APPLICATION OF THE VALUE AVERAGING INVESTMENT METHOD ON THE US STOCK MARKET

Martin Širůček[1], Ivana Škatuĺárová[2]

[1] Department of Finance, Faculty for Business and Economics, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic

Abstract

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The paper focuses on empirical testing and the use of the regular investment, particularly on the value averaging investment method on real data from the US stock market in the years 1990–2013. The 23-year period was chosen because of a consistently interesting situation in the market and so this regular investment method could be tested to see how it works in a bull (expansion) period and a bear (recession) period. The analysis is focused on results obtained by using this investment method from the viewpoint of return and risk on selected investment horizons (short-term 1 year, medium-term 5 years and long-term 10 years). The selected aim is reached by using the ratio between profit and risk. The revenue-risk profile is the ratio of the average annual profit rate measured for each investment by the internal rate of return and average annual risk expressed by selective standard deviation. The obtained results show that regular investment is suitable for a long investment horizon or the longer the investment horizon, the better the revenue-risk ratio (Sharpe ratio). According to the results obtained, specific investment recommendations are presented in the conclusion, e.g. if this investment method is suitable for a long investment period, if it is better to use value averaging for a growing, sinking or sluggish market, etc.

Keywords: regular investment, value averaging, risk and profit profile, standard deviation, crisis period, US market, S & P 500

INTRODUCTION

Investment into stock markets is suitable for investors who have enough available finance and who require higher yields, as well as for those who are ready to accept a higher level of risk. These markets are characterized by higher volatility (standard deviation) over a short time, but by a growth trend for a long investment horizon. It is precisely the higher volatility (variation) which is the greatest disadvantage for investment on the stock market. Consequently, investors search for ways of eliminating (minimzing) the risk of loss. A good method of risk reduction is diversification via stock indices, where many companies cover one investment into one index and the risk is spread over a wide range of stocks. However, this investment style (passive investment strategy) cannot guarantee that the investor does not make a loss, because the index can possibly react very sensitively and for example, sink in response to developments in the economy and expectations.

This is why investors look for investment methods offering some profit and the possibility of also making a gain through intensive falls or market reductions. The value averaging investment method works on a simple principle: that the portfolio value grows according to a given value (e.g. USD 1,000, EUR 100 per month). This investment method offers to buy shares when market prices are sinking and to sell them when prices are growing. Thus it is possible that this method is profitable also through negative movements and falls.

The value averaging investment method combines some characteristics of dollar cost averaging and portfolio rebalancing. This investment strategy was

developed by Prof. Michael E. Edleson in 1988. According to Marshall (2000), the pivotal point of this method is a precisely set mathematical process, which consists of the regular investment of a given amount of money for a defined period of time (e.g. for 1, 3, 5, 10 years or a longer investment period). This is how investors can manage their portfolios so that their value grows by the same amount in regular periods. Thanks to this, value averaging can be considered a type of regular investment although investors do not invest the same sum for example every month as by the dollar cost averaging method. The biggest difference between value averaging and dollar cost averaging is that with dollar cost averaging, the investor makes a regular investment with the same amount of money (e.g. each month), while with value averaging, the amount of money regularly invested is varied. With value investment the investor has to reach the nominal investment goal, which is divided into the whole investment period (see below). So the investor can react to actual development on the market, allowing not only buying but also selling of assets.

Varga (2011) mentioned that it is a specific feature of this investment method that the portfolio grows every month (if not set otherwise) by a constant amount of money no matter what market developments and fluctuations there are. As a result, investors buy more shares at the time of a downtrend and the frequency of buying is lower at the time of growth. The mathematical formula is set so that owned shares are sold at a time of high value. Edleson (2007) states that in comparison with
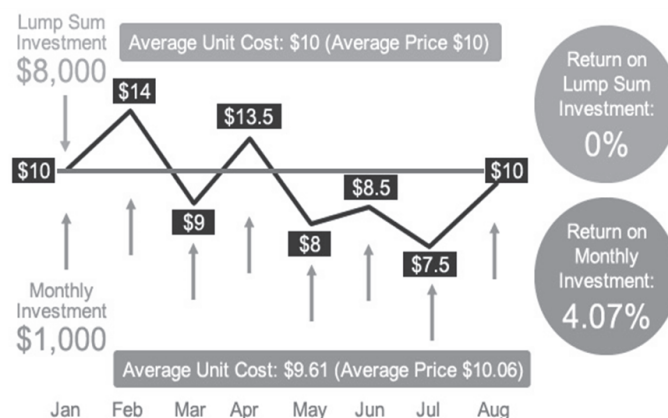
dollar cost averaging, investors can not only buy new shares, but they can sell them too, and it is not necessary to invest a fixed and constant amount of money during the whole investment period.

The function of value averaging is described in the following example of investment in a growing stock market. The investor sets an investment target of USD 2,000 over the next five months with an initial investment of USD 400 (2000:5). The market price in the first period (month) is USD 5 per share and the investor buys 400 shares. At a market price of USD 8 in the next period, the target value of the portfolio will be USD 800. According to the investment target, the investor buys 20 shares, each for USD 8. So the regular investment in the second period (month) is USD 160. Since in the third period, the price grew to USD 10 per share and because the target value of the portfolio in that month was USD 1,200, the investor had to buy 20 shares. In the following month, the price is also USD 10 and according to the target value of USD 1,600, the investor buys 40 shares. After four investment periods, the investor owns 160 shares. In the last period, the price grew to USD 16 and the portfolio value in this period had to be equal to the target value of USD 2,000. Thanks to the price increase, the investor can sell a portion of the shares (35 units) and will own altogether 125 units (125 · 16 = 2000) at the end of the whole period.

According to this strategy, the investor has to think about the amount that needs to be saved. Before starting to save, the investor determines an investment goal (nominal value) which he wants

I: *The principle of value averaging investment method*

Period	Market price (USD)	Required value (USD)	Owned unions (pcs)	Bought unions (pcs)	Regular investment (USD)
1	5	400	80	80	400
2	8	800	100	20	160
3	10	1 200	120	20	200
4	10	1 600	160	40	400
5	16	2 000	125	−35	−560

1: *Regular vs. lump sum investment*
Source: Guili (2015)

to accumulate. This value consists of an initial investment and an amount of regular investment. Nevertheless, it is not a "core" regular payment in the sense of how much is invested in each selected period. It is meant as a value, which regularly increases a portfolio (Marshall, 2006).

An easier explanation of this method is described by Hayley (2010) as an investment strategy which can be shown to achieve lower average costs and a higher internal rate of return than alternative strategies.

The basic principle of regular investment is shown in Fig. 1, which illustates that investor can make a profit also when the buying price is the same as the selling price (of course we do not reflect the fees).

The level of regular payments is not the same because the regular investment is developing according to the situation in the market in accordance with the value averaging strategy (Varga, 2011). If the market is in recession and prices are low, investors buy more units depending on the selected amount by which the portfolio is regularly increased. By contrast, there are fewer purchases of shares during a bullish market (Marshall, 2000).

This method is suitable for application in more volatile markets with bigger spreads in prices, since there is a possibility of reaching higher profits (Edleson, 2007). The rate of profit is highest when a large amount of shares are bought at a low price and these shares are sold when prices are high. That is why it is recommended to invest on stock markets which are characterized by higher volatility (Hallam, 2013).

The biggest advantage of this method is the fact that the investor buys shares in the time of a growing market and also in the time of a bear trend. So the risk of bad timing is eliminated, as is the impact of the investor's subjective, emotional response (Škatuľárová, Šoba, Širůček, 2014). The risk of timing is the biggest risk connected with a lump sum investment (the investor opens positions at a time of high prices). Kohout (2013), quoting a study by Ibboston Associates, mentioned that one dollar invested in the year 1925 grew during 70 years to the value of value 1,114 dollars. But if the investor had missed the 35 best months from all 840 months, his profit would have been just tenfold, meaning that 99% of profits take place during just 4% of investment time. On the other hand transaction fees grow with higher frequency of trading by regular investment compared with a lump sum investment.

Compared to dollar cost averaging, the most important difference is the possibility of selling shares. It is also the most typical and most interesting fact of this strategy. However, it is not possible to eliminate the risk of bad timing; this method provides much more recognizable signals about the phase in which the market is (Edleson, 2007). If the market reaches its top, the value averaging mechanism will induce the investor to sell the shares. In the case of an opposite situation, when the market goes down and the shares are cheap, the money obtained from the previous sale is used for purchasing more shares. If the investor follows the mechanism, he will avoid inappropriate withdrawals or deposits at times when markets are reaching extreme values (Markese, 2009). This technique is even more intuitively appealing than dollar cost averaging. As with dollar cost averaging, more investment units are purchased when prices are low. However, value averaging requires that relatively more units be purchased as prices decline than does dollar cost averaging since the unit price decline reduces the value of the portfolio. Furthermore, and contrary to dollar cost averaging, value averaging gives a rule for selling. As the market price increases, beyond what it was recently, value averaging may require unit sales since the growing price rise increases the value of the portfolio. And, if the market price continues to increase dramatically, value averaging gives even more aggressive sell signals to control the value of the portfolio to the level desired (Marshall, 2000). Marshal, Baldwin (1994) stated that dollar cost averaging is appealing because this method is contrary in the sense that fewer shares are purchased when prices are high and more shares are purchased when prices are low, facilitating the "buy low" aspect of the ancient investment adage, "buy low, sell high". Haiwei, Estes (2009) say that the investor who specifies their investing goal which they want to achieve after the termination of saving and follow the rules according to the value averaging method, will, with very high probability, reach the goal.

Edleson (2007) compared the value averaging and dollar cost averaging investment method from the point of reached profit and stated that value averaging brings to the investor higher profit than dollar cost on a short term investment period (5 years) and also on a long term investment period (20 years).

Hayley (2010), who compared the dollar and value averaging investment method with the Monte Carlo simulation said that dollar and value averaging

II: *Comparison of DCA and VA*

	Average annual return	
	5-year investment	**20-year investment**
dollar cost averaging	14.82%	14.31%
value averaging	16.22%	15.59%

Source: Edleson (2007)
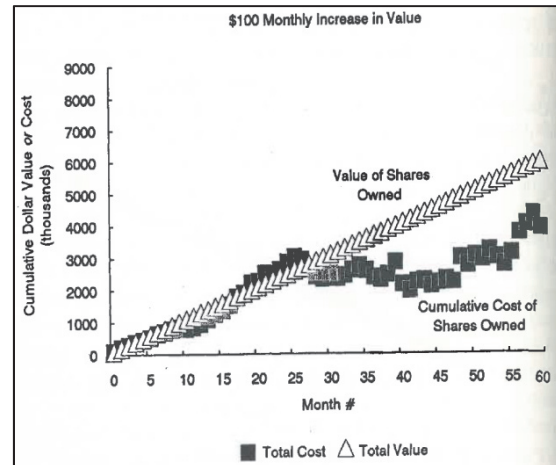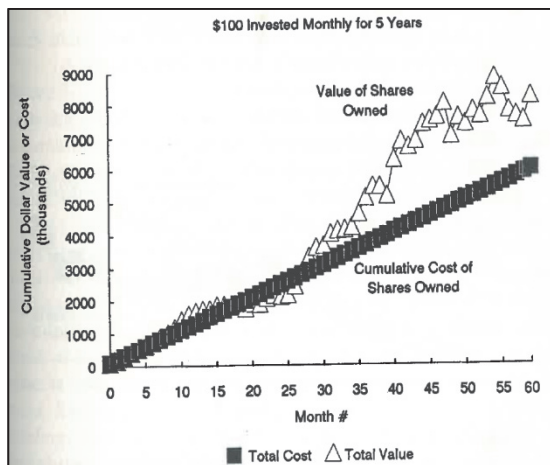
2: *Total cost and value by dollar cost and value averaging*
Source: Edleson (2007)

always achieve lower average purchase costs than the equal share amount strategy (and value averaging always achieves a greater cost reduction than dollar cost averaging because of its more aggressive response to share price movements).

Both the regular investment method can be also compared from the point of total cost and total value. Fig. 2 shows the cumulative amount of money invested, and the value of the total portfolio, at each point in time for the given strategy over a five-year period. The amount of money put into dollar cost averaging goes up smoothly by the fixed amount. The resulting shares increase in values as they accumulate and as the price level of the market rises. On the other hand value averaging does much the opposite in that we force the value of the shares to go up smoothly by the fixed amount. The total amount of money invested in value averaging varies randomly, going up when market is down, and going down when the market increases to dictate the sale of shares.

The fact that the following fixed mechanism minimizes the risk of bad timing is one of the greatest advantages which the value averaging strategy offers. Other advantages include its flexibility, since predefined parameters can be modified at any time during the investment process (Edleson, 2007). Regular payments can be of different amounts; therefore, it is not possible to set a standing order. In addition, the risk of loss is increasing because there is no limit for regular payments (Bajkowski, Markese, 2001). A disadvantage of the value averaging method is that it imposes higher requirements on the mathematical knowledge of investors. Another disadvantage is time consumption, as the market development has to be watched in every period. This is not needed by the dollar cost averaging

method because there is the same payment in every investing period (Marshall, 2000).

MATERIALS AND METHODS

The aim of this paper is to make recommendations to investors who use the value averaging method for making regular investments on the US stock market. Empirical analysis and the comparison of the quantified profit rate and risk level of regular investments using the value averaging method with different lengths of investment horizon according to predefined methodological criteria will be used as a basis for suggested recommendations.

This empirical research of the value averaging method makes use of real data from the US stock market, represented by the S & P 500 Index, which can be regarded as a barometer of the American economy. At the beginning of each investment period the investment goal was set. According to the goal we determined the compounding value of each month on USD 1,000. So the value of each investment should grow each month for USD 1,000[1]. The data, which was taken from the Bloomberg Terminal, consists of historical monthly closing prices in the form of total return (that is, prices including dividends) between 1990–2013. For the 1-year investment period (short term investment horizon) 168 simulations of investment were made, 228 simulations were made for the medium 5-year investment period (medium term investment horizon) and 276 investment simulations were made for the 10-year investment period (long term investment horizon). In the monitored period, significant speculative bubbles, falls in stock prices and subsequently their growth on selected markets can be observed.

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1   It does not matter if the investor calculates with the compounding value USD 1,000 or USD 100. It has no impact on the principle of the method.

III: *Input variables used in the empirical part*

Investment horizon (years)	1	5	10
Nominal investment goal (USD)	12,000	60,000	120,000
Initial investment (USD)	1,000	1,000	1,000
Compounding value of each month (USD)	1,000	1,000	1,000

Parameters in Tab. III are chosen for the application of the value averaging method.

The evaluating criteria for the choice of stock market and investment horizon are the revenue-risk profile and probability of loss after termination of the investment. The revenue-risk profile is the ratio of the average annual profit rate measured for each investment by the internal rate of return and average annual risk expressed by selective standard deviation (Vlachý, 2006). The probability of loss after termination of the investment is expressed as a percentage ratio of unprofitable investments and the total number of observations. The investor with assumed risk aversion will be recommended a market and an investment horizon based on performed calculations, where the application of the value averaging strategy allows investing on average at the highest level of revenue-risk profile and at the lowest percentage of investment termination and loss.

The Sharpe Ratio, the most frequently used measurement of mutual fund investement, is also used as a criterion to help investors find an acceptable investment in a given investment period. The Sharpe index examines the performance of an investment by adjusting for its risk. Sharpe (1966) introduced a measure for the performance of investment and proposed the term reward-to-variability ratio to describe it.

$$SR = \frac{(r_A - r_{FR})}{\sigma_A},$$

where
r_A ...... the performance of investment,
r_{FR} ..... the risk-free rate,
σ_A ..... the standard deviation of specific investment.

The considered risk-free rate of return on three-month US treasury bills (US Government Treasury Bills 3-Month) is 0.05%.

Risk of the regular investment is calculated as standard deviation in percentage points.

$$\sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \overline{x})^2},$$

where
n .... number of observation in each period,
x_i .... finding value of profit,
$\overline{x}$ .... average value of profit.

RESULTS

As mentioned in the methodology, the analysis of regular investment on the American market was applied by using the value averaging method at 1, 5 and 10-year investing horizons. In each period, the achieved revenue from the regular investment was considered, its final value in relation to invested amounts and its appreciation. Attention was also given to the level of risk and the ratio of revenue and risk.

Investment held for one year achieved the following results: In Fig. 3, which compares the final portfolio value after one year of the investment and the value of physically embedded money, we can see how the value averaging method worked in 1990–2013 and if the embedded money was appreciated. The investment goal was to save the amount of USD 12,000. It was fulfilled in 63% of cases from 276 simulations. The minimum value was reached in November 2008 when the investor saved only USD 10,003 because of the fall in stock prices towards the end of the investment period, which caused the low value of the portfolio in the last month and its sale for a low price. The investment was terminated a year later in April 2009 when it reached the maximum value of USD 13,918 because prices were low at the beginning of the investment period and gradually increasing during the year.

If the investment goal was fulfilled or not, or if the investment was terminated with profit or loss we cannot know by only looking at the final value of the investment. When we use the value averaging strategy, the more informative value represents a comparison of the portfolio value at the time of termination of the investment and the sum of money paid in during the investing period, respectively the sum of the cost for this investment. The previously mentioned investment terminated in April 2009 attained USD 13,918 but the cost was USD 16,575, which is a maximum from the values of embedded money in this monitored period. This phenomenon was caused by a rapid fall of stock prices from April 2007 to April 2008. Whereas the stock shares were bought at the value of USD 2,163 in the first month, the index value in the twelfth month was only USD 1,133. The rapid fall caused the portfolio value increase in the first six months since it had contained shares bought for a high price, which rapidly decreased in the second six months.

An important evaluating factor is the profit rate of the investment. Absolute level of profit or loss of a one-year investment with the established term of termination is in Fig. 4. After the slumps in 2001
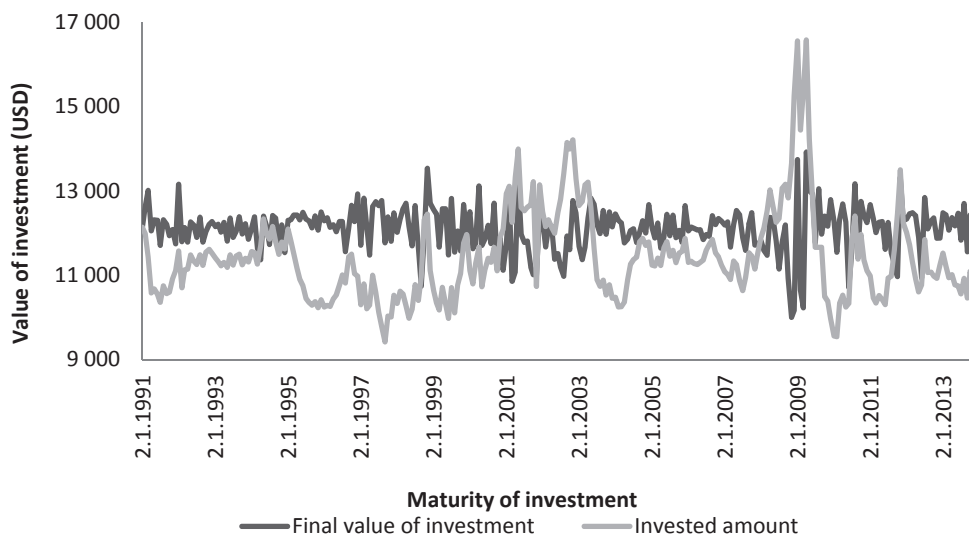
3: *Final value of investment vs. invested capital, one-year investment period*
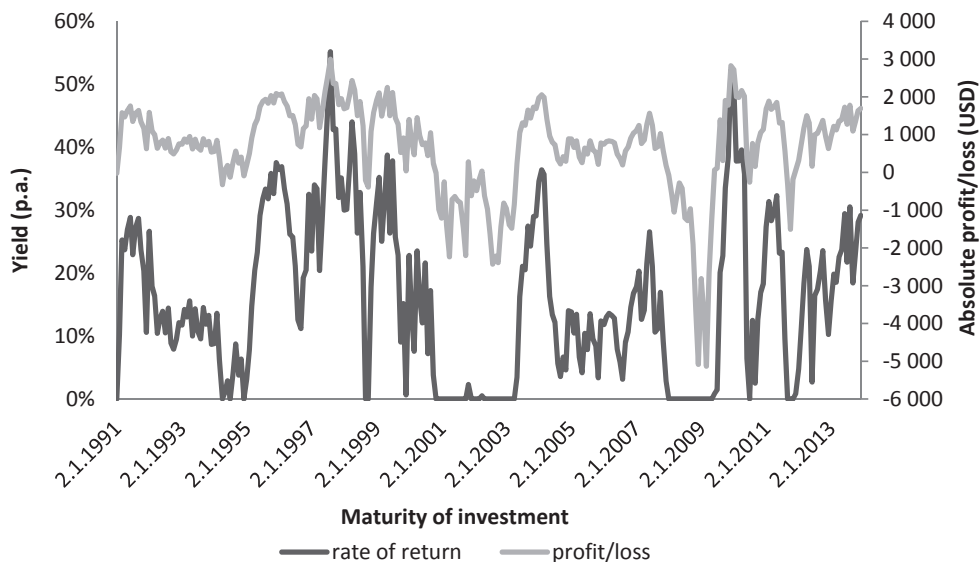
4: *Rate of return and absolute profit/loss, one-year investment period*

and 2009 when the investment had a zero revenue, there was always a growth period. It is caused by principles of the value averaging method, which works on the basis of purchasing at a low price and selling at a high price which ensures profit.

In 1990–2013, the average annual profit rate of a one-year investment was 15.62%; the deviation in revenues achieved the value of 12.96 p. p. due to deep falls, which affected the monitored period. Thus the risk and revenue profile can be calculated, that is the profit and risk ratio which is 1.205. This ratio tells the investor that each unit of risk borne is paid by 1.205 units of profit.

If we measured the reward to variability using the Sharpe ratio, that is if we measure the surplus profit over the risk-free rate, the Sharpe ratio of the one-year investment period was 1.201 (the higher the Sharpe ratio, the better the investment).

The risk was compensated for by the adequate level of revenue. However, it is necessary to be reminded that 20% of investments were terminated with a loss; thus, a large risk existed that the investment would be terminated at an inappropriate time. To conclude, we can state that a one-year investment horizon is not suitable for using the value averaging investment strategy.

In the five-year investment horizon, the target value of the investment was set as USD 60,000. Fig. 5 shows the development of the portfolio target value and expenses during the investment. Contrary to the one-year investments, we can see that the processing of the investment is more stable and is less fluctuating. This can be explained by the fact that the one-year investment horizon does not offer too much space for the sales of stock shares; moreover, it is not possible to identify major falls and increases during such a short period.
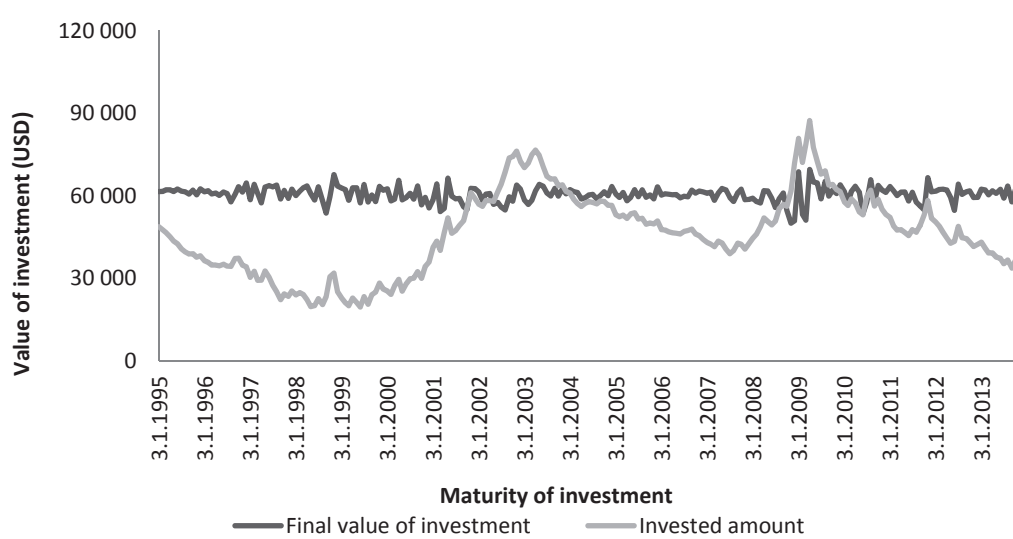
5: *Final value of investment vs. invested capital, five-year investment period*

In the five-year investment horizon, the value averaging method brings profit due to purchasing at the time of falls and selling at times of growing prices. The money deposit curve is basically the inversion value of the local stock market development. It is obvious that the value averaging method has not been able to overcome the falls throughout the dotcom crisis and mortgage crisis.

The most expensive investment was that initiated in April 2004. Total costs, i.e. the sum of regular investments, were USD 87,314 after five years of investing. The final value of this investment was USD 69,593, so, as a result, the investor has lost more than a quarter of the embedded money. In 2004–2009 the American stock market grew, so that the money accumulated in the form of regular investments was rather high in this period. Nevertheless in the last few months of the investment period, stock prices fell deeply and with them also the portfolio value. Before January 2010, no five-year investment was

terminated in the black. Equally, the value averaging method was unable to overcome deep falls of stocks within the dotcom bubble, which affected the investments terminated in 2001–2004. The method produces its worst results in a situation of price growth followed by a sharp fall, because the portfolio value is sold at actual market price in the last month. If the investment is terminated at a time when the dotcom bubble bursts and the price is much lower as compared with the previous ones, the money accumulated in the investment period is depreciated and the investment can be terminated with a loss (as it was in the critical years from 2001 to 2004 and from 2008 to 2010).

Although the investments with the five-year investment horizon did not reach a revenue in the critical years 2001–2004 and 2008–2010, compared to the one-year investments, 84% of the investments terminated in the black for the whole period. Fig. 6 illustrates the rate of revenue and absolute profit or
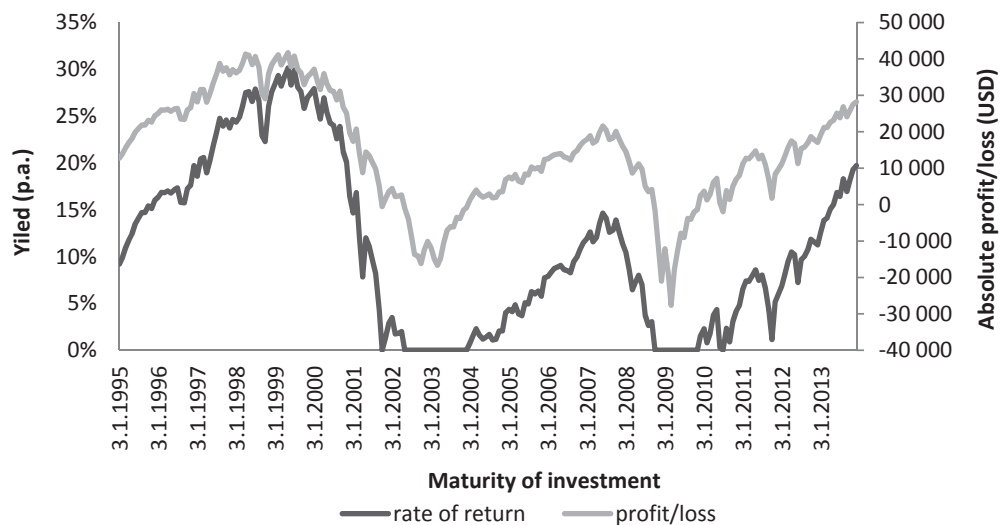

6: *Rate of return, absolute profit/loss, five-year investment period*

loss development according to the date of maturity of the investment on the five-year investment period.

Even though it was not possible to overcome the falls and terminate the investment in the black while using the value averaging strategy at the time of falls of the stock markets, the average annual rate of return was generally 10.95% in the monitored period. While measuring the average rate of return with an average risk of 9.11 p. p., the achieved revenue-risk profile was 1.202. A similar result is indicated by the Sharpe index, which was 1.196. In conclusion, for the five-year investments, we can say that using this method is suitable for markets with stable growth and also for markets with a high dispersion in stock prices if the investment horizon is at least 5 years.

The target level for a ten-year investment horizon was set at USD 120,000. During the analysis of results gained by the testing value averaging method in the ten-year investment horizon it was found that in 95% of cases the investment attained positive indexing. However, as with the short-term investments, it was not possible to terminate the investment in the black in 2008–2009 by using this strategy. Considering there was a big difference in stock prices in the first decade of the analysed period, there was the possibility of achieving high profits, because it was permitted to sell the equity shares already in the portfolio. The algorithm dispatched many signals to sell the equity shares in the portfolio, which was implemented thanks to the active administration of the portfolio. Looking at the investment terminated in July 2000, we can observe that this investment was terminated at nearly zero costs. These costs represent the sum of regular monthly payments.
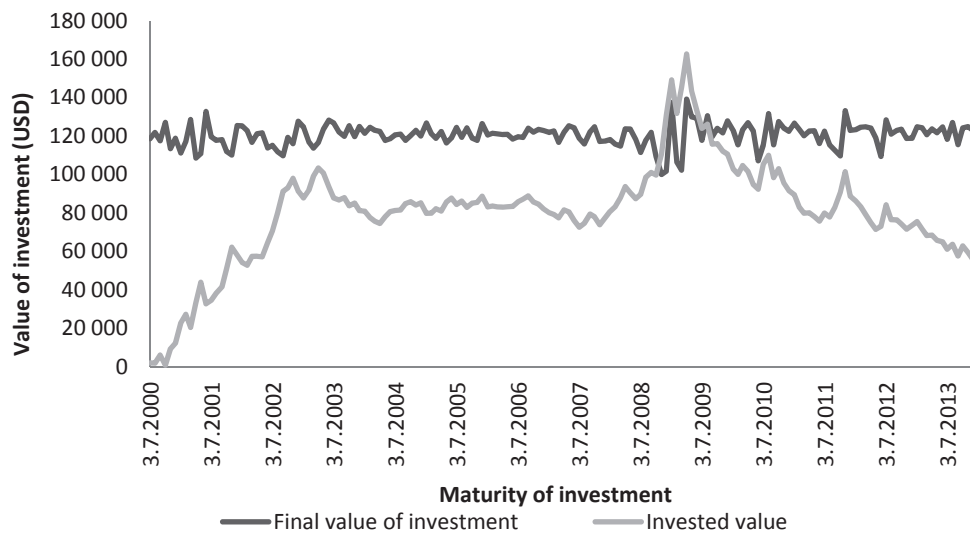
7: *Final value of investment vs. invested capital, ten-year investment period7*
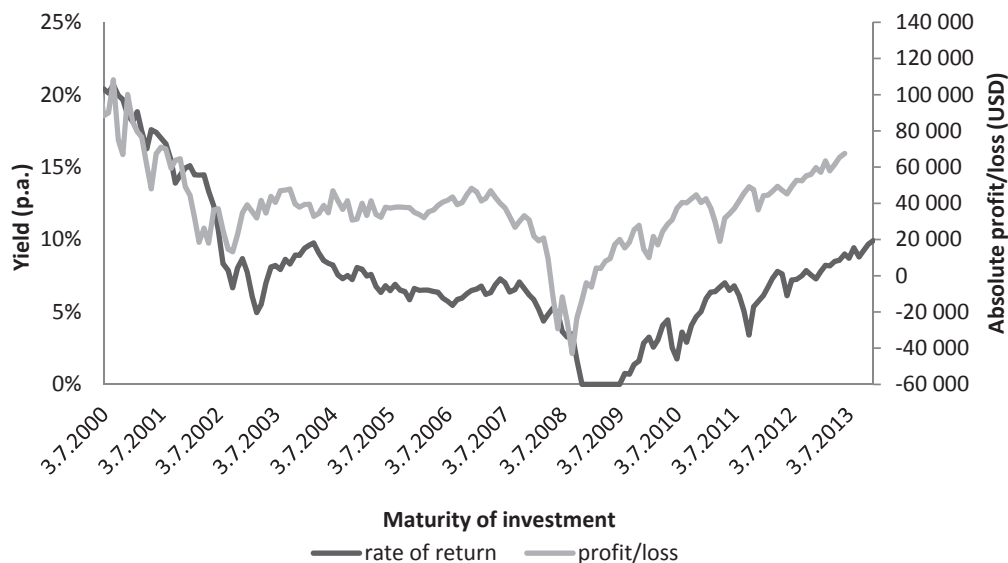
8: *Rate of return, ten-year investment period*

Since many sales of shares were effectuated in this period, especially in its second half, which had been purchased at very low prices at the beginning of the investment period, the investor accumulated some extra profits to the portfolio due to more sales of shares. In this case, there is an obvious difference compared to classic saving where a certain amount is embedded in the market every month and spent on shares of an asset. In this particular investment (from July 1990 to July 2000), there were 40% of cases when the investor sold the shares – thus gaining other funds and only 60% of months when he purchased (saved). Therefore, we can claim that with the increasing length of the investment horizon, there is a higher probability of the equity shares sell-off.

It was possible to achieve the highest rate of return at the level of 20.7% with the investment terminated in August 2000. By contrast, the investments from November 2008 to July 2009 were not profitable. Compared to the previous investment horizons, the ten-year investments were more profitable. Considering the revenue, a minimum ten-year investment horizon can be recommended. Fig. 8 illustrates the development of the rate of revenue, respectively the absolute profit or loss. The ten-year investment period had the lowest average profit of investment, only 7.53% p.a., in comparison with the short term and medium term.But on the other hand, the standard deviation or the risk was also lowest at 4.51 p.p. The risk-revenue profile was then calculated as 1.669, which was the best result. This means that the investor must always compare not just the profit of each investment, but also include the calculation of the risk. The same result was shown by the Sharpe ratio, which was also the best of each investment, namely 1.658.

DISCUSSION AND CONCLUSION

Tab. IV presents a final evaluation of the value averaging method on the American market for 1, 5 and 10-year investment horizons in view of an average revenue, risk and revenue-risk profile of the investment. To conclude, it can be advised to choose at least a ten-year investment horizon. The revenue-risk profile of the ten-year investment reached 1.67, i.e. the average revenue from the investment was higher than the average risk, which was compensated by the revenue. The level of the revenue-risk profile by five-year and one-year investments represents a compensation of the risk by the revenue; nevertheless, there is a risk of bad timing of the investment in these cases, because the value averaging method was not able to overcome the falls surrounding the dotcom crisis and the recent mortgage crisis. In the ten-year investment, the final value of the portfolio exceeded the embedded money in 95% of cases, the investment in the five-year investment horizon reached positive indexing in 84% of cases.

IV: *Investment parameters and results*

	Investment period		
	l year	5 years	10 years
Average yield (% p.a.)	15.62	10.95	7.53
Average risk (p. p.) per year	12.96	9.11	4.51
Revenue-risk ratio	1.205	1.202	1.669
Sharpe ratio	1.201	1.196	1.658

In the table we can observe a decreasing trend in the values of average annual return and average annual risk. If we consider a very short investment period, in this case the one-year investment period, there is no space for fluctuations in share prices and the trend is mostly only increasing or only decreasing. Thus, it is equally possible to achieve high profits or high losses. That is why it can be noticed that there is a significant volatility in revenues for the one-year investment horizon, which has not been compensated by additional profit. On the contrary, it was possible to identify falls and growths within one investment for a long-term investment horizon, which can be profitable for the tested investment strategy. For this reason, the profits were not very significant; nevertheless, dramatic losses did not occur either. This is why we can see a more stable development of revenue and risk for the long-term investment.

The obtained results are in compliace with Edleson (2007), who also comes with results that the longer the period, the lower the profit, but also the lower the volatility and that the ratio between profit and risk (standard deviation) is higher (best) in the long term investment period (in his case, a 20-year investment period).

The investor should always compare the relationship between risk and profit. So that he can recognise which investment has the best risk and profit ratio, that is which investment brings him the biggest reward for the smallest risk.

The obtained results have some limitations. First of all it is necesary to say that these results cannot be generalized, because on another market, in another time period, for example, a short investment period can bring better results. Also if the market embodies short but stable rising, e.g. linear growth with low volatility (level of risk, standard deviation), the investor can obtain high profit with low risk and the results can be otherwise. On the other hand if we focused on stock market where the recommended investment period is more than 5 or 7 years, the results of the revenue-risk ratio confirm the longer period as the better risk-profit profile. The same is confirmed by the Sharpe ratio, where the asset profit was just adjusted of risk-free rate and compared with the risk of the asset.

The best ratio between profit and risk (1.669) is in the longest investment period, where each unit of additional risk brings the investor 0.669 units of profit. The best Sharpe ratio was also with the long-term investment horizon, namely 1.658, where each additional unit of risk brings the investor an additional 0.658 unit of profit investment above the adjusted risk-free rate of return.

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Contact information

Martin Šírůček: martin.sirucek@mendelu.cz