



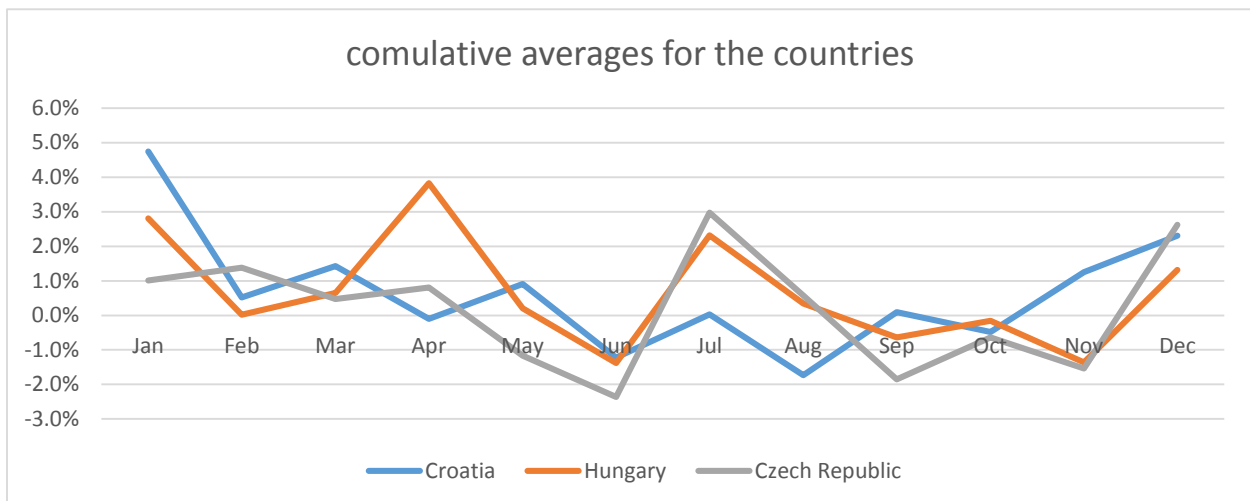
**Stock market seasonality analysis for
Croatia, Hungary, and Czech Republic**

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Introduction

The stock markets across the globe reflect the performance of the economy in their respective countries. In this paper we examine three countries: Hungary, Czech Republic, and Croatia to ascertain seasonal movements within and between their markets. Countries are selected for their common geographic location. In theory these three countries involve proximity should experience similar economics environments. We examine the last 15 years of returns to evaluate the performance and make comparisons between the three countries to determine if similar factor influence their returns. All these countries were behind the iron curtain shackled in commission after World War 2, these markets were closed for nearly 50 years. The Hungary market first opened January 18, 1864, June 21, 1990 reopened and called by Budapest stock exchange. The Czech Republic market founded in 1871 then reopened in 1993 as the Prague stock exchange. The Croatia market were established in 1991 as the Zagreb stock exchange.

Exhibit 1
The cumulative averages for the countries to compare their performance



The markets in these three countries has the same effects and seasonality changes such as Halloween effect, January effect, and holiday's affect. That is the main reason to test the stuck markets here to see how if it's connected to each other by the geographic reasons or each country has its own stock market environment. The seasonality effects come in different ways in the global markets. There is a January effect which is coming in the beginning of the year. After that, the Halloween effect that is starting in May through October. Those variables are different from market to another, some markets are attached to each other, independent, or it has itself environment which is not affected by around markets exchange. In this study we will see if there is a connection in these three countries and measure the markets result to see how it affect each other. In exhibit 1 the cumulative average for each country to compare the performance in all the study time period.

Literature review

The well-known market advice "Sell in May and Go away", also commonly known as the Halloween effect. The Halloween effect is wildly documented in stock markets across the globe where the summer period which is from May through October significantly underperforms the period from November to April. The period from November through April include the time periods for the turn of the year Christmas effect and January effect which are observed in most stock markets across the globe. Friday and Peterson (1997) report a January effect in the U.S. Median Home Price index. The turn of the year Christmas effect is when performance after the markets reopen in January typically are effected companies by having significantly higher returns at this time. Kathryn and Pradyot (2015) "tax-loss selling explanation for the January effect."

Also, some of the financial analysts looking for the beginning of the year to see how the January effect runs into the market to predict how the year performance will be. Haugen and Jorion (1996) found that the January effect still occurs in the New York Stock Exchange indicating the January effect is still present in some of the largest markets on the globe. Friday and Hoang (2015) found that in the Vietnam stock exchange the month that has the highest return is January over all the period from 2000 to 2010 which supports the January effect. Kim and Park (1994) found a holiday effect for major holidays in general. The effect is independent for each country's holidays for major holidays in the US, UK, and Japan. Maperly, E and Pierce (2003) found a primary Halloween effect in the Japanese stock exchange during the 1980s. Starks, Yong, and Zheng (2006) found that the mean of January return for municipal bonds was 2.21% compared to the average return of -0.19% for the rest of the year from 1990 to 2000. Friday and Bo (2015) said "The Halloween effect occurs when stocks perform better in the post-Halloween period from November through April as compared to the pre-Halloween period from May through October." In this study we will examine the Zagreb stock exchange, Budapest stock exchange, and Prague stock exchange to see how the January, Halloween, or any major seasonality effect the market and makes the average returns significant or insignificant.

Analysis

- **Croatia:**

Croatia was a part of Yugoslavia after World War 2, which was one of the members of the communist block countries. After the communist regime 1991 to 1995 collapsed Croatia fought for and won its independence. The war lasted hobbling Croatian economy and markets. Exhibit 2 provides the returns for the last 17 years which is from 1998 until September 2015. As most of the poor performance occurs between May and October. This provides support we observe for the Halloween effect. The Zagreb exchange has its highest returns in January which averages 4.7% across 16 years. In addition 70% of the returns are positive for the month of January. December also a strong month with 2.3% in the last 16 years with 52.9% positive returns. The worst months on averages are June, August, and October with -1.2%, -1.7%, and -0.5%. The highest returns for the Croatian market is between February 2009 and September 2009.

Exhibit 2
Monthly return in Zagreb stock exchange for last 17 years

years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1998	xxxxx	0.12	0.00	-0.09	-0.12	0.00	-0.04	-0.42	0.21	0.07	0.17	0.01
1999	0.09	-0.05	-0.03	0.00	0.05	-0.03	-0.06	-0.03	-0.23	0.05	0.20	0.11
2000	0.09	0.09	0.12	-0.12	0.05	-0.05	-0.05	0.05	-0.01	0.03	0.06	-0.02
2001	0.00	0.08	-0.03	0.05	-0.04	0.05	0.03	0.00	-0.07	0.01	0.07	0.02
2002	0.13	0.03	0.07	-0.04	0.00	-0.06	-0.06	0.02	0.00	-0.01	0.06	0.01
2003	-0.07	-0.04	0.00	0.06	0.02	0.01	-0.02	0.03	-0.06	0.04	0.04	0.00
2004	0.01	-0.02	-0.01	0.01	-0.03	0.01	0.04	0.03	0.13	0.04	0.10	-0.02
2005	0.23	0.08	-0.12	-0.03	-0.03	0.04	0.02	0.05	0.05	-0.01	0.00	-0.01
2006	0.05	0.03	0.13	0.03	-0.01	0.09	0.06	0.08	0.02	0.03	0.00	-0.01
2007	0.17	0.01	0.12	0.09	0.08	-0.03	0.04	-0.06	0.06	0.02	-0.09	0.12
2008	-0.14	-0.06	-0.09	-0.01	0.05	-0.10	0.01	-0.04	-0.14	-0.27	-0.27	0.07
2009	-0.02	-0.18	0.05	0.10	0.35	-0.12	-0.01	0.07	0.09	-0.02	-0.04	-0.03
2010	0.10	-0.03	0.00	0.01	-0.08	-0.07	0.00	0.00	0.04	-0.02	-0.04	0.18
2011	0.09	-0.02	0.02	-0.02	0.02	-0.02	-0.03	-0.06	-0.09	-0.01	-0.06	0.00
2012	-0.01	0.03	0.03	-0.02	-0.07	0.02	0.00	-0.01	0.02	0.02	0.00	-0.01
2013	0.08	0.03	0.03	-0.03	-0.05	-0.03	0.02	0.00	-0.02	-0.03	0.00	0.01
2014	0.01	0.00	-0.02	-0.02	-0.01	0.05	0.01	0.02	0.04	-0.04	-0.03	-0.03
2015	0.01	-0.01	-0.02	0.02	-0.01	0.00	0.04	-0.03	-0.03	xxxxx	xxxxx	xxxxx
Mean	4.7%	0.5%	1.4%	-0.1%	0.9%	-1.2%	0.0%	-1.7%	0.1%	-0.5%	1.3%	2.3%
median	4.7%	0.2%	0.3%	-0.7%	-1.0%	-1.1%	0.8%	-0.1%	1.0%	1.0%	0.3%	0.1%
SD	8.7%	6.9%	6.7%	5.6%	9.9%	5.3%	3.6%	10.8%	10.1%	7.3%	10.4%	5.9%
Count	17	18	18	18	18	18	18	18	18	17	17	17
Positive returns	70.6%	50.0%	61.1%	44.4%	38.9%	44.4%	61.1%	50.0%	50.0%	52.9%	52.9%	52.9%
Negative returns	29.4%	50.0%	38.9%	55.6%	61.1%	55.6%	38.9%	50.0%	50.0%	47.1%	47.1%	47.1%
Significant test												
%5	Sign	insign	insign	insign	insign	insign	insign	insign	insign	insign	insign	insign
Note: Sign means significant and insgn means insignificant												

- **Hungary:**

Hungary is the second country in this study but it's one of the oldest markets in the globe. The Budapest stock exchange established and the operation began 1864 and it went through the World War 1 and 2 and that make the market hold the operation and stop a few time which is caused wobbling in the performance until 1990 when the exchange reopen until present. To compare what is the different in the stock market and the common factors in the impact of all the three markets in this study. The data I found for Hungary stock market for last 15 years which is from 2000 until September 2015. As it is showing in exhibit 3 it has a huge effect was on the market in the financial crisis in 2008, otherwise the market was healthy and normal. The Budapest stock exchange has the highest return in April by 3.8% average and 75% positive returns, January also is strong month by average 2.8% and 66.7% positive returns. As we can notice the poor performance existed in June and November by -1.4% averages and 37.5% positive returns in June and 53.3% positive returns in November.

Exhibit 3
Monthly return in Budapest stock exchange for the last 15 years

Years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	XXXX X	0.06	-0.01	-0.11	0.02	-0.08	-0.01	0.03	-0.02	-0.01	-0.16	0.14
2001	0.04	-0.13	-0.07	0.03	0.03	-0.05	-0.02	-0.04	-0.03	0.10	0.05	0.00
2002	0.14	-0.02	0.02	0.07	-0.06	-0.11	-0.03	0.09	-0.07	0.03	0.08	-0.02
2003	-0.04	-0.04	0.03	0.10	0.02	-0.07	0.07	0.09	-0.01	0.07	-0.05	0.03
2004	0.07	0.02	0.07	0.01	0.02	0.02	0.01	0.04	0.04	0.04	0.08	0.04
2005	0.05	0.18	-0.07	-0.04	0.03	0.11	0.11	0.04	0.06	-0.11	0.03	-0.02
2006	0.07	0.05	-0.01	0.06	-0.13	0.01	0.06	-0.02	-0.02	0.03	0.02	0.09
2007	-0.03	-0.03	0.00	0.09	0.05	0.08	0.01	-0.06	0.04	-0.04	-0.06	0.02
2008	-0.11	0.00	-0.08	0.04	0.00	-0.10	0.09	-0.05	-0.10	-0.28	-0.06	-0.04
2009	-0.06	-0.12	0.09	0.16	0.16	0.03	0.13	0.12	0.04	0.02	0.01	0.02
2010	0.03	-0.03	0.14	0.02	-0.11	-0.05	0.06	0.01	0.03	0.00	-0.11	0.03
2011	0.06	0.02	0.00	0.05	-0.03	-0.03	-0.05	-0.15	-0.15	0.12	0.00	-0.04
2012	0.11	0.02	-0.03	-0.02	-0.12	0.08	0.00	0.01	0.06	0.03	-0.05	-0.01
2013	0.07	-0.03	-0.05	0.02	0.05	-0.01	-0.02	-0.02	0.03	0.01	0.00	-0.01
2014	0.02	-0.06	-0.01	-0.01	0.10	-0.03	-0.06	0.01	0.01	-0.03	0.00	-0.04
2015	-0.01	0.10	0.08	0.15	-0.01	-0.02	0.03	-0.05	-0.01	xxxxx	xxxxx	xxxxx
Mean	2.8%	0.0%	0.6%	3.8%	0.2%	-1.4%	2.3%	0.3%	-0.6%	-0.2%	-1.4%	1.3%
Median	3.8%	-1.0%	-0.5%	3.6%	1.8%	-2.5%	1.2%	1.0%	-0.1%	1.7%	0.2%	0.1%
SD	6.4%	7.6%	6.3%	6.9%	7.8%	6.4%	5.6%	6.8%	5.9%	9.2%	6.4%	4.7%
Count	15	16	16	16	16	16	16	16	16	15	15	15
Positive returns	66.7%	50.0%	43.8%	75.0%	56.3%	37.5%	62.5%	56.3%	50.0%	60.0%	53.3%	53.3%
Negative returns	33.3%	50.0%	56.3%	25.0%	43.8%	62.5%	37.5%	43.8%	50.0%	40.0%	46.7%	46.7%
Significant test %5	Sign	insign	insign	Sign	insign	insign	Sign	insign	insign	insign	insign	insign

Note: Sign means significant and insign means insignificant

- **Czech Republic:**

Czech Republic is the third country in this study to compare the stock market performance with Croatia and Hungary. I choose this country because they are on the same continent and they have almost the same factors that affect their economies in general and stock market like world war 2 and which is studying in this paper. I got the last 21 years database for this market from Quandl web site to study and see the market performance and the risk that related to the market then compare it with countries market in this paper. Prague Stock Exchange (PSE) is the largest market in Czech Republic in the last 50 years, after the World War 2. As we see in Exhibit 4 the market has two crisis, the first one was 1998 and the second one was 2008 same as all the world. The market return wobbling most of the 21 years. The highest return was 1999. Also, after 2008 crisis the market has a sharp rise on returns which is reflect they correct their economics situation. In general I can say the market is healthy because the performance wobbling which has some low performance and high performance. The Prague stock exchange has the highest returns average in July and December by 3% and 2.6% and positive returns 66.7% and 76.2% and both of them are significant. The poor performance existed in June, September, and November by averages -2.4%, -1.9%, and -1.5% and negative returns by 61.9% for June and September, 52.4% for November that makes all of this three months insignificant.

Exhibit 4
Monthly return in Prague stock exchange for the last 21 years

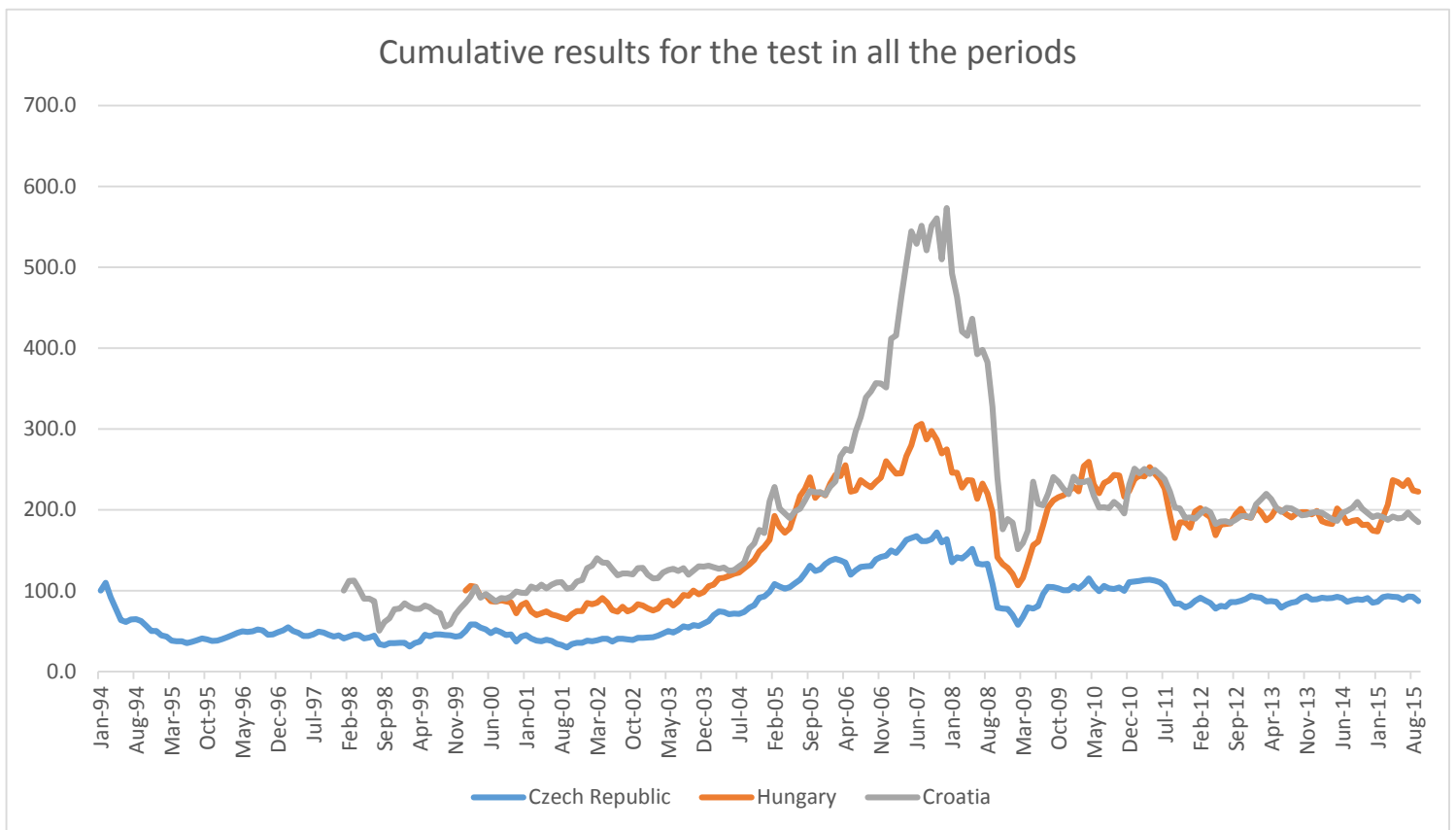
years	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1994	xxxxx	0.10	-0.16	-0.16	-0.18	-0.04	0.05	0.01	-0.03	-0.10	-0.11	0.00
1995	-0.11	-0.03	-0.12	-0.02	-0.01	-0.06	0.04	0.05	0.06	-0.02	-0.06	0.02
1996	0.04	0.06	0.06	0.07	0.04	-0.01	0.01	0.05	-0.02	-0.10	0.01	0.06
1997	0.05	0.08	-0.08	-0.05	-0.08	0.00	0.04	0.07	-0.02	-0.06	-0.05	0.03
1998	-0.08	0.05	0.06	-0.01	-0.09	0.03	0.05	-0.23	-0.05	0.08	0.00	0.01
1999	0.00	-0.14	0.14	0.06	0.23	-0.05	0.05	0.00	-0.01	-0.01	-0.04	0.03
2000	0.13	0.16	0.00	-0.06	-0.04	-0.09	0.09	-0.06	-0.07	0.01	-0.19	0.17
2001	0.05	-0.09	-0.06	-0.02	0.05	-0.05	-0.08	-0.05	-0.09	0.13	0.05	0.01
2002	0.08	-0.02	0.03	0.05	0.01	-0.09	0.09	0.00	-0.02	-0.03	0.08	-0.01
2003	0.01	0.02	0.04	0.06	0.07	-0.04	0.06	0.09	-0.03	0.06	-0.02	0.06
2004	0.05	0.12	0.06	-0.01	-0.04	0.01	0.00	0.03	0.07	0.04	0.11	0.02
2005	0.06	0.09	-0.03	-0.03	0.02	0.05	0.04	0.07	0.08	-0.05	0.02	0.05
2006	0.03	0.02	-0.02	-0.02	-0.11	0.05	0.03	0.01	0.00	0.06	0.02	0.01
2007	0.05	-0.02	0.05	0.05	0.01	0.01	-0.04	0.00	0.02	0.05	-0.07	0.02
2008	-0.17	0.04	-0.01	0.04	0.05	-0.12	-0.01	0.00	-0.19	-0.27	-0.02	-0.01
2009	-0.10	-0.17	0.17	0.17	-0.02	0.04	0.19	0.09	0.00	-0.01	-0.02	0.00
2010	0.05	-0.03	0.05	0.07	-0.08	-0.06	0.06	-0.03	-0.01	0.02	-0.04	0.11
2011	0.01	0.01	0.01	0.00	-0.01	-0.02	-0.04	-0.11	-0.11	0.0039	0.0553	0.0366
2012	0.07	0.04	-0.04	-0.04	-0.08	0.04	-0.01	0.07	0.00	0.02	0.03	0.04
2013	-0.02	-0.01	-0.05	0.01	-0.01	-0.08	0.05	0.03	0.01	0.06	0.02	-0.04
2014	0.00	0.02	-0.01	0.00	0.02	-0.02	-0.05	0.02	0.01	-0.01	0.03	-0.06
2015	0.01	0.07	0.01	-0.01	0.00	-0.04	0.05	-0.01	-0.05	xxxxx	xxxxx	xxxxx
Mean	1.0%	1.4%	0.5%	0.8%	-1.2%	-2.4%	3.0%	0.6%	-1.9%	-0.6%	-1.5%	2.6%
Median	3.3%	2.1%	0.5%	-0.2%	-0.8%	-2.8%	4.2%	0.6%	-1.5%	-0.4%	-1.7%	2.1%
SD	7.2%	8.1%	7.8%	6.6%	8.2%	5.0%	5.9%	7.4%	6.0%	8.4%	6.5%	4.8%
Count	21	22	22	22	22	22	22	22	22	21	21	21
Positive returns	75.0%	61.9%	47.6%	52.4%	42.9%	38.1%	66.7%	66.7%	38.1%	47.6%	47.6%	76.2%
Negative returns	25.0%	38.1%	52.4%	47.6%	57.1%	61.9%	33.3%	33.3%	61.9%	52.4%	52.4%	23.8%
significant test												
%5	insign	insign	insign	insign	insign	insign	Sign	insign	insign	insign	insign	Sign

Note: Sign means significant and insgn means insignificant

- **Examination:**

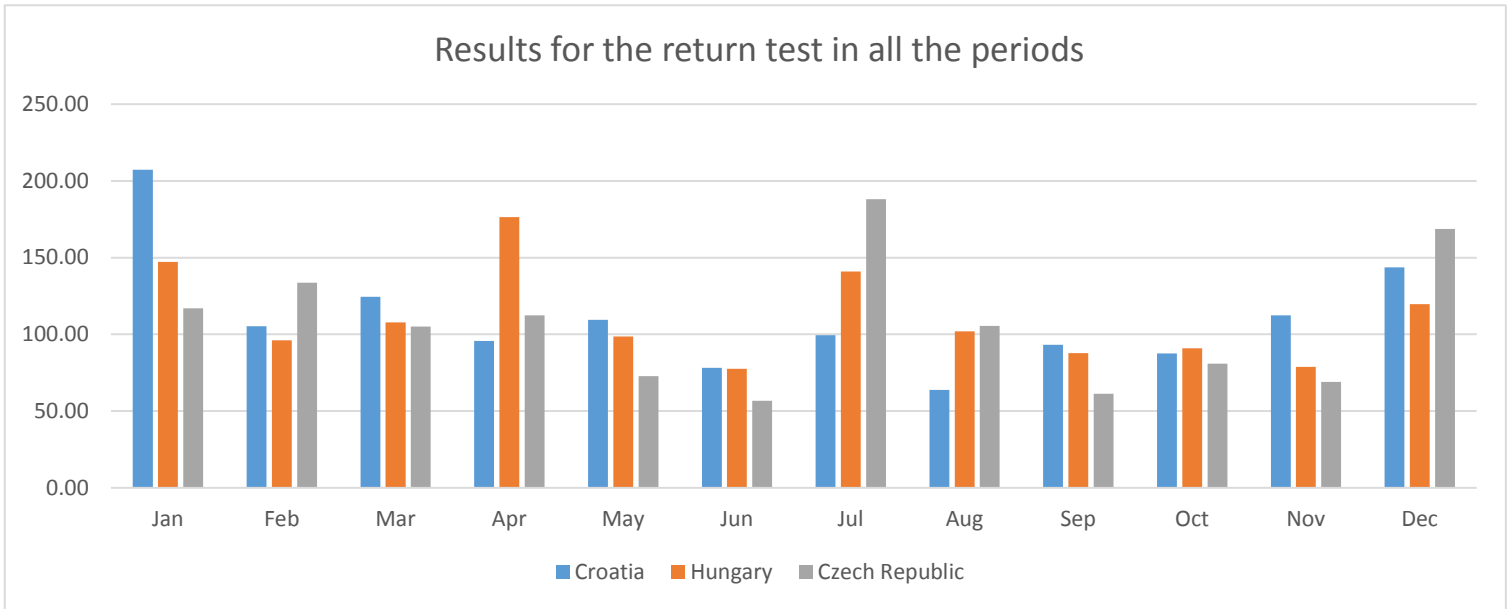
To exam the markets that included in this study we assume that we put \$100 to see how the profit goes in the market and test which months is usually had effected by the Halloween, January effect, or any holiday effect. In exhibit 5 the graph shows the cumulative test in the all years we have the data included.

Exhibit 5
Test the market by add a \$100 on each market from the beginning to see the results



In exhibit 6 it shows the return on each month to know how it is in each month and if any effect usually related to that month such as Halloween effect or January effect. We test the profits and losses of investing \$100 in each market to analysis each month.

Exhibit 6
The results for each month chart after we invest \$100 in each market to test the profits

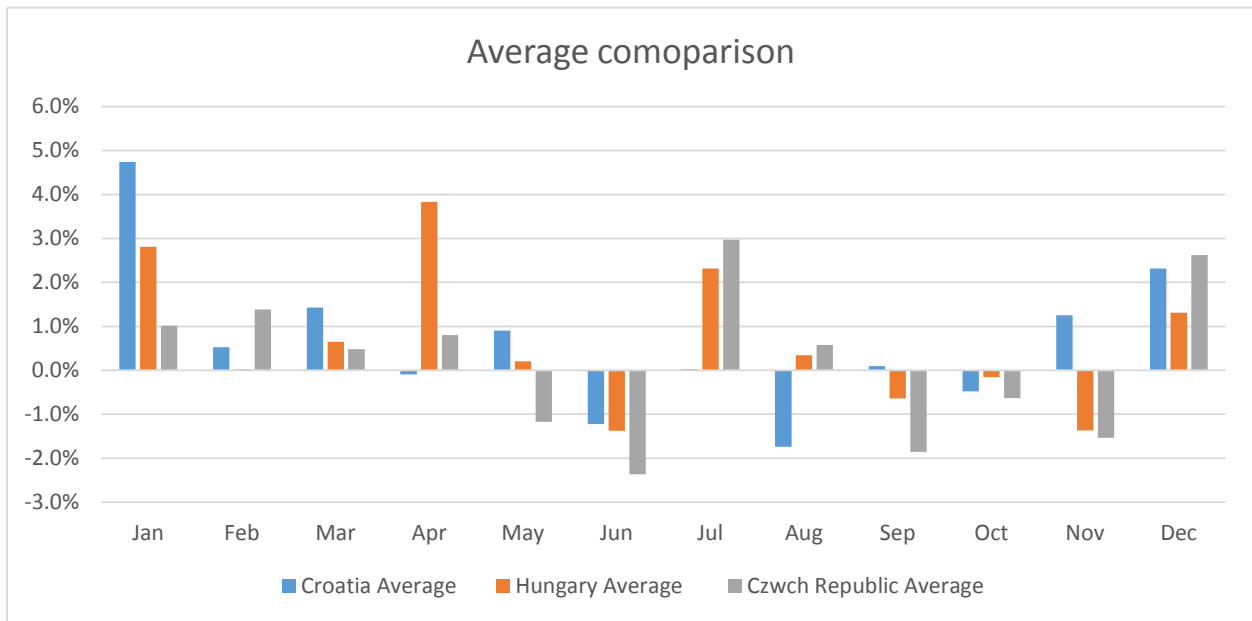


Note: we put \$100 on the beginning of the period in each month and see if we invest just in that month what the amount will be in the end of the test period.

- **Results and Conclusions:**

In this study I was looking for three countries has similar factors which is religion, economics, or geographic. I choose Croatia, Hungary, and Czech Republic because they are small countries on the same content that has medium level economics which is suitable environment to study their stock markets. The results in this paper showing that Croatia stock market has a Halloween effect on the performance and return which is different from Hungary and Czech Republic. The risk shows there is an effect from Halloween on all three countries stock market which is showing on the charts. So we can say that even if all the countries on the same content and has almost the same factors that affect their economies not necessarily they will have the same performance on the stock market or the same effect will harm the market.

Exhibit 7
The cumulative averages in each months for the three markets exchange to compare the performance



As we can see in exhibit 7 the average in the period between May through October is low except July for Hungary and Czech Republic which is showing a negative Halloween effect in those three countries. In general the highest returns averages in December and January which is showing a positive January effect and confirm what the literature review shows that the January effect is still affecting the global market.

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