

PROPOSAL OF INVESTMENT PORTFOLIO OF HEDGE FUND

Jan Budík¹, Radek Doskočil², Lenka Niebauerová³

Brno University of Technology, Kolejní 4, 612 00 Brno, Czech Republic
Email: ¹budik@fbm.vutbr.cz; ²doskocil@fbm.vutbr.cz; ³niebauerova@fbm.vutbr.cz

Abstract. This paper deals with the Hedge Fund as a alternative investment opportunity. The key of Hedge Fund success is stable and robust investment strategies with high focus on risk management. This paper describes one part of all Hedge Fund investment portfolio. Purposed strategy use foreign exchange pairs (USD.JPY and GBP.USD) as a financial instrument for decision making. As a main tool for proposing of this investment strategy is software MATLAB, which include financial and statistical toolbox and is connected to broker for decision making realization in real time. The key is to purpose low volatility investment strategy with low risk and diversification with other investment strategies.

Keywords: Hedge Fund, investment strategy, MATLAB, foreign exchange, decision making, investment opportunities.

Jel classification: G11, G17, G29, G24

1. Introduction

The main aim of this paper is to present one of the investment strategies, which are using big financial institution – Hedge funds. Investment strategy of Hedge funds can be focused on quantitative analysis of market environment with using of software MATLAB. This paper shows investment strategy for foreign exchange markets, especially for currency pairs USD. JPY and GBP.USD.

Hedge Funds, until recently an unknown combination of words for most of the population, have begun to open to the wide public including small clients and are no longer limited to experienced investors. Hedge Funds invest in nearly all financial and commodity instruments and unlike the other funds are not subject to such a strict surveillance. The strategy selections as well as its results are therefore largely dependent on the will and skills of the Hedge Fund manager. Hedge Funds represent a different investment culture. They are usually administered by smaller companies dominated by one or two key investors bringing about a new dimension in the investment manager – client relationship.

Hedge Funds are often considered high-risk funds. This article will therefore focus on description of a model which should lead to reduction of the risk in combination with knowledge and skills of the Hedge Fund manager.

2. State of scientific knowledge

The capital market prediction, especially stocks, futures and foreign exchanges, is one of the hardest parts of prediction at all. There are a lot of reasons, why is difficult to predict environment of capital market price moves. The most significant problem consists of process of price move making, because of unknown information, as sentiment of traders, mood of traders, political news, and geopolitical news.

The main denominator of this unknown information consists of unpredictability and fact that most of them never happen before, so influence to price move is unknown too. A lot of scientific papers are trying to confirm or disprove theory of market efficiency. The authors of paper Financial crisis and stock market efficiency: Empirical evidence from Asian countries (Lim, Brooks, Kim 2007) are trying to empirically investigate the effect of financial market crisis in 1997 on Asian stock markets through rolling bi-correlation statistic test of three sub-periods of pre-crisis, crisis and post-crisis.

The other scientific paper called Testing for efficiency in selected developing foreign exchange markets: An equilibrium-based approach (Giannelis, Papadopoulos 2008) is trying to find alternative way of testing foreign market efficiency for developing countries. The test is applied to three Central and Eastern European Countries – members of the European Union.

3. Investment strategy

There are a number of strategies Hedge Fund managers may apply for their business strategies. The nature of this trading may be very versatile, including foreign exchange trading share or other commodity trading, real estate trading etc.

The strategy described here concerns trading on forex markets and represents one of the basic strategies using the leverage system.

For further basic investment strategies of Hedge Fund see the brief descriptions below:

Convertible arbitrage – This strategy tries to generate profit from potential price ineffectiveness of market valuation of various security types of the same company.

Distressed securities – Hedge funds governed by this strategy purchase company shares when the company is undervalued and surrounded with a mass of negative information with the aim to sell the shares later when their price goes up. Another option of this strategy is quick sale of shares of companies where the hedge fund manager expects negative development.

Long/short equity, equity hedge – The portfolio manager purchases shares for both long and short positions, correcting their ratio on the basis of expected market development.

Equity market neutral – Very similar to the previous strategy but the ratio between the long and the short shares is maintained constant at 50:50.

Event driven – In the context of this strategy the hedge fund makes use of market events connected with lifecycle of joint-stock companies. The hedge fund tries to purchase and sell shares on the basis of these events in the most convenient moment. The events to which the hedge fund reacts may include for example management change, publication of financial statements, acquisition, change of owners, restructuring or legislation amendment.

Merger arbitrage – A strategy which, unlike the previous one, mainly focuses on arbitration opportunities connected with mergers, acquisitions and hostile takeovers. The portfolio manager purchases shares of companies for both long and short positions on the basis of the expected development.

Global macro – This strategy provides the greatest freedom to portfolio managers. The portfolio manager tries to estimate future development of securities on the basis of political events or macroeconomic data such as foreign exchange rates, commodities and interest rates.

Relative value arbitrage – This strategy lays emphasis on fundamental analysis. With the help

of fundamental analysis the portfolio manager assesses internal values (the shares should have in his opinion) of the considered companies and if a share is undervalued then the portfolio manager purchases and vice versa (Základní investiční strategie hedge fondů 2010, Stowell 2010, Nicholas 2000, Nicholas 2004).

4. Hedge Fund – description of overall investment issue

Hedge Fund as a combination of the below mentioned elements works with entrusted finance. The investor, creditor, is the first step of the process. His goal is to choose a suitable Hedge Fund (Hedge Fund manager) on the basis of the presented achieved results and entrust his funds to him. On the basis of agreement with the Hedge Fund manager he usually receives annual or semi-annual statements on the current valuation of his input capital (Lo 2010, Ruy 2001).

The following Fig. 1 shows a survey of key persons involved in the trading.

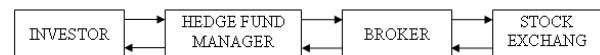


Fig.1. Diagram of persons involved in trading (Source: made by the authors)

Investor – A natural person or legal entity entrusting finance to Hedge Fund manager for the purpose of their valuation.

Hedge Fund Manager – A person trading the entrusted finance (implementing business strategies).

Broker – An institution procuring access to electronic stock exchange.

Stock Exchange (electronic) – A virtual space for transaction implementation.

The key role in the whole trading process is performed by the Hedge Fund manager decision-making. The decision-making process is affected by several factors: knowledge, experience, data. There are a number of definitions of the abovementioned terms (Stefanini 2006).

The authors characterise them as follows:

Knowledge – Theoretical knowledge related to the issue in question;

Experience – Knowledge obtained by observation and investigation of the addressed phenomenon and deduction of the relevant information;

Data – Historic database of price movements (time lines).

4.1. MATLAB as means of support for managerial decision-making

Managerial decision-making related to creation of an investment portfolio can be supported by the commercial software MATLAB. The functions provided by the software can mainly be used for analysis of and facilitation of work with time lines (Kantardzic 2002, Kitigawa 2010). The MATLAB software is very popular and widely used in the area of mathematical modelling and simulation, when with the help of the created toolboxes it significantly facilitates work of its users, saving their time in the process. Toolboxes are developed one by one by specialists in different fields and may be purchased and installed additionally in the original installation of MATLAB. For the purpose of processing of financial time lines there is the toolbox called “financial“ and “financial derivatives“ containing special functions for financial calculations. The software includes implemented functions for stock exchange data for the graphic output (*bar, candle, highlow*), and there are also functions for technical indicator calculations (*rsindex, willprct, macd, bollinger*). There are also more sophisticated functions of the expected maximum drop of capital based on Brawn movement (*emaxdrawdown*). For easier work with input data there is the implemented *load* function allowing for upload of an input file including record of price changes for the given financial instrument in a matrix (The MathWorks-Function Reference 2010, Dostál 2008, The MathWorks. MATLAB – Financial Toolbox - User’s Guide 2008).

4.2. Application for optimum parameter search

The MATLAB environment includes an application processing a priori expert knowledge for decision-making on financial markets and searching for optimum setting of several parameters and rules (Altucher 2004, Hanselman 2005).

The main idea of the a priori expert knowledge is based on the fact that markets tend to show sufficiently significant movements in one direction in the context of intra-day movements at certain times. As these financial instruments also allow to work with sales orders, the direction of the price movement is not important. What is important in the potential of the total movement in one direction.

Inputs to the created application therefore include the a priori expert knowledge, financial decision-making and time line of the selected financial instrument sampled by the period of one minute. This fact is presented by Fig. 2.

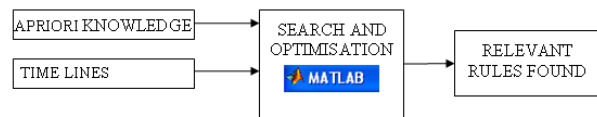


Fig.2. Diagram of the system of search for optimum rules (Source: made by the authors)

Optimum time periods are found within this line for entry to the electronic stock exchange, the values of the risk and the potential gain are optimised. The found periods, risk and potential gain values are assessed by an expert and supported with a fundamental truth such as stock exchange opening, publication of fundamental news, stock exchange closing etc.

The output from the application confirms the information that the financial markets do not generate the price at random. Despite the large number of the non-measurable inputs a certain order can be found in these systems.

The application will perform a search for the optimum parameters and enter the successfully found rules in the matrix. An expert with a sense for the issue must be used for assessment of relevance of the found rules. The rules passing the expert filter are then forwarded to a separate application not related to the application for rule search. This program is connected via API to corporate servers providing for direct contact to the electronic exchange and executes orders.

Note: Where automatic trading systems are applied requiring price movement processing in MATLAB it is possible to use API for communication with servers of companies providing access to the electronic stock exchange to the users (Dreman 1995, Golam 2000). Figure 3 shows a block diagram of the system for implementation of orders for sales and purchases.

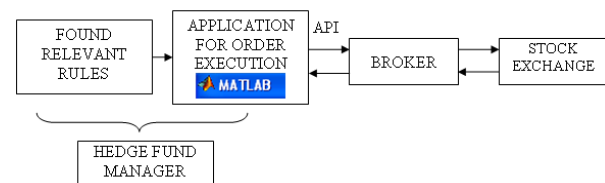


Fig.3. Diagram of trading order implementation system (Source: made by the authors)

5. Investment portfolio proposal case study

The created system of search for the relevant rules only works with one of the several strategies available when proposing the complex portfolio. The robust portfolio of a Hedge Fund may consist of partial portfolios focused on shares, commodities or currencies. Or the portfolio may be diversified by intra-day and position accesses on the abovementioned markets.

Analysis of input data, which is represented by market price moves, was made with using of principles of quantitative analysis based on correlation and apriory knowledges of expert for financial decision making.

The proposed rules are applied to trading on the currency market and involve intra-day access to speculations, which means that the individual transactions are opened and closed within one business day. The system is fully automatic, i.e. does not require expert assistance in generation of purchase and sales orders.

There are a lot of opinion, what is better – use full automatic trading systems or use trading system driven by portfolio managers. This paper show just full automatic alternative for trading. The best way for creating diversified portfolio lies between this two possibilities as show Fig. 4.

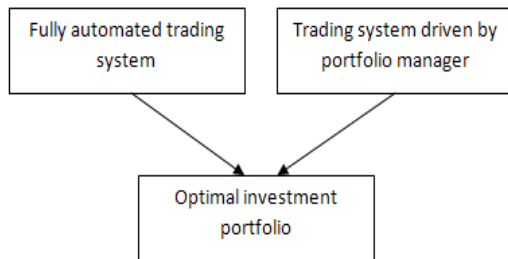


Fig. 4. Optimal investment portfolio (Source: made by the authors)

5.1. Learning process

The rules were obtained in 2007 and 2008. Their application started in 2009 and ended in May 2010. The selected financial instruments included cross pairs USD-JPY and GBP-USD, with selection of two instruments used for diversification of this part of the portfolio. Tables 1 and 2 show performance in percent of valuation of the input capital without application of re-investments.

Table 1. Valuation for GBP USD in the period 2007 and 2008 (Source: made by the authors)

	Q1 ¹	Q2	Q3	Q4	ΣQn
2007	25 %	5 %	12 %	9 %	51 %
2008	12 %	-5 %	13 %	1 %	21 %

Table 2. Valuation for USD JPY in the period 2007 and 2008 (Source: made by the authors)

	Q1	Q2	Q3	Q4	ΣQn
2007	7 %	-4 %	21 %	14 %	38 %
2008	18 %	15 %	-5 %	0 %	28 %

¹ Letter Q marks the individual quarter years.

The found rules say that the cross pair GBP-USD shows the biggest trend towards price movements in one direction at 7:30 GMT+1, which is supported with the fundamental fact of European stock exchange opening. The cross pair USD-JPY shows the biggest trend towards price movements at 2:00 GMT+1 and this fact is caused by opening of the Tokio stock exchange.

5.2. Testing process

The following tables 3 and 4 show performance of input capital valuation with application of the knowledge obtained by the learning process. This is the so called out of sample analysis, i.e. application of the rules to data not used for the learning process.

Table 3. Valuation for GBP USD in the period 2009 and 2010 (Source: made by the authors)

	Q1	Q2	Q3	Q4	ΣQn
2009	4 %	-2 %	16 %	10 %	28 %
2010	11 %	12 %			23 %

Table 4. Valuation for USD JPY in the period 2009 and 2010 (Source: made by the authors)

	Q1	Q2	Q3	Q4	ΣQn
2009	15 %	3 %	31 %	20 %	69 %
2010	22 %	22 %			44 %

5.3. Comparison process

The statistical instrument of correlation coefficient was used for assessment of the portfolio diversification rate².

The calculated values of the correlation coefficient for the individual strategies in the analysed years are described in table 5.

Table 5. Calculated values of the correlation coefficient in the analysed years (Source: made by the authors)

Year	Correlation coefficient [-]
2007	0.016
2008	0.081
2009	0.0086
2010	-0.13

The interpretation of the calculated results fully corresponds to the basic logic of the correlation coefficient, i.e. that the portfolio consists of two sufficiently independent strategies, for all the calculated values approach zero in all years.

²Theoretical characteristics of the correlation coefficient are not described here for it is not subject of this contribution.

5.4. Comments to the obtained results

Figure 5 shows capital increase for the combined portfolio of pairs GBP-USD and USD-JPY.

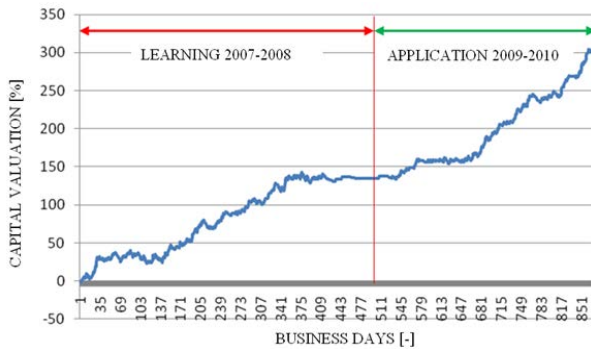


Fig.5. Investment portfolio trend in the monitored years (Source: made by the authors)

The system showed sufficient stability despite the varied market volatility in the individual years. It further proved that even with very simple rules, suitably applied, sufficient profits may be generated for trading continuity assurance.

6. Conclusions

Hedge funds as one of the alternative financing methods are not so widespread on the Czech financial market as for example in the United States of America, where there are thousands of registered institutions of this type and the mean annual capital valuations reach 20–120 % with the best performing funds.

The reasons why this is so can be many. The authors consider as one of the substantial philosophical reasons for this the fact that the market is not mature and the investors show low inclination towards accepting the potential risk which is certainly related to this type of investment. This contribution may be one of the guides to elimination of this risk as it analyses and describes the basic factors generating investment risk.

This paper revealed one of the investment strategies, which are using big financial companies – Hedge funds. The results show the raising of initial capital about tens of percent per year. There are used two economic models for financial decision making, which are designed for foreign exchange markets, especially currency pairs USD.JPY and GBP.USD. The correlation of outputs of those two models has value between -0.13 and 0.081.

References

Altucher, J. 2004. *Trade Like a Hedge Fund: 20 Successful Uncorrelated Strategies & Techniques to Winning profits*, Wiley. 240 p. ISBN 978-0471484851.

Dostál, P. 2008. *Pokročilé metody analýz a modelování v podnikatelství a veřejné správě, (The Advanced Methods of Analyses and Simulation in Business and Public Service in Czech)*, CERM, Brno, 432 p, ISBN 978-80-7204-605-8.

Dreman, D., N.; Berry, M., A. 1995. Analyst Forecasting Errors and Their Implications for Security Analysis, *Financial Analysts Journal* 51(3): 30–41. <http://dx.doi.org/10.2469/faj.v51.n3.1903>

Golam, M., Jeroen, K., Van. 2000. *Trends in and determinants of mortality in the elderly population of Matlab, Medicine* 50(6): 763–771. ISSN 0277-9536.

Hanselman, D.; Littlefield, B. 2005. *Mastering, MATLAB 7*, USA, Pearson International Edition, ISBN 0-13-185714-2.

Kantardzic, M. 2002. *Data Mining: Concepts, Models, Methods, and Algorithms*, Wiley-IEEE Press. 360 p. ISBN 978-0-471-22852-3. <http://dx.doi.org/10.1109/9780470544341>

Kian-ping L.; Brooks, R.; Kim, J. 2008. Financial crisis and stock market efficiency: Empirical evidence from Asian countries, *International Review of Financial Analysis* 17(3): 571–91. ISSN 1057-5219.

Kitagawa, G. 2010. *Introducing to Time Series Modeling*, Chapman & Hall. 296 p, ISBN 9781584889212. <http://dx.doi.org/10.1201/9781584889229>

Lhabitant, F. 2004. *Hedge Funds: Quantitative insights*, Wiley. 354 p. ISBN 978-0470856673.

Lo, A. 2010. *Hedge fund: An Analytic Perspective*, Princeton University Press. 416 p. ISBN 978-0691145983.

Ruey, S. 2001. *Analysis of Financial Time Series*, Wiley-Interscience. 472 p. ISBN 978-0471415442.

Stefanini, F. 2006. *Investment Strategies of Hedge Funds*, Wiley. 336 p. ISBN 978-0470026274.

Stowell, D. 2010. *Investment Banks, Hedge Funds, and Private Equity*, Academic Press. ISBN 978-0123745033.

The MathWorks. 2008. *MATLAB – Financial Toolbox – User's Guide*, The MathWorks, Inc.

The MathWorks-Function Reference. 2010 [online] [accessed 6 March 2010]. Available from Internet: <<http://www.mathworks.com/access/helpdesk/help/toolbox/finance/f6-213137.html>>

Nicholas, J. 2000. *Market-Neutral Investing: Long/Short Hedge Fund Strategies*, Bloomberg Press. 336 p. ISBN 978-1576600375.

Nicholas, J. 2004. *Hedge Fund of Funds Investing: An Investor's Guide*, Bloomberg press. 288 p. ISBN 978-1576601242.

Giannellis, N.; Papadopoulos, A. 2009. Testing for efficiency in selected developing foreign exchange markets: An equilibrium-based approach, *Economic Modelling* 26(1): 155–166. ISSN 0264-9993.

Základní investiční strategie hedge fondů [online] [accessed 1 January 2010] Available on Internet: <<http://www.hedge-fondy.cz/zakladni-investicni-strategie-hedge-fondu/>>