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Weather Effects in Transition

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Abstract

This paper tests whether weather affects stock returns in the transition countries of Central and Eastern Europe and the CIS. In these countries, reliable information about the fundamentals of stocks is scarce, and hence the 'mood' of investors is more likely to play an important role in investment decisions. Nevertheless, our results suggest that there is little evidence of a systematic effect of weather variables on stock markets in these countries.

Introduction

By now, there exists a sizable academic literature on the effect of weather on stock returns. Some have argued that good weather improves investors' mood, that good mood translates into optimistic expectations about financial markets and thus leads to increased stock market activity and increased prices. Others believe in the efficiency of stock markets and argue that any correlation between stock market behaviour and weather indicators is spurious.

Those who believe in the effect of weather find support in the psychology literature. Psychologists for a long time have argued that people become more optimistic during sunny weather and more pessimistic during rainy or cloudy days (Eagles, 1994; Rind, 1996). They also have argued people's decisions are usually made in accord with their mood (Schwarz, 1990). And that investors who are in a good mood are inclined to invest in riskier projects as they believe more in the success of their ventures (Herren et al., 1988).

Those believing in a weather effect also get support from the economics and finance literature. Saunders (1993) for example, found a strong negative relationship between cloud cover and returns on stocks on the New-York City Exchange indices. Hirshleifer and Shumway (2003) using stock indices of 26 countries confirmed Saunders' findings and found that also sunshine has a significant positive relation to stock returns. Finally, Dowling and Lucey (2005) showed how rain affects stock returns on the Irish Stock Market, while Loughran et al. (2004) found a negative relationship between the amount of blizzard strokes and trading volumes.

Sceptics, however, refer to the literature that does not find significant weather effects: Krämer and Runde (1997), using German stock index data, found that local weather does not affect short-term stock returns. Similarly, Pardo et al. (2003) found no effect of sunshine and humidity on stock returns on the Madrid Stock Exchange. Worthington (2006) came to the same conclusion using Australian stock market data and Tufan (2006) using data for the Istanbul Stock Exchange.

In this paper, we use a rich database with several weather variables to test for the existence of weather effects in stock markets in transition countries. As far as we know, this is the first paper to test the impact of weather on stock returns in Ukraine, Romania, Croatia, Slovenia, Bulgaria, Slovakia, and the Baltic States. And while Jacobsen et al. (2008) found no weather effects in the MSCI (Morgan Stanley Capital International) Indices returns data for Russia, Poland, Hungary and

Czech Republic, this paper is the first to test how weather related variables affect the national indices of these countries (the Russian RTS Index, the Polish WIG Index, the Hungarian BUX Index, and the Czech PX Index).

While the MSCI Indices are developed by Morgan Stanley to track the performance of the most liquid and attractive equities in a given country, we want to focus on the less liquid and less transparent national indices. One indeed would expect mood effects to have a more visible impact on such indices – if little or no information on fundamentals is available, it is more likely that investor behavior will be driven by non-fundamental factor such as the weather. In this way, this paper contributes to the existing literature on the weather effect on stock market returns – that is, if no weather effects can be found in markets where they are most likely to occur, it will be hard to argue that weather effects do exist.

Data Description and Methodology

Our sample consists of 13 CIS and CEE countries, states that are situated in close proximity, have integrated markets and are culturally and historically interconnected. Stock market daily data on closing prices is available from Bloomberg.

We compute daily Index returns in the usual way:

$$IndexRet_t = 100*((IndexPrice_t / IndexPrice_{t-1}) - 1)$$

As different countries have introduced their indices at different times, available sample periods differ across countries. Descriptive statistics of the returns can be found in Appendix A. As usual, stock returns exhibit high volatility and non-normality.

Daily weather data for the cities where the stock exchanges are located were taken from the historical archives of the RussianWeather[1] website. Only the weather in these cities is considered as traders outside these cities are usually small players and their trading volumes are unlikely to have a

[1] http://meteo.infospace.ru/koi/wcarch/html/r_index.sht

significant influence on stock prices and returns. The top-5 traders in each country are almost all located in the city where the stock exchange is located[2].

For each of our cities, we have data on temperature, cloud cover, atmospheric pressure, wind, precipitation, visibility and humidity measured at noon daily. Sample periods are matched with those for the indices. Wind ranges from 0 to 33 meters per second (mps) with 0 indicating the absence of wind. Cloud Cover ranges from 0 (clear skies) to 3000 (heavy clouds) points. Precipitation is measured from 0 (dry weather) and above in millimeters. Visibility is the distance at which a target can be seen regardless of weather conditions. Its values range from 0 (objects not visible at 20 miles distance) to 60 (objects are not visible at above 50 yards distance). In our regressions, we standardize these explicative variables so the coefficients in our regressions reflect the change in the dependent variable if these independent variables change by 1 standard deviation. Descriptive statistics of our weather variables can be found in Appendix C[3].

Even though the local traders will typically provide information to the potential investors, information that can be 'colored' by the weather the traders experience, one could argue that the final investment decision is made by the investors who might reside in different locations than the traders. As a robustness check, we therefore also experiment with a specification that includes New-York (NY) weather variables. If investors, that trade stocks of the countries in our analysis, are located outside these countries, the weather in the countries where the investors reside might affect stock markets in these destination countries. For almost all of the countries in our sample, the biggest share of outside investment comes from USA, hence we use NY weather to control for this external weather effects[4].

We use both OLS and GARCH models to test the relationship between stock returns and weather variables. Chang et al. (2006) note that GARCH models may be a better tool for estimation as stock market data exhibit heteroscedasticity and are characterized by so-called "volatility clustering" when

[2] Appendix B provides precise statistics on the percentage of brokers located in the capital cities where the exchanges are located.

[3] We have calculated correlation coefficients for weather variables (correlation statistics are in Appendix F). Only humidity and pressure variables are strongly correlated (with correlations reaching 70-80% for few countries). Other correlation coefficients are relatively low.

[4] Statistics on the amount of portfolio investment from USA to the analyzed countries can be found in Appendix E.

observations are high during some periods of time and low during others causing time variability of amplitude of returns (Engle, 2001). Hence, we run the following regressions

OLS: $IndexRet_t = \beta_0 + \beta_1 v_t + u_t$

GARCH: $IndexRet_t = \beta_0 + \beta_1 v_t + u_t$

$\sigma^2_t = \alpha_0 + \alpha_1 \sigma^2_{t-1} + \alpha_2 IndexRet^2_{t-1}$

where σ^2_t is a conditional time dependent variance and v_t is the vector of weather variables.

We also estimate threshold models to test whether weather variables only have an effect after exceeding a threshold value. That is, we test whether extreme weather, rather than normal weather, impacts investors' mood[5].

Seasonal dummies (like Winter, Spring, Autumn) are included into the regressions to control for seasonality. January and December dummies are included (following Saunders, 1993) to account for the so-called "Holidays effect" when stock markets show upward movements in stock prices because of increased investor activity connected to the holiday rush.

[5] Threshold values are found following Chang et al. (2006) and Chan (1993). First, observations are sorted in ascending order and then the 5% highest and 5% lowest values are deleted. The remaining observations are used to determine a threshold value which minimizes the residual sum of squares. This estimation procedure leads to consistent estimates as shown in Chan (1993). Threshold values of weather variables can be found in Appendix D.

OLS Threshold: $IndexRet_t = \beta_0 + \beta_1 W^{up} v_t + \beta_2 W^{down} v_t + u_t$

GARCH Treshold: $IndexRet_t = \beta_0 + \beta_1 W^{up} v_t + \beta_2 W^{down} v_t + u_t$

$\sigma^2_t = \alpha_0 + \alpha_1 \sigma^2_{t-1} + \alpha_2 IndexRet^2_{t-1}$

where W^{up} is a dummy variable equal to 1 if $v_t > \tau$ (threshold); W^{down} is a dummy variable equal to 1 if $v_t < \tau$ (threshold).

Results

Tables 1 and 2 report the OLS regressions results. No effect of weather variables on returns is found for the indices of Slovakia (SAX), Romania (BET), Ukraine (PFTS), Russia (RTS), Latvia (RIGSE), Lithuania (VILSE), and Croatia (CROBEX). There is a positive effect of wind on returns in the Czech Republic (PX) but a negative effect on returns in Estonia (TALSE). Precipitation and visibility affect returns in Hungary (BUX) while atmospheric pressure positively affects returns in Slovenia (SBITOP). The returns in Estonia (TALSE) fall as humidity rises, while increasing temperature negatively affects returns in Hungary (BUX), Estonia (TALSE) and Poland (WSE).

The OLS results thus suggest that the BUX and TALSE indices are most weather sensitive as they are affected by the largest number of weather variables, 3 and 2 respectively (see Table 2). And that temperature is the weather variable that most often has a significant effect (more specific in 3 countries). But even these significant effects are small in size, when compared to the volatility of returns in these countries. As an example, in case of the Estonian TALSE Index, an increase in humidity by one standard deviation, decreases returns by 0.128 which is about one tenth of the standard deviation of returns (1.22).

Tables 3 and 4 give the results of the GARCH estimation. As in the case of OLS, they suggest there is no effect of weather variables on returns in Slovakia (SAX), Romania (BET), Latvia (RIGSE), Lithuania (VILSE) and Croatia (CROBEX). And that wind positively affects returns in the Czech Republic (PX), atmospheric pressure positively affects returns in Slovenia (SBITOP) and precipitation has a positive impact on return of Hungary (BUX). But many GARCH results are different from the OLS results: higher levels of cloud cover increase the returns in Russia (RTS), while temperature now has a negative impact on returns in Bulgaria (SOFIX) and Estonia (TALSE). Humidity negatively affects returns in Ukraine (PFTS), Russia (RTS), Czech Republic (PX), Bulgaria (SOFIX) and Estonia (TALSE). According to these GARCH regression results the indices of Hungary, Russia, Czech Republic, Bulgaria and Estonia are most sensitive to the weather, as for all of them 2 weather variables are significantly different from zero. At the same time, the humidity variable is now most often significant, for 5 countries[6].

[6] Note further that "Holidays effects" are found in Hungary, Estonia, Poland (both for OLS and GARCH), Ukraine and Bulgaria (GARCH).

Table 1. OLS results

	Dependent Variables, Index Returns, %												
	Slovakia	Romania	Hungary	Ukraine	Slovenia	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	Croatia
wind	-0,0298	-0,0459	-0,0709	0,1240	-0,0671	-0,0483	0,1830**	-0,0341	-0,1690*	0,0067	-0,0172	-0,0367	-0,0208
cloud	-0,0413	-0,0686	-0,0262	-0,1100	-0,0507	0,1440	0,0256	-0,0155	-0,0277	-0,0337	0,0490	-0,0739	-0,0637
pressure	-0,0152	0,0618	0,1330	-0,0811	0,3830*	-0,1180	0,1110	-0,0091	0,0164	-0,0103	-0,0079	0,0024	0,0374
precipit	0,0031	0,0160	0,1260**	-0,0347	-0,0125	-0,1060	0,0521	-0,0867	-0,0301	0,0493	-0,0255	0,0085	0,1060
humidity	0,0311	-0,0382	-0,1380	-0,0018	-0,2220	0,2070	-0,1580	0,0555	-0,2270	-0,1280*	0,0099	-0,0820	-0,1950
temp	-0,0728	-0,0428	-0,1670*	0,0466	0,0062	-0,0167	0,0927	-0,0116	-0,3450	-0,1520**	-0,0302	-0,1670*	-0,0610
visibility	0,0740	0,0388	0,2050***	-0,1610	-0,2030	0,0180	-0,1410	0,0241	0,0046	0,0425	-0,0637	0,1020	0,0697
winter	-0,0754	0,0623	-0,3140	0,5800*	0,0649	-0,0069	0,1720	-0,2270	-1,1500**	-0,2880	0,0827	-0,5500**	0,0113
spring	0,0026	0,0165	0,1390	0,4040**	0,1690	0,0995	0,1850	-0,1730	-0,6690*	-0,0824	0,0684	-0,0261	0,0517
autumn	0,0575	0,0668	0,0919	0,1080	0,5210***	-0,4070	0,2740*	-0,1980	-0,4730	-0,0100	0,0205	-0,0505	0,0420
dec	0,0962	0,2870	0,6930**	0,0756	0,4010	-0,1150	0,3260	0,1350	0,6020	0,5380**	0,0661	0,5940**	0,4660
jan	0,0525	0,1870	0,5930**	-0,3680	0,2190	0,4130	0,0975	-0,0686	0,2060	0,2520	0,0742	0,3660	0,1730
Constant	-0,0324	0,0137	-0,0527	-0,1910	-0,0813	0,1780	-0,1360	0,2940	0,8290***	0,1490	0,0837	0,1470	-0,0316
Observations	1560	1850	832	1044	239	836	970	873	679	829	824	808	345
R-squared	0,00	0,00	0,03	0,02	0,06	0,02	0,02	0	0,01	0,02	0,01	0,02	0,02

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2. Number of significant weather coefficients in OLS regressions.

	Slovakia	Romania	Hungary	Ukraine	Slovenia	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	Croatia	**Total**
wind							1		1					**2**
cloud														
pressure					1									**1**
precipit			1											**1**
humidity										1				**1**
temp			1							1		1		**3**
visibility			1											**1**
Total			**3**		**1**		**1**		**1**	**2**		**1**		

Table 3. GARCH results.

	Dependent Variables, Index Returns, %												
	Slovakia	Romania	Hungary	Ukraine	Slovenia	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	Croatia
wind	-0,0244	-0,0571	-0,0741	-0,0541	-0,0538	-0,0975	0,1620**	-0,0665	-0,0831	0,0224	-0,0235	-0,0370	0,0751
cloud	-0,0296	-0,0188	-0,0425	0,0097	-0,0542	0,1860***	0,0046	-0,0260	0,0021	-0,0525	0,0591	-0,0935	0,0173
pressure	-0,0025	0,0498	0,1340	0,1470	0,3950*	-0,0989	0,2190	-0,0006	-0,0105	0,0006	0,0277	0,0064	0,0106
precipit	-0,0119	-0,0060	0,1210**	0,0074	-0,0153	-0,0952	0,0570	-0,0526	-0,0723	0,0583	-0,0082	0,0089	0,1110
humidity	-0,0091	-0,0369	-0,1350	-0,1950*	-0,2450	0,2470**	-0,2560*	-0,0049	-0,2470**	-0,1440**	0,0374	-0,0763	-0,1310
temp	-0,0676	-0,0803	-0,1430	-0,0939	0,0103	-0,1100	0,0487	0,0177	-0,3220**	-0,1610**	-0,0464	-0,1400	0,0401
visibility	0,0617	0,0052	0,2040***	-0,3760	-0,1960	-0,0336	-0,1430	0,0073	-0,1520	0,1060	-0,0608	0,0929	0,0914
winter	-0,0294	-0,0631	-0,3010	0,6120**	0,1000	-0,2540	0,1460	0,1140	-1,4600***	-0,3060	0,0700	-0,5100*	0,1610
spring	0,0107	-0,0915	0,1580	0,3390*	0,2050	-0,0965	0,2120	0,0829	-0,6650***	-0,0812	0,0857	0,0182	0,0785
autumn	0,0979	-0,0771	0,1170	0,0631	0,5030**	-0,7280***	0,3020*	0,0659	-0,5960**	-0,0488	0,0590	-0,0280	0,2430
dec	0,0902	0,1230	0,6340**	-0,7930**	0,3930	-0,0951	0,3790	0,0835	0,7750***	0,5170**	0,0747	0,5700*	0,5330
jan	0,0037	0,0563	0,6100**	-0,603*	0,1400	0,2420	0,1460	-0,0417	0,2430	0,2310	0,0608	0,3290	-0,0693
Constant	-0,0138	0,1780	-0,0522	-0,1990	-0,0852	0,4060**	-0,1340	0,0069	0,8040***	0,2080	0,0404	0,1310	-0,1140
Observations	1560	1850	832	1044	239	836	970	873	679	829	824	808	345

Notes: * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. Number of significant weather coefficients in GARCH regressions.

	Slovakia	Romania	Hungary	Ukraine	Slovenia	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	Croatia	**Total**
wind							1							**1**
cloud						1								**1**
pressure					1									**1**
precipit			1											**1**
humidity				1		1	1		1	1				**5**
temp									1	1				**2**
visibility			1											**1**
Total			**2**	**1**	**1**	**2**	**2**		**2**	**2**				

The above results show how sensitive the significance of specific weather variables is to changes in the estimation methodology. This is also confirmed by the results of threshold models (see Appendix G - where, as an example, $wind^{up}$ indicates that the wind in a given day exceeds the threshold and and $wind^{down}$ that it is lower than the threshold[7]), which shows for example that the Slovakian index (SAX) which so far turned out not to be sensitive to weather variables, is sensitive to high values of the visibility index. Overall, also this specification confirms the previous results, that there are few significant weather variables, that those coefficients that are significant have relatively small sizes, and that different variables are significant for different transition countries.

Next we includes the S&P 500 index and New-York city weather variables into the model to account for the impact of the rest of the world on stock returns in the countries under consideration (results are in Appendix H). First, we add the New-York weather. The results then show that while the R^2 of the regressions are higher, that NY weather variables show a similar irregular pattern as local weather variables. Then we add the S&P 500 Index returns. The coefficient of this index, however, is not significant for several countries (Ukraine, Romania, Croatia, Slovenia, Estonia, Bulgaria and Lithuania) and overall, the results for both models, with or without S&P 500 Index returns, do not differ much.

Conclusions

This paper tests the relationship between stock market returns and the weather in transition countries of Central and Eastern Europe. Given the scarcity of credible data on stock fundamentals (and changes therein), these countries' indices should be the most likely to be influenced by the 'mood' of investors, the mood which can be influenced by the weather.

Individual regressions do show significant correlations between specific weather variables and specific stock indices which can be sees as evidence in support of weather effects. However, the overall picture shows that different specifications lead different weather variables to be significant, that the significant weather variables are different for different countries and that, in general, significant coefficients are small in size relative to the volatility of returns. Hence, the overall

[7] If in these threshold regressions, the maximum log-likelihood function does not converge to its maximum when GARCH is run, only OLS results are reported.

impression that comes from our results is that there is little evidence of a systematic effect of weather on stock markets in Central and Eastern Europe.

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APPENDICES

APPENDIX A. Indices Returns Variables Description.

Table A1. Indices description.

Index	Country	Description
PFTS	Ukraine	It is a capital-weighted price index of the 20 major and most liquid Ukrainian equities traded at the PFTS Stock Exchange
WIG	Poland	It is a total return index which includes all companies listed on the main market, excluding foreign companies and investment funds
RTS	Russia	An index of 50 Russian stocks that trade on the RTS Stock Exchange in Moscow
BUX	Hungary	An official index of blue-chip shares listed on the Budapest Stock Exchange Ltd.
PX	Czech Republic	Price index of blue chip issues that trade on the Prague Stock Exchange
BET	Romania	Reflects the evolution of the most liquid 10 stocks (except Investment Funds) and is the most followed index of the Bucharest Stock exchange
CROBEX	Croatia	An official share index of the Zagreb Stock Exchange and it includes stocks of 24 companies and is calculated continuously using latest stock prices
SBITOP	Svolenia	It comprises only the most liquid shares of the Slovene securities market
SOFIX	Bulgaria	The official Bulgarian Stock Exchange index
SAX	Slovakia	It is the official share index of the Bratislava Stock Exchange
TALSE	Estonia	Reflects changes in the prices of shares listed in the Main and Investor lists of the Estonian Stock Exchange
VILSE	Lithuania	It is capitalization-weighted chain-linked total return indexes
RIGSE	Latvia	An all-share index consisting of all the shares listed on theMain & Secondary lists on the Riga Stock Exchange

Table A2. Indices returns descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
PFTS	2 323	0,15288	1,99984	-15,067	22,170	0,351	15,039
WIG	1 846	0,05002	1,54780	-7,362	6,366	-0,023	4,268
RTS	1 762	0,16288	2,23944	-16,188	16,832	-0,102	7,952
BUX	1 907	0,04474	1,65712	-10,578	7,669	-0,222	4,881
PX	972	0,06102	1,50699	-5,577	10,636	0,168	5,809
BET	1 850	0,07897	1,90048	-18,866	15,540	-0,233	14,340
CROBEX	345	0,04009	1,43963	-8,699	7,398	-0,848	10,605
SBITOP	1 061	0,11742	1,10649	-6,336	6,662	0,068	7,416
SOFIX	1 482	0,21697	1,97377	-19,218	23,213	1,007	30,674
SAX	3 112	0,00319	1,30045	-6,852	6,822	-0,064	6,756
TALSE	1 878	0,10709	1,22098	-5,562	8,092	0,336	7,150
VILSE	866	0,13190	0,97234	-4,281	4,687	0,339	5,451
RIGSE	921	0,15245	1,85386	-13,678	9,924	-0,528	17,099

APPENDIX B. Statistics on location of the brokers/stock exchanges members.

Stock Exchange	**Location**	**Number of brokers/exchange members located in the capital city, % of total**
PFTS	Kyiv	78%
WSE	Warsaw	65%
RTS	Moscow	77%
BUX	Budapest	79%
PX	Prague	95%
BET	Bucharest	59%
CROBEX	Zagreb	71%
SBITOP	Ljubljana	65%
SOFIX	Sofia	87%
SAX	Bratislava	83%
TALSE	Tallinn	82%
VILSE	Vilnius	85%
RIGSE	Riga	74%

APPENDIX C. Weather Variables Description.

		wind	cloud	pressure	precipitation	humidity	temperature	visibility
Bratislava	**Obs**	3113	3113	3113	1560	3113	3113	3113
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-1,3708	-1,3775	-2,5277	-0,4571	-1,9059	-3,6508	-1,3123
	Max	6,1332	1,7062	0,4708	12,3302	1,8838	2,3340	2,6250
Bucharest	**Obs**	3582	3582	3582	3582	3582	3582	3582
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-1,4734	-1,4005	-4,1988	-0,1812	-2,0324	-2,5103	-2,1435
	Max	15,1664	1,2680	0,3458	15,9628	2,1227	2,3372	4,2898
Budapest	**Obs**	3538	3538	3538	1560	3538	3538	3538
	Mean	0	0	0	0	0	0	0
	Min	-1,6473	-1,6254	-4,1948	-0,3815	-2,3090	-2,1188	-1,4000
	Max	4,5505	1,5924	0,3525	12,8077	2,0219	2,1791	1,8710
Kyiv	**Obs**	3535	3535	3535	1565	3535	3535	3535
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-1,7174	-1,3614	-4,0169	-0,2990	-2,3564	-3,1313	-1,2869
	Max	27,4758	1,4220	0,3652	12,2631	1,6575	2,2347	1,6399
Ljubljana	**Obs**	3113	3113	3113	1562	3113	3113	3113
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-1,2798	-1,4373	-2,5305	-0,4081	-1,9128	-2,0666	-1,3680
	Max	4,2349	2,0495	0,4649	8,0629	1,7220	2,4139	3,3082
Moscow	**Obs**	3294	3294	3294	1570	3294	3294	3294
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-1,2958	-1,2571	-3,9502	-0,3381	0,0000	0,0000	0,0000
	Max	15,8030	1,8111	0,4246	12,9246	1,5675	2,1217	3,3566
Prague	**Obs**	1820	1820	1820	1820	1820	1820	1820
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-1,2233	-0,9929	-1,8022	-0,3668	-1,6104	-1,8862	-1,2354
	Max	5,6072	2,2434	0,6363	13,0124	1,3901	2,8799	2,1032
Riga	**Obs**	1957	1957	1957	1513	1957	1957	1957
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-2,1690	-1,1850	-16,4218	-0,5282	-3,2826	-2,8292	-1,9256
	Max	5,1798	1,6445	0,6146	11,9010	1,5878	2,3156	9,5977
Sofia	**Obs**	3411	3411	3411	1512	3411	3411	3411
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-0,9798	-2,3396	-27,1949	-0,4192	-3,0455	-2,9828	-1,4514
	Max	15,9092	2,5463	0,6063	9,2320	2,3049	2,4047	2,7297
Tallimn	**Obs**	3461	3461	3461	1513	3461	3461	3461
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-2,1742	-1,0509	-9,5620	-0,5461	-3,3381	-3,2737	-1,1424
	Max	3,5201	2,3796	0,4768	10,4288	1,4304	2,3136	2,4908
Vilnius	**Obs**	1933	1933	1933	1513	1933	1933	1933
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-2,2036	-1,2716	-12,0615	-0,3782	-2,8677	-3,0635	-2,3988
	Max	5,0931	1,7247	0,4413	14,5422	1,5733	2,2684	7,6312
Warsaw	**Obs**	3491	3491	3491	1513	3491	3491	3491
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-2,0218	-1,4883	-20,5032	-0,3169	-3,1873	-3,1830	-1,4669
	Max	5,8274	1,8511	0,7286	12,4875	1,7115	2,3097	2,4296
Zagreb	**Obs**	1493	1493	1493	1493	1493	1493	1493
	Mean	0	0	0	0	0	0	0
	Std. Dev	1	1	1	1	1	1	1
	Min	-1,6746	-1,9725	-18,5166	-0,3131	-2,0002	-2,3583	-1,6342
	Max	4,6489	1,5401	0,6421	9,7704	2,3310	2,2770	1,8496

APPENDIX D. Threshold Values of Weather Variables.

Country	Index	Weather variable						
		Wind	Cloud	Pressure	Precipit	Humidity	Temperature	Visibility
Ukraine	PFTS	3	3 000	0	1	50	5	50
Poland	WIG	5	1 750	1 003	0	62	16	7
Russia	RTS	3	3 000	994	2	72	13	10
Hungary	BUX	1	2 250	1 005	0	30	27	6
Czech Republic	PX	4	450	952	0	0	20	30
Romania	BET	3	3 000	998	0	90	8	10
Croatia	CROBEX	1	800	967	0	56	5	10
Slovenia	SBITOP	1	0	975	10	28	21	40
Bulgaria	SOFIX	5	1 250	948	1	88	22	6
Slovakia	SAX	2	800	1 011	0	71	15	25
Estonia	TALSE	3	450	999	0	41	4	21
Latvia	RIGSE	7	150	1 009	0	81	3	2
Lithuania	VILSE	6	450	985	0	91	-1	6

Country	Index	New York weather variable					
		Wind	Cloud	Pressure	Humidity	Temperature	Visibility
Ukraine	PFTS	3	2250	1017	74	22	6
Poland	WIG	5	450	1016	82	9	11
Russia	RTS	0	3000	1004	85	22	16
Hungary	BUX	0	1750	1032	69	27	9
Czech Repu	PX	3	1250	1017	86	23	7
Romania	BET	3	1250	1023	81	-5	16
Croatia	CROBEX	4	3000	987	78	15	12
Slovenia	SBITOP	3	1750	1008	84	1	16
Bulgaria	SOFIX	3	1750	1008	75	9	16
Slovakia	SAX	4	250	1012	76	11	15
Estonia	TALSE	7	1250	1020	73	26	11
Latvia	RIGSE	10	1250	1024	70	5	15
Lithuania	VILSE	3	1750	1015	75	1	12

APPENDIX E. Share of portfolio investments from USA to CEE and CIS states.

Country	Portfolio Investment from USA, USD mln									
	2003	% of total	**2004**	% of total	**2005**	% of total	**2006**	% of total	**2007**	% of total
Ukraine	17	24%	25	13%	50	19%	235	39%	643	28%
Poland	1 671	31%	3 072	31%	4 562	29%	7 384	33%	9 078	30%
Russia	13 259	47%	10 775	37%	18 631	37%	40 291	34%	74 386	41%
Hungary	2 412	36%	4 503	35%	4 880	31%	7 619	37%	7 309	38%
Czech Republic	1 249	33%	1 843	30%	1 727	25%	3 045	34%	5 155	42%
Romania	24	14%	120	22%	249	30%	372	27%	612	19%
Croatia	270	42%	234	31%	189	25%	74	8%	164	14%
Slovenia	13	5%	1	0,2%	48	32%	116	20%	318	35%
Bulgaria	5	20%	6	6%	78	24%	95	13%	387	27%
Slovakia	14	5%	-	-	1	0,4%	-	-	-	-
Estonia	138	15%	304	21%	62	6%	63	4%	135	6%
Latvia	-	-	4	3%	10	5%	13	4%	18	7%
Lithuania	3	2%	3	1%	20	3%	9	1%	29	3%

Source: IMF (2010) **Portfolio Investment: Coordinated Portfolio Investment Survey (CPIS) Data - Geographic Breakdown Tables.** Available from: http://www.imf.org/external/np/sta/pi/geo.htm

APPENDIX F. Correlation between weather variables.

Kyiv

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	0,36	1,00					
pressure	0,63	0,53	1,00				
precipit	0,02	-0,11	-0,01	1,00			
humidity	0,38	0,22	0,71	0,08	1,00		
temp	0,17	0,12	0,35	-0,01	-0,09	1,00	
visibility	0,53	0,48	0,71	-0,01	0,18	0,50	1,00

Warsaw

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	-0,02	1,00					
pressure	0,08	0,12	1,00				
precipit	-0,01	-0,19	-0,02	1,00			
humidity	-0,01	-0,66	0,04	0,23	1,00		
temp	-0,03	0,33	0,03	0,07	-0,56	1,00	
visibility	0,11	0,23	0,10	-0,08	-0,41	0,26	1,00

Moscow

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	0,17	1,00					
pressure	0,39	0,46	1,00				
precipit	-0,02	-0,13	0,02	1,00			
humidity	0,21	0,14	0,74	0,19	1,00		
temp	0,07	0,05	0,25	0,07	-0,12	1,00	
visibility	0,38	0,42	0,67	-0,14	0,25	0,40	1,00

Budapest

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	0,23	1,00					
pressure	0,54	0,56	1,00				
precipit	0,10	-0,10	0,03	1,00			
humidity	0,26	0,28	0,68	0,11	1,00		
temp	0,26	0,20	0,44	-0,02	-0,08	1,00	
visibility	0,33	0,31	0,49	0,03	0,14	0,47	1,00

Prague

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	0,35	1,00					
pressure	0,67	0,55	1,00				
precipit	0,05	-0,14	-0,02	1,00			
humidity	0,60	0,36	0,88	0,04	1,00		
temp	0,19	0,30	0,44	-0,05	0,14	1,00	
visibility	0,56	0,42	0,68	0,00	0,39	0,59	1,00

Bucharest

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	0,11	1,00					
pressure	0,34	0,33	1,00				
precipit	0,00	-0,08	-0,09	1,00			
humidity	0,15	0,00	0,44	0,06	1,00		
temp	-0,01	0,05	0,28	-0,07	-0,41	1,00	
visibility	0,26	0,21	0,51	-0,07	-0,14	0,42	1,00

Zagreb

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	-0,07	1,00					
pressure	0,09	0,12	1,00				
precipit	0,00	-0,22	-0,01	1,00			
humidity	-0,22	-0,31	-0,04	0,36	1,00		
temp	0,06	0,11	0,02	-0,06	-0,60	1,00	
visibility	0,24	0,09	0,04	-0,20	-0,63	0,45	1,00

Ljubljana

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	0,42	1,00					
pressure	0,64	0,71	1,00				
precipit	-0,04	-0,08	-0,02	1,00			
humidity	0,40	0,51	0,83	0,05	1,00		
temp	0,55	0,42	0,63	-0,05	0,27	1,00	
visibility	0,58	0,55	0,69	-0,03	0,32	0,68	1,00

Sofia

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	-0,12	1,00					
pressure	0,11	0,34	1,00				
precipit	-0,01	-0,01	-0,04	1,00			
humidity	-0,15	-0,26	0,06	0,02	1,00		
temp	-0,02	-0,03	0,01	0,10	0,02	1,00	
visibility	-0,03	-0,03	0,29	0,13	0,08	0,03	1,00

Bratislava

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	0,47	1,00					
pressure	0,69	0,74	1,00				
precipit	0,07	-0,10	0,02	1,00			
humidity	0,55	0,57	0,85	0,08	1,00		
temp	0,41	0,44	0,61	-0,02	0,28	1,00	
visibility	0,46	0,48	0,63	0,00	0,39	0,59	1,00

Vilnius

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	0,02	1,00					
pressure	0,07	0,08	1,00				
precipit	0,00	-0,20	-0,04	1,00			
humidity	-0,08	-0,49	0,18	0,27	1,00		
temp	0,03	0,12	-0,02	0,04	-0,54	1,00	
visibility	0,08	0,31	0,08	-0,18	-0,50	0,31	1,00

Riga

	wind	cloud	pressure	precipit	humidity	temp	visibi~y
wind	1,00						
cloud	0,03	1,00					
pressure	-0,03	0,10	1,00				
precipit	0,00	-0,22	-0,06	1,00			
humidity	-0,10	-0,54	0,09	0,34	1,00		
temp	-0,07	0,24	0,04	-0,06	-0,54	1,00	
visibility	0,08	0,18	0,06	-0,11	-0,42	0,21	1,00

APPENDIX G. Threshold Model Estimation Results.

Table I1. OLS Results

	Dependent Variables, Index Returns, %												
	Slovakia	Romania	Hungary	Ukraine	Slovenia	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	Croatia
wind_up	-0,0316	-0,0382	-0,0682	0,1150	-0,0707	-0,0748	0,0330	0,0515	-0,1230	-0,0310	-0,0241	0,0151	-0,0025
wind_down	-0,0218	-0,0225		0,0293		-0,0351	-0,1430**	-0,0515	0,0449	-0,1090**	0,0099	0,0249	
cloud_up	-0,0318		-0,0552		-0,0191		0,0347	-0,0436	-0,0700	-0,0288	0,0504	-0,0611	0,0135
cloud_down	-0,0733	0,0437	-0,0840	0,0662		-0,0433	0,0213	-0,0394	-0,1640	0,0130	-0,0083	0,0058	0,0157
pressure_up			0,2210	-0,1700	0,1530	0,2160	0,1400	-0,0092	0,1090	0,0488	-0,0886	-0,0859	0,1050
pressure_down	-0,1000	0,0139	0,1650		0,0489	0,2520	0,0498	-0,0318	0,0090	-0,0104	-0,1770	-0,1430	
precipit_up	-0,0051	0,0143	0,1370**	-0,0316	-0,0050	-0,1360*	0,0497	-0,0689	-0,1180	0,0674	-0,0159	0,0195	0,0433
precipit_down					-0,0539	-0,0544							
humidity_up	0,1510	-0,0242	-0,1060	0,1170	0,0586	0,1390	-0,0659	0,1020	-0,0122	-0,1720*	0,0909	0,0996	0,1320
humidity_down	0,1280	0,0469	-0,0505	0,0716	0,0530	-0,0515		0,1890	-0,2660	-0,0505	0,0570	0,2180*	0,1110
temp_up	-0,0487	-0,0400	-0,0264	0,0612	0,0619	0,0053	0,0732	-0,0477	-0,2180	-0,1470**	-0,0127	-0,1620*	0,0615
temp_down	0,0344	-0,0057	-0,0520	0,0996	-0,0354	0,0086	0,0564	0,0563	-0,0261	-0,0448	-0,0196	-0,0187	-0,0603
visibility_up	0,1090**	0,0146	0,2230***			-0,0017	-0,0483	0,0117	0,0433	-0,0006	-0,0296	0,1290	0,1230
visibility_down	-0,0001	-0,0418	0,0423	-0,0639	-0,1070	-0,0821	-0,0374	0,0471	0,1140	-0,1240	0,0486	0,0182	-0,0260
winter	-0,0534	-0,0170	-0,1870	0,5480	0,0377	0,0808	0,1940	-0,2160	-0,8150	-0,3170	0,1320	-0,4450*	0,1890
spring	-0,0106	-0,0022	0,2240	0,3950*	0,2050	0,1420	0,2100	-0,2150	-0,6230*	-0,1060	0,0954	-0,0398	0,2060
autumn	0,0236	0,0266	0,1570	0,0775	0,5090**	-0,3720	0,2690	-0,2100	-0,4780	-0,0251	0,0229	-0,0455	0,0532
dec	0,0500	0,3030	0,6840**	0,0932	0,2880	-0,1060	0,2970	0,1570	0,6330	0,5470**	0,0284	0,6120**	0,3390
jan	0,0149	0,1990	0,6130**	-0,4160	0,2390	0,3460	0,0755	0,0226	0,3150	0,2470	0,0552	0,3940	0,0234
Constant	-0,0403	0,0444	-0,1340	-0,1010	-0,0512	0,1630	-0,1390	0,2950	0,7560**	0,1520	0,0674	0,1350	-0,1050
Observations	1560	1850	832	1044	239	836	970	873	679	829	824	808	345
R-squared	0,01	0	0,04	0,02	0,07	0,02	0,02	0,01	0,02	0,03	0,02	0,03	0,02

* significant at 10%; ** significant at 5%; *** significant at 1%

Table G2. Number of significant weather coefficients in OLS regressions.

	Slovakia	Romania	Hungary	Ukraine	Slovenia	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	Croatia	**Total**
wind_up														
wind_down							1			1				**2**
doud_up														
doud_down														
pressure_up														
pressure_down														
precipit_up			1			1								**2**
precipit_down														
humidity_up										1				**1**
humidity_down												1		**1**
temp_up										1		1		**2**
temp_down														
visibility_up	1		1											**2**
visibility_down														
Total	**1**		**2**			**1**	**1**			**3**		**2**		

Table G3. GARCH Results

	Dependent Variables, Index Returns, %											
	Slovakia	Romania	Hungary	Ukraine	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	Croatia
wind_up	-0,0086	-0,0465	-0,0752	0,1030	-0,1490**	0,0401	-0,0119	-0,0872	-0,0012	-0,0338	0,0053	0,0917
wind_down	0,0130	-0,0222		0,0869	-0,0847	-0,0967	-0,0753	-0,0618	-0,0938	0,0040	0,0133	
cloud_up	-0,0172		-0,0703			0,0195	-0,0437	-0,0486	-0,0316	0,0615	-0,0791	0,0466
cloud_down	-0,0388	0,0242	-0,0923	0,0295	-0,0560	0,0126	-0,0043	-0,0806	0,0343	0,0001	0,0078	0,0536
pressure_up			0,2110	-0,1030	0,1480	0,1930	-0,0404	0,0564	-0,3010	0,0270	-0,0840	0,0110
pressure_down	-0,1090	0,0225	0,1840		0,1700	0,0671	-0,0463	-0,0337	-0,3420	-0,0789	-0,1190	
precipit_up	-0,0181	-0,0102	0,1270**	0,0037	-0,1150	0,0546	-0,0424	-0,1280	0,0669	0,0085	0,0154	0,1180
precipit_down					0,0118							
humidity_up	0,1030	-0,0256	-0,1050	0,1280	0,2670	-0,1500	-0,0761	-0,1850	-0,1450	0,1210	0,0998	-0,4190***
humidity_down	0,1280	-0,0024	-0,0279	0,1100	0,1430		0,0393	-0,3750**	-0,0068	0,0945	0,2120	-0,4390***
temp_up	-0,0572	-0,1010	-0,0092	0,1790	-0,0374	0,0298	-0,0406	-0,4360***	-0,1470*	-0,0345	-0,1380	0,0993
temp_down	0,0143	-0,0526	-0,0582	0,3040***	-0,0546	0,0198	0,0602	-0,2080*	-0,0478	-0,0042	-0,0053	-0,0868
visibility_up	0,0938**	0,0207	0,2200***		-0,0514	-0,0504	-0,0206	0,0611	0,1050	-0,0161	0,1310	0,0654
visibility_down	-0,0154	-0,0175	0,0419	-0,2270*	-0,1360	-0,0155	0,0234	0,1940**	-0,0882	0,0494	0,0226	-0,0795
winter	-0,0194	-0,1200	-0,1810	0,6720**	0,1380	0,1700	0,0935	-1,3500***	-0,3610	0,1220	-0,4110	0,2270
spring	0,0067	-0,1070	0,2670	0,4960***	0,1300	0,2290	0,0426	-0,7010***	-0,1110	0,1070	-0,0014	0,1050
autumn	0,0754	-0,0992	0,2010	0,1340	-0,2480	0,2940*	0,0291	-0,6890***	-0,0664	0,0635	-0,0210	0,2140
dec	0,0640	0,1480	0,6460**	0,6540**	0,0494	0,3490	0,1100	0,7170**	0,5410**	0,0511	0,6140*	0,5920
jan	-0,0192	0,0624	0,6580**	-0,4630	0,1010	0,1250	0,0196	0,2160	0,2280	0,0701	0,3530	-0,2880
Constant	-0,0258	0,1900*	-0,1480	-0,0347	0,2340	-0,1350	0,0197	0,9070***	0,2370*	0,0187	0,1230	-0,1210
Observations	1560	1850	832	1044	836	970	873	679	829	824	808	345

* significant at 10%; ** significant at 5%; *** significant at 1%

Table G4. Number of significant weather coefficients in GARCH regressions.

	Slovakia	Romania	Hungary	Ukraine	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	Croatia	**Total**
wind_up					1								**1**
wind_down													
cloud_up													
cloud_down													
pressure_up													
pressure_down													
precipit_up			1										**1**
precipit_down													
humidity_up												1	**1**
humidity_down								1				1	**2**
temp_up								1	1				**2**
temp_down				1				1					**2**
visibility_up	1		1										**2**
visibility_down				1				1					**2**
Total	**1**		**2**	**2**	**1**			**4**	**1**			**2**	**13**

APPENDIX H. Model with NYC Weather and S&P 500 Index

Table H1. OLS Results.

	Dependent Variables, Index Returns, %												
	Slovakia	Romania	Hungary	Ukraine	Slovenia	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	Croatia
wind_up	-0,0143	0,0155	-0,0543	0,1150	-0,0907	-0,0545	0,0249	0,0491	-0,1410*	-0,0287	-0,0129	0,0220	0,0363
wind_down	0,0141	0,0111		0,0274		-0,0003	-0,1250*	-0,0730	0,0276	-0,0906*	0,0201	0,0493	
cloud_up	0,0134		-0,0374		-0,0375		0,0275	-0,0766	-0,0958	-0,0061	0,0524	-0,0758	-0,0325
cloud_down	-0,1040	0,0323	-0,0667	0,0758		-0,0241	0,0312	-0,0618	-0,1870*	0,0243	-0,0127	-0,0225	0,0129
pressure_up			0,1680	-0,1850	0,1230	0,2150	0,0760	-0,0562	0,1970	-0,0134	-0,1350	0,0185	-0,2480
pressure_down	-0,2340*	-0,0036	0,1270		0,0455	0,2080	0,0352	-0,1080	0,1320	-0,0755	-0,2200*	-0,0405	0,0000
precipit_up	-0,0059	0,0104	0,1510***	-0,0195	0,0380	-0,1210	0,0676	-0,0739	-0,0925	0,0712	-0,0140	0,0018	0,0175
precipit_down					-0,0808	-0,0608							
humidity_up	0,2050	0,0411	-0,0447	0,1070	0,0750	0,0173	-0,0226	0,1170	-0,0273	-0,1810*	0,1340*	0,1080	0,1760
humidity_down	0,1670	0,1110	-0,0516	0,0621	0,0377	-0,0804		0,2220	-0,2840	-0,0645	0,0869	0,2240*	0,1780
temp_up	-0,0293	-0,0694	0,0024	0,1230	0,1130	0,0510	0,0788	0,0616	-0,2560	-0,1700**	0,0150	-0,1070	0,1510
temp_down	0,0678	0,0021	-0,0831	0,0678	0,0133	-0,0308	0,0578	0,0336	-0,0358	-0,0350	-0,0278	0,0049	-0,0690
visibility_up	0,1410**	-0,0038	0,2210**			0,0306	-0,0156	0,0133	-0,0102	-0,0423	-0,0343	0,1320	0,1270
visibility_down	0,0292	-0,0854	-0,0004	-0,1020	-0,0845	-0,0839	0,0123	0,0676	0,0868	-0,1770*	0,0467	0,0442	-0,0036
winter	0,1360	0,1490	0,1820	0,4710	0,0822	0,2960	0,2460	-0,3490	-1,0500*	-0,1550	0,1520	-0,3220	-0,1160
spring	0,0092	0,1240	0,4080**	0,3180	0,0548	0,3210	0,2180	-0,3340	-0,6780	-0,0098	0,1300	-0,1070	-0,1450
autumn	0,1200	0,1650	0,3550*	-0,0191	0,4430*	0,0474	0,3810**	-0,2930	-0,5340	0,0290	0,0660	-0,1040	-0,2390
dec	0,0324	0,2530	0,6540**	-0,0069	0,3160	-0,0782	0,3310	0,1860	0,6730	0,5980***	0,0470	0,5660**	0,3460
jan	-0,1310	0,0740	0,5960**	-0,4760	0,7600*	0,3450	0,0605	-0,0162	0,2110	0,2440	0,0702	0,4720*	0,1500
spx_ret	0,5230***	0,0196	0,2080***	-0,0638	-0,1050	0,3780***	0,2320***	0,0771	-0,0351	-0,0063	-0,0483*	0,2440***	0,0503
wind_ny_up	0,0119	0,0171	-0,0704	0,0724	0,0438	-0,1660	0,0034	0,0096	-0,1720	-0,0485	0,0270	0,0303	0,0268
wind_ny_down	-0,0098	0,0135		0,0549	-0,0142		0,0217	-0,0395	0,0058	0,0555	-0,0593	0,0628	0,0003
cloud_ny_down	0,0824	0,0060	-0,0782	0,0872	0,0634	0,0892	0,0304	0,1170	0,0285	-0,0216	-0,0066	0,0336	0,0945
cloud_ny_up	0,0747	0,0198	0,0631	-0,0228	-0,0301		0,0947	0,1780**	-0,1620	0,0908	-0,0160	0,1340*	
pressure_ny_up	0,1870	-0,4530**	-0,0063	-0,7890**	-0,2270	-0,0772	-0,0853	0,2120	0,1910	0,0548	0,1290	-0,2220	0,1320
pressure_ny_down	0,2150	-0,4730**	-0,0475	-0,7760**	-0,2780	-0,2140	-0,0218	0,2650	0,2900	0,1130	0,1080	-0,2540	0,0025
humidity_ny_up	-0,2370	0,0933	-0,1830	0,1340	-0,2410	-0,2150	-0,2250**	0,1260	-0,1050	-0,1100	-0,1260	0,1670	0,2690
humidity_ny_down	-0,1430	0,1220	-0,1400	0,1830	-0,3260*	-0,1390	-0,2430**	0,1310	0,0943	-0,1380	-0,1100	0,1230	0,1070
temp_ny_up	0,0763	0,0523	0,0480	-0,0411	-0,0781	0,1010	0,0753	-0,1480	-0,0587	0,0187	-0,0208	-0,0086	-0,2600
temp_ny_down	0,0651	-0,0115	0,1750*	-0,0420	0,2090**	-0,1100	0,0052	-0,0390	-0,0830	0,0561	0,0379	0,0985*	-0,0450
visibility_ny_up	-0,1300	-0,0161	0,0667	0,1010	-0,0660	-0,0200	0,0014	-0,1930	-0,1820**	-0,0893	-0,0786	-0,0972	0,0622
visibility_ny_down	-0,0719	0,0011	0,0980	-0,0248	-0,1640**	-0,0152	0,0439	-0,0884	-0,0352	0,0057	0,0085	-0,0812	-0,0329
Constant	-0,1270	-0,0409	-0,2930*	-0,0192	0,1020	-0,1460	-0,1720	0,4030**	0,824**	0,0461	0,0385	0,1350	0,2000
Observations	1034	1536	791	966	229	782	922	841	661	808	799	789	342
R-squared	0,18	0,01	0,08	0,03	0,17	0,08	0,07	0,03	0,04	0,05	0,04	0,09	0,05

* significant at 10%; ** significant at 5%; *** significant at 1%

Table H2. Number of significant weather coefficients in OLS regressions.

	Slovakia	Romania	Hungary	Ukraine	Slovenia	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	Croatia	**Total**
wind_up									1					**1**
wind_down							1			1				**2**
cloud_up														
cloud_down									1					**1**
pressure_up														
pressure_down	1										1			**2**
precipit_up			1											**1**
precipit_down														
humidity_up										1	1			**2**
humidity_down												1		**1**
temp_up										1				**1**
temp_down														
visibility_up	1		1											**2**
visibility_down										1				**1**
wind_ny_up														
wind_ny_down														
cloud_ny_down														
cloud_ny_up								1				1		**2**
pressure_ny_up		1		1										**2**
pressure_ny_down		1		1										**2**
humidity_ny_up							1							**1**
humidity_ny_down					1		1							**2**
temp_ny_up														
temp_ny_down			1		1							1		**3**
visibility_ny_up									1					**1**
visibility_ny_down					1									**1**
Total	**2**	**2**	**3**	**2**	**3**		**3**	**1**	**3**	**4**	**2**	**3**		

Table H3. GARCH Results with NYC Weather and S&P 500 Index.

	Dependent Variables, Index Returns, %										
	Slovakia	Romania	Hungary	Ukraine	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland
wind_up	-0,0070	-0,0351	-0,0731	-0,0412	-0,0696	0,0442	0,0382	-0,0663	0,0053	-0,0235	0,0118
wind_down	0,0502	-0,0074		-0,0610	0,0021	-0,0805	-0,0350	0,0159	-0,0775	0,0163	0,0400
doud_up	0,0148		-0,0284			-0,0028	-0,0474	-0,0282	-0,0114	0,0552	-0,0858
doud_down	-0,0499	0,0232	-0,0473	0,1050*	-0,0181	0,0241	-0,0171	-0,1780*	0,0419	-0,0062	-0,0137
pressure_up			0,1620	-0,0767	0,1580	0,1360	-0,2010	-0,5310	-0,1100	0,0059	0,0219
pressure_down	-0,2220**	0,0132	0,1490		0,1870	0,0376	-0,2230*	-0,5700	-0,1520	-0,0936	-0,0222
precipit_up	-0,0048	0,0011	0,1470**	0,0109	-0,1030	0,0600	0,0041	-0,0945	0,0710	0,0094	0,0079
precipit_down					-0,0011						
humidity_up	0,1360	-0,0031	-0,0645	-0,1450	-0,0173	-0,0978	-0,2700*	-0,0661	-0,1470	0,1440	0,1160
humidity_down	0,1240	0,0276	-0,0614	-0,0977	-0,0470		-0,1130	-0,3470**	-0,0040	0,1050	0,2250
temp_up	-0,0388	-0,0908	0,0074	-0,0071	0,0765	0,0547	-0,1400	-0,3680***	-0,1730*	-0,0122	-0,0732
temp_down	0,0699	0,0309	-0,0873	-0,2170***	-0,0917	0,0270	0,0371	-0,2020*	-0,0377	-0,0147	0,0147
visibility_up	0,1680***	0,0123	0,2610***		0,0447	-0,0332	-0,1250***	-0,1070	0,0468	-0,0208	0,1340
visibility_down	0,0378	-0,0703	0,0213	0,0388	0,0263	0,0159	0,0272	0,0564	-0,1560	0,0512	0,0461
winter	-0,0193	0,1040	0,2200	0,4010	0,1890	0,1800	0,0463	-1,2500***	-0,1850	0,0764	-0,2930
spring	0,0437	0,0241	0,3940*	0,2110	0,3090	0,1700	0,2290	-0,4390	-0,0207	0,0854	-0,0846
autumn	0,1550	-0,0222	0,3770*	-0,0877	0,0601	0,3370*	0,0855	-0,4220	0,0062	0,0738	-0,0774
dec	0,1660	0,0619	0,5770*	-1,2500***	-0,0049	0,3600	0,2130	0,9020***	0,5740**	0,0771	0,5470*
jan	-0,1190	-0,1470	0,5280*	-0,8170***	0,3300	0,0346	-0,0713	0,4350	0,2530	0,0757	0,4320
spx_ret	0,5500***	0,0132	0,2160***	-0,0653	0,3350***	0,2240***	0,0417	-0,0089	-0,0074	-0,0443*	0,2310***
wind_ny_up	0,0241	0,0466	-0,0607	0,0685	-0,1730*	0,0407	0,0040	-0,0453	-0,0426	0,0679	0,0428
wind_ny_down	0,0075	-0,0060		0,0384		0,0347	-0,0324	0,0557	0,0467	-0,0436	0,0661
doud_ny_down	0,1060	0,0025	-0,1010	0,2270***	0,0686	-0,0073	0,0963**	-0,1580	-0,0150	-0,0413	0,0551
doud_ny_up	0,0093	-0,0522	0,0616	0,1280		0,0936	0,1990***	-0,1670	0,1210*	-0,0019	0,1400*
pressure_ny_up	0,3530*	-0,6440***	-0,0057	-0,5820	-0,0546	-0,0283	0,1440	0,2390	-0,0260	0,0272	-0,2130
pressure_ny_dow	0,3670*	-0,7170***	-0,0440	-0,5470	-0,1440	0,0086	0,3110**	0,2170	0,0230	-0,0024	-0,2420
humidity_ny_up	-0,2650*	0,0856	-0,2400	0,0540	-0,0343	-0,2260**	-0,1530	0,2000	-0,0697	-0,0946	0,1520
humidity_ny_do	-0,1450	0,1160	-0,1940	0,2020	0,0063	-0,2180**	-0,1410	0,2630	-0,1390	-0,0809	0,1160
temp_ny_up	0,0689	-0,0170	0,0438	-0,1620	0,1010	0,0178	-0,0951	-0,0229	0,0836*	-0,0394	-0,0297
temp_ny_down	0,0459	0,0746	0,1860*	-0,2010*	-0,1340	-0,0015	-0,0776	0,0510	0,0594	0,0425	0,1080*
visibility_ny_up	-0,1340	0,0068	0,0237	-0,0950	-0,0218	-0,0474	-0,4460***	0,1030**	-0,0494	-0,0761	-0,1170
visibility_ny_dow	-0,1010	0,0272	0,0516	-0,1070	-0,0380	0,0399	-0,2380**	0,0242	0,0034	0,0186	-0,0870
Constant	-0,0788	0,1140	-0,2900*	0,1170	-0,0702	-0,1230	-0,1230	0,5800**	0,1210	0,0350	0,1330
Observations	1034	1536	791	966	782	922	841	661	808	799	789

* significant at 10%; ** significant at 5%; *** significant at 1

Table H4. Number of significant weather coefficients in GARCH regressions.

	Slovakia	Romania	Hungary	Ukraine	Russia	Czech	Latvia	Bulgaria	Estonia	Lithuania	Poland	**Total**
wind_up												
wind_down												
doud_up												
doud_down				1				1				**2**
pressure_up												
pressure_down	1						1					**2**
precipit_up			1									**1**
precipit_down												
humidity_up							1					**1**
humidity_down								1				**1**
temp_up								1	1			**2**
temp_down				1				1				**2**
visibility_up	1		1				1					**3**
visibility_down												
wind_ny_up					1							**1**
wind_ny_down												
doud_ny_down				1			1					**2**
doud_ny_up							1		1		1	**3**
pressure_ny_up	1	1										**2**
pressure_ny_down	1	1					1					**3**
humidity_ny_up	1					1						**2**
humidity_ny_down						1						**1**
temp_ny_up									1			**1**
temp_ny_down			1	1							1	**3**
visibility_ny_up							1	1				**2**
visibility_ny_down							1					**1**
Total	**5**	**2**	**3**	**4**	**1**	**2**	**8**	**5**	**3**		**2**	