; Heyeng Keun, 1999; Hiroshi, Wijayanayake, 2001).

Step	Currency	Portfolio structure							Increase	Accumulated sum
		EUR (USD)	GBP	CHF	CAD	AUD	JPY	EUR (USD)		
191	USD	0.0833	0.0833	0.1667	0.4167	0.25	0	0	0.006453	1.006453
192	USD	0	0	0.0833	0	0	0	0.9167	-0.00011	1.006344
193	USD	0	0.5	0	0.5	0	0	0	-0.00169	1.004654
194	USD	0	0	0	0.0833	0	0	0.9167	-1.3E-05	1.004641
195	EUR	0	0	0.0833	0	0	0	0.9167	-3.4E-05	1.004607
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395	EUR	0	0	0.0833	0	0	0	0.9167	5.06E-05	1.082219
396	USD	0	0	0	0	0	1	0	-0.00381	1.078412
397	USD	0	0	0	0	0.0833	0	0.9167	-0.0007	1.077707
398	EUR	0	0	0.0833	0	0	0	0.9167	5.61E-05	1.077763
399	EUR	0	0	0	0	0	0.0833	0.9167	-0.0001	1.07766
400	USD	0	0	0	0	0	0.0833	0.9167	-0.00095	1.076711
401	USD	0.1667	0.1667	0.0833	0.5833	0	0	0	0.003142	1.079853
402	EUR	0	0	0	0.0833	0.0833	0	0.8333	0.000497	1.080351
403	EUR	0	0	0.0833	0	0	0	0.9167	0.000143	1.080494

a) portfolio table



b) graphical view of the increase



c) accumulated capital sum

Figure 3. Results of one of the strategies application

The currency rate and stock price forecasting system described in chapter 2 is a component of information support for portfolio decisions in currency and capital markets. If while using elementary strategies – maxims – for forecasting systems, the task is to show (<http://www.vgtu.lt/usr/rutkauskas/en/eksperimentas.html>) the directions of changes of currency rates or stock prices possibly more often, then talking about portfolio decisions the reliability and accuracy of a portfolio is important.

However, the main objective of this paper is to analyse portfolio decision strategies and to evaluate their efficiency in the real currency rate change. We will shortly remind the main statements and organizing principles of the strategy:

- by using the historical currency rates data for the $[t_0, t]$ period, it is possible to forecast the probability distribution of rate change for the $t+1$ step;
- on the basis of the current portfolio and the forecasts a new currency portfolio for the $t+1$ step can be chosen;
- as the historical data for the $t+1$ period appear, the effect of the decision made is evaluated;
- combining the $t+1$ period data with the historical database, forecasts and a portfolio for the $t+2$ period are made;
- the process continues.

The schemes of Figure 3 present the results of using one of the portfolio strategies. In the 1st column of the table there are numbers of days included in the experiment – these are conditional numbers of an experiment. Column 2 shows the currency which became the trump currency at the corresponding day. In 3-9 columns there are indicators of the respective portfolio structures showing how the trump currency was diversified: 3 – EUR (USD), 4 – GBP, 5 – CHF, 6 – CAD, 7 – AUD, 8 – JPY, 9 – EUR (USD). Column 10 shows an increase in EUR rates depending on the selected portfolio and the real currency rate changes. Column 11 shows the accumulated sum, with the assumption that the initial sum equals 1. It should be noted that portfolio rebalancing costs were evaluated according to the FOREX rules.

Blocks *b* and *c* of the Figure under discussion contain the graphs of invested capital increase and accumulated sum, respectively.

Conclusions

- Hypothesis of market efficiency, formulated for the financial markets, and the random movement assumption of the price variation of financial assets contradict any possibility to create, using only historical data, such investment strategies, which allow to increase the investment effect, generated by the corresponding market, in a long-run period. However, the results, received by the authors, argue that such strategies are possible.
- Twofold trump model of decision management in the global trump currency market FOREX, that was offered earlier by one of the authors and analysed in the paper, allows to form, leaning only on historical information, practically nonrisky investment strategies, allowing to gain higher investment ef-

fect than the effect, insured by the market investment instruments of the corresponding term.

- Single experiments to find the strategy of decision management in the currency market FOREX at any point of time were successful; however the authors carry out the long-term experiment to prove that in the currency market there are always “nonefficiency shoals”. The results of the experiment can be observed on the following web page: <http://www.vgtu.lt/usr/rutkauskas/en/eksperimentas.html>.
- The results witness that the twofold trump model can be already used as the effective tool for the investment in the currency market in pursuance of certain personal, company or Treasury goals.

References

1. Balabanov, I. T. Risk management. Moskva: Finance and Statistics, 1996, 187 p. (in Russian).
2. Benth, F. E. Optimal portfolio management rules in a non-Gaussian market with durability and intertemporal substitution / F. E. Benth, K. H. Karlsen, K. Reikvam // Finance and Stochastics, 2001, Vol. 5, p. 447-467.
3. Browne, S. Beating a moving target: Optimal portfolio strategies for outperforming a stochastic // Finance and Stochastic, 1999, Vol. 3, p. 275-294.
4. Dieter, K. Portfolio optimization: volatility constraints versus short-fall constraints / K. Dieter, R. Zagst // OR Spectrum, 1999, Vol. 21, p. 97-122.
5. Dupacova, J. Portfolio optimization via stochastic programming: methods of output analysis // Mathematical Methods of Operations Research, 1999, Vol. 50, p. 245-270.
6. Environment monitoring 1993-1995, Vilnius: LRAAM, 1996, 136 p.
7. Grabovski, M. T. Risk in contemporary business. Moskva: Alyans, 1994, 237 p. (in Russian).
8. Heyeng Keun, Koo. Consumption and portfolio selection with labor income: A discrete-time approach // Mathematical Methods of Operations Research, 1999, Vol. 50, p. 219-243.
9. Hiroshi, K. Portfolio optimization problem under concave transaction cost and minimal transaction constraints / K. Hiroshi, A. Wijayanayake // Mathematical Programming, 2001, Vol. 89, p. 233-250.
10. Kofi Asante-Duah, D. Risk Assessment in Environmental Management, New York, John Willey and Sons, Inc., 1998.
11. Lintner, J. The valuation of risk assets and the selection of risky investments in stock portfolios and capital budget // Review of Economics and Statistics, 1965, February, p. 13-27.
12. Markovitz, H. M. Portfolio selection // Journal of Finance, 1952., March, Vol. 7, No. 1, p. 77-91.
13. Risk Management. A practical guide, Risk metrics group, 1999, 141 p.
14. Rutkauskas, A. V. Formation of adequate investment portfolio for stochastic possibilities // Property Management, 2000, Vol. 4, No. 2. Vilnius: Technika, p. 100-116.
15. Rutkauskas, A. V. Isoguarantees as instrument of portfolio decision making // Proceedings of international conference “Modelling and simulation of business systems”, May 13-14, 2003, Vilnius, Lithuania. Kaunas University of Technology Press, 2003, p. 239-243.
16. Rutkauskas, A.V. Regional business risk informative system / A. V. Rutkauskas, A. Miečinskienė // Zeszyty naukowe. Kolegium gospodarki swiatowej. Szkoła glowna handlowa, Warszawa, 2002, p. 148-166.
17. Rutkauskas, A.V. Regiono verslo rizikos monitoringas. Konferencijos „Verslo kontraktai ir vadyba“, LITEXPO 2000 m. balandzio 13-14 d., medžiaga. Vilnius, 17 p.
18. Rutkauskas, A.V. Formation of an investment portfolio adequate for stochasticity of profit possibilities / A. V. Rutkauskas, J. Stankevičienė // Journal of Business Economics and Management, 2003, Vol. IV, No1, p. 3-12.
19. Rutkauskas A. V. The double-trump decision management model in

global exchange // *Ekonomika*, 2005, Nr. 72.

20. Sharpe, W. F. Capital asset price: a theory of market equilibrium under conditions of risk // *Journal of Finance*, 29(3) September, 1964, p. 425-442.
21. Sharpe, W. F. A simplified model for portfolio analysis // *Management Science*, January, 1963.
22. Tobin, J. The theory of portfolio selection in F. H. Hahn and F. R. P. Brechling (eds) // *The Theory of Interest Rate*, London: Macmillan, 1965, p. 3-51.
23. Vaughan, E. J. Risk Management. New York: John Wiley and Sons Inc., 1997, 812 p.
24. Experiment: Evaluation of double trump model application possibilities for decision management in FOREX market. Web-page: <http://www.vgtu.lt/usr/rutkauskas/en/eksperimentas.html>.

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Apie kai kurias dvigubo kozirio modelio savybes, eksperimentinius taikymo rezultatus ir sprendimo būdus

Santrauka

Pagrindinis šio straipsnio tikslas yra teoriškai išanalizuoti originalios sprendimų valdymo globalioje valiutų rinkoje FOREX sistemos sukūrimo prielaidas bei galimybes ir kartu išnagrinėti autorių jau anksčiau pasiūlytų sprendimų valdymo valiutų rinkoje modelių eksperimentinio panaudojimo rezultatus. Pagrindinis dėmesys skirtas vadinamajam dvigubo kozirio sprendimų valdymo valiutų rinkoje modeliui (Rutkauskas, 2005), kurio eksperimentinis naudojimas indikuoja apie investavimo strategijų, teikiančių geresnes negu rinkos diktuojami investiciniai sprendimai sukūrimo galimybes. Kartu su pasirinkto modelio savybių, kurios, autorių nuomone, ir leido atskleisti tokių strategijų buvimą, nagrinėjimu yra suformuluoti investavimo sprendimų ir strategijų efektyvumo palyginimo su rinkos efektyvumu principai.

Be to, maga atkreipti skaitytojo dėmesį į vieną esminę mokslinio tyrimo, kurio rezultatai yra aprašyti šiame ir ankstesniuose autorių šios krypties darbuose, vykdymo aplinkybę. Keliamoms tezėms patikrinti ir kuriamai originaliai sprendimų valdymo globalioje valiutų ir kapitalo rinkose sistemai verifikuoti yra vykdomas plataus masto ilgalaikis eksperimentas, kurio rezultatus galima rasti adresu: <http://www.vgtu.lt/usr/rutkauskas/lt/eksperimentas.html>

Tinkamas piniginių srautų valdymas daugianacionalinėse korporacijose tampa vienu iš pagrindinių tų korporacijų sėkmės garantų. Valiutų kursų svyravimai ryškiai veikia ne tik korporacijų veiklos, bet ir atskirų valstybių tarptautinių ekonominių ryšių intensyvumą ir naudingumą. Valiutų kursų rizikos valdymas tampa vis svarbesne tiek atskirų verslo subjektų, tiek ir tarpvalstybinių ekonominių ryšių intensyvumo ir naudingumo priemone.

Savo ruožtu valiutų kursų elgsenos, kaip ir rinkos efektyvumo tapso dėsninumų pažinimas ir prognozavimas, yra fundamentaliai ekonomikos mokslo problemos, nuo kurių išsamesnio suvokimo ir bent dalinio sprendimų pagilino priklausau ekonomikos mokslo pritaikomumo galia ir naudingumas.

Investavimo sprendimai nebūtinai be dabarties ir ateities piniginių srautų naudingumo subendraminimo. Tiesa, efektyviosios finansų rinkos hipotezė teigia, kad efektyvioji rinka yra tuomet, kai visa informacija apie akcijas ar valiutos vertės kaitą sukaupia einamojoje šių aktyvų kainoje ir kad ši kaina nepriklauso nuo istorinių kainų, taigi negali būti prognozuojama istorinių kainų pagrindu.

Investavimo sprendimai turi privalumų jų pranašumams prieš rinkos sprendimus įvardyti. Naujas investicinis sprendimas turėtų būti laikomas pranašesnis prieš rinkos sprendimus, jeigu jis yra efektyvesnis už visus iki šiol atitinkamoje rinkoje sukurtas atitinkamos trukmės ir rizikingumo investavimo priemones (instrumentus).

Paminėtas straipsnis „Dvigubo kozirio sprendimų valdymo globalinėje valiutų rinkoje modelis“ skirtas abiejų aptartųjų problemų sprendimui. Pirmiausia, čia siekiama praplėsti diskusiją apie finansų rinkų efektyvumą, testuojant rinkos efektyvumo hipotezę ne bandymu įveikti rinką, o bandymu paliudyti rinkos nehomogeniškumą, t. y. įrodyti, kad rinkoje visuomet esama neefektyvumo „salių“. Rinkos nehomogeniškumas egzistuoja, kai galima sprendimų formavimo strategija, leidžianti pakankamai ilgą laikotarpį turėti pranašumą prieš geriausia tokios rinkos diktuojamų sprendimų efektą, t. y. būti efektyvesnei už jau esamas valiutų rinkoje investavimo priemones.

Antra, straipsnyje siekiama sukurti operatyvią sprendimų valdy-

mo valiutų kursų rinkoje sistemą, kuri leistų bet kuriuo momentu, galbūt tik išskyrus krizinius laikotarpius, pasirinkti tokias sprendimų valdymo strategijas, kurios būtų pranašesnės prieš bet kurias esamas tam tikros trukmės ir rizikingumo investavimo priemones. Tokių strategijų kūrimas ir įgyvendinimas taptų efektyvia valiutų kursų rizikos valdymo priemone tiek atskiriems verslo subjektams, tiek ir visam valstybės išdui (exchequer).

Dvigubo kozirio modelio struktūra ir efektyviųjų investavimo sprendimų strategijos įgyvendinimo priemonės

Priminsime, kad efektyvią investavimo sprendimų valiutų rinkoje strategiją ir toliau suprasime kaip veiksmų ir priemonių visumą, leidžiančią parinkti tokį investuoto ar spekuliacinio kapitalo valdymą, kuris garantuotų pranašumą prieš visas esamas atitinkamos trukmės ir rizikos investavimo priemones.

Dvigubo kozirio modelis kaip investavimo galimybių analizė, tikslų formavimo ir sprendinių paieškos priemonė turi ir adekvačią struktūrą. Tai –

- valiutų kursų prognozavimo posistemis,
- tikslų suformavimo ir jų pasiekimo priemonių posistemis,
- sprendimų priėmimo valiutų rinkoje modelių sistemos pobūdžio identifikavimas ir kiekybinių jos sprendimo metodų posistemis,
- gaunamų sprendinių efektyvumo matavimo ir efektyviųjų sprendinių galimybių ir sąlygų monitoringas.

Sprendimų valdymo strategijos efektyvumas labai priklauso nuo valiutų kursų prognozavimo sistemos adekvatumo. Kad ir kokie toboli būtų sprendimų paieškos kriterijai ir galimybių apribojimai, sprendimų priėmimas vis tiek priklausys nuo prognozių patikimumo ir tikslumo.

Siūlomas sprendimų priėmimo valiutų rinkose sistemos sudarymas formaliai prasideda nuo valiutų kursų prognozavimo metodų parinkimo. Kadangi šioje sistemoje, kaip ir techninėje analizėje, konkretus tyrimo objektas yra istoriniai valiutų kursų rodikliai, todėl siūlomas prognozavimo metodus tikslinga sugretinti su jau naudojamais techninėje analizėje prognozavimo metodais, kurių yra gana daug ir labai įvairių. Techninėje analizėje šalia tradicinių visoms veiklos sritims prognozavimo metodų – įvairiausių tradicinių modelių, regresinių modelių, slankiųjų vidurkių modelių ir pan., – intensyviai naudojami ir modelių identifikavimo principu. Pastarojo principo esmę sudaro tai, kad bandoma nustatyti tam tikrus šablonus, pagal kuriuos būsimų rodiklių kaita turėtų pakartoti istorinių duomenų kaitą.

Siūlomos prognozavimo sistemos ypatumai

Kalbant apie pateikiamų valiutų kursų ir akcijų kainų prognozių patikimumą ir tikslumą, stendas gali būti valiutų kursų kitimą ribojančių zonų diagramos, kurias toliau vadinsime valiutų kursų kitimo pasikliautinumo zonomis. Diagramose kartu su prognozuojamomis pasikliaujamosiomis zonomis zonų viduje yra pateikti ir atitinkami istoriniai rodikliai. Šių rodiklių pasiskirstymas pasikliaujamosiose zonos parodo faktą, kad valiutų kursų ir akcijų kainų elgsena ne tik derinasi su dėsninumu, kuriems paklūsta stochastinių dydžių elgsena pasikliaujamosiose jų intervaluose, bet ir $\pm\sigma$, $\pm 2\sigma$ ir $\pm 3\sigma$ pasikliaujamieji intervalai turi žymiai aukštesnius pasikliaujamumo lygmenis negu 68,3%, 95,4% ir 99,7%. Atitinkamų stochastinių hipotezių tikrinimas tai visiškai patvirtina.

Istorinių duomenų sklaidos dėsninumi gana ilgoje pasikliaujamųjų intervalų zonoje įtikinamai paliudija, kad turimi istoriniai duomenys – tai viena iš begalės stochastinio proceso realizacijų. Tai leidžia teigti, kad pasirinktas prognozavimo metodas ne tik užtikrina aukštą prognozavimo tikslumą, bet ir atskleidžia rinkos elgsenos motyvą, t. y. nustato, kuriai galimybei teikiamas pirmumas. Empirinių stebėjimų rezultatų pagrindu galima teigti, kad rinka iš galimybių visumos orientuojasi į labiausiai tikėtiną reikšmę, jeigu tik tokios esama. Taigi valiutų ir kapitalo rinkoje labiau galima kalbėti ne apie „nematomą ranką“, bet apie „nematomą protą“. Vadinasi kalbant apie valiutų ir kapitalo rinkų skiriamuosius požymius, tenka panaudoti intelektualiosios rinkos ar panašaus pobūdžio epitetus, norint apibūdinti jos elgseną ir evoliuciją.

Pasikliaujamųjų zonų diagramos galėtų būti nebloga iliustracinė priemonė ir modelių korektiškumui paaiškinti.

Portfelio sprendimų valdymo valiutų rinkose posistemis ir jo praktinio naudojimo rezultatai

Aptarta valiutų kursų prognozavimo sistema yra informacinio aprūpinimo sudedamoji dalis portfelio sprendimams priimti valiutų rinkose. Naudojantis paprastosiomis strategijomis, – maksimumis, –

prognozavimo sistemoms keliami užduotis kuo dažniau atspėti valiutų kurso ar akcijos kainos kitimo kryptis, o kalbant apie portfelio sprendimus jau svarbu ir prognozės tikslumas ir patikimumas, kurių nagrinėjimo principai buvo paminėti anksčiau.

Tačiau pagrindinis šio straipsnio tikslas yra išnagrinėti portfelio sprendimų strategijas ir įvertinti jų efektyvumą realios valiutų kursų kaitos kontekste. Trumpai priminsime strategijos pagrindines nuostatas ir organizavimo principus:

- naudodami $[t_0, t]$ periodo valiutų kursų istorinius duomenis, prognozuojame kursų kitimo $t+1$ žingsniu galimybių tikimybės skirstinius;
- esamo portfelio ir parengtų prognozių pagrindu parenkame naują valiutų portfelį $t+1$ žingsniui;
- pasirodžius istoriniams $t+1$ periodo duomenims, įvertiname priimto sprendimo efektą;
- prijungus $t+1$ periodo duomenis prie istorinių duomenų bazės, parengiame prognozes ir suderiname portfelį $t+2$ periodui;
- taip procesas tęsiasi toliau.

Išvados

- Nors rinkos efektyvumo hipotezė, suformuluota finansų rinkoms, kartu su finansinių aktyvų kainos kitimo kaip atsitiktinio judesio prielaida neigia galimybę sukurti, naudojantis tik istoriniais duomenimis, tokias investavimo strategijas, kurios leistų ilguoju laikotarpiu viršyti atitinkamos rinkos gen-

eruojamą investicinį efektą, tačiau autorių gauti rezultatai liudija, kad tokios strategijos yra įmanomos.

- Vieno iš autorių anksčiau pasiūlytas ir straipsnyje išnagrinėtas vadinamasis dvigubo kozirio sprendimų valdymo globalioje valiutų rinkoje FOREX modelis leidžia suformuoti, pasiremiant tik istorine informacija, praktiškai nerizikingas investavimo strategijas, įgalinančias pasiekti aukštesnį investicinį efektą negu tai garantuoja toje rinkoje esančios atitinkamos trukmės investicinės priemonės.
- Pavieniai eksperimentiniai bandymai surasti bet kuriuo momentu sprendimų valdymo valiutos rinkoje FOREX strategijas, efektyvesnes už rinkos generuojamą efektą, buvo sėmingi, tačiau galutiniam įrodymui, kad valiutų rinkoje visuomet esama „neefektyvumo sekulumų“ (nonefficiency shoal), autoriai vykdė platų ilgalaikį eksperimentą, kurio rezultatai gali būti stebimi adresu <http://www.vgtu.lt/usr/rutkauskas/lt/eksperimentas.html>.
- Greiti rezultatai liudija, kad dvigubo kozirio modelis jau dabar galėtų būti panaudotas kaip efektyvi investavimo į valiutų rinką priemonė, siekiant tam tikrų asmeninių, korporacijos ar valstybės išdų tikslų.

Raktažodžiai: *valiutų rinka, sprendimų valdymas globaliose valiutų ir kapitalo rinkose, adekvatusis investicinių sprendimų patikimumui įvertinti portfelis, stochastinis programavimas.*

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