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TESTING THE IMPACT OF QUARTERLY RESULTS AND ANALYSTS' EXPECTATIONS ON PRICES OF SELECTED EQUITIES

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Abstract. The aim of the article is to find the relationship between the growth and decline in the share price during the promulgation period of quarterly results of companies and surprise, either positive or negative in the quarterly results. Quarterly results are compared with the forecasts of analysts who publish their forecasts for quarterly results at Thomson Reuters and Bloomberg. Relationship is confirmed statistically, where stock returns in the period is the dependent variable, independent variables are three – return of the corresponding market index, excess impact – measure of surprise in quarterly results in comparison with analysts' estimates and VIX index. Linear regression is used for testing of return and GARCH model is used for testing of volatility, there is focus on adaptation of actual volatility to the long-term average volatility after accidental shock.

Keywords: quarterly results, shares' return, analysts' estimates, stock exchange.

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JEL classification: C120, C190, G140.

1. Introduction

In this paper I have tried to find and statistically validate certain dependence on the share price announcement of quarterly results, specifically in response to the fact that the declared results are worse or better than analyst expectations were and what is the reaction of the share price of such surprise.

The main objective of this work was to identify and validate a statistical dependence of shares' returns on quarterly results of the companies and the degree of surprise in the announcement of quarterly results, compared with analysts' estimates. Quarterly results were compared with the estimates of analysts who publish their forecasts for

Thomson Reuters. For testing was used linear regression, where the dependent variable is the return of the stock in the reporting period, the independent variables were reduced to three explanatory variables, namely, it was the return of the stock exchange index, excess impact - which is basically the most important variable and the VIX index. Subsequently volatility was tested, mainly focusing on the return of volatility rate to the long-term average after accidental shock.

In the past some authors devoted their papers to the under or overreaction on the some expected or not expected news related to the return of shares, it is possible to mention Abarbanell and Bernard (1992), Baginski, Hassell and Waymire (1994), Foster, Olsen and Shevlin (1984), Freeman, Tse (1989), Jung, Kwon (1988), Lehavy, Sloan (2005), Liang (2003), Shane, Brous (2001) and Narayanamoorthy (2005). From Czech authors it is necessary to mention Hájek (2006), Tran (2007) and Stádník (2011) and their works related mainly to efficiency of the stock market.

15 day period was taken into account, i.e., 5 days before the declaration of results, the day of the results, and 9 days after the announcement of the results. Results were followed for at least two years. Most common number of observations per share is 13, i.e. basically for three years and a quarter.

A total of 75 shares were tested in the U.S. stock market, 23 on the German stock market, and 8 for the Czech stock market.

Shares tested from the US stock market are stated in the Table 1.

Table 1. Shares tested on US stock market

Google Inc	Las Vegas Sands Corp.	Ericsson (ADR)
Apple Inc.	Mastercard Inc	Verizon Communications Inc.
Netflix Inc	Alcoa Inc.	Sprint Nextel Corporation
Sohu.com Inc	Intel Corp	Finisar Corporation
Caterpillar Inc	Dendreon Corporation	Oplink Communications, Inc
OpenTable Inc	Clearwire Corporation	Barrick Gold Corporation (USA)
Molycorp, Inc.	Exelixis, Inc.	Yamana Gold Inc. (USA)
Potash Corp./Saskatchewan (USA)	Renren Inc	Primero Mining Corp
JDS Uniphase Corp	Lattice Semiconductor	Agilent Technologies Inc.
Wynn Resorts, Limited	E TRADE Financial Corporation	United States Cellular Corporation
JPMorgan Chase & Co.	Office Depot Inc	Deere & Company
VMware, Inc.	Adobe Systems Incorporated	Yahoo! Inc.
Coca-Cola Enterprises Inc	Best Buy Co., Inc.	Cisco Systems, Inc.
Salesforce.com, inc.	Cabot Oil & Gas Corporation	Yandex NV
Goldcorp Inc.	SINA Corp	AOL, Inc.
F5 Networks, Inc.	Ciena Corporation	General Motors Company
Baidu.com, Inc. (ADR)	International Business Machines Corp.	Tesla Motors Inc
Goldman Sachs Group, Inc.	Metropolitan Health Networks, Inc.	Global Payments Inc

End of Table 1

AT&T Inc.	Informatica Corporation	ADTRAN, Inc.
NVIDIA Corporation	Quality Systems, Inc.	Tellabs, Inc.
Lockheed Martin Corporation	Akamai Technologies, Inc.	Rockwood Holdings, Inc.
Microsoft Corporation	Hexcel Corporation	Leap Wireless International, Inc.
Ford Motor Company	Hovnanian Enterprises, Inc.	America Movil SAB de CV (ADR)
Amazon.com, Inc.	Altria Group, Inc.	Celestica Inc. (USA)
Freeport-McMoRan Copper & Gold Inc.	Rite Aid Corporation	Neostem Inc.

Shares from German stock market are stated in the Table 2.

Table 2. Shares tested on German stock exchange

ThyssenKrupp AG	BASF SE	Allianz SE
Bayerische Motoren Werke AG	Siemens AG	Commerzbank AG
SAP AG	Deutsche Bank AG	Daimler AG
Infineon Technologies AG	Deutsche Boerse AG	Deutsche Lufthansa AG
United Internet AG	Bayer AG	HeidelbergCement AG
Wirecard AG	RWE AG	Henkel AG & Co KGaA
Nordex SE	Volkswagen AG	Merck KGaA
Stratec Biomedical AG	adidas AG	

Shares tested from the Czech stock market are in the Table 3.

Table 3. Shares tested on czech stock exchange

CEZ AS	Unipetrol AS	Vienna Insurance Group AG Wiener Versicherung Gruppe
Erste Group Bank AG	Komercni Banka AS	KIT Digital Inc
Telefonica Czech Republic AS	Central European Media Enterprises Ltd	

Regarding the selection of equities at the U.S. stock market, I tried in the first step to choose shares in a way to follow industry-composition of the Czech stock market - to allow comparison - this was the first selected about 30 shares of USA, which were subsequently tested. Next, I tried to pick shares that are the most traded in the U.S. equity markets, ie have the greatest liquidity and can be said that they are popular among investors, speculators, traders and asset managers. In this way 45 companies were chosen, most of which are from the field of technology, ie new technology, internet, telecom, semiconductors, and so on.

On German stock market I again focused on collection of similar sector shares as traded on the Czech stock market, in order to compare the results. In Germany, the dominant industrial sector is production of consumer goods, which is not fully consistent with the composition of the Czech Stock Exchange. On the other hand, the German stock market is more similar to Czech stock market than stock market in US.

At the Czech stock market, it is necessary to say that this is a specific market and that the number of analysts' estimates of quarterly results is not entirely satisfactory, though I think some are taking the effort to a closer look.

Number of analysts' estimates for individual quarters in different markets was different. The U.S. stock market, with the largest and most liquid shares, had about 30 analysts' forecasts. Less liquid U.S. stock shares had about 10 different analysts' consensus estimates. On the German stock market there was slightly worse situation, where the number of estimates of the most liquid shares were about 20, and for the Czech stock market there were around 5–8 estimates for the biggest shares of the companies and for smaller companies that are at least 2 or 3.

2. Model

For estimates I used linear regression:

$$\text{Return}_{i,t} = \alpha_0 + \alpha_1 \text{Index}_{i,t} + \alpha_2 \text{EI}_{i,t} + \alpha_3 \text{VIX}_{i,t}, \quad (1)$$

where:

$\text{Return}_{i,t}$ – return of the share, dependent variable, the yield in the tested time period

$\alpha_0, \alpha_1, \alpha_2, \alpha_3$ = Coefficient;

$\text{Index}_{i,t}$ – time series of index return, for the U.S. market index is the S&P500, for German stock market index is DAX30 and for the Czech stock market index is PX;

$\text{EI}_{i,t}$ – Excess Impact, degree of surprise in the announcement of quarterly results;

$\text{VIX}_{i,t}$ – index indicating the risk of market.

For further explanation variable named Excess Impact (EI) is separately reported, EI represents some excessive quarterly revenues bigger than expected.

$$\text{EI}_{i,t} = (\text{sn}_{i,t} - \text{E}_{t-1}[\text{sn}_{i,t}]) / \sigma_t, \quad (2)$$

where

– $\text{EI}_{i,t}$ is the value – and the scope of the report which will be announced in time t,
– $\text{E}_{t-1}[\text{sn}_{i,t}]$) is the value of the report at time t - 1, as it is expected by the analysts,
– σ_t denotes the standard deviation of analysts' estimates at the time t.

For this variable, I used the standard deviation of analysts' estimates. Some authors such as Hanousek and Kočenda (2010), Andersen, Bollersev, Diebold, Vega (2007) used the standard deviation of the sample notice, ie standard deviation calculated from a longer time series of announcements, other authors such as Doyle, Lundholm and Soliman (2006), and Bartov, Givoly and Hayn (2002), Kasznik, McNichols (2002), Bernard, Thomas (1990) or Ball, Kothari (1991) in the denominator instead of the standard deviation are using the price of the share at the time t. I decided to use the standard deviation of analysts' estimates at the time t, because of surprise effect in resulting value expressed. If consensus of analyst estimates has large variance, the degree of surprise is not that big and the standard deviation is higher than in the situation, where all analysts' estimates are around the same value – estimates are very similar (standard deviation is relatively small) and there is quite a considerable surprise to analysts' estimates. Therefore I decided to use the standard deviation of the estimates at the time of the announcement of quarterly results of companies.

Some other authors used similar models for testing of results in different way with accent on return in absolute numbers or modifications with categories created according to stocks' return in tested period like Baber, King (2002), Livnat, Mendenhall (2006), Johnson, Schwartz (2005), Chordia, Shivakumar (2005) and Bartov, Radhakrishnan, Krisy (2000).

For a description of volatility GARCH model was used (1.1). Volatility equation:

$$\sigma^2_{i,t} = \omega + \alpha\varepsilon^2_{t-1} + \beta\sigma_{t-1} + \gamma \text{Return}^2_{t-1}, \quad (3)$$

ω – Coefficient,

$\alpha\varepsilon^2_{t-1}$ – ARCH member, shows the impact of the primary messages and measure of surprise from the previous period,

$\beta\sigma_{t-1}$ – GARCH member, measured the impact of volatility from the previous period to the current conditional volatility,

Return^2_{t-1} – yield in the previous period.

Statistically significant and positive coefficient α less than one characterizes the situation when this volatility was not destabilized by the shock. If α is greater than 1, the last shock had a destabilizing effect. Statistically significant coefficient β, which is close to 1 indicates a high degree of inertia in the volatility of stock prices. The sum of the coefficients α and β refers to the speed of convergence of conditional volatility to steady state. The sum of the coefficients ensures that the unconditional variance was positive - random variable cannot have a negative variance. The value of this sum is closer to 1, the convergence to the steady state is slower. It is also necessary that all model coefficients are non-negative. If it is negative, it can be considered as a component of a destabilizing effect of conditional volatility (Hanousek, Kočenda 2010).The last part deals with panel data. Panel data are all tested for the all shares from concrete stock market. This means that for all three stock markets, for each of these, ie USA, Germany and the Czech Republic are the different data types. Panel data were tested using a model with fixed effects and also random effects model.

Model with fixed effects (Fixed Effects Model - FEM) - where the individual effects of Z_1 to Z_q are unobservable but correlated with the explanatory variables, then the solution is to include all effects to estimateable conditional mean with $\alpha i = \alpha_1 z_{i1} + \ldots + \alpha_q z_{iq}$ and FEM model is following (Pánková 2007)

$$y_{it} = \alpha_1 + \beta_1 x_{it1} + \beta_2 x_{it2} + \ldots + \beta_k x_{itk} + u_{it}, \quad (4)$$

where α_i is a fixed effect specific constant for each cross-sectional unit.

Model with random effects (Random Effects Model - REM) - where the individual effects of Z_1 to Z_q are unobservable, but uncorrelated with the explanatory variables, so the solution is made up from random component $\varepsilon_i + u_{it}$, which in addition to the original random component implies a specific random component for each cross-sectional unit (Baltagi 2005). REM model is then shaped like

$$y_{it} = \beta_1 x_{it1} + \beta_2 x_{it2} + \ldots + \beta_k x_{itk} + (\alpha + \varepsilon_i) + u_{it}. \qquad (5)$$

Specifically for testing of returns of shares at the time of publication of quarterly results the equation is

$$Return_{i,t} = \alpha_0 + \alpha_1 Index_{i,t} + \alpha_2 EI_{i,t} + \alpha_3 VIX_{i,t} + u_{it}, \qquad (6)$$

and equation for a model with random effects is

$$Return_{i,t} = \alpha_1 Index_{i,t} + \alpha_2 EI_{i,t} + \alpha_3 VIX_{i,t} + (\alpha_0 + \varepsilon_i) + u_{it}. \qquad (7)$$

On the US stock market 75 shares were tested, 9 from Basic materials sector, 27 from sector of Communications, 9 from Consumer, Cyclical, 9 from Consumer, Non-cyclical, one company from Energy sector, 3 companies form Financial sector, 5 shares from Industrial sector and 12 shares from Technological sector.

For the readability, sectors with tested US shares are stated in the Table 4.

Table 4. US stocks by sectors

Sector	Industry	Total
Basic Materials	Chemicals	2
	Mining	7
Communications	Internet	12
	Telecommunications	15
Consumer, Cyclical	Car Manufacturers	3
	Home Builders	1
	Lodging	2
	Retail	3
Consumer, Non-cyclical	Agriculture	1
	Beverages	1
	Biotechnology	2
	Commercial Services	2
	Healthcare Services	2
Energy	Oil & Gas	1
Financials	Banks	2
	Diversified Financial Services	1
Industrial	Aerospace/Defense	1
	Electronics	2
	Machinery-Constr&Mining	1
	Machinery-Diversified	1
	Miscellaneous Manufacturing	1
Technology	Computers	2
	Semiconductors	2
	Software	7
	Technology	1

Sectors with German shares are in the following Table 5.

Table 5. German stock by sectors

Sector	Industry	Total
Basic Materials	Iron/Steel	1
	Chemicals	1
Communications	Internet	1
Consumer, Cyclical	Airlines	1
	Apparel	1
	Car Manufacturers	3
Consumer, Non-cyclical	Commercial Services	1
	Healthcare Services	1
	Household Products/Wares	1
	Pharmaceuticals	2
Energy	Energy-Alternate Sources	1
Financials	Banks	2
	Diversified Financial Services	1
	Insurance	1
Industrial	Miscellaneous Manufacturing	1
	Building Materials	1
Technology	Software	1
	Semiconductors	1
Utilities	Electricity	1

Shares from Czech stock exchange sorted by sectors are in the Table 6.

Table 6. Czech stocks by sectors

Sector	Industry	Total
Financials	Banks	2
	Insurance	1
Energy	Oil & Gas	1
	Electricity	1
Communications	Telecommunications	1
	Media	1
	Internet	1

On German stock market there were 23 shares of companies tested, 2 from Basic materials sector, 1 from sector of Communications, 5 from Consumer, Cyclical, 5 from Consumer, Non-cyclical, one company from Energy sector, 4 companies form Financial sector, 2 shares from Industrial sector, 2 shares from Technological sector and one company from Utilities sector. On the Czech stock market 8 shares were tested – all shares with available estimates. Three from Financial sector, 2 from Energy sector and 3 from Communications sector.

3. Results

3.1. Results for individual stocks

In the technology sector were tested twenty seven companies - among tested one of the largest companies represented. There are several reasons. First, the companies in the stock markets in the U.S. in the course, both are relatively liquid, the market operates several technology giants, who determine the direction of development in information technology, not only in the U.S. but around the world. Very good results were achieved by the telecommunications sector. A possible explanation can be sought in many areas. Telecommunications services market is in terms of investors very attractive, has a relatively short innovation cycles and companies that cannot keep up with technology leaders and fail to capture the latest trends in innovation quickly ends on the market. The cyclical consumer goods sector of the nine actions, statistical significance was confirmed in one company that manufactures automobiles. The cyclical consumer goods sector was tested eight exciting companies, statistical significance based on earnings announced by quarterly results. In the financial sector have been tested a total of three stock title statistically significant dependence was not confirmed by either one of them - it's probably due to lack of interest of investors in this sector due to the relatively broad government guarantees and saving banks in the U.S., where it is quite difficult for investors to appreciate the Company with respect to the current profit or loss is somehow play with depreciation. The manufacturing sector is in two of the eight shares were statistically confirmed the dependence of the share price in the period when the size of the surprise publication of quarterly results. Both companies are in a very similar field are manufacturers of large machines. The technology sector has been observed total of twelve equities and surprisingly no one shares with statistically confirmed dependence on quarterly results. I expected better results with technology stocks, but on the other hand, it must be said that these companies are largely owned by large institutional investors, of which the bulk of the money entrusted to seek to make investments a long time.

On the German stock market I tested a total of 23 shares. In the basic materials sector was tested two stocks, there is no statistical confirmation of the dependence of their revenues in the period in the development of surprised when announcing quarterly results. A similar result can be seen in a single test for the information technology sector. In the cyclical consumer goods sector was tested five companies, none of them statistically confirmed the dependence of their revenues in the period in the development of surprised when announcing quarterly results. For non-cyclical consumer goods sector was tested five equities of the German Stock Exchange with similar conclusions as in the case of shares of cyclical consumer goods sector. A similar result has the only company in the energy sector. In the financial sector have been tested four companies, statistical significance was not confirmed. In the industrial sector both companies confirmed the observed dependence of the return on quarterly results. In the technology sector were tested two companies, none of them statistically confirmed dependence on quarterly earnings surprises in quarterly results of different companies, as well as in the case of utilities sector with one tested company.

On the Czech stock market there is no confirmation of dependence of quarterly earnings surprises for the eight tested shares across sectors. But it must be noted that the Czech stock market is quite specific and small market.

3.2. Panel data results

The data from the U.S. stock market, if there is analysis of panel data, namely using models with fixed effects, so it can be seen that the increased number of observations had a positive impact on results, ie confirmed statistically dependent not only on the development of the index returns, but also in the development of Excess Impact (EI), which is important for this working paper. Also the F-statistic is less than 0.05, confirming the statistical significance of the model.

Results are visible on the figure 1, where is output from statistical software Stata 11. Variable EI is statistically confirmed as important; probability of hypothesis was tested at 5% level. F-statistics of the whole model is also confirmed on the 5% confidence level.

```
Fixed-effects (within) regression               Number of obs      =     13065
Group variable: pozorovani                      Number of groups   =        67

R-sq:  within  = 0.0684                         Obs per group: min =       195
       between = 0.0528                                        avg =     195.0
       overall = 0.0683                                        max =       195

                                                F(3,12995)         =    318.13
corr(u_i, Xb)  = -0.0031                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       akcie |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ei |   .0224843   .0068703     3.27   0.001     .0090176    .0359511
       index |   .0482865   .0032489    14.86   0.000     .0419181    .0546549
         vix |  -.0310021   .0219537    -1.41   0.158    -.0740346    .0120303
       _cons |   .0052682   .0280296     0.19   0.851     -.049674    .0602104
-------------+----------------------------------------------------------------
     sigma_u |  .23700964
     sigma_e |  2.8955563
         rho |  .0066553   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(66, 12995) =     1.30           Prob > F = 0.0494
```

Fig. 1. US data testing results, Fixed-effects model

Results for US shares tested by Random-effects model can be seen on the figure 2. There are no differences in results from Fixed-effects model - variable EI is statistically confirmed as important; probability of hypothesis was tested at 5% level. F-statistics of the whole model is also confirmed on the 5% confidence level.

```
Random-effects GLS regression                   Number of obs      =     13065
Group variable: pozorovani                      Number of groups   =        67

R-sq:  within  = 0.0684                         Obs per group: min =       195
       between = 0.0537                                        avg =     195.0
       overall = 0.0683                                        max =       195

Random effects u_i ~ Gaussian                   Wald chi2(3)       =    958.08
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
       akcie |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ei |   .0210053   .0061886     3.39   0.001     .0088758    .0331347
       index |   .0484226   .0032357    14.96   0.000     .0420807    .0547645
         vix |  -.0300492   .0218694    -1.37   0.169    -.0729123     .012814
       _cons |   .0076264    .031269     0.24   0.807    -.0536598    .0689125
-------------+----------------------------------------------------------------
     sigma_u |  .12097744
     sigma_e |  2.8955563
         rho |  .00174256   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Fig. 2. Random-effects model, US data tested

No differences are confirmed with Hausman test, which can be seen on the figure 3.

```
                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |      all           .          Difference          S.E.
-------------+----------------------------------------------------------------
          ei |    .0224843     .0210053        .0014791        .0029836
       index |    .0482865     .0484226       -.0001361        .0002926
         vix |   -.0310021    -.0300492        -.000953        .0019224
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        1.23
                Prob>chi2 =      0.7462
```

Fig. 3. Hausman test, if there is any specific random variable

The data from the German stock market, if there is analysis of panel data, namely using models with fixed effects, so it can be seen, like for the US stock market, that the increased number of observations had a positive impact on results, ie confirmed statistically dependent not only on the development of the DAX returns, but also in the development of Excess Impact (EI), which is important for this to work. Unfortunately, the total F-statistic is greater than 0.05, which does not confirm the statistical significance of the model as a whole.

Results from German stock market – from tested shares are visible on the figure 4, where is visible output from statistical software. Variable EI is statistically confirmed as important; probability of hypothesis was tested at 5% level of confidence. But the F-statistics of the whole model is not confirmed at 5% confidence level.

```
Fixed-effects (within) regression               Number of obs      =      4444
Group variable: pozorovani                      Number of groups   =        23

R-sq:  within  = 0.0057                         Obs per group: min =       190
       between = 0.1127                                        avg =     193.2
       overall = 0.0044                                        max =       195

                                                F(3,4418)          =      8.42
corr(u_i, Xb)  = -0.1678                        Prob > F           =    0.0000

------------------------------------------------------------------------------
       akcie |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ei |   .0282649   .0074035     3.82   0.000     .0137504    .0427795
         dax |   .0007191   .0002459     2.92   0.003      .000237    .0012012
         vix |   .0073139   .0096507     0.76   0.449    -.0116063    .0262341
       _cons |  -.0548099    .019286    -2.84   0.005    -.0926202   -.0169996
-------------+----------------------------------------------------------------
     sigma_u |  .09263447
     sigma_e |  1.2769251
         rho |  .00523522   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(22, 4418) =     0.97            Prob > F = 0.5038
```

Fig. 4. Fixed-effects model results for German shares

Results for German shares tested by Random-effects model can be seen on the figure 5. There are no differences in results from Fixed-effects model – what is confirmed by Hausman test on the figure 6. Variable EI is statistically confirmed as important; probability of hypothesis was tested at 5% level of confidence. But the F-statistics of the whole model is not confirmed on the 5% confidence level.

```
Random-effects GLS regression                   Number of obs      =      4444
Group variable: pozorovani                      Number of groups   =        23

R-sq:  within  = 0.0056                         Obs per group: min =       190
       between = 0.1132                                        avg =     193.2
       overall = 0.0045                                        max =       195

Random effects u_i ~ Gaussian                   Wald chi2(3)       =     20.16
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0002

------------------------------------------------------------------------------
       akcie |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          ei |   .0212421   .0068932     3.08   0.002     .0077317    .0347526
         dax |   .0007262   .0002456     2.96   0.003     .0002448    .0012075
         vix |   .0073409   .0096457     0.76   0.447    -.0115643    .0262461
       _cons |  -.0528114   .0192692    -2.74   0.006    -.0905783   -.0150445
-------------+----------------------------------------------------------------
     sigma_u |          0
     sigma_e |  1.2769251
         rho |          0   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Fig. 5. Random-effects model results for German shares

No differences are confirmed with Hausman test, what can be seen on the figure 6 – there is no specific random variable in the data tested.

```
                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |      all           .           Difference          S.E.
-------------+----------------------------------------------------------------
          ei |    .0282649     .0212421        .0070228         .002701
         dax |    .0007191     .0007262       -7.05e-06        .0000124
         vix |    .0073139     .0073409       -.0000269        .0003108
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        6.90
                Prob>chi2 =      0.0752
```

Fig. 6. Hausman test for any specific random variable

Results for the Czech stock market are very similar to those for individual stocks on the Czech stock market that have been tested. Confirmed the dependence of revenues on the development of PX index, dependence on Excess Impact is not statistically confirmed. Similarly, reliance on development of index VIX was not confirmed. The overall F-statistic model is not statistically significant.

Results from testing Czech stocks are visible on the figure 7, where is output from statistical software. Variable EI is not statistically confirmed as important; probability of hypothesis was tested at 5% level of confidence. Also the F-statistics of the whole model is not confirmed at 5% confidence level.

```
Fixed-effects (within) regression               Number of obs      =      1200
Group variable: pozorovani                      Number of groups   =         8

R-sq:  within  = 0.1740                         Obs per group: min =       150
       between = 0.4699                                        avg =     150.0
       overall = 0.1748                                        max =       150

                                                F(3,1189)          =     83.50
corr(u_i, Xb)  = 0.0311                         Prob > F           =    0.0000
```

akcie	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ei	.099351	.0596111	1.67	0.096	-.0176037	.2163057
px	.7682253	.0488665	15.72	0.000	.6723512	.8640995
vix	.3325601	.2985856	1.11	0.266	-.2532533	.9183735
_cons	-.9272067	.8131649	-1.14	0.254	-2.522605	.6681913
sigma_u	3.2961362					
sigma_e	27.221599					
rho	.0144498	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(7, 1189) =     2.19          Prob > F = 0.0324
```

Fig. 7. Fixed-effects model for Czech shares

Results for the shares tested on Czech stock market with Random-effects model can be seen on the figure 8. There are no differences in results from Fixed-effects model – what is confirmed by Hausman at Figure 9. Variable EI is not statistically confirmed as important; probability of hypothesis was tested at 5% level of confidence and also the F-statistics of the whole model is not confirmed on the 5% confidence level.

```
Random-effects GLS regression                   Number of obs      =      1200
Group variable: pozorovani                      Number of groups   =         8

R-sq:  within  = 0.1740                         Obs per group: min =       150
       between = 0.4702                                        avg =     150.0
       overall = 0.1748                                        max =       150

Random effects u_i ~ Gaussian                   Wald chi2(3)       =    252.75
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
```

akcie	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ei	.1022081	.058737	1.74	0.082	-.0129143	.2173305
px	.7712885	.0488541	15.79	0.000	.6755361	.8670408
vix	.3177386	.2986374	1.06	0.287	-.2675801	.9030572
_cons	-.9108287	1.085395	-0.84	0.401	-3.038164	1.216507
sigma_u	2.0327601					
sigma_e	27.221599					
rho	.00554536	(fraction of variance due to u_i)				

Fig. 8. Random-effects model for Czech market

No differences between Fixed-effects model and Random-effects model are confirmed with Hausman test on the figure 9 – there was not any specific random variable in the data tested.

```
                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |      all           .          Difference          S.E.
-------------+----------------------------------------------------------------
          ei |    .099351     .1022081       -.0028571         .010171
          px |   .7682253     .7712885       -.0030632        .0010993
         vix |   .3325601     .3177386        .0148216               .
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        9.00
                Prob>chi2 =      0.0292
                (V_b-V_B is not positive definite)
```

Fig. 9. Hausman test any specific random variable in the random-effects model

3.3. Volatility

By testing volatility I have received interesting results. Shares, for which the model can be used, that rule, the coefficients are non-negative and statistically significant, the prevailing situation is situation when the beta is close to one, as the sum of the coefficients alpha and beta are equally close to one, which means a high degree of inertia in the volatility of stock prices and quite slow convergence of conditional volatility to the steady state.

4. Conclusion

At the end I would like to write, that in this paper I tried to find and statistically validate certain dependence on the share price announcement of quarterly results, specifically in response to the fact that the declared results are worse or better than analyst expectations were and what is the reaction of the share price of such surprise. That dependence was validated within shares from US stock exchange, for German shares dependence was not validated by statistical methods. Very similar situation like by testing shares from German stock exchange can be seen at Czech stock market, when shares from Czech stock market are being tested. These results became from testing of shares with panel data models, when testing sole shares, results are not so positive. But in the whole process of testing panel data results are more important, so it is possible to write these positive conclusions.

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