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THE PERFORMANCE OF MINIMUM VARIANCE PORTFOLIOS IN THE CROATIAN TOURISM SECTOR

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Abstract
Croatian economy is largely dependent on tourism, the direct contribution of travel and tourism to GDP is 10.7%, while total contribution amounts 24.7%, tourism has great impact on employment also. Since tourism is one of the most important sectors for Croatian economy, the aim of this research was to analyze stock liquidity in Zagreb stock exchange and to construct efficient frontier which includes only tourism stocks. Level of liquidity for the Croatian market is generally very low, so only certain stocks which met liquidity criterium were used in this research. Currently there are 31 stocks listed on the Croatian capital market in the tourism sector, and this sector is one of the largest on the Zagreb stock exchange. Purpose of this research was to find out which performance have minimum variance portfolios in Croatian tourism sector, and to measure market risk in a portfolio using value-at-risk methodology. In this research two approaches of measuring value-at-risk methodology have been used: historical and conditional, results were compared with stock market index Crobex and explained.

Keywords: Portfolio theory, illiquidity, stocks, efficient frontier, value at risk.

Jel Classification: G11; L83

INTRODUCTION

Tourism in global terms plays very important role in economic development. According to the UNWTO (2016) tourism is generating 10% of the world GDP, one of ten persons is employed in tourism, tourism generates US$ 1.4 trillion in exports, this industry makes 7% of world's exports. From the perspective of Croatia, tourism is considered one of the most important sectors for the economic development. To confirm this fact, World Travel and Tourism Council has published some key facts of tourism impact on economic

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development. According to the World Travel and Tourism Council (2017) the direct contribution of Travel & Tourism to GDP in 2016 was HRK 37,017.7 mn (10.7% of GDP). This result was made by industries such as hotels, travel agents, airlines and other passenger transportation services, etc. Total contribution of Travel & Tourism to GDP was HRK 85,173.4mn in 2016 (24.7% of GDP). Tourism has a great importance on employment also, in 2016 tourism sector directly supported 10% of total employment. Investments in tourism in Croatia in 2016 were 11% of total investments. There are numerous research papers which confirm relationship between tourism and economic growth like: Briedenhann and Wickens (2004), Kim, Chen and Jang (2006), Tang and Tan (2015), Chou (2013), Antonakakis, Dragouni, and Filis (2015) etc. According to the data from Croatian Bureau of Statistics in 2017 Croatia has achieved record breaking tourist results, more than 86 million of overnight stays which is 10.63% higher compared to 2016. Tourist arrivals increased from 15.4 in 2016 to 17.4 million, and over the last decade have continued to grow remarkably. According to all previously stated facts, it can be concluded that tourism plays an important role in the economic development of Croatia, it has played vital role in economic recovery after six-year long recession. Dogru and Bulut (2017, 1) concluded that "tourism industry showed a remarkable recovery after the economic downturn and resilient growth in the past two decades in major European countries that have a coastline in the Mediterranean Basin." Although, countries like Croatia, Greece, and Spain have experienced negative average economic growth their tourism industry has grown significantly. Since Croatia is country that largely depend upon tourism, the aim of this paper is to construct portfolio mix that consists of tourism companies from Croatian capital market and to investigate risk and return possibilities.

1. TOURISM SECTOR ON CROATIAN CAPITAL MARKET

Stocks which are listed on Croatian capital market are currently divided into the sectors due to their principal economic activity which is done according to the Statistical Classification of Economic Activities 2007 (NN 58/07 and 72/07). This breakdown of listed companies is in charge of the Croatian Bureau of Statistics. Each listed company on Croatian capital market is assigned to a sector according to the intermediate aggregation A*38 which is composed of 38 categories. Currently, sector with the highest number of listed companies (31) is tourism sector. This sector on the Zagreb stock exchange is known as the *Accommodation and food service activities sector.* It is marked with the symbol letter "I" and it is at the very top of the sectors with a large market capitalization. According to the last trading day in 2017, tourism sector was placed on the third place with more than HRK 23 billion, just after the sector *Manufacture of coke, and refined petroleum products* (HRK 32.5 billion) and *Financial and insurance activities.* All tourism stocks are shown in the table 1.

Table 1. Tourism stocks listed in Croatian capital market

Symbol	Issuer	Mcap (HRK)	% share in Mcap
AMDN	Apartmani Medena	57,403,200	0.25
ARNT	Arena Hospitality Group	2,184,835,146	9.58
DUPM	Dubrovacko primorje	60,249,700	0.26
HBRL	Hoteli Brela	208,135,465	0.91
HBVD	Hoteli Baška Voda	23,844,249	0.10
HHLD	Hoteli Haludovo Malinska	26,402,954	0.12

Table 1. (*continued*)

Symbol	Issuer	Mcap (HRK)	% share in Mcap
HIMR	Imperial hotelijerstvo	515,042,550	2.26
HJDR	Hoteli Jadran	21,423,000	0.09
HMAM	Hoteli Makarska	300,017,960	1.31
HMST	Hoteli Maestral	156,778,880	0.69
HPDG	Medora hoteli i ljetovalista	88,473,000	0.39
HTCP	Hoteli Tucepi	184,195,200	0.81
HTPK	Htp Korcula	143,194,402	0.63
HTPO	Htp Orebic	36,162,320	0.16
HUPZ	Hup	1,555,171,200	6.82
HVDC	Hoteli Vodice	42,191,119	0.18
HZLA	Hoteli Zlatni Rat	109,553,369	0.48
HZVG	Hoteli Zivogosce	4,541,400	0.02
ILRA	Ilirija	456,149,232	2.00
JLSA	Jelsa	49,708,501	0.22
LRH	Liburnia Riviera Hoteli	1,265,039,380	5.54
LRHC	Ftb Turizam	553,833,030	2.43
MAIS	Maistra	3,327,079,056	14.58
OLVD	Olympia Vodice	35,158,950	0.15
PLAG2	Plava Laguna	0	0.00
PLAG	Plava Laguna	3,824,123,280	16.76
PLCH	Palace Hotel Zagreb	15,460,572	0.07
RIVP	Valamar Riviera	5,116,718,205	22.43
SLRS	Solaris	447,846,275	1.96
SUKC	Sunce Koncern	928,541,780	4.07
TUHO	Turisthotel	1,078,262,640	4.73

According to table 1. and based on the size of the market capitalization first five stocks (RIVP, PLAG, MAIS, ARNT and HUPZ) together make 70.2% of total market capitalization in tourism sector, while first ten stocks make together sum of 89.2% of total market capitalization. For simplicity, instead of full company names, only stock symbols (tickers) will be used in further text.

After comparing the indices from Zagreb stock exchange, it can be concluded that tourism sector is one of the fastest growing sectors on Croatian capital market compared to transport, food, construction and industry sector. In figure 1. is shown comparison of the sectors for the maximum possible time period 22.02.2003–29.12.2017.

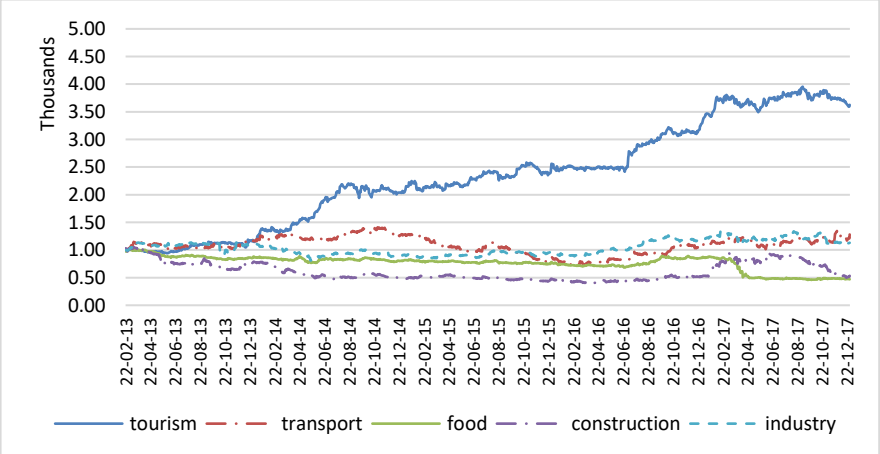

Figure 1. Comparison of sector indices for the period 22.02.2013–29.12.2017

1.1. Illiquidity problems of tourism stocks on Croatian capital market

Liquidity is not easy to define and there is no common definition of liquidity anyway (Wyss 2004), we can define liquidity as possibility of trading stocks in large volumes without affecting the price. General problem on Croatian capital market is low liquidity, for the purposes of determining daily trading limits, the liquidity band of a particular security is calculated as well as the liquidity category. These data are available on the official web pages of Zagreb stock exchange. The liquidity category is obtained by calculating average daily number of transactions for each particular share. Calculation of average daily number of transactions for each particular share was done by the European Securities and Markets Authority (ESMA) on the web page of the Zagreb Stock Exchange are published liquidity categories. Considering that whole tourism sector was analyzed according to liquidity categories, it can be concluded that: one stock was never traded (PLAG2) this stock doesn't have any category, only two stocks (ARNT and RIVP) are categorized in category two which means, they have $10 \leq$ average daily number of transactions < 80. All other tourism stocks belong to first category which have average daily number of transactions < 10.

According to the trading manual (ZSE, 2017) when defining the criteria for applying volatility interruption mechanism shares and ETF units which are traded in procedure continuous trading are divided into three classes according to the liquidity criteria, taking into account the number of trading days and the average daily turnover in the last 6 (six) months. The liquidity classes are as follows: Class 1 –in respect to any shares and ETF units traded on 75% of trading days for an average daily turnover in excess of HRK 100,000.00; Class 2 – in respect to any shares and ETF units traded on 50% of trading days for an average daily turnover in excess of HRK 50,000.00; Class 3 – other shares and ETF units. There are only two stocks in first class (ARNT and RIVP) and four stocks in second class (HUPZ, MAIS, PLAG and TUHO).

For more detail liquidity analysis of tourist stocks, authors have analyzed in the period 01.01.2008–01.01.2018 (total of 120 months) on monthly basis 26 stocks. Several stocks which have only few trading days (DUPM, HVDC, JLSA and SUKC) or weren't traded at all, like PLAG2, were not taken into consideration for creating optimal portfolio. All other stocks are analyzed in table 2.

Table 2. Tourist stocks analysis

No.	Stocks	TM	% Tm	TT	TTN in HRK mil.	Amivest Liquidity ratio
1	RIVP	120	100%	62,695	1,115.45	159,402,909.6
2	HUPZ	120	100%	10,414	308.68	57,244,800.0
3	LRH	120	100%	14,415	202.63	23,295,404.9
4	TUHO	120	100%	3,439	114.62	20,672,455.6
5	ARNT	120	100%	17,454	210.37	19,025,870.8
6	MAIS	120	100%	10,059	85.56	11,261,324.3
7	HTPK	120	100%	7,309	37.26	3,039,264.4
8	PLAG	119	99%	4,319	147.29	26,208,147.7
9	SLRS	119	99%	4,463	31.02	3,175,019.9
10	HMAM	116	97%	2,864	55.46	8,012,555.5
11	HIMR	115	96%	8,246	116.54	14,439,427.6
12	HMST	101	84%	7,672	46.46	3,974,960.2
13	HPDG	101	84%	1,636	42.70	2,567,961.4
14	HBRL	85	71%	2,200	7.14	470,925.7
15	AMDN	83	69%	1,112	1.49	135,737.1
16	HZVG	82	68%	449	0.94	66,091.6
17	HTCP	64	53%	467	2.59	435,918.5

Table 2. (*continued*)

No.	Stocks	TM	% Tm	TT	TTN in mil. HRK	Amivest Liquidity ratio
18	ILRA	51	43%	637	13.90	3,357,817.4
19	HZLA	47	39%	511	1.93	553,117.3
20	HTPO	36	30%	157	2.38	484,018.5
21	HJDR	34	28%	102	0.46	66,477.5
22	HHLD	32	27%	3,634	4.56	937,736.1
23	HBVD	27	23%	78	1.61	1,193,785.4
24	OLVD	15	13%	44	0.80	105,591.9
25	LRHC	14	12%	1,164	11.68	10,885,726.8
26	PLCH	6	5%	12	0.03	35,284.0

Table 2 shows the analysis of tourist stocks in Croatia. All abbreviations in a table are defined in order of appearance as follows: TM – number of trading months, %Tm – percentage of total traded months, TT – total number of transactions, TTN – total turnover in HRK millions. Based on 26 analyzed stocks, only 7 stocks were traded every month in the observed period, which has total of 120 months. The highest number of transactions is realized with the RIVP stock company, averaging 522 transactions per trading month. At the second place there is an ARNT stock with an average number of 145 transactions and on the third place is LRH with an average number of 120 transactions per month. Authors have also employed Amivest Liquidity ratio (Amihud 2002), which is daily ratio of absolute stock return to its dollar volume, averaged over some period, but for the purpose of this research authors have used this ratio as monthly ratio. Aim was to find out monthly price response associated with one dollar of trading volume, as a rough measure of price impact. According to the Amivest liquidity ratio top five stocks with the highest liquidity are: RIVP, HUPZ, LRH, PLAG and TUHO. A larger value of liquidity implies a lower price impact.

2. CREATING OPTIMAL TOURISM MIX

In this research authors have analyzed monthly historical stock returns of the tourism sector on the Zagreb Stock Exchange (ZSE). Purpose of this research was to find out which performance have minimum variance portfolios in Croatian tourism sector. The concept of "minimum variance portfolio optimization" comes from the modern portfolio theory. This theory enables investors to construct portfolio on tourism stocks according to their own risk preferences.

This theory was pioneered by Harry Markowitz in 1952, when published an article *Portfolio Selection*. Harry Markowitz is often called the *father of modern portfolio theory*. Later (1959) he expanded his research in book-length study. In 1990 he won Nobel Prize for economics. Markowitz's model is the first step of portfolio management: the identification of the *efficient set of portfolios*, or, as it is often called, the *efficient frontier of risky assets*. This model was further developed by Sharpe (1966, 1994). In 1964 Sharpe (1964) has developed Capital Asset Pricing Model (CAPM) which is still often use in variety of research in portfolio selection. By using this theory investor can optimize or maximize expected return based on a given level of market risk. For example, investor will choose portfolio one over portfolio two if the return is equal or higher, and if the risk (standard deviation) is lower than for portfolio two. This is not the only reason, for choosing the first portfolio, first portfolio can have advantage over second portfolio

if the return is higher and if the risk (standard deviation) is lower than or equal to that of portfolio two.

After analyzing liquidity of tourism stocks, finally 11 stocks have chosen to create portfolios which will lie on efficient frontier. First step was to calculate monthly average price by dividing total monthly turnover with the number of traded stocks. Returns of monthly average prices were calculated according to the formula 1

$$R_i = \frac{(P_t - P_{t-1})}{P_t} \quad (1)$$

After calculating monthly stock returns second step was to calculate volatility and monthly mean values of tourism stock returns.

Table 3. Volatility and mean value of monthly stock returns

	RIVP	HUPZ	LRH	TUHO	ARNT	MAIS	HTPK	PLAG	SLRS	HMAM	HIMR
Mean	0.68%	0.36%	0.38%	0.99%	1.03%	0.36%	-0.75%	0.55%	0.52%	0.72%	0.50%
Volatility	8.67%	5.86%	10.15%	6.51%	13.57%	8.49%	12.01%	6.66%	10.57%	10.44%	11.36%
Min	-30.25%	-23.13%	-25.60%	-26.90%	-51.83%	-26.98%	-31.13%	-31.74%	-30.65%	-26.31%	-50.88%
Max	31.38%	16.54%	46.02%	21.49%	47.47%	23.55%	33.57%	22.49%	25.58%	71.46%	56.53%
CV	12.72	16.33	26.72	6.59	13.19	23.36	-	12.13	20.33	14.52	22.63

According to table 3, ARNT has the highest mean value of return, but also the highest volatility. TUHO is on the second place according to the mean value with second lowest volatility compared to the rest of the group. CV (coefficient of variation) is defined as the ratio of the standard deviation to the mean value. CV can help investors to decide in which asset to invest based on risk/reward ratio, this ratio allows to determine how much risk in comparison to the amount of expected return. The lower the ratio, the better, since a high ratio may suggest that asset has a high degree of volatility. CV for HTP was not calculated since mean value is negative CV would then be misleading. According to the CV ratio lowest value has TUHO, in next group are PLAG, RIVP, ARNT and HMAM. Risk averse investors would individually prefer those stocks. In order to test diversification possibilities, correlation coefficients among stocks in tourism sector are presented in table 4.

Table 4. Correlation matrix of stocks returns in the period 01.01.2008–01.01.2018

	RIVP	*HUPZ*	*LRH*	*TUHO*	*ARNT*	*MAIS*	*HTPK*	*PLAG*	*SLRS*	*HMAM*	*HIMR*
RIVP	1.00										
HUPZ	0.34	1.00									
LRH	0.40	0.29	1.00								
TUHO	0.30	0.33	0.13	1.00							
ARNT	0.27	0.23	0.15	0.35	1.00						
MAIS	0.44	0.46	0.44	0.39	0.50	1.00					
HTPK	0.35	0.50	0.40	0.33	0.32	0.50	1.00				
PLAG	0.49	0.38	0.27	0.35	0.40	0.58	0.41	1.00			
SLRS	0.41	0.33	0.33	0.46	0.52	0.51	0.45	0.46	1.00		
HMAM	0.07	0.19	0.27	0.11	0.13	0.20	0.15	0.18	0.22	1.00	
HIMR	0.31	0.27	0.32	0.35	0.12	0.29	0.28	0.22	0.33	0.21	1.00

According to the data in correlation matrix it can be concluded, there are no big diversification possibilities among tourism stock companies. Higher correlation coefficients lower the diversification possibilities. All coefficients are positive values, as it is shown in the table 4. Correlation is only one of several important factors in

constructing a strong and diversified portfolio, but investors should keep in mind that correlation coefficients should not be the only important fact in decision making, which stocks to buy. To obtain the minimum variance and covariance at a certain level of return, QP was used in this study. Short sales were not allowed.

Table 5. Optimal portfolios

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	R	S	T	U	V	Z
RIVP	0.00	0.00	0.00	0.00	0.03	0.07	0.11	0.11	0.11	0.10	0.10	0.09	0.09	0.08	0.08	0.07	0.06	0.06	0.05	0.04	0.04	0.03
HUPZ	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.07	0.10	0.12	0.15	0.18	0.20	0.23	0.26	0.28	0.31	0.34	0.35
LRH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.05
TUHO	0.00	0.48	0.89	0.84	0.79	0.73	0.69	0.65	0.62	0.59	0.57	0.54	0.52	0.49	0.46	0.44	0.41	0.38	0.35	0.32	0.30	0.28
ARNT	1.00	0.52	0.10	0.08	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MAIS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HTPK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PLAG	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.06	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.18	0.18	0.19
SLRS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HMAM	0.00	0.00	0.01	0.08	0.12	0.14	0.15	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.12	0.12	0.11	0.11	0.10	0.10
HIMR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Σwi	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
$E(r_p)$ in %	1.03	1.01	0.99	0.97	0.95	0.93	0.91	0.89	0.87	0.85	0.83	0.81	0.79	0.77	0.75	0.73	0.71	0.69	0.67	0.65	0.63	0.62
σ_p in %	13.57	8.68	6.41	6.09	5.86	5.68	5.53	5.40	5.29	5.19	5.09	5.00	4.92	4.84	4.78	4.72	4.67	4.63	4.60	4.58	4.57	4.57
CV	13.19	8.61	6.49	6.29	6.18	6.11	6.08	6.08	6.09	6.11	6.14	6.18	6.24	6.30	6.38	6.48	6.59	6.72	6.88	7.06	7.27	7.38

As shown in table 5, a set of the mix solutions were found in 22 presented market portfolios which have different shares of tourism companies. The portfolio A has the highest return but also highest risk, this portfolio consists of only one stocks (ARNT). In the last row of the table 5 it is calculated coefficient of variation which allows investors to determine how much volatility, is assumed in comparison to the amount of return expected from investment. Portfolio G has the lowest value of CV 6.08 and offers to an investor the best combination of risk and return. This portfolio is consisted of RIVP, TUHO, ARNT, PLAG, and HMAM. Portfolio Z has the lowest volatility and the lowest return, which makes this portfolio safest, it is consisted of RIVP, HUPZ, LRH, TUHO, PLAG and HMAM. In figure 2 it is estimated efficient frontier of calculated portfolios.

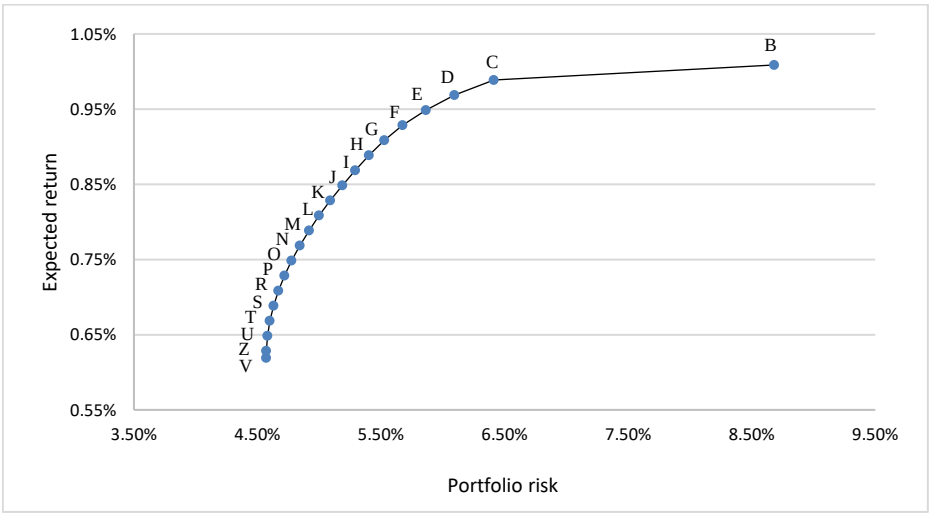

Figure 2. Efficient frontier of tourism stocks in Croatia

For each level of the expected return, investor can vary the portfolio weights on the stock companies to determine the portfolio that has the least risk. All portfolios that lie on the efficient frontier have the minimum variance for a given expected level of return. The portfolio that is farthest to the left, it is label as portfolio V (has the least risk) and it is known as the minimum-variance portfolio. Just for comparison tourism stock index CROBEXturi has the mean value of expected return 0.11% and standard deviation of 1.15%, but this data was not calculated for the 10-year period, because stock index CROBEXturi was created 21.02.2013. Official stock index from Zagreb stock exchange which is consisted of 25 most liquid stocks — Crobex was also analyzed for the same time period 01.01.2008–01.01.2018, authors have calculated average expected return for Crobex -0.51% while risk amounts 6.76%, based on this data it can be concluded that tourist portfolios which lie on efficient frontier outperformed investing in Crobex.

3. ESTIMATING VALUE AT RISK AND CONDITIONAL VALUE AT RISK

The next step was to measure the portfolio risk by applying the Value at risk (VAR) as one of the commonly used tools. Authors have calculated historical VaR by using the empirical distribution. According to Bogdan, Baresa and Ivanovic (2015) The three most important elements in the VaR method include: the amount of potential loss, a specific time within the risk is estimated and the probability of loss or reliability. The amount of risk may be expressed in absolute or relative number. Another type of VaR was calculated in this research—CVaR which is derived by taking a weighted average between the value at risk and losses exceeding the value at risk. Abbreviation CVaR stands for conditional value at risk and it is generally considered a better approximation of potential losses than historical VaR. Results were calculated in table 6.

Table 6. Comparison of VaR values

	historical VAR 90%	historical VAR 95%	historical VAR 99%	CVaR 90%	CVaR 95%	CVaR 99%
A	-14.2%	-21.8%	-36.5%	-25.1%	-33.0%	-75.6%
B	-9.2%	-14.5%	-26.0%	-16.2%	-20.9%	-45.5%
C	-6.3%	-9.1%	-13.4%	-10.8%	-13.6%	-34.1%
D	-6.4%	-8.6%	-12.6%	-10.2%	-12.7%	-31.8%
E	-6.2%	-8.3%	-11.8%	-9.9%	-12.1%	-30.0%
F	-6.1%	-8.1%	-11.4%	-9.7%	-11.9%	-29.1%
G	-6.2%	-7.7%	-11.5%	-9.5%	-11.8%	-28.7%
H	-6.7%	-7.5%	-11.6%	-9.4%	-11.6%	-28.2%
I	-6.5%	-7.5%	-11.5%	-9.3%	-11.7%	-27.5%
J	-6.4%	-7.4%	-11.5%	-9.2%	-11.6%	-26.7%
K	-6.0%	-7.4%	-11.4%	-9.1%	-11.6%	-25.8%
L	-5.6%	-7.3%	-11.4%	-9.0%	-11.5%	-25.0%
M	-5.3%	-7.2%	-11.4%	-8.8%	-11.4%	-24.2%
N	-5.4%	-7.2%	-11.7%	-8.7%	-11.4%	-23.9%
O	-5.1%	-7.2%	-12.2%	-8.7%	-11.3%	-23.7%
P	-4.8%	-7.2%	-12.8%	-8.6%	-11.2%	-23.4%
R	-4.5%	-7.2%	-13.3%	-8.5%	-11.2%	-23.2%
S	-4.1%	-7.2%	-13.3%	-8.5%	-11.1%	-23.0%
T	-4.0%	-7.1%	-13.4%	-8.4%	-11.0%	-23.6%
U	-4.0%	-6.9%	-13.6%	-8.4%	-11.0%	-24.5%
V	-4.2%	-6.8%	-13.9%	-8.3%	-11.0%	-25.3%
Z	-4.3%	-6.8%	-14.0%	-8.3%	-10.9%	-25.7%
Crobex	-6.5%	-10.1%	-25.1%	-13.2%	-18.1%	-44.9%

The empirical results show that minimum variance portfolios have lower volatility compared to stock market index Crobex. As expected, VaR value rises as return grows. Largest risk has portfolio A. Considering that portfolio G has the most optimal CV value we can interpret historical VaR 90% as the 10% chance that investor will lose 6.2% and in the worst 10% of returns average loss will be 9.5% according to CVaR. CVaR is considered superior to VaR because CVaR quantifies tail risk and has been shown to be subadditive. By comparing the risk values to stock market index Crobex it can be concluded that most of the portfolios from the efficient frontier outperformed Crobex in terms of expected return and risk, which confirms that investing in tourism sector may bring less risk and larger return than other sectors. Considering that VaR methodology is based on historical data, and it relies on idea that the future will be like past, this methodology has been very often criticized (Linsmeier and Pearson 2000).

CONCLUSION

In the last decade Croatian tourism turnover largely confirms that tourism is an active generator of its economic development. Since Croatia has an exceptionally attractive tourism potential and since this sector has stable and prosperous future, authors have researched investment possibilities in tourism sector on the Croatian capital market. The aim of this research was to compare optimal stock portfolios consisted of tourism stocks with Crobex. Crobex presents official stock market index which is consisted of 25 representative companies, value of Crobex presents the value of Croatian stock market. After analyzing stock market liquidity in tourism sector 11 stocks were chosen for creating optimal mix. All stocks were analyzed in the period 01.01.2008–01.01.2018. This research makes some unique contributions from the theoretical and empirical points of view. After comparing performance of optimal stock portfolios with Crobex on monthly basis, it can be concluded that investing in tourism sector can outperform investing in stock market index Crobex. Calculated risk values were much lower for the portfolios in tourism sector compared to Crobex. Considering that VaR has been criticized because of its lack of subadditivity, authors have calculated CVaR which is considered as more reliable. CVaR estimate cannot be lower than a VaR estimate.

It is also necessary to point out some facts as limitations of this study: first limitation was that authors have used historical method with the assumption that the pattern of historical returns will repeat in the future. A second limitation, also arising from the historical value, is the difficulty of predicting expected return by using mean value. Third, transaction costs were not included in creating portfolio. Despite limitations this research has lots of room for further research. Authors suggest using more complex methods in estimating expected return and calculating risk value which will provide more precise results.

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