DOI: 10.20472/EFC.2017.007.001

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THE PORTFOLIO SELECTION FOR A HEDGING STRATEGY

Abstract:

Every trader or investor who holds financial instruments has different approach to a portfolio selection. In this paper we focus on a delta-gamma-hedging strategy using an alternative protective collar strategy for shares and warrants approach. We compose a portfolio constiting of shares and warrants. We choose them based on four criteria - liquidity, volatility, correlation and amount. We get nine shares which meet our criteria and warrants which have these shares as underlying assets, the tenth instrument is gold and warrant on gold, representing defensive asset. We make portfolios delta-gamma-neutral and follow their performance in one month period starting in October 2016. The hypothesis stated is that for decreasing shares our strategy will generate above-average profit. In the observed period our strategy resulted in 1.21% profit, while benchmark was -0.7% in loss. That makes approximately 14% profit per year, even though only seven shares were decreasing while the others were increasing in the observed period. We consider this strategy to be successful. However, it is suitable for bearish trend on capital markets and we ommited taxes and spreads.

Keywords:

portfolio, warrant, strategy, bearish trend

Introduction

Every trader or investor who holds financial instruments has different approach to a portfolio selection. We try to find a process of portfolio selection which is independent on investor's current mood and is not affected by his/her psychical conditions. Our method is based on modern portfolio theory introduced by Markowitz (1952). Accordingly to his work the portfolio selection has two stages. First is observation, second is selection. Assume investor is rational and his/her main aim is to maximize profits and he/she prefers lower to higher risk. Therefore, a portfolio is selected based on not only return but risk as well. It is also important to divesify the portfolio by using more assets based on their returns and risk. Presumptions of Markowitz theory are: investor is rational, risk-averse and maximizes returns, it is possible to buy a fraction of an asset, investors accept the price and cannot influence it, there are no taxes and transaction costs, investors make decision based on mean and standard deviation of portfolio returns.

Methodology

The financial instruments used in our portfolio are warrants and shares. They are chosen in four steps depending on the following criteria - liquidity, volatility, correlation and amount. The dataset was gathered from Frankfurt Stock Exchange from October to November 2016.

Liquidity

If we want to minimize risk related to the underlying assets, we should choose the most liquid shares. Our research is done on the Frankfurt Stock Exchange therefore we use shares involved in DAX index. It is composed of 30 shares from different fields of economy, e.g. banking, construction, chemistry or health care.

Volatility

Because our trading strategy is based on delta-gamma-hedging, we choose shares with medium volatility as defined by Florianová (2015). See the volatility of shares in Table 1. The volatility was calculated from daily closing prices in Xetra.

Table 1: Volatility

Daimler	BMW	Volkswagen	BASF	Beiersdorf	MAN
27.95	29.82	30.79	25.85	21.74	9.11
Heidelber-gcement	Deutsche Telekom	Deutsche Bank	Deutsche Borse	Infineon Technol.	Deutsche Post
26.68	28.1	27.82	24.62	28.61	25.85
Fresenius SE&CO	Deutsche Lufthansa	Metro	Adidas	Thyssenkrupp	Fresenius MedCare
26.18	23.21	30.34	25.3	27.37	25.89
Linde	Siemens	RWE	Merck	Commerzbank	Bayer
22.32	20.61	26.2	27.3	26.1	29.87
Munich	SAP	Allianz	Henkel	E.ON	K+S
19.25	19.52	22.72	22.05	24.29	55.6

Source: Author's construction

Companies suitable for a portfolio are Daimler, BMW, Volkswagen, BASF, Heidelbergcement, Commerzbank, Deutsche Bank, Bayer, Fresenius SE&CO, Merck, Metro, Adidas, Thyssenkrupp, RWE, Deutsche Telekom, Infineon Technologies,

Fresenius Medical Care a Deutsche Post. Rest of the companies is eliminated from further investigation.

Correlation

The need to take correlation into account arises from Markowitz's portfolio theory. According to him the assets should not be strongly correlated. Firstly, we find if the data are normally distributed. We find out that some of them are. Although some of them are not normally distributed, we can presume normal distribution thanks to the large dataset. Therefore we use Pearson correlation coefficient. See correlations in table 2.

Table 2: Corellation of call warrants (sample)

	Vo.	Co.	Ba.	Fr.	Me.	Ad.	Th.	De.	In.
Volkswagen	1	0.42	0.39	0.65	0.77	-0.57	-0.31	-0.32	-0.64
Commerzbank	0.42	1	0.64	0.66	0.65	-0.76	-0.06	0.3	-0.41
Bayer	0.39	0.64	1	0.67	0.43	-0.73	0.26	0.4	-0.15
Fresenius Medical Care	0.65	0.66	0.67	1	0.81	-0.75	-0.29	0.29	-0.36
Metro	0.77	0.65	0.43	0.81	1	-0.73	-0.47	-0.07	-0.72
Adidas	-0.57	-0.76	-0.73	-0.75	-0.73	1	0.02	-0.3	0.5
Thyssenkrupp	-0.31	-0.06	0.26	-0.29	-0.47	0.02	1	0.27	0.29
Deutsche Telekom	-0.32	0.3	0.4	0.29	-0.07	-0.3	0.27	1	0.31
Infeon Technologies	-0.64	-0.41	-0.15	-0.36	-0.72	0.5	0.29	0.31	1

Source: Author's construction using software Gretl and the Bloomberg terminal

Amount

According to Gup a portfolio may reach only the lowest level of risk and cannot go under it even if we add more assets to the portfolio. He states that the distinction in risk between e.g. 10 and 200 shares is irrelevant. Therefore we presume that 10 assets is enough for our portfolio.

Selected companies

We choose 9 companies from the set of 18 which resulted from the volatility criterion according to their correlation. We also take into account the field of work to eliminate sector risk. We get Volkswagen, Commerzbank, Bayer, Fresenius Medical Care, Metro, Adidas, Thyssenkrupp, Deutsche Telekom and Infineon Technologies.

Finally we add gold as a defensive asset to the portfolio. The weight of every warrant in portfolio is the same, 10%.

Selection of portfolio

From the long term perspective share markets grow. Our strategy is suitable for declining shares therefore the time horizon needs to be short. We investigate period of

30 days originated on 28th October 2016. The characteristics of selected warrants are presented in table 3.

Table 3: Characteristics of call warrants

Underlying asset	WKN	strike	σ_0	σ_t	W_0	W_t	Δ_0	Δ_t	Γ_0	Γ_t	T
Volkswagen	CW5H3L	100	0.36	0.37	2.76	2.41	0.88	0.87	0.01	0.01	13/3
Commerzbank	UT1D1L	11.5	0.7	1.47	0.001	0.001	0.7	0.03	0.07	0.04	12/12
Bayer	PS9ZHX	105	0.16	0.47	0.002	0.001	0.01	0.06	0.12	0.01	16/12
Fresenius	UT483T	104	0.33	0.92	0.001	0.001	0.01	0.03	0.24	0.01	12/12
Metro	PS584P	22	0.37	0.90	0.54	0.59	0.95	0.9	0.09	0.03	16/12
Adidas	CR1TC9	90	0.20	0.67	5.87	4.84	1	1	0.32	0	14/12
Thyssenkrupp	DG33GR	35	0.70	1.36	0.006	0.006	0.03	0.06	0.04	0.02	16/12
Telekom	HY6SJ7	11	0.48	0.91	3.92	3.79	0.97	0.95	0.02	0.04	14/12
Infineon Tech.	CR1TRT	12.2	0.35	0.48	3.91	3.78	0.99	1	0.03	0.01	14/12
gold	VS24X5	1200	0.1	0.15	7.28	0.96	0.9	0.4	0.06	0.01	16/12

Source: Author's construction based on Frankfurt Stock Exchange data

Table 4: Characteristics of put warrants

Underlying asset	WKN	strike	σ_0	σ_t	W_0	W_t	Δ_0	Δ_t	Γ_0	Γ_t	T
Volkswagen	TD6567	140	0.38	0.49	1.56	1.78	-0.88	-0.89	0.01	0.01	14/12
Commerzbank	GL57Z7	8.5	0.68	0.41	3.16	3.05	-0.5	-0.57	0.08	0.09	21/12
Bayer	CX4WQV	100	0.34	0.24	1.08	1.16	-0.76	-0.84	0.01	0.02	13/2
Fresenius	PB8XWM	95	0.31	0.31	2.04	2.11	-0.89	-0.95	0.01	0.01	17/2
Metro	CR5SD8	18	0.10	1.10	0.001	0.001	-0.01	-0.02	0.01	0.01	14/12
Adidas	PB5044	112	0.37	0.28	0.1	0.063	-0.07	-0.05	0.04	0.01	17/2
Thyssenkrupp	CX4ZVX	21.5	0.33	0.31	1.59	1.18	-0.53	-0.55	0.12	0.17	16/1
Telekom	GD0X8T	15.6	0.21	0.21	1.02	0.96	-0.66	-0.74	0.40	0.27	20/1
Infineon Tech.	PB8XME	17	0.37	0.32	1.51	1.3	-0.55	-0.64	0.22	0.19	20/1
gold	VN4LVY	1150	0.18	0.17	0.25	0.99	-0.06	-0.26	0.01	0.01	6/1

Source: Author's construction based on Frankfurt Stock Exchange data

In table 5 the prices of shares and gold are available.

Table 5: Prices of underlying assets (in EUR)

Asset	S_0	S_t
Volkswagen	125.35	122.599
Commerzbank	6.27	6.445
Bayer	90.572	88.8
Fresenius Medical Care	74.586	73.68
Metro	27.272	27.755
Adidas	149.252	138.967
Thyssenkrupp	20.931	21.118
Deutsche Telekom	14.848	14.779
Infineon Tech.	16.241	16.069
gold	1284.25	1194.75

Source: Author's construction based on Frankfurt Stock Exchange data

Delta-gamma-neutral portfolio

Our portfolio is delta-gamma-neutral and we apply alternative protective collar strategy (strikes of puts and calls are switched). Meaning that we use certain amount of shares and put warrants and call warrants on these shares. We use Black-Scholes model as presented by Black and Scholes (1973). Delta and gamma are characteristics of warrants and they can be derived from Black-Scholes model through partial derivation (Hull, 2012). The initial position of portfolio is 1000 underlying assets and 1000 call warrants. For an example see table 6.

Table 6: An example ofportfolio-Volkswagen (in EUR)

	initial		gamma-neutral		delta-neutral		present	profit
asset	amount	value	amount	value	amount	value	value	value
call warrant	1000	2760	1000	2760	1000	890	2410	1520
put warrant	0	0	-481	-1182	-481	-976	-856,18	119,82
share	1000	125350	1000	125350	-1297	-162631	-15902	3569

Source: Author's construction using Excel software

Call warrants on Volkswagen shares in long position make a profit of 1520 EUR in the given period, put warrants in short position make a profit of 119.82 EUR andshares in short position make a profit of 3569 EUR. The total profit was 5209 EUR. Rate of return for the given period is 4.06%. The annual rate of return is approximately 48.8%.

The summary of results calculated for all the companies are listed in table 7.

Table 7: Profits and losses of portfolios (in EUR)

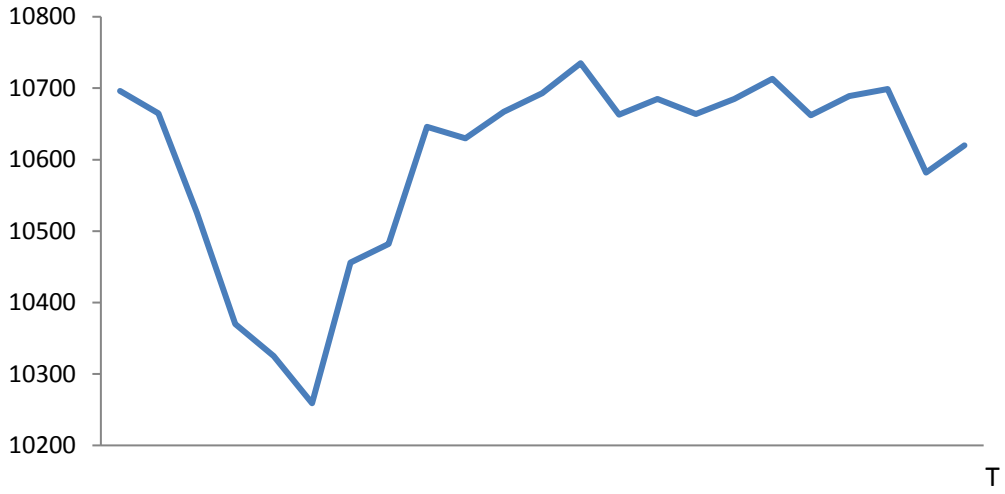
asset	Profit call	Profit put	Profit underlying	Total profit	Profit in %
Volkswagen	1520	119.82	3569	5209	4.06
Commerzbank	-889	274.85	-143	-757	-12
Bayer	-889	-12944	16178	2345	2.58
Fresenius	-889	-1680	19361	16792	22
Metro	-300	0	-502	-802	-2.89
Adidas	3950	296	16045	20291	0.13
thyssenkrupp	-884	136.667	-39	-786	-0.03
Telekom	2900	3	69	2972	0.15
Infineon tech.	2890	28.64	183	3102	0.15
gold	70	-4440	112770	108400	0.08

Source: Author's construction using Excel software

A comparison of our portfolio and benchmark

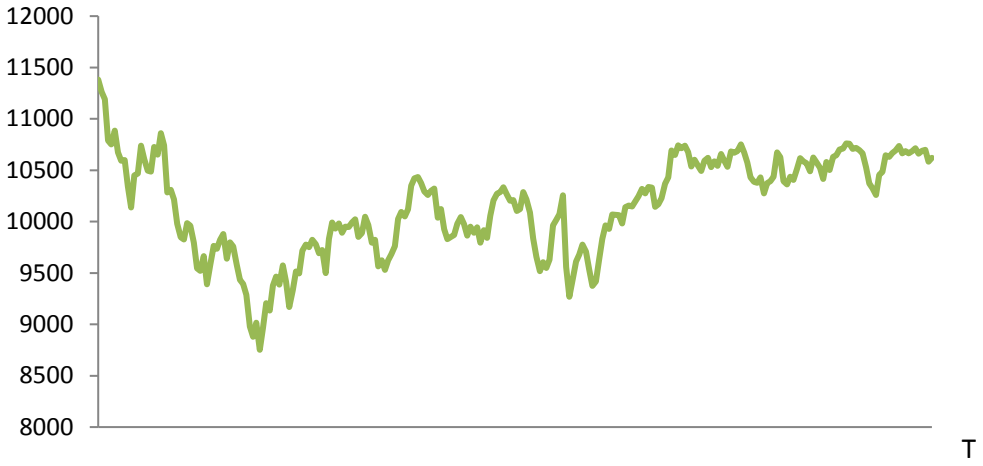
To evaluate the success of our strategy, it must be compared with benchmark. In our case, we take DAX index as benchmark as we use shares involved in this index. See performance of DAX in a corresponding time period in figure 1.

Figure 1: The performace of DAX from 28/10/2016 to 29/11/2016 (in points)



Source: Author's construction based on Bloomberg data using Excel software

Figure 2: The performace of DAX from 29/11/2015 to 29/11/2016 (in points)



Source: Author's construction based on Bloomberg data using Excel software

The closing value of DAX to date of portfolio origin (28/10/2016) was 10696.19. The closing value of DAX to date of portfolio exercise (29/11/2016) was 10620.49.The closing value of DAX to annual date (30/11/2015) was 11382.23. There was a declension of 0.7% in our investment horizon and 6.7% per year. See comparison in table 8.

Table 8: The performace of our strategy and benchmark

	Benchmark (DAX)	Portfolio
Investment horizon (one month)	-0.7 %	1.21 %
Annual	-6.7 %	14.5 %

Source: Author's construction

Conslusion

Our strategy of portfolio selection based on alternative collar strategy and delta-gamma-hedging has proven to be successful. Our portfolio beated the benchmark even though only seven out of ten chosen underlying assets were declining in the given period of time and our strategy is intended for declining assets. If we managed to choose more suitable shares, the strategy could be even more successful. However, the results are influenced by omitting spreads, taxes and dividends.

Acknowledgement

Support of Masaryk University within the project MUNI/A/0823/2016 “Behavioral, knowledge and economic aspects of pricing and trading in financial and other assets” is gratefully acknowledged.

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