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Heinz Roland Weistroffer

Virginia Commonwealth University, hrweistr@vcu.edu

Narczyz Roztocki

State University of New York at New Paltz, roztockn@newpaltz.edu

Dorota Dobija

Kozminski University, dobija@kozminski.edu.pl

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Market Reactions to Investments in Information Technology: Insight from Warsaw Stock Exchange

Dorota Dobija

Kozminski University
dobija@kozminski.edu.pl

Karol Marek Klimczak

Kozminski University
kmklim@wspiz.edu.pl

Narcyz Roztocki

State University of New York at New Paltz
roztockn@newpaltz.edu

Heinz Roland Weistroffer

Virginia Commonwealth University
hrweistr@vcu.edu

ABSTRACT

Building on the Roztocki and Weistroffer (2009c) explanatory model, this study examines stock market reactions to announcements of information technology investments in Poland, an emerging market and transition economy. Based on 68 announcements by companies traded at the Warsaw Stock Exchange in the period 2002 to 2009, our study confirms some previously published results, but also shows that specific characteristics of announcements play a more important role than has been commonly assumed. Our results indicate that investors in Poland react more positively if systems are acquired from global rather than local vendors. Announcements about completed projects are more positively received than announcements about planned or in-progress projects. Furthermore, announcements in Polish, targeted at existing shareholders, are more likely to be received positively than similar announcements released in English, targeting global investors.

Keywords

Event studies, information technology, investments, Poland, transition economies.

INTRODUCTION

For most public companies in today's challenging business environment, the performance of their stocks is seen as an important proxy measure of their business success. If a company's stocks are seen as outperforming the competition, it is usually much easier for the particular company to obtain additional capital for expansion. In contrast, underperforming stocks may ruin the trust in a particular company and make it difficult to secure any needed financing.

Access to private capital is particularly important for companies in transition economies. Frequently, these companies developed out of previously state-owned enterprises, underwent privatization and substantial restructuring, and are on the way to claim their position in the global market. For many of these companies, the stock market is the major source of capital (Jermakowicz and Gornik-Tomaszewski 1998).

In spite of the vital importance of capital markets for companies in transition economies, to our knowledge, there is not a single published study that examined the impact of information technology (IT) investment announcements on stock performance in transition economies, other than China. In many of these economies, IT has been used as an important tool to support restructuring efforts from a centrally planned to a market-oriented economy (Roztocki and Weistroffer 2008b; Samoilenko 2008). Also in Poland, after 1989, the privatization and restructuring process of formerly state-owned companies was heavily accompanied by IT investments (Janson and Wrycza 1999). Many of these system implementations proved to be more costly than typical in mature economies (Soja 2008a) and their payoffs more uncertain. Overall, there is a scarcity of studies in the field of economics of IT that examine the relationship between IT and firm performance in Poland or in other transition economies. It may be reasonably expected that such studies on IT in transition economies may produce different results from what has been uncovered by similar studies conducted in highly developed economies.

Thus, the objective of this paper is to close some of this gap and to contribute to the knowledge base in economics of IT by conducting an event study using data from the Warsaw Stock Exchange (WSE) in Poland, a transition economy.

The remaining paper is structured as follows. After providing some contextual background, we introduce the Roztocki and Weistroffer (2009c) explanatory model, which serves as the underlying basis for establishing our research hypotheses. Then in the following section, we describe our research methodology, data collection method, and data analysis. Subsequently, we

present and discuss our findings. We conclude our paper by discussing the contribution and limitations of our study, and point to opportunities for future research.

RESEARCH BACKGROUND

Information Technology in Transition Economies

The term transition (or transitional) economies refers to countries that recently transitioned or are in the process of transitioning from centrally controlled to market driven economies, especially the countries of the former Eastern Bloc and countries that originated from the break-up of the Soviet Union (Roztocki and Weistroffer 2008b; Roztocki and Weistroffer 2008c).

During the cold war, partly because of the Coordinating Committee for Multilateral Export Controls (CoCom) embargo, the IT industry in the Eastern Bloc countries lagged eight to twelve years behind technology in the western countries (Marble 2004). Political and economic reforms, together with the cessation of the CoCom embargo, led to turbulence in the IT industry, as many local, large companies with obsolete technology found themselves unable to compete in the global market (Harindranath 2008). On the other hand, a large number of small IT firms emerged in these transition economies, as newly inspired entrepreneurs embraced the opportunities offered by the free market (Soja 2008b).

Although the literature on IT in transition economies is highly fragmented and focused on a relatively small set of countries, it appears that the communist past still influences much of the current use of IT in many of these economies; presenting both unique obstacles and exceptional opportunities. For example, a study on electronic commerce in Serbia (Travica, Josanov, Kajan, Vidas-Bubanja and Vuksanovic 2007) reports that past, strong governmental control over the telecommunication industry highly affects its current diffusion. A different study on IT-supported organizational learning in Slovenia (Cecez-Kecmanovic, Janson and Zupančič 2008; Janson, Cecez-Kecmanovic and Zupančič 2007) reports that the studied company highly benefited in its IT initiatives from a high level of worker participation, typical in communist and post-communist countries. Also, in contrast to typical IT managers in Western countries, IT managers in transition economies seem to focus more on technical than non-technical issues (Dexter, Janson, Kiudorf and Laast-Laas 1993). Overall, the results from many comparative studies seem to support substantial differences in IT management in transition economies as compared to developed countries, such as the USA (Dekleva and Zupančič 1996).

Some cross-country studies investigating payoffs from information and communication technologies in transitional economies (Samoilenko 2008; Samoilenko and Osei-Bryson 2008) suggest not only differences in comparison to developed countries, but also large differences among the various transition economies themselves.

Information Technology in Poland

The transition from a central planning system to a free market economy began in 1989, after Poland abolished communist rule. At that time the Polish economy was dominated by large, state-owned companies with only a marginal private sector. IT in most companies was used primarily for reporting purposes and not for profitability calculation (Soja 2008b). The ensuing privatization process was accompanied by heavy investments in IT systems more suitable for a market driven economy (Janson and Wrycza 1999). At this time, IT started to be widely used for linking Polish suppliers with international companies, often competing over price, such as in the case of IKEA, a large furniture retailer (Baraldi and Waluszewski 2005).

In spite of the fact that transformation in Poland started two decades ago, the published literature confirms many similarities in the use of IT to that in developed economies, but also points to some substantial differences. A study conducted in the USA and Poland reports that Polish programmers share the same dress code as their American colleagues (Jemielniak 2007). Also similar to Americans, Polish programmers rather prefer to work for small, less bureaucratic companies. However, another study, conducted in southern Poland, indicates problems with the IT infrastructure not common in western countries, while reporting fewer implementation problems than in developed countries arising from conflicts among team members (Soja and Paliwoda-Pekosz 2009). A study that examined the difficulties experienced during the process of implementing large enterprise systems in Poland (Soja 2008a) also reported a different set of implementation problems as compared to earlier studies in developed economies. A different study examining e-business capacity in Polish firms (Pastuszak 2008) reported a high level of human capital, exceeding the availability of human capital in many developed countries, but inadequate infrastructure, which seems to be one of the major factors hindering competitiveness. Another factor which may make IT management in Poland distinct from developed, mature economies are fast changing laws and regulations highly affecting implementation projects (Pawłowska 2004).

Transition Economies and Stock Market Reaction to Investments in Information Technology

According to our knowledge, before this current study, there was not a single published event study that specifically investigated stock market reaction to IT investments in countries of the former European Eastern Bloc. Event studies in other emerging economies are also rare. One published study compared stock market reaction to IT investments in China to similar investments in the USA (Meng and Lee 2007). The results of that study suggest that financial markets in China react differently from those in the USA, and that on average the stock market reaction is more positive than in the USA. Two other studies investigated stock market reaction to e-commerce initiatives in Taiwan (Cheng, Tsao, Tsai and Tu 2007; Lin, Jang and Chen 2007). Both studies reported positive stock market reactions.

Frequently, stock markets in transition economies are considered “young” by global investors, even though some have rich histories, but were closed during communist rule and then reopened in the transition process. For example, the WSE in Poland was first established in 1817, but closed in 1939 and stayed closed under communist rule. Since the WSE reopened on April 16, 1991, the number of companies traded has grown steadily from only five at the first session to 375 in August 2009, reaching a capitalization of more than 684 billion zloty (approximately 230 billion US dollars) (Giełda Papierów Wartościowych w Warszawie 2009). Along with the Wiener Börse in Austria, the WSE is often considered a major source of capital for companies located in the transition economies of Central and Eastern Europe. The steady growth in the number of listed companies at the WSE underscores one of the major differences between capital markets in transition economies as compared to the mature capital markets, where growth rates in the number of listed companies and overall capitalization are rather modest.

Based on the results from the few existing event studies on IT investments in emerging economies, the unique dynamics in IT markets and the existing differences in IT management, as well as the literature on financial markets in transition economies (Jermakowicz and Gornik-Tomaszewski 1998), the results for IT investments in transition economies and stock market reactions will likely be very different from those reported in studies conducted in the USA, dealing with much larger, more mature financial markets.

EXPLANATORY MODEL AND HYPOTHESES DEVELOPMENT

Explanatory Model for Stock Market Reaction

Although, the number of event studies in the field of IT research is growing steadily (Roztocki and Weistroffer 2008a, 2009a), the stock market reaction, or lack thereof, to IT investment announcements is still not understood well. This lack of understanding is evidenced not only in often contradictory results, but also by an absence of a widely accepted theory to explain stock market reactions to IT investments.

Recently Roztocki and Weistroffer (2009c) proposed an explanatory model based on a meta-analysis of twenty-three event studies in IT research. This model, depicted in Figure 2, postulates that the stock market reaction to IT investments is determined by a number of influential factors that can be grouped in five major categories: company characteristics, type of IT investments, vendor characteristics, economic conditions, and announcements characteristic.

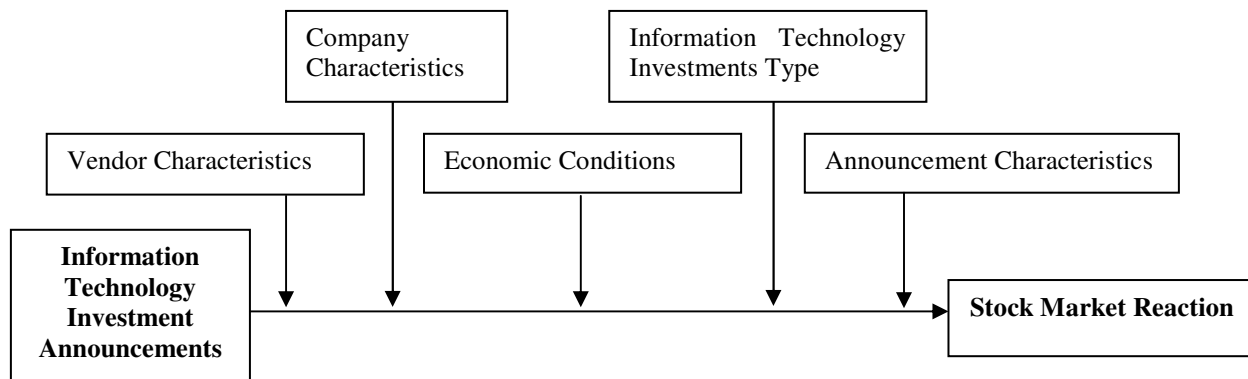


Figure 2. Explanatory model (adapted from Roztocki and Weistroffer, 2009c)

Research Hypotheses

The Roztocki and Weistroffer (2009c) explanatory model was used as the theoretical basis for establishing the research hypotheses because it provides the most complete list available of explanatory variables. Such variables are useful in understanding and interpreting the patterns in empirical observations (Sutton and Staw 1995; Whetten 1989), namely stock market reaction to investments in IT.

In highly developed and mature economies, large vendors with established records seem to make the IT investments more attractive to market investors. The past reputation of the large vendors appears to help establish trust, and the stock market reaction is more likely to be positive, as compared to IT investments using smaller vendors with shorter track records (Hayes, Hunton and Reck 2001; Ranganathan and Brown 2006). Although in transition economies, such as Poland, small, local vendors may possess better knowledge of the intricacies of the local market, and are more flexible in offering customized solutions than subsidiaries of global, large vendors, these small companies may lack the resources needed for implementing large and risky IT projects. For this reason the following hypothesis is proposed:

H1: The stock market will react more positively to IT investment announcements when the system is acquired from a global, large vendor, as compared to a small, local vendor.

Earlier event studies, using data mainly from the USA, looked at which, if any, specific company characteristics are important factors in determining stock market reactions (Chatterjee, Richardson and Zmud 2001; Dehning, Richardson and Stratopoulos 2003; Dos Santos, Peffer and Mauer 1993; Hayes et al. 2001; Im, Dow and Grover 2001; Ranganathan and Brown 2006). Several event studies examined various company characteristics, such as industry, size, financial health, and industry leadership. However, many of these factors appear to not have any substantial impact on stock market reactions (Roztocki and Weistroffer 2009c). One factor that was found to be influential is the security beta (Roztocki and Weistroffer 2009b). It is likely that systematic company risk, measured by beta, is also an important factor in emerging economies such as Poland. Thus we postulate:

H2: The stock market will react more positively to announcements of IT investments when the investments are by companies with high beta factor, as compared to similar announcements by companies with low beta factor.

Results of several event studies conducted with data from the USA suggest that stock market conditions are highly influential on the stock market reaction. In essence, bull market conditions benefit positive market reactions to IT investments, whereas in bear markets the reactions to similar IT investments are likely to be less positive (Roztocki and Weistroffer 2009b). We expect that this also holds true in transition economies and hypothesize:

H3: The stock market will react more positively to IT investment announcements conducted during a bull market, as compared with similar investments under declining market or bear market conditions.

Further, building on the invest type category from the Roztocki and Weistroffer (2009c) model, it may be reasonably assumed that the status of the IT investment is an influential factor. In other words, it is likely that the stock market differentiates between investments planned for the future and investments already in progress or completed. The status of IT investments may be a particularly crucial factor in transition economies as many IT projects tend to be more expensive than in developed economies (Soja 2008a). Thus we hypothesize:

H4: The stock market will react more positively to announcements of completed IT investments or projects already in progress, than to announcements of future planned projects.

Past event studies suggest that financial markets respond more positively when the announcement is released by the investing company as compared to announcements released by vendors (Oh, Kim and Richardson 2006). In the context of transition economies, we believe that announcement language and focused targeting of existing investors, as opposed to new investors, will have a positive effect on the stock market reaction. Therefore, we postulate:

H5: There will be a difference in stock market reaction, when the investment is announced in Polish and targeted at existing shareholders, as compared to announcements made in English and targeting global prospective investors.

METHODOLOGY

Data Collection

The announcements were collected by using several databases, such as Emerging Markets Information Service (EMIS) and Lexis-Nexis. Our announcement search was focused on IT investments conducted by companies traded at the WSE. In the context of this research, we used the definition of IT investments suggested by Roztock and Weistroffer (2009c), which expands the traditional definition proposed by Bacon (1992) beyond expenses on hardware and software. Thus, in line with Roztock and Weistroffer (2009c), we consider as IT investments “any large, non-routine expenses for implementing new technology or aimed at making better use out of existing technology.”

Although, our search was not restricted to specific languages used in the source, we were only able to identify announcements in English and Polish. Some announcements that we did identify were excluded from the final sample because stock data was not available or other relevant news, such as profit disclosures, was released during the event window. Overall, we were able to collect 68 usable announcements.

Data Analysis

In our data analysis, we decided to use a 250-day estimation period, ranging 270 to 20 days before the date of the given announcement. This relatively long estimation period was chosen to lessen the effects of possible seasonal stock price movements and the possibility of some stocks not being traded on some business days.

Overall, our analysis was similar to procedures used in earlier event studies. The stock market reaction was assessed using standard procedures for calculating abnormal returns (AR) based on the market model. Standardized abnormal returns (SAR) were calculated by dividing AR by the standard error of the estimate from the market model. Cumulative standard abnormal returns (CSAR) were calculated by summing the SAR for individual days in the event windows. The hypotheses were then tested by calculating the average CSARs for particular sub-samples and testing this average for significance in four event windows. In addition to the two short event windows (two and three days) used in most previous event studies in IT research, we also used two longer event windows: a twenty-six day and a twenty-one day event window. As a proxy for market returns we used the Warsaw Stock Exchange Index (WIG). For more information about the procedure, see for example (Roztock and Weistroffer 2008d).

To test our research hypotheses, the full sample was divided into several sub-samples. Accordingly, to test the hypothesis about the effect of vendor characteristics (H1), the announcements in our sample were examined for information about the vendors of the acquired systems. If the system was purchased from Oracle or SAP, the vendor was classified as global, and if the system was acquired from Asseco, Comarch, Digitland, or Procom, the vendor was classified as local.

To test our second hypothesis (H2), the full sample was again divided in two subsamples, with one subsample including all companies with beta factor of 0.9 and higher, and the second subsample including all companies with beta factor lower than 0.9.

During the time period from January 2, 2002 until July 6, 2007 the average stock prices measured by WIG increased from 13,995 points to 67,569 points, an increase of approximately 383 percent. Consequently, all announcements released in this time period were classified as “bull market” announcements. Then from its peak on July 6, 2007, the WIG decreased to 39,986 points on December 31, 2009, a decrease of approximately 41 percent. We divided this time of decreasing stock prices into two periods: “declining market” from July 6, 2007 to January 7, 2008 (decline of 20 percent) and “bear market” from January 8, 2008 to December 31, 2009. Thus, the “bear market” encompassed time when stock prices in Warsaw declined from its peak by 20 percent or more. The three resulting sub-samples were used to test our third hypothesis (H3).

To test our fourth hypothesis (H4), the full sample was again divided into two subsamples: announcements about completed IT projects and announcements about planned or in-progress IT projects.

Finally, to test our fifth hypothesis (H5), the full sample was divided into two subsamples according to the language used in the announcement, i.e. Polish or English. If an announcement was released in Polish and English simultaneously, it was not included for testing of this hypothesis.

RESULTS

Sample Description

As mentioned earlier, we were able to use 68 announcements released in the 2002–2009 period. Table 1 depicts the distribution of the announcements by year and industry sector.

| Year | Sector | | | | | | Total |
|--------------|---------------|-----------|---------------|----------|-----------|----------|-----------|
| | Manufacturing | Finance | Communication | Service | Retailing | Others | |
| 2002 | 0 | 1 | 0 | 0 | 0 | 1 | 2 |
| 2003 | 1 | 0 | 0 | 0 | 0 | 1 | 2 |
| 2004 | 1 | 2 | 1 | 0 | 0 | 0 | 4 |
| 2005 | 0 | 2 | 2 | 1 | 0 | 0 | 5 |
| 2006 | 3 | 2 | 3 | 1 | 0 | 0 | 9 |
| 2007 | 11 | 1 | 4 | 3 | 1 | 1 | 21 |
| 2008 | 9 | 2 | 0 | 2 | 1 | 3 | 17 |
| 2009 | 2 | 1 | 0 | 1 | 3 | 1 | 8 |
| Total | 27 | 11 | 10 | 8 | 5 | 7 | 68 |

Table 1. Sample Characteristics

Analysis Results

As summarized in Table 2, the reaction to IT investments for the full sample is insignificant.

Regarding hypothesis 1, for global vendors the data shows a statistically significant positive reaction for three out of the four event windows used. In contrast, for smaller, local vendors no significant reaction is observed. Thus, hypothesis 1 appears to be supported.

Regarding hypothesis 2, for companies with beta factor below 0.9 there is no significant reaction. For companies with beta factor 0.9 or above, the stock market reaction is also statistically insignificant. Therefore, hypothesis 2 is not supported.

Regarding hypothesis 3, for bull markets, the stock market reaction is positive but significant only in one of the event windows used, while the reaction is mixed for declining markets, and no significant reaction is observed for bear markets. This does not give full support for hypothesis 3.

In regard to hypothesis 4, financial markets seem to react differently based on the status of IT investments. Announcements about completed IT projects are more positively received than announcements about planned or in-progress IT projects. However, the statistical significance of this positive reaction is limited to the [-20, 5] and [-15, 5] event windows, giving only partial support for our hypothesis.

Hypothesis 5 seems to be supported, as on average, announcements in Polish result in positive stock market reaction (significant for two of the event windows used), while reactions to similar announcements in English are insignificantly negative.

Table 2 shows the results of our analysis, while Table 3 depicts a summary of the hypotheses supported or not supported.

| Sample/Subsample | [-20,5] | | | [-15,5] | | | [-1,1] | | | [-1,0] | | |
|---|---------|-------|---------|---------|-------|--------|--------|-------|---------|--------|-------|--------|
| | N | CSAR | Z | N | CSAR | Z | N | CSAR | Z | N | CSAR | Z |
| Full Sample | 62 | 0.05 | 0.36 | 63 | 0.09 | 0.73 | 68 | 0.08 | 0.68 | 68 | 0.03 | 0.29 |
| Breakdown by Vendor | | | | | | | | | | | | |
| Local | 26 | -0.20 | -1.04 | 26 | -0.21 | -1.09 | 27 | 0.07 | 0.39 | 27 | 0.09 | 1.29 |
| Global | 16 | 0.66 | 2.64*** | 17 | 0.55 | 2.29** | 19 | 0.57 | 2.48*** | 19 | 0.36 | 1.58 |
| Breakdown by Company | | | | | | | | | | | | |
| Beta below 0.9 | 26 | 0.01 | 0.06 | 27 | 0.00 | -0.02 | 32 | 0.05 | 0.29 | 32 | 0.09 | 0.51 |
| Beta 0.9 or above | 36 | 0.07 | 0.42 | 36 | 0.16 | 0.97 | 36 | 0.11 | 0.66 | 36 | -0.01 | -0.09 |
| Breakdown by Market Conditions | | | | | | | | | | | | |
| Bull Market | 19 | 0.43 | 1.86* | 20 | 0.25 | 1.12 | 23 | 0.20 | 0.95 | 23 | 0.00 | 0.01 |
| Declining Market | 12 | 0.37 | 1.29 | 12 | 0.61 | 2.10** | 12 | -0.32 | -1.12 | 12 | -0.49 | -1.68* |
| Bear Market | 24 | -0.29 | -1.43 | 24 | -0.18 | -0.90 | 25 | 0.18 | 0.92 | 25 | 0.27 | 1.34 |
| Breakdown by Investment Status | | | | | | | | | | | | |
| In-Progress/Future | 43 | -0.25 | -1.64 | 44 | -0.19 | -1.29 | 46 | 0.09 | 0.62 | 46 | 0.08 | 0.51 |
| Completed | 17 | 0.58 | 2.40** | 17 | 0.62 | 2.56** | 19 | 0.01 | 0.02 | 19 | -0.07 | -0.32 |
| Breakdown by Announcement Language | | | | | | | | | | | | |
| Polish | 31 | 0.36 | 2.02** | 31 | 0.41 | 2.27** | 35 | 0.24 | 1.39 | 35 | 0.13 | 0.75 |
| English | 28 | -0.26 | -1.36 | 29 | -0.18 | -0.99 | 30 | -0.08 | -0.44 | 30 | -0.11 | -0.59 |

* Significant at 10 percent **Significant at 5 percent *** Significant at 1 percent

Table 2. Summary of Results

| Hypothesis | Supported | Comments |
|------------|-----------|--|
| 1 | Yes | Significant, positive stock price reaction for global vendors, but not for local vendors. |
| 2 | No | Stock price reaction for companies with low or high beta is not significant. |
| 3 | Partially | Significant positive stock price reaction during bull markets, but only in one event window. Mixed reaction during declining markets. No significant reaction during bear markets. |
| 4 | Partially | Significant stock price reaction for announcements of completed projects, but not for planned projects. The evidence is, however, limited to only two event windows. |
| 5 | Partially | Announcements in Polish are more likely to result in positive stock market reaction. The evidence is, however, limited to only two event windows. |

Table 3. Overview of Results

DISCUSSION

Our research reveals some important findings. For example, stock market reaction is likely to be more positive when the system is acquired from a global vendor such as SAP or Oracle, rather than from a local, Polish vendor. It seems that those smaller vendors are still in the process of building their reputation and need to focus more on marketing and brand building.

A comparison of our results with the three previous event studies about IT investments in emerging economies (Cheng et al. 2007; Lin et al. 2007; Meng and Lee 2007) shows some similarities but also substantial differences. For example, in contrast to the three studies (one in Mainland China, two in Taiwan), which reported positive reaction for the full sample, the reaction for our full sample was positive but statistically insignificant. None of the three studies reports the language of the announcements. It is not clear if the announcements used in the three studies were in Chinese or English, or both, or maybe in a different language. In our study we differentiated between announcements in English and Polish. If we had used only announcements released in Polish the reaction in our study would also be significantly positive in two event windows.

Though the so-called “Good Practices on Corporate Governance” rule for WSE listed companies requires the companies to have all their investor related documents in English, in practice, the compliance to this rule is limited. This is not very surprising, as the WSE exchange is a local, medium sized stock exchange. Only recently WSE started to also trade stocks of foreign companies, but mostly from Central and Eastern Europe. As a result we may expect a slow change related to language use. In our sample, only three announcements were released simultaneously in both English and Polish.

Finally, our results confirm that the Roztocki and Weistroffer (2009c) explanatory model, after some modifications, could be effectively applied to explain stock market reaction to investments in IT not only in mature markets but also in transitional economies.

LIMITATIONS AND FUTURE WORK

Although our sample of 68 announcements appears to be sufficient as compared to other studies of stock market reaction in emerging economies (Cheng et al. (2007) used 32 announcements and Meng and Lee (2007) used 65 announcements for China), we believe that a larger sample size will definitely benefit our research. Consequently, we plan to expand our sample by including announcements released before 2002 and possibly in 2010 as they become available. In addition to data from the WSE in Poland, we plan to include data from other transition economies with established stock markets, such as the Prague Stock Exchange in the Czech Republic and the Budapest Stock Exchange in Hungary.

Moreover, in addition to replicating event studies from the USA with stock data from various transitional countries, we plan to include a number of variables more specific to these economies. For example, one event study may look at previous ownership of companies and compare the stock reaction of companies that emerged from privatization of state-owned enterprises to those which were funded thru private capital from the beginning.

CONCLUSIONS

In this work, we examined stock market reactions to IT investments in Poland, an emerging and transition economy. Although subject to limitations, we believe that our work makes a significant contribution to the existing knowledge in economics of IT in several respects. First, this is perhaps the first attempt to conduct an event study in a transition economy, other than China. Second, we found several differences between our results and results from studies in developed economies, thus justifying further research promising unique and unexpected results. Third, our research can benefit business managers in transition economies that are looking at acquiring capital for their companies thru stock markets, by providing them with a little extra information, limited as it may be.

To conclude, given the growing importance of emerging and transition economies, combined with the scarcity of research in the field of IT in transition economies, we are hopeful that more authors will follow our path and that this work will help open up new avenues for their own research endeavors.

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