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INTRADAY AND INTRAWEEK TRADE ANOMALIES ON THE CZECH STOCK MARKET

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Abstract

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The paper examines intraday and intraweek market returns on the Czech stock market for the search of time and seasonal anomalies in its activities during the last ten years. Existence or absence of anomalies indicates the efficiency of the market. A group of regression models and GARCH (1,1) model is used for the analysis of daily and high frequency data of the PX index. Time varying nature of market seasonalities is revealed with the Czech equity market having implications for changing efficiency over the studied period, when the Czech Republic's accession to the EU implied the increase in efficiency and the global financial crisis led to opposite results and regularities, which are not yet fully overcomed. Additionally, significant hour-of-the-day effect (open jump effect) in the index returns is established.

stock market, stock returns, day-of-the-week effect, intraday effects, market efficiency

Stock market of the Czech Republic, which economy is probably the best example of the successful transformation, is of particular interest to global investors and academic researches. Nevertheless, the question of stock market efficiency in the Czech Republic is not considerably studied and verified, but still extremely important for an understanding of how this capital market works. In this paper, we test the efficiency of the Czech stock market through the existence or absence of intraweek and intraday patterns in its returns for the last ten years.

The concept of stock market efficiency for the following study is determined by the efficient market hypothesis, firstly introduced by Fama (1970). The hypothesis suggests that all traded securities are priced effectively by the market to reflect the whole range of available and hidden information of their intrinsic value at any time. However, the hypothesis cannot explain some anomalies, among which seasonalities or calendar anomalies are well documented and perhaps the best-known examples of inefficiencies in financial markets (Mitchell and Lian Ong, 2006). Returns can be significantly higher or lower in some part of day (hour-of-the-day effect, open jump effect, final jump or end of session effect), on some day of week (day-of-the-week effect, weekend effect, or more specifically Monday and Friday effects) or at some month in year (turn-of-the-month effect) (Thaler, 1987). Such anomalies violate the weak form of market efficiency since asset prices become predictable, and investors could apply a trading strategy solely based on past price patterns of abnormal returns.

The aim of the paper is to determine possible intraweek and intraday trade anomalies on the Prague Stock Exchange, assuming that it uncovers inefficiency of the market. Existence of intraweek and intraday patterns on the Czech stock market reflects a greater opportunity for global investors. On the other hand, we assume that a gradual change of the Czech market from the emerging to the developed one had eliminated the market anomalies. At the same time the influence of the global financial crisis on the market efficiency should not be overlooked.

An overview of the Czech stock market

Even if the importance of the stock market to the economy is well proved and non-arguable, the necessity of having stock market in every small open economy of the European Union, undergoing financial integration of a high degree, is absolutely unclear. Koke and Schroder (2003) suggest that

Central Europe stock exchanges (with exception of the Warsaw Stock Exchange) are underdeveloped and less important to the domestic economies. The same problem could be stated for the Czech stock market of recent years in particular, which ability to allocate capital resources is highly questionable due to clear patterns in its evolution.

A rapid growth of the Czech equity market has been mainly driven by the accession to the European Union and following inflows of foreign direct investments. Stock trading activity statistics (Tab. I) also indicate that since the outburst of the global financial crisis the market was struggling to grow again with trade value and market capitalization plunging back to the pre-accession era.

The number of listed companies is small, while trading is dominated by only few (banks, telecom, power generating companies). Also large companies are usually listed on other stock exchanges, e.g. London (CEZ, Komerční Banka and Unipetrol in MTF, and NWR in regulated market). This is typical for markets of the Eastern European countries, which are illiquid and so far served simply for privatization purposes (Allen *et al.*, 2004). An unspoken opinion, that stock market in transition economies represented nothing more than a potent symbol of capitalism might be even found in some studies, when shaky investor confidence and discussable role of successful IPOs since the stock market opening are named among the main problems (Bonin and Wachtel, 2003).

Czech stock market is small and illiquid in comparison with the neighbouring markets (see Tab. II). Not only it is small as compared with the most developed European financial markets (like Germany), its both size and activity are usually lower than the values recorded in countries with similar level of economic development (e.g. Poland).

An international integration of the small economies stock exchanges could improve the integration of listed companies into international markets. The Czech stock market took that step in 2008, becoming a member of CEE (Central and Eastern European) Stock Exchange Group, which has equity interests in three more countries with the leadership of the Vienna Stock Exchange. Supposedly, this consolidation process of financial markets of several small open economies would raise the weight of their financial systems in the global context. However, its outcomes and perspectives are not-widely promoted and as in 2011 still unclear. In this research we take this consolidation process as a part of the most recent phase of the Czech market development.

Literature Review

The amount of research in the area of calendar and time anomalies on the capital markets is immense, frequent and deliberate, probably making it one of the most heavily researched topics in the financial market theory. Evidence of such effects is well documented and established for the majority of developed stock markets. However, no season or time effects have been acknowledged on the developed markets since 1987, drawing attention to the importance of financial crises to gradually increase market efficiency. More recent research also shows the effects moving to other days in the week (other than Monday and Friday), reversing and vanishing (Philpot and Peterson, 2011).

For the purposes relevant to our study, we should take into consideration some recent results from

I: *Trading activity on the Prague Stock Exchange*

Indicator	2001	2003	2005	2007	2009	2011
Total trade value, bln. CZK	128.80	257.44	1 041.17	1 013.02	463.86	370.99
Average daily trade value, mln. CZK	515.20	1 025.67	4 115.31	4 052.08	1 855.44	1 466.35
Trade volume, mln. pieces	546.54	830.77	1 764.88	983.92	967.80	637.17
Market capitalization*, bln. CZK	340.25	644.48	1 330.81	1 841.68	1 293.48	1 060.77
Number of issues*	102	65	39	32	25	26

Source: Prague Stock Exchange
Note: * as of December, 31st

II: *Major market characteristics of chosen countries at the end of 2010*

Indicator	Czech Republic	Germany	Poland	Austria
GDP, mln. US$	192 032,1	3 280 529, 8	469 440,1	379 069,3
Number of listed stocks	16	571	569	72
Market capitalization, mln. US$	43 055,6	1 429 706,7	190 234,9	67 682,8
Market capitalization as % of GDP	22,4	43,2	40,6	17,9
Market turnover, mln. US$	14 082,5	1 405 037,1	77 463,9	48 117,4
Market turnover as % of GDP	7,3	42,5	16,5	12,8
Market liquidity, %	32,7	98,3	40,7	71,1

Source: World Development Indicators (The World Bank)

the studies conducted on the European emerging markets only and the Czech stock market specifically.

Ajayi *et al.* (2004) focus on day-of-the-weekend return anomaly based on major market indices in eleven Eastern European countries. Their results indicate negative Monday returns in six of eleven emerging markets and positive market returns in remaining five with three of them being statistically significant. Holden (2005) focuses on weekend effect in several European markets (including the Czech Republic) with allowances for the 1987 Stock Market Crash and the events of September 2001. His results give no evidence of the existence of trade patterns. Tonchev and Kim (2004) find very week support for five different types of calendar effects in the newly developing financial markets of the Czech Republic, Slovakia and Slovenia. Stoica and Diaconasu (2011) analyse day-of-the-week effect on the Central European stock markets between 2000 and 2010 with different results depending on the time period (pre- and post-accession to the European Union). For the Czech market, they establish negative Monday effect in whole period and sub-periods, positive Wednesday effect for pre-accession sub-period and whole period, and positive Friday effect for post-accession sub-period and whole period. The hypothesis of greater market efficiency after the accession to the EU for the majority of new union members is rejected. However, the study by Guidi *et al.* (2011) with similar research objectives comes to the exactly opposite results.

Hajek (2007) tests Efficient Market Hypothesis (in a weak form) on the Czech capital market in the years 1995–2005 using PX-50 and PX indices. He suggests that the Czech market is relatively less effective than other developed markets.

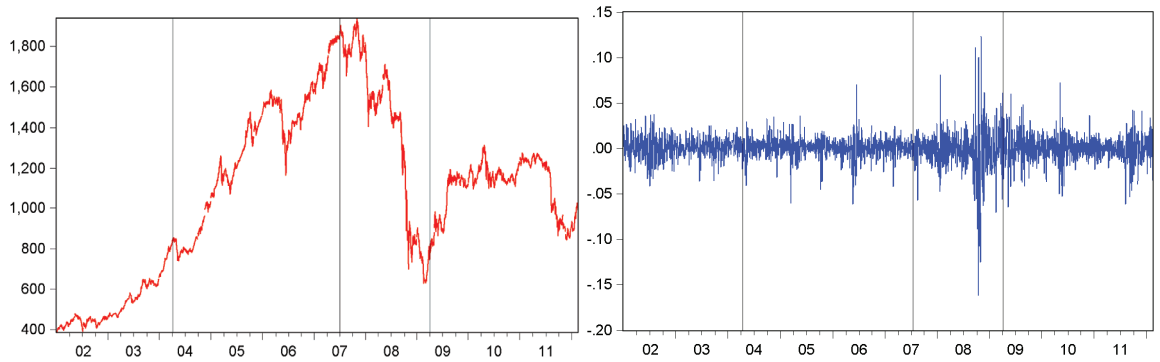
Even though the research in this area is comparatively extensive, we could find only few studies addressing the impact of recent global financial crisis on the existence of market anomalies. Hourvouliades and Kourkoumelis (2009) analyse day-of-the-weekend effect during the financial crisis in five emerging and one developed European markets. Their results show mixed evidence depending on a different level of maturity and interdependence.

Main differences in research results are originated in different methods, different regions and time periods. Therefore, the outcomes are logically incomparable and sometimes contradictory, but overall reveal presumptive notion of emerging markets being inefficient to some degree. Supposedly, the main reason for contradictory results driven from different studies is the choice of time intervals. Shorter time intervals give more precise and robust results, since larger intervals are not reflecting changes in investors' behavior, macroeconomic situation, and institutional and regulatory requirements. There is also question of fixity in day seasonality. Most studies are based on assumption that seasonality is steady for over time but the pattern of day seasonality within a market can shift over time (Doyle et al. 2009). Hence, the issue of time varying nature of possible market anomalies is to be addressed in our study.

Data

The overall performance of the Czech stock market is measured by the PX index, which is a market capitalization-weighted index. Our empirical analysis is based on two datasets for PX index: daily data from January 2nd, 2002 till February 13th, 2012 and the 5-minute data from August 2nd, 2011 till February 13th, 2012. The dataset is gained from Bloomberg, which, unfortunately, imposes some limitations on the period of high-frequency intraday data (only observations for last 120 trading days are available). Nevertheless, it allows us to capture trading patterns in the most recent market situation with Czech economy falling into stagnation.

In order to the address the possibility of intraweek trade patterns changing over time, total sample period was divided into four sub-periods according to some major economic and financial changes in the Czech Republic and Europe. The sub-periods are pre-EU-accession period (January 2nd, 2002–April 30th, 2004), pre-crisis period (May 5th, 2004–June 29th, 2007), crisis period (July 2nd, 2007–March 31st, 2009), and post-crisis period (April 1st, 2009–February 13th, 2012). We believe that this periodization gives us a better perspective of the



1: *PX Index Movement (on the left) and Daily Returns (on the right)*

III: *Descriptive statistics for daily log returns of PX index*

Statistics	All days	Monday	Tuesday	Wednesday	Thursday	Friday
Observations	2 543	503	510	509	510	511
Mean	0.000377	0.000865	–0.000501	0.001029	0.001141	–0.000641
Median	0.000881	0.001484	–0.000270	0.001271	0.001373	0.000475
Minimum	–0.16185	–0.08837	–0.07037	–0.08287	–0.06274	–0.16185
Maximum	0.12364	0.09955	0.10035	0.12364	0.08772	0.11093
Std. deviation	0.015738	0.016644	0.014102	0.015595	0.015705	0.016490
Skewness	–0.54839	–0.23429	0.17370	0.10436	0.38846	–2.6911
Kurtosis	15.90867	9.55718	9.65887	12.96926	8.28963	33.0817

IV: *Descriptive statistics for each hour (half-hour) of 5-minute intraday data*

Statistics	Observations	Mean	Std. deviation	Skewness	Kurtosis
Full sample	11 931	–0.000012	0.001679	–2.531806	158.2083
09.10–10.00	1 495	–0.000078	0.003952	–1.486347	40.54265
10.00–11.00	1 632	0.000011	0.000992	–1.165329	21.17316
11.00–12.00	1 632	0.000005	0.000879	0.006389	14.14093
12.00–13.00	1 632	–0.000014	0.000773	0.549357	16.69541
13.00–14.00	1 629	0.000003	0.000835	1.139841	44.24558
14.00–15.00	1 620	–0.000020	0.000955	0.215161	14.90297
15.00–16.00	1 620	–0.000022	0.001088	–0.133319	8.980611
16.00–16.25	672	0.000050	0.001699	–0.482543	13.96622

general situation in the market and fully represents investors' anticipations, since after-accession periods denote clearly observed trends in the stock market. We chose the crisis period to not start with the Lehman bros. bankruptcy and major panic on the markets, we would like to capture prior anticipations, when the banking crisis changed the comfort expectations of investors.

Market returns are calculated as a logarithmic first difference of the PX index closing prices for each trading day (or each 5-minute interval) in the chosen periods.

Tab. III reports the preliminary statistics for the returns on the each day of the week as well as for the returns of the entire period. Mean values of returns are negative on Fridays and Tuesdays and positive otherwise. Standard deviations of returns are relatively equal on each day of the week. According to the small skewness and higher than normal kurtosis measures, the return distributions for all days are non-normal. Alternatively, this implies that there exist opportunity for investors to benefit from abnormal returns.

Some patterns of normal distribution are observed for the high-frequency data (Tab. IV), the returns are almost symmetric with fat tails and substantial peak at a mean value. 5-minute interval returns are left-skewed. Mean returns at the beginning of trading session are negative and positive at the end.

METHODOLOGY

The extensive literature on the subject provides several methodological opportunities on which market anomalies research might be designed. The common approaches to test time and season abnormalities are ordinary least square regressions of index returns against the set of dummy variables (usually with some corrections to avoid autocorrelation and heteroskedasticity), ARCH/GARCH family (autoregressive conditional heteroskedasticity) models which are exercised to evaluate yield volatility, and different statistical tests, such as analysis of variance (ANOVA) and Kruskal-Wallis test. We chose several commonly used methods with some minor enhancements to test calendar and time patterns on the Czech stock market. First we propose methodology for the study of daily data first and then for high-frequent data. Each procedural set includes four models.

First model represents standard approach to investigate the-day-of-the-week effect, where index returns are regressed against five daily dummy variables. Lag values of the return variable are included to the equation to eliminate the possibility of having autocorrelated errors. Model specification can be written as follows:

$$r_t = \beta_1 MON_t + \beta_2 TUE_t + \beta_3 WED_t + \beta_4 THU_t +$$

$$+ \beta_5 FRI_t + r_{t-1} + \varepsilon_t.$$

Dummy variables are equal to 1, if it is the day it is representing and 0 otherwise. Error term ε_t has a normal distribution with variance $\sigma_t(\varepsilon_t \sim (0, \sigma_t^2))$.

We could not ignore a possibility that returns on the each day of the week could correlate with the same day of the previous week. Therefore, to avoid autocorrelation of higher degree, we include ARMA terms as a simple robustness test (in spirit of Doyle and Chen, 2009). The inclusion of ARMA (20,1) terms shows whether day anomalies in the market appears within the short-term memory of chosen ARMA window – one month:

$$r_t = \beta_1 MON_t + \beta_2 TUE_t + \beta_3 WED_t + \beta_4 THU_t + \\ + \beta_5 FRI_t + \sum_{k=1}^{20} r_{t-k} + \varepsilon_t. \quad (2)$$

In order to address dependability of the Czech stock market we include log returns of DAX (Frankfurt Stock Exchange) and WIG (Warsaw Stock Exchange) indices. German and Polish stock markets are chosen due to a proven significant long-run relations between three markets reported by Voronkova (2004), Gilmore *et al*. (2005) and many others.

$$r_t = \beta_1 MON_t + \beta_2 TUE_t + \beta_3 WED_t + \beta_4 THU_t + \\ + \beta_5 FRI_t + \sum_{k=1}^{20} r_{t-k} + DAX_t + WIG_t + \varepsilon_t. \quad (3)$$

And, in order to address the problem of heteroskedasticity, we presume variances of error terms to be dependent over time, so that conditional heteroskedasticity is included. We employ Engle (1982) methodology, in which conditional variance σ_t depends upon the past squared residuals from the previous equation ($\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \gamma\sigma_{t-1}^2$). Here we model a time variance using a GARCH (1.1) process:

$$\sigma_t = \omega + \sum_{j=1}^{q} \alpha\varepsilon_{t-j}^2 + \sum_{j=1}^{q} \gamma\sigma_{t-j}^2. \quad (4)$$

The methodology for high-frequency data is designed in a similar manner. We regress 5-minute returns against the dummies for hours, adding lags of returns and log returns of German and Polish stock market indices in a consecutive order. Therefore, we have the third model for intraday data in a following form:

$$r_t = \sum_{i=1}^{\infty} \beta_i Hour_i + \sum_{k=1}^{n} r_{t-k} + DAX_t + WIG_t + \varepsilon_t. \quad (5)$$

An additional set of models is proposed to capture the changes that happen during the closure of the market. A dummy, that holds the difference between the close value of the index on previous day and the opening value, is included.

$$r_t = \sum_{i=1}^{5} \beta_i Open_i + \sum_{k=1}^{n} r_{t-k} + DAX_t + WIG_t + \varepsilon_t. \quad (6)$$

Proposed stepwise methodology allows us to report robust results of studied trade patterns in market returns.

RESULTS AND DISCUSSION

Estimation results for each day of the week from the full sample are reported in Tab. V (only statistically significant results for ARMA terms are included). There is no substantial evidence of day-of-the-week effect on the Czech stock market. However, the results of the same modeling for the each subsample (summarized in Appendix I) verify the hypothesis of trade pattern anomalies changing over time. The most significant day-of-the-week

V: *Day-of-the-week effects and stock market volatility for the full sample period*

	Variable	OLS_1	OLS_2	OLS_3	GARCH (1.1)
Return Equation	Monday	0.000895	0.000907	0.000067	0.000241
	Tuesday	–0.000571	–0.000595	–0.000414	–0.000337
	Wednesday	0.001082	0.000956	0.000834	0.000990**
	Thursday	0.001023	0.000991	0.000925	0.000537
	Friday	–0.000706	–0.000702	–0.001021	–0.000265
	Return $_{t-1}$	0.066877**	0.068684**	0.060234**	0.043294**
	Return $_{t-2}$	-	–0.068483*	–0.038268*	–0.031055*
	Return $_{t-3}$	-	–0.044213*	–0.053839***	–0.036212*
	Return $_{t-17}$	-	0.071344**	0.035196*	0.021311
	DAX return	-	-	0.233823***	0.200119***
	WIG return	-	-	0.590642***	0.460588***
Volatility Equation	ω (const)	-	-	-	0.000006***
	α (variance term)	-	-	-	0.139325***
	γ (volatility term)	-	-	-	0.817462***

Note: Here and further on *, ** and *** indicate significance at 10%, 5% and 1% level

VI: *Intra-daily hour effects*

Variable	OLS_1	OLS_2	OLS_3	GARCH (1.1)
09.10–10.00	–0.000078*	–0.000071*	–0.000099**	–0.000035
10.00–11.00	0.000011	0.000015	0.000017	0.000044**
11.00–12.00	0.000004	0.000004	0.000004	0.000001
12.00–13.00	–0.000014	–0.000012	–0.000005	–0.000012
13.00–14.00	0.000003	0.000005	0.000008	0.000005
14.00–15.00	–0.000020	–0.000017	–0.000015	–0.000028***
15.00–16.00	–0.000022	–0.000018	–0.000013	–0.000010
16.00–16.25	0.000050	0.000051	0.000059	–0.002582***
Return $_{t-1}$ (5 minutes)	-	0.089167***	0.086681***	0.154857***
Return $_{t-2}$ (10 minutes)	-	0.000447	0.010918	0.051011***
Return $_{t-3}$ (15 minutes)	-	0.036327***	0.036980***	0.037175***
DAX return	-	-	0.028844***	–0.003396*
WIG return	-	-	–0.038431***	–0.011534***
ω (const)	-	-	-	0.0000001***
α (variance term)	-	-	-	0.723327***
γ (volatility term)	-	-	-	0.486410***

VII: *Open jump effects on each day of the week*

Variable	OLS_1	OLS_2	OLS_3	GARCH (1.1)
Open Monday	0.000292	0.000262	–0.001391***	0.000785***
Open Tuesday	–0.001716***	–0.001695***	–0.001668***	–0.002454
Open Wednesday	–0.000142	–0.000147	–0.000025	–0.001047
Open Thursday	0.000152	0.000177	0.000866***	–0.000915***
Open Friday	–0.001522***	–0.001553***	–0.001889***	–0.001349***
Return $_{t-1}$ (5 minutes)	-	0.089286***	0.087535***	0.093938***
Return $_{t-2}$ (10 minutes)	-	0.001330	0.012298	–0.004931
Return $_{t-3}$ (15 minutes)	-	0.036653***	0.037799***	0.112979***
DAX return	-	-	0.027906***	0.006406***
WIG return	-	-	–0.036747***	–0.074919***
ω (const)	-	-	-	0.0000003***
α (variance term)	-	-	-	0.837225***
γ (volatility term)	-	-	-	0.666077***

effect in the market is found on Thursdays before the accession to the EU (GARCH model also disclosed addition anomaly on Wednesdays). However, the effect is vanished after the accession. Discovered existence of the weak form market efficiency in this period is consistent with the findings of Guidi *et al.* (2011). Surprisingly, the effect is resurfaced after the 2007 global financial crisis, undoubtedly demonstrating the problems the Czech stock market is currently facing. But contradictory results of different models may indicate that market is slowly restoring its efficiency to a previous level. On the other hand, index returns became more volatile and not correlated with the returns of previous days during and after the crisis. The dependability of the Czech market is recognized in the each period of market's development.

Tab. VI covers the findings of market trade patterns during the operating day. Open jump is significant and negative for the last six months of market activities. Final jump is also present in the estimation with considered volatility. It may be linked to the anticipation or reaction to the opening of North American markets (Strawinski and Slepaczuk, 2008). It might also be explained by the fact that the Prague Stock Exchange is opening and index is calculating a few minutes later, than other European stock exchanges, e.g. the Warsaw Stock Exchange and the Frankfurt Stock Exchange.

Attempting to capture patterns of market activities during the market closure, we further repeat our analysis with dummy variables for each day of the week. We found that there exists indefinite open effect on Mondays and Thursdays and negative effect on Tuesdays and Fridays. These

findings additionally prove that the open jump effect is present at each day of the week, except for Wednesdays.

Trading situation on the Czech stock market is changing approximately every twenty minutes, which is indicated by the correlation of index returns in both sets of intraday models. Czech stock market returns are also found to be dependent on the returns of German and Polish markets in the intraday trading. GARCH models imply that returns are positively related to its volatility.

CONCLUSIONS

Unconvincing performance of the Czech stock market after the global financial crisis rises the question of its efficiency. Even if we didn't find certain trade patterns in the PX index returns for the full sample of past ten years, revealed trade patterns in the smaller sample sub-periods do not allow us to state a weak-form efficiency of the Czech capital market. We could not distinguish any day-of-the-week effect, which is persistent through several periods of the research. Most of all, it indicates time varying nature of discovered market anomalies. As we previously presumed, market anomalies had disappeared with the further development of the market with the Czech stock market peaked its highest degree of efficiency after the accession to the EU and until the global financial crisis. Recent market situation might be described as transitional with possible restoring of market efficiency, since we have contradictory results from different model specifications. Intraday patterns of market returns imply the open jump effect, which is present at each day of the week, except for Wednesdays. Additionally, we documented evidence that the Czech stock market does not follow a random walk process. Dependence on German and Polish market is proven both on daily and intraday data.

The Czech stock market inefficiency in the information sense gives investors an opportunity of exploiting observed regularities, however, it is crucial to investigate market anomalies by different techniques on a regular basis. Further integration and consolidation of the stock markets in the Central European region may eliminate any displays of market inefficiency and should be studied in future researches.

SUMMARY

The article examines intraweek and intraday trade anomalies on the Prague Stock Exchange, which in the context of efficient market hypothesis are considered to be the indicators of market inefficiency. A group of regression and autoregressive conditional heteroskedasticity with dummy variables is employed to test the existence of the day-of-the-week effect and time jump effects during the trading day. Having daily data sample divided into four sub-periods according to major economic and financial changes in the Czech Republic and European Union, we established the time changing nature of market anomalies on the Czech stock market. Market efficiency of the Czech equity market is found to be the most efficient after the accession to the EU and until the global financial crisis and less efficient in its most recent developments with strong open jump effect revealed from the study of intraday data. However, contradicting results of different models could indicate that market is slowly restoring its efficiency to a previous level.

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Appendix I: *Day-of-the-week effects and stock market volatility*

		Variable	OLS_1	OLS_2	OLS_3	GARCH (1.1)
2/1/2002–30/4/2004	Return Equation	Monday	0.001749	0.001709	0.000603	0.000991
		Tuesday	–0.000218	–0.000415	0.000232	–0.000150
		Wednesday	0.001087	0.001249	0.001901	0.002211**
		Thursday	0.002371**	0.002879***	0.002199**	0.001799*
		Friday	0.001037	0.001085	0.000323	0.000662
		Return $_{t-1}$	0.027898	0.045533	0.033455	0.038770
		Return $_{t-2}$	-	0.011823	0.009118	0.000292
		Return $_{t-3}$	-	–0.072708	–0.066951*	–0.057626
		Return $_{t-17}$	-	0.093112**	0.073143**	0.0704294**
		DAX return	-	-	0.106230***	0.122389***
		WIG return	-	-	0.331431***	0.296342***
	Volatility Equation	ω (const)	-	-	-	0.000001
		α (variance term)	-	-	-	0.143603
		γ (volatility term)	-	-	-	0.728627***
3/5/2004–29/6/2007	Return Equation	Monday	0.000701	0.000809	–0.000348	0.000278
		Tuesday	0.001258	0.001337	0.001113	0.000706
		Wednesday	0.000352	0.000505	–0.000004	0.000264
		Thursday	0.001419	0.001431	0.000538	0.000785
		Friday	0.001008	0.001157	–0.000218	0.000257
		Return $_{t-1}$	0.082153*	0.084152*	0.082811**	0.058817**
		Return $_{t-2}$	-	0.013378	–0.039900	–0.032601
		Return $_{t-3}$	-	–0.036028	–0.047908	–0.053417
		Return $_{t-9}$	-	0.091591**	0.037042	0.037356
		DAX return	-	-	0.354055***	0.286189***
		WIG return	-	-	0.433301***	0.371592***
	Volatility Equation	ω (const)	-	-	-	0.000005*
		α (variance term)	-	-	-	0.122428**
		γ (volatility term)	-	-	-	0.807457***

		Variable	OLS_1	OLS_2	OLS_3	GARCH (1.1)
2/7/2007–31/3/2009	Return Equation	Monday	–0.000647	–0.001182	0.001943	0.001689*
		Tuesday	–0.002338	–0.002454	–0.001799	–0.002186*
		Wednesday	–0.000245	–0.000003	0.001455	0.000736
		Thursday	–0.002327	–0.002024	0.001719	0.000577
		Friday	–0.004173	–0.003898	–0.000199	0.001017
		$Return_{t-1}$	0.059772	0.061898	0.085188**	0.065862*
		$Return_{t-2}$	-	–0.107554	–0.027918	–0.007190
		$Return_{t-3}$	-	–0.041942	–0.083601**	–0.024106
		DAX return	-	-	0.413858***	0.359896***
		WIG return	-	-	0.718755***	0.526518***
	Volatility Equation	ω (const)	-	-	-	0.000006
		α (variance term)	-	-	-	0.157379**
		γ (volatility term)	-	-	-	0.815464***
1/4/2009–13/2/2012	Return Equation	Monday	0.001387	0.001576	0.000355	0.000008
		Tuesday	–0.001745	–0.001643	–0.001917**	–0.001678**
		Wednesday	0.002647**	0.002243*	0.000812	0.000731
		Thursday	0.001507	0.001333	0.001452*	0.000204
		Friday	–0.001915*	–0.001827	–0.001767**	–0.000961
		$Return_{t-1}$	0.072433	0.073564	0.056441*	0.041060
		$Return_{t-2}$	-	–0.087142	–0.038471	–0.044088
		DAX return	-	-	0.219411***	0.234463***
		WIG return	-	-	0.584365***	0.565313***
	Volatility Equation	ω (const)	-	-	-	0.000006*
		α (variance term)	-	-	-	0.148338***
		γ (volatility term)	-	-	-	0.796237***

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