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Essays on Financial Markets

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Contents

Abstract

This thesis studies financial markets and the information we can obtain from observing the actions of financial market participants.

In the first chapter, I study how the combination of different accounting ratios, which are considered to be financial signals of future performance, can affect the analysts' and managers' earnings forecast releases. The findings show that analysts treat the firms differently depending on whether the firms have only strong financial indicators (high signal group), weak financial indicators (low signal group), and those with both positive and negative signals (mixed signal group). The study also provides evidence that the managers may realize the heterogeneity in analysts' treatment, and as a result the managers' earnings forecasts will be affected both by the signal group type of the firm and the analysts' bias characteristic for the appropriate signal group. At the same time, the findings show that the analysts sometimes fail to disregard the managers' forecast biases and are misled by the managers. This provides evidence of inaccuracy on the part of analysts and potential gaming on information disclosure between analysts and managers.

In the second chapter, I examine whether trading activity responds to the industry-related earnings announcement and whether this activity is informative. I find that the subsequent announcer's abnormal trading volume is informative about their stock performance upon the first and own subsequent announcement and in the post announcement period. While the first announcer's earnings surprise is expected to be informative about that of the subsequent announcer, I also show that not only the first announcer's earnings surprise in the current quarter but the history of both first and subsequent announcers can predict the latter's earnings surprise. I also check whether the informativeness of the subsequent announcer's abnormal trading volume is not solely explained by the market agents' ability to incorporate the predictability of their earnings surprises. The results suggest that although the subsequent announcer's trading activity is driven by updating of beliefs made upon the first announcement, the market fails to fully incorporate the earnings surprise predictability, which provides some evidence of market inefficiency.

In the third chapter (with Yuko Hashimoto), we study whether the EU member countries act as a single investor due to the stronger financial integration over recent years. Although we find evidence that the portfolio investments of the EU countries tend to move together, there is still some diversity among the Union members. In our analysis, we distinguish two types of countries: those who prefer to invest more evenly among counterparties (low concentration type) versus those who invest more heavily in some

counterparties (high concentration type). Consistent with our hypothesis, we find that the level of investment concentration and investment share at the destination play a role in the way the countries will respond to the changes in the macrovariables. We also find evidence of the crisis period affecting both the co-movements of EU members' investment shares at destination and the macrovariables driving international portfolio investments. In particular, variables of the health of the financial system become important determinants for portfolio investment during the crisis.

Abstrakt

Tato dizertační práce studuje finanční trhy a informace, které můžeme získat pozorováním činnosti účastníků finančních trhů.

V první kapitole studuji jak kombinace různých účetních ukazatelů, které jsou považované za finanční signály budoucích výsledků, mohou ovlivnit vydávání prognóz příjmů analytiky a manažery. Výsledky prokazují, že analytici hodnotí firmy odlišně v závislosti na tom, jestli firmy mají pouze silné finanční indikátory (pozitivní signální skupina), slabé finanční indikátory (negativní signální skupina) nebo s pozitivními i negativními signály (smíšená signální skupina). Studie také poskytuje důkazy o tom, že manažeři si mohou uvědomovat různorodost hodnocení analytiky a v důsledku jsou prognózy příjmů manažerů ovlivněny jak signální skupinou firmy, tak i zkreslením analytiků charakteristicým pro danou signlní skupinu. Výsledky zároveň ukazují, že analytici někdy nezapracují zkreslení v prognóze manažerů a jsou manažery uvedeni v omyl. Toto poskytuje důkaz o nepřesnostech analytiků a potenciálním manipulování se zveřejňování m informací manažery.

Ve druhe kapitole zkoumám zda aktivita obchodování reaguje na zveřejnění výsledků ve stejném odvětví, a zda tato aktivita obchodování je informativní. Zjišťuji, že abnormální aktivita obchodování u následného oznamovatele je informativní o výnosnosti akcií tohoto oznamovatele při prvním oznámení v odvětví, při vlastním oznámení a o výnosnosti akcií po oznámení. Zatímco se očekává, že překvapení ohledně výsledků prvního oznamovatele bude informativní o překvapení ohledně výsledků následujícího oznamovatele, ukazuji, že nejen překvapení v současném čtvrtletí, ale i historie překvapení prvního i následujícího oznamovatele může předpovědět překvapení ohledně výsledků následujícího oznamovatele. Dále kontroluji, zda informativnost abnormálního obchodování následujícího oznamovatele není vysvětlena výlučně schopností účastníků trhu zohlednit předvídatelnost překvapení ohledně výsledků následujícího oznamovatele. Výsledky ukazují, že zatím co aktivita obchodování následujícího oznamovatele je způsobena aktualizováním přesvědčení během prvního oznámení, trh nezohledňuje plně předpověditelnost překvapení ohledně výsledků.

Ve třetí kapitole (společně s Yuko Hashimoto) studujeme zda členské země EU jednají jako jediný investor kvůli větší finanční integraci během nedávných let. Přestože nalézáme důkazy o tom, že portfoliové investice zemí EU mají tendenci se pohybovat společně, existuje stále určitý stupeň různorodosti mezi členy unie. V naší analýze rozlišujeme dva typy zemí: země preferující investovat rovnoměrně mezi protistrany (typ nízké koncentrace) a země, které investují více u některých protistran (typ vysoké koncentrace). Konzistentně s naší hypotézou zjišťujeme, že úroveň koncentrace investic a podílu investic v místě určení

hrají roli v tom, jak země reagují na změny v makroekonomických proměnných. Také zjišťujeme, že období krize ovlivnilo společný vývoj podílu investic členských států EU a makroekonomické proměnné, které ovlivňují mezinárodní portfoliové investice. Konkrétně proměnná ohledně zdraví finančního systému se stala důležitým určovatelem portfoliových investic během krize.

Preface

This thesis studies financial markets and the information we can obtain from observing the actions of their participants. The first paper investigates financial analysts' and managers' forecasting accuracy and how this may be affected by potential gaming between them. The second paper studies the informativeness of the trading volume upon intraindustry earnings announcements and whether the market participants fully incorporate this informativeness. The goal of the third chapter (co-authored with Yuko Hashimoto) is to investigate whether the EU countries act as a single investor as a result of the increasing financial integration.

The focus of my first chapter is the accuracy of the financial analysts. The accuracy of financial analysts' forecasts is a particularly important topic in research, since it can signal the value of the services provided by the analysts. Among the documented drivers of the financial analysts' forecast inaccuracy are key financial indicators (Abarbanell & Bernard, 1992), market expectations (Bergman & Roychowdhury, 2008; Mikhail, Walther, & Willis, 2009), and attention distraction (Hirshleifer, Lim, & Teoh, 2009). Motivated by the existing research on the extensive use by financial analysts of the key accounting ratios (Drake, Rees, & Swanson, 2011; Frankel & Lee, 1998; Jegadeesh, Kim, Krische, & Lee, 2004) in creating the earnings forecast, I contribute to the literature on the analysts' accuracy by incorporating a financial signaling approach. By financial signaling, I mean that there might be three types of firms: those with only strong financial indicators (high signal group), weak financial indicators (low signal group), and with both strong and weak financial indicators (mixed signal group). On the one hand, it might be much easier for the analysts to produce forecasts for high and low signal groups since every financial

indicator points in one direction. On the other hand, solely strong or weak financial indicators may push the analysts to produce too optimistic or too pessimistic forecasts. It might be even more ambiguous for the mixed signal group since some financial indicators may point to good future performance while the others indicate poor future performance, which can complicate the forecasting further. Overall, the findings of this chapter show that analysts treat the firms with low, high and mixed signals differently. Moreover, there is evidence that the managers of the firms realize this and try to adjust their own forecasts in order to correct or, maybe, to exploit the analysts' biases. The findings also show that the analysts sometimes fail to adjust for managers' strategic forecasts and can be misled by them.

In the second paper, I discuss such important topics in finance as the informativeness of the trading volume and intra-industry information transfers. Trading volume informativeness has received considerable attention (Campbell, Grossman, & Wang, 1992; Connolly & Stivers, 2003; Conrad, Hameed, & Niden, 1994; Gallant, Rossi, & Tauchen, 1992; Lee & Swaminathan, 2000) since the actions and beliefs of the market participants should be reflected in the trading volume. Moreover, it can serve as an extra or purifying information signal (Schneider, 2009) for other information signals. A particularly valuable form of information arrivals for the market agents is the industry related news (Firth, 1976; Foster, 1981; Baginski, 1987; Han, Wild, & Ramesh, 1989; Han & Wild, 1990; Freeman & Tse, 1992; Thomas & Zhang, 2008; etc.). I combine these two streams of research and show that the subsequent announcer's trading volume upon the first earnings announcement in the industry is informative. Upon this first announcement, the market agents receive a new piece of information in the form of the earnings surprise of the first announcer. As a result, they may adjust their expectations about the future performance of the subsequent announcing firms, which will be reflected in the trading activity. However, the response to the first announcer's earnings surprise might depend on the earnings surprise history of both the first and subsequent announcer, since a strong earnings surprise history might be extrapolated into the future, while irregularity in positive earnings surprises in the past may lead to the perception of the current quarter earnings surprise as a temporal favorable outcome, which should not be extrapolated into the future. This chapter provides evidence that the subsequent announcer's trading activity and stock performance upon the first announcement is driven not solely by the first announcer's earnings surprise itself, but rather by the history of both the first and subsequent announcer. I also find that the future earnings surprises of subsequent announcing firms can be predicted by the first

announcer's earnings surprise as well as the earnings surprise history of both the first and subsequent announcer. Moreover, I show that the market fails to realize fully the subsequent announcer's earnings surprise predictability, which can be interpreted as some form of market inefficiency.

The third chapter discusses the international portfolio investments made by the EU member countries. It is expected that due to higher financial integration the financial markets of the EU members should converge into a single market. As a result, one should consider the international portfolio investments stemming from the EU members in the same manner as those originating from a single market, or a single country-investor. Consistent with expectation, the findings show that the EU members' shares of the total portfolio investments into the destination countries co-move together to a high degree, which suggests that they act as a single investor. At the same time, financial integration is still not complete and there is high diversity among EU members. Due to this diversity, it is expected that they may differ in the international investment strategies and motives of international investments, which may consequently lead to heterogeneous responses to the changing investment environment in the country-destinations. In particular, in this study two investment types of EU countries are considered: low concentration type (those who prefer to invest more evenly among the country-destinations) and high concentration (those who prefer to invest more evenly among the country-destinations). The results also show that low-concentration type countries respond in the opposite direction relative to the high-concentration type countries: when the portfolio flows exhibit a negative reaction to the changes in the macro variables for the high-concentration type, the low-concentration type reaction to such variables is less negative or even positive; conversely, the positive reaction of the high-concentration type is accompanied by a less positive reaction of the low-concentration type.

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Chapter 1

Financial Signaling and Earnings Forecasts [1]

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Abstract

This chapter examines the extent to which financial signaling affects analysts' and managers' forecast releases. The findings give evidence of heterogeneity of analysts' forecast errors between firms with strong financial indicators (high signal group), weak financial indicators (low signal group), and those with both strong and weak financial indicators (mixed signal group). The paper further indicates that managers' forecast releases also depend on the type of the firm and that managers may try to use the heterogeneity in analysts' treatment while producing forecasts. The findings also suggest that the analysts sometimes fail to adjust for managers' forecast biases and for this reason they may be misled by managers' forecasts. This provides evidence of inaccuracy on the part of analysts and potential gaming on information disclosures between analysts and managers.

1.1 Introduction

The reaction to new information releases in the financial markets has created intense attention in the literature. The vast literature on this topic shows that investors do not fully incorporate all available information at once (referred to in the literature as overreaction or underreaction), which is evidenced by the existence of return drift[2]. The empirical evidence of overreaction and underreaction to new information has motivated researchers to reconsider assumptions of total rationality and homogeneity[3].

The phenomenon of underreaction or overreaction can be explained by at least two facts. The first is behavioral, and implies that people just cannot incorporate all relevant information at once, but do this rather with a time lag, as in the model of Hong and Stein (1999), where the agents incorporate only some subset of all the publicly available information. This results in underreaction at first and subsequent overreaction. The underreaction and overreaction can also result from representativeness and conservatism in learning (Kahneman & Tversky, 1972; Barberis et al., 1998; Brav & Heaton, 2002; Alti & Tetlock, 2014; Gennaioli et al., 2015). Under the earlier type of learning, an event consistent with a recent trend (or conjunctive event) will be perceived as natural and will prompt a reaction at once, while an unexpected (or disjunctive) event will be more difficult to interpret. In the case of the later learning type, the new information will be neglected, or its value will be underestimated. Moreover, optimism and pessimism of the market agents may also lead to the deviation from rationality (Cecchetti, Lam, & Mark, 2000).

A second explanation for such a phenomenon could be the technical difficulties in putting accurate weights on the information signals that market participants receive simultaneously. As an example of technical difficulties in interpreting information signals, we can consider a situation in which the returns are predictable by the set of variables.

[2]Previous research gives evidence of overreaction or underreaction to earnings announcements. Bernard and Thomas (1989), for example, show that the return drift can be explained by the market agents failing to fully realize the implication of recent earnings for future earnings. Chan (2003) distinguishes between public news and private information and explains the existence of the return drift with the market participants' underreaction to the valid information and the documented reversal as the result of investors' overreaction to the shocks. The return drift can also result from changes in the dividends policy as shown by Michaely, Thaler, and Womack (1995).

[3]Thus, for example, Daniel, Hirshleifer, and Subrahmanyam (1998) introduce overconfidence and biased self-attribution to explain the investors behavior consistent with empirical evidence. Barberis, Shleifer, and Vishny (1998) model investors' overreaction and underreaction by introducing conservatism and representativeness, built on the past stream of the information. According to Gennaioli, Shleifer, and Vishny (2015) underreaction and overreaction to the information arises due to the investors' representativeness bias in their updating of beliefs.

In this case, it may be difficult for market participants to extract information from the several signals which predict different future performance paths of the same stock. Another example of technical difficulties in optimally updating information can arise from the time-varying relevance of the informational signals and inability to predict this relevance. Depending on macroeconomic conditions, some signals may have more predictive power compared to others, but under different macroeconomic conditions these predictive indicators may have no predictive power at all (Rapach, Strauss, & Zhou, 2010).

Taking these findings together, I expect that either behavioral or technical difficulties or both will have an impact on the financial analysts' forecast accuracy. As has been shown by previous research, financial analysts use accounting information extensively for earnings forecasts (Abarbanell & Bernard, 1992; Frankel & Lee, 1998; Jegadeesh, Kim, Krische, & Lee, 2004; and Drake, Rees, & Swanson, 2011). Since earnings can be predicted by a set of key accounting ratios (Foster, 1977; Ou, 1990; Fairfield, Sweeney, & Yohn, 1996; Nissim & Penman, 2001; and Dichev & Tang, 2009), they will all be important information signals for the analysts. That is why, on the one hand, for firms which have only high or low indicators, the analysts may be quite sure about future performance, since every indicator will point in the same direction, and there might be no technical difficulties for producing forecasts for this type of firms. On the other hand, due to representativeness the set of only strong or only weak accounting indicators may respectively lead to optimism or pessimism in the analysts' earnings forecasts. The situation can be even more ambiguous for firms which have both strong and weak financial indicators, since it will be hard for analysts to sort the relevant accounting ratios from the irrelevant, but it might also be possible that positive and negative signals from the strong and weak accounting indicators may neutralize each other.

To study whether the financial analysts' accuracy is influenced by the possible difficulties in optimally incorporating all the publicly available information, I introduce the accounting based financial signaling approach. By financial signaling I mean that there might be three types of firms: those with strong financial indicators (high signal group), weak financial indicators (low signal group), and those with both positive and negative indicators (mixed signal group). It should be mentioned here that the managers of firms may or may not try to drive market expectations by managing the financial indicators. Regardless, these financial indicators may be perceived by the market agents as informative signals of the future performance of the firms. For the purposes of distinguishing different types of firms, following previous research findings (Foster, 1977; Ou, 1990; Fairfield et al.,

1996; Nissim & Penman, 2001; and Dichev & Tang, 2009) I consider three main groups of financial indicators: which indicate profitability, operating efficiency, and capital structure.

Previous research also shows that managers may try to drive the analysts' forecasts. Thus, for example, Bergman and Roychowdhury (2008) show that, depending on macroeconomic conditions, managers may drive the analysts' forecasts up or down. Ma and Chang (2007) show that managers may disclose more actively in order to avoid the earnings surprise volatility. This may also suggest that if the analysts treat firms with low, high and mixed signals differently, we might expect that the managers would adjust their own forecasts in order to correct or, maybe, exploit the analysts' biases. For this reason, it might be of interest to consider the managers' forecast releases from the standpoint of their response to the analysts' perception, as well as the impact of managers' forecasts on the analysts.

However, the analysts are sophisticated market players, so they may, or may not, always be misled by the managers. By examining the analysts' earnings forecast revisions in response to the managers' forecast announcements, we may gain insights into whether and how the analysts are influenced by the managers' forecasts. If the managers really release their forecasts strategically, the analysts may foresee such strategic behavior and revise their forecasts, adjusting for the possible forecast biases of managers depending on the types of the firms (i.e. low, high, and mixed signal groups). Evidence of the heterogeneity of managers' forecast behavior and the analysts' forecast revisions in response, depending on the type of the firms, could imply that there is a forecast disclosure game between analysts and managers.

Overall, the findings of this paper show that the distributions of analysts' forecast errors differ across low, high, and mixed signal groups. Financial signals influence analysts' forecasts and the impact of the combination of the signals is not equal across low, high and mixed signal groups. There is also evidence of heterogeneity in managers' forecast errors depending on the signal group of the firm and analysts' failure to adjust the earnings forecast revisions for the managers' biases.

In contrast to the previous literature, which shows usefulness of accounting statements as the source of information (Foster, 1977; Ou, 1990Fairfield et al., 1996; Nissim & Penman, 2001; Piotroski, 2000; DeFond, 2002; Jegadeesh et al., 2004; Nguyen, 2005; Drake et al., 2011; etc.), I show that information from financial statements may also create inefficiencies on the part of analysts and managers trying to exploit such inefficiencies. The findings of this paper may also motivate future research to identify the hierarchical structure of key

financial ratios predicting future earnings of firms, which may improve financial statement analysis and equity valuation practices.

The paper is organized as follows. In the following section the existing literature is discussed. The model and methodology are described in the third section. The fourth section addresses the issue of data and the sample selection. The fifth and sixth sections present the main findings. The seventh and final section concludes the paper.

1.2 Related Literature

There is a range of literature which aims to explain inaccuracy in analysts' forecasts[4]. Another area of research concentrates more on the asymmetries of market perception of new information arrivals. Bagchee (2009), for example, finds asymmetry in the reaction of the investors based on the performance of the IPO of firms. If the firms upgrade, the investors react to new information faster, while if they downgrade they adjust their expectations approximately 3 times more slowly than after a positive signal. Larson and Madura (2003) find that the reaction to the new information will be different depending on whether it concerns losers (those stocks that have recently performed poorly) or winners (those stocks that perform well). They find that while losers experience underreaction from the market participants to the new information, winners, on the contrary, are more likely to experience overreaction. These findings suggest that market players tend to act not only based on the information they get but also on their own judgments and beliefs formed by the contents of the new information obtained, which is consistent with the previous finding of representativeness bias in updating beliefs (Kahneman & Tversky, 1972; Brav & Heaton, 2002).

Moreover, Hirshleifer, Lim, and Teoh (2009) find that analysts underreact more when there are earnings announcements by other firms, which is explained by attention distraction: the more information there is, the more difficult it may be to process it. In comparison, I expect that it will be more difficult to process information about the same firm if it gives multidirectional signals. The difficulties in interpreting signals may also be noticed by the reaction of the market to the sequence of signals. If investors observe signals of the same sign in several periods in a sequence, they may perceive it as a pattern and overreact, while after receiving signals of different signs, investors underreact, not

[4]The literature includes the works of Abarbanell and Bernard (1992), Mikhail, Walther, and Willis (2003), De Bondt and Thaler (1990), Benou (2003), Constantinou, Forbes, and Skerratt (2003), etc.

knowing how to interpret contradictory signals (Poteshman, 2001; Kaestner, 2006). While previous studies consider the time dimension for the sequence of news, it may be of interest to see the reaction to signals which are sent simultaneously. For cases when firms send only signals of the same sign, every subsequent signal will confirm a previous one. This may lead to the correct interpretation of the information or it may cause overreaction, while the signals of different signs may raise difficulties in interpreting their mutual effect and lead to underreaction.

When creating their forecasts, analysts make extensive use of all available information. Frankel and Lee (1998), for example, show that firms with particular characteristics such as higher past sales growth and higher market-to-book ratios receive higher optimistic forecasts by analysts. At the same time, Drake et al. (2011) and Jegadeesh et al. (2004) show that information from accounting statements can indicate the direction of short interest as well as revisions of analysts' recommendations. It is also commonly accepted that no particular financial ratio is informative unless it is considered as a part of the more complicated set of signals. This happens because the relative level of indicators rather than absolute value and/or their combinations are informative.

In fact, firms may give multidirectional and more complicated signals (the key financial indicators are informative and as such they can be considered to be information signals): some may be positive and others negative simultaneously. This implies that correct interpretation of these signals separately without taking into account the rest may be a difficult task. Consider the following situation. Suppose that firm's earnings increased in the last quarter, but its leverage also increased in the same time period. On the one hand, the increase in earnings may imply some momentum in them. On the other hand, the higher leverage may also signal a future decrease of profits due to increased liabilities, or that the increase of the leverage is the result of a government's quantitative easing policy. A small increase in leverage may still be considered a positive signal if the leverage of a firm compared to that of other firms in the same industry is low. Moreover, the change in leverage may be the result of adjustments to the optimal level. Such adjustments may imply additional resultant costs (Fischer, Heinkel, & Zechner, 1989), but firms deviating from the optimal leverage ratio incur losses (Ju, Parrino, Poteshman, & Weisbach, 2002). Small dividend policy changes can also be misleading. The dividends reductions can be considered a signal of investment and potential growth (Décamps & Villeneuve, 2007) or an excess need for cash, and poor performance. These findings are also supported by Simpson, Emery, and Moreno (2009), who find evidence of overreaction hypotheses,

uncertain information hypotheses, overoptimism, and market efficiency after dividend announcements. A similar logic can be applied, let us say, to the inventory level, since changes in inventory and sales can be the result of demand fluctuations rather than indicators of a firm's operating efficiency.

In addition to the accounting information of firms, the analysts' forecasts are influenced by market expectations (Mikhail, Walther, & Willis, 2009; and Lemmon & Portniaguina, 2006). While a range of authors establish the impact of market expectations on forecast accuracy and the fact that accuracy is lowest during times when optimism is not explained by fundamental values (Mikhail et al., 2009), Bergman and Roychowdhury (2008) show that managers drive the analysts' forecasts upwards or downwards during periods of optimistic and pessimistic market expectations respectively. The authors explain this phenomenon by the managers' attempts to keep investors optimistic about the future of their firms during low market expectations, while during high market expectations the managers want firms to remain slightly undervalued. The authors also argue that the choice of managers to drive analysts' forecasts is strategic, but it would also be natural to suspect that their strategic behavior is predetermined not only by the market expectations, but also by the expected future prospects of firms and the uncertainty of these prospects (or in other words by the financial ratios and their combinations).

If the choice of managers to "walk" the forecasts up or down really is strategic, the market (and especially such sophisticated players as analysts) may treat the managers' disclosures differently, since they may anticipate different reliability or implications of these forecasts depending on the types of firms. Managers of low signal firms may have many fewer incentives to drive the market expectation down even during optimistic periods, while the managers of high signal firms can afford to drive the analysts' forecasts downwards even during pessimistic periods.

Moreover, it is expected that for the high signal group the managers' forecasting practices might be more strategic. Since the managers' forecasts should be credible (otherwise the market will disregard them), it is expected that their forecast will most probably be accompanied by financial statements management. Given that the firms with extreme financial performance indicators are more likely to engage in earnings management (Dechow, Sloan, & Sweeney, 1995), it is the high signal group who is more likely to do so. Moreover, the managers of the high signal group might have more freedom to manage the financial statements if they decide to do so. This argument is consistent with the findings of Barton and Simko (2002) who show that earnings management is constrained

by double entry accounting which links the balance sheet and income statement: the increase in earnings should be recognized as an increase in the net asset value. However, since the net asset value should be reported according to the GAAP requirements, there is an upper limit on the opportunistic increase in the earnings reported by managers.

The literature on managers' strategic forecast releases shows that they will avoid disclosure if they expect to achieve higher trading profits under the condition of non-disclosure, but at the same time they may disclose more actively under circumstances of higher volatility of earnings surprises and higher probability of liquidity shocks (Ma & Chang, 2007). Other documented reasons for managers' disclosure decisions include the reputation effect (Bebbington, Larrinaga, & Moneva, 2008), maintenance of stock prices (Pownall, Wasley, & Waymire, 1993), avoidance of negative earnings surprise (Burgstahler & Eames, 2006), building of credibility, and conveying potential growth opportunities (Graham, Harvey, & Rajgopal, 2005). Dobler (2008) shows, on the contrary, that the value of managers' forecasts should not be overestimated, since government regulation cannot impose a verifiability mechanism on the managers' disclosure practices.

Contributing to the literature on the managers' disclosure, in my study I concentrate on how the financial characteristics of a company and analysts' perception of a firm can motivate managers to release their forecasts. The arguments above suggest that the managers of different signal groups may have different incentives and different possibilities to release strategical forecasts. Additionally, by following the analysts, the managers may identify their biases and try to correct or exploit any inefficiency. By behaving strategically, managers try to drive the market in general, and analysts in particular. One might expect that such strategic forecast releases may fail, because analysts may foresee the incentives for managers to opportunistically manage them.

1.3 Methodology

With reference to the accuracy of analysts' forecasts, it is normal in the literature for regressions aimed at estimating analysts' underreaction to earnings announcements (running forecast errors on previous period earnings changes) to include only earnings changes, returns, lagged forecast errors, number of firms followed by analysts, analysts' experience, brokerage size, forecast age, and forecast frequency (Abarbanell & Bernard, 1992; Constantinou et al., 2003; Mikhail et al., 2009).

Since I hypothesize that the complexity of financial ratios leads to inefficiency on

the analysts' part, I am not interested in the impact of the change of every separate variable, but rather the informativeness of all financial indicators taken together. In order to implement the analysis and draw the inference, following the methodology of Jegadeesh et al. (2004) and Drake et al. (2011) I assign each financial ratio a score depending on its value relative to the prevailing levels in the industry in which the firm operates. As shown by Piotroski (2000), Jegadeesh et al. (2004), Nguyen (2005) and Drake et al. (2011) the sum of the scores can be considered as a screening device for the future performance of a firm. These scores will allow me to differentiate those firms whose financial indicators are strong from those whose are weak, as well as from those whose are both strong and weak.

The other explanation for using this approach in order to accomplish the goal of this study is as follows. There is evidence that a combination of forecasts made on different variables is more accurate than those based on a particular variable (Rapach et al., 2010). It has been shown that the simple models can work better than more elaborated models (Rapach et al., 2010). In these models a set of regressions is used and the dependent variable in each regression is regressed on one explanatory variable. Then the expected value of the dependent variable is calculated as an equally weighted average of the predicted values taken from this set of regressions. The intuition behind the better performance of forecast combinations is explained by the fact that individual specific variables fail to capture macroeconomic fluctuations, while the use of only macroeconomic variables does not take into account the specific economic performance and opportunities of firms. However, the combination of both specifications delivers a synergic effect. In the context of this study, every financial indicator included in the calculation of the scores has predictive power for the earnings surprises[5]. By the construction of the score, the high or low score is believed to signal potentially strong or weak future earnings respectively. Since the analysts are sophisticated financial market players, they are expected to use the informativeness of these variables for their forecasts.

For construction of the scores, the following groups of economic variables are taken into account: profitability, operating efficiency, and capital structure. The profitability ratios include sales profit margin (SPM), effective tax rate (ETR), interests-to-debt ratio (INTD), and dividends-to-earnings (DE) ratio. The operating efficiency ratios include asset turnover (TURNA), total accruals (TOTACR), capital expenditure (CAPEXP), correlation between costs and revenues (CCR), assets growth (AG), and depreciation-to-

[5]The set of signals include those variables which were found to be significant for earnings predictability by previous research (Dichev & Tang, 2009; Fairfield et al., 1996; Foster, 1977; Nissim & Penman, 2001).

assets ratio (DA). The capital structure measures include book value-to-assets ratio (BVA), market-to-book value (BM), leverage (L), common stock interest (CSI), and minority stock interest (MSI). In order to test the informativeness of these signals, I construct a signal informativeness model, in which I run the earnings per share on all of the signals[6]. Additionally, I also include such variables as lag of earnings per share and size of firms, but I consider these variables as the state variables and do not take them into account when assigning scores to the signals.

The scores to each signal are assigned in the following way. Since the values of these variables may differ across industries, the score is assigned relative to the percentile level of a particular variable in the industry, where industries were determined by the 2-digit Standard Industry Classification Code (SIC). For each of the financial indicators listed above, a score of 0, 1, or 2 is assigned, depending on whether the indicator of the firm is below the 35th percentile in the industry, between the 35th and 65th percentile, or is above the 65th percentile. My approach of assigning the scores to the indicators differs only slightly from the methodology of Jegadeesh et al. (2004), who assign 0 or 1 depending on whether a particular indicator is below or above the median in the industry. In contrast, I consider the level of every financial indicator around the median as being neutral and the deviation in either of the sides as a positive or negative sign respectively[7].

Since for such variables as SPM, TURNA, DE, CAPEXP, CCR, INTD, AG, and CSI, the higher the value of these indicators, the more efficient the firm is, the score for each of these variables is 0, 1, or 2 for the firms that have this value below the 35th percentile, within the bound of the 35th and 65th percentile or above the 65th percentile respectively. For such indicators as TOTACR, ETR, BVA, BM, L, DA, and MSI 2 points are given to the firms for which the level of this indicator is below the 35th percentile, 1 and 0 to those with these indicators in the range of the 35th and 65th percentile and above the 65th percentile, respectively[8].

There are two main goals of this study. The first is to test whether there is a heterogeneous perception of the analysts of high, low and mixed signal firms. The second is to test how the combination of financial indicators or the signals can affect the accuracy of the analysts' and managers' forecasts.

[6]The full specification and estimation results of signal informativeness model are provided in Appendix 1.A and 1.B respectively.

[7]A similar methodology but with slight modifications was also used by Piotroski (2000), Nguyen (2005), and Drake et al. (2011).

[8]There were missing values in the data for some of the financial indicators. These were assigned score 1, since it is considered to be neutral (neither positive, nor negative).

In order to achieve the first goal, I differentiate three main groups in my analysis: those firms with a high number of weak signals (low signal firms), those with a high number of strong signals (high signal firms), and those with high number of both high and low signals (mixed signal firms). As the first step, I calculate the total score and the standard deviation of the scores (or signals). Following the approach used by Piotroski (2000), Jegadeesh et al. (2004), and Nguyen (2005), the total score is constructed as the sum of the signals (or scores). The total score is supposed to capture how good the firm's key financial indicators are. The standard deviation of the scores measures the uncertainty or heterogeneity of the signals. To finally form the groups, I further apply the following rules:

$$\begin{aligned} D_{low} &= I[TotScore \leq TotScore\_25Per;\ sdScores \leq sdScores\_25Per] \\ D_{mixed} &= I[sdScores \geq sdScores\_75Per] \\ D_{high} &= I[TotScore \geq TotScore\_75Per;\ sdScores \leq sdScores\_25Per], \end{aligned}$$

where D_j is the dummy variable, which is equal to one if a firm is considered to belong to group j and zero otherwise, $I[\bullet]$ is the indicator variable, which is equal to 1 if the conditions hold and zero otherwise, $TotScore$ and $sdScores$ are the sum and standard deviation of the scores of the key financial ratios, $TotScore\_kPer$ and $sdScores\_kPer$ is the k-th percentile of the total score and standard deviation of the scores respectively[9].

To answer the question whether the analysts treat different signal groups heterogeneously, I use the Kolmogorov-Smirnov test and test the equality of distributions of the

[9]The intuition behind the imposed rules is as follows. Let us consider the rule for the low signal group. Conditioning on a low total score selects into a low signal group those firms who have a high number of low signals. At the same time, conditioning on a low standard deviation also warrants that the firms do not just have a high number of low signals, but that they have most of them. Similar logic can be applied to a high signal group. The rule of forming the mixed signal group is even more straightforward: conditioning on a high standard deviation of the scores selects those firms who have the highest amount of multidirectional signals.

Another approach to forming the groups was also considered: to form the low signal group only with a high number of low signals, some neutral signals and no high signals; for the high signal group to include only firms with a high number of high signals, some neutral signals and no low signals; and to construct the mixed signal groups of firms with high numbers of both positive and negative signals. This approach may be in line with the research question, but could also lead to the situation in which I would be working with very specific types of firms. In contrast, although one may argue that following the approach I am using, the low signal group may include a couple of high signals, and the high signal group may include a few low signals, this approach nevertheless seems more plausible, since firms with even one or two negative (low) signals on the background of, say, 5 positive (high) signals will be perceived as rather financially strong and stable. The same argument can be applied to the low and mixed signal groups.

analysts' forecast errors across different types of firms. Rejecting the null hypothesis of equality of forecast errors distribution across different types of firms will provide evidence that the analysts tend to have different biases in the forecasts for different types of firms.

Further, I study analysts' and managers' forecast accuracy. All models used in the analysis of the accuracy of the forecasts are nested in the following general form specification[10]:

$$Y = \alpha + \beta X + \gamma Z + \pi M + \eta, \tag{1.1}$$

where Y is the vector of dependent variables. Matrix X contains the control variables representing the characteristics of analysts. Matrix Z consists of control variables representing the characteristics of the firms. Control variables of macroeconomic conditions are contained in matrix M. Vector η consists of the error terms with zero mean and constant variance.

For my analysis of the accuracy of analysts' forecasts, I follow the specifications of Abarbanell and Bernard (1992), Constantinou et al. (2003), and Mikhail et al. (2009). While Abarbanell and Bernard (1992), Constantinou et al. (2003) use the simple OLS, Mikhail et al. (2009) use the fixed effect model. I use the first difference estimator, since it allows me to take into account the possible firm-analyst fixed effects as well as potential serial correlation of idiosyncratic errors.

In the models of forecast accuracy I study two aspects of forecast accuracy: a direction of forecast inaccuracy and forecast precision. The direction of forecast inaccuracy shows whether the analysts' or managers' forecasts tend to under- or overestimate actual values, while forecast precision measures how far the forecasts deviate from the actual values. In the model of analysts' forecast accuracy, vector Y represents the vector of their forecast errors (in the submodel of the direction of forecast inaccuracy) or absolute forecast errors (in the submodel of forecast precision). Matrix X, with the analysts' characteristics, includes lag of dependent variable (a forecast error or its absolute value in the previous quarter), forecast age, forecast frequency, and the number of firms followed by the analysts in the same 2 digit SIC industry. The set of variables of matrix Z includes momentum and reversal in the earnings change. In my specification, matrix Z also includes the total score and the standard deviation of the scores, on which I form signal groups. Matrix M is constituted by control variables of macroeconomic conditions such as the fundamental

[10] All the estimation equations with the variable construction description are provided in Appendix 1.A.

and residual parts of consumer sentiment, and quarter dummies.

Next, I analyze managers' forecast behavior and analysts' responses to their forecast releases. In order to test whether the managers' forecast errors differ across types of firms, I use the ordinary least squared estimation of equation (1.1), which contains matrices Z and M as the matrices of explanatory variables.

In this model, Y is the vector of managers' forecast errors (in the submodel of the direction of forecast inaccuracy) or their absolute values (in the submodel of forecast precision). Among the firms' specific characteristics of matrix Z are the mean returns and standard deviation of returns, mean abnormal trading volume over 10 trading days prior to the managers' forecast release date, since Rogers and Stocken (2005) find that market information matters for the managers' forecast accuracy. Following Ma and Chang (2007), I include the standard deviation of the analysts' forecasts. Combining the findings of Bergman and Roychowdhury (2008) with those of Mikhail et al. (2009), I include the following firm specific variables: the mean bid-ask spread over 10 trading days prior to the managers' forecast release date, and standard deviation of price over the last half a year prior to the managers' forecast announcement date, dummy variable of loss in the previous quarter, dummy variable of negative managers' forecasts, dummy variable of "bad' news, which is defined as such if it is below the analysts' mean forecast; interaction term of dummy of "bad" news and managers' forecast news, where the news defined as the difference between the analysts' mean forecast and managers' estimate; forecast horizon, industry concentration, insider transaction, and the size of the firms. Macroeconomic variables including fundamental and residual parts of consumer sentiment are contained in matrix M.

To test the impact of analysts' heterogeneity on the managers' incentives to release forecasts, I construct the analysts' bias variable. For this purpose, I run model 1.1 of the of analysts' forecasts precision, save the explained and residual parts, and average the latter over analysts for a firm for the respective quarter. While the predictable part should take into account the rational portion of analysts' forecast imprecision, the residual part should contain the irrational bias. This is because if the error term from model 1.1 is represented by:

$$\eta_{j,j,t} = b_{i,j,t} + \epsilon_{i,j,t}, \tag{1.2}$$

where $b_{i,j,t}$ is the bias of analyst i for firm j in period t, and $\epsilon_{i,j,t}$ is the error term with

zero mean and constant variance. Then averaging $\eta_{i,j,t}$ over analysts for a particular firm i results in $\bar{\eta}_{j,t} = \bar{b}_{j,t}$ or, in other words, in the average bias for the firm.

To test the hypothesis that analysts discount managers' forecasts and that their discount factor will depend on the type of the firm, I use the robust least squared estimator for equation (1.1), but here Y is the vector of analysts' adjustment and the estimation equation includes X, Z, and M as matrices of explanatory variables.

From the set of the explanatory variables of analysts' adjustments, managers' forecasts, managers' forecast range, total score, and standard deviation of signals are of primary interest. Among the other firm specific variables are: the mean stock returns and standard deviation returns over 10 trading days prior to the analyst's forecast revision date, mean abnormal trading volume and mean bid-ask spread over 10 trading days prior to the analyst's forecast revision date, dummy variable of a negative managers' forecast, dummy variable of "bad" managers' news, interaction term of dummy of "bad" news and forecast news, managers' forecast horizon, industry concentration, insiders' transaction, firm's size, standard deviation of analysts' forecasts. One might expect that analyst's accuracy characteristics may also have an impact on his/her adjustment. For this reason, I include such explanatory variables as analyst's forecast age and forecast frequency, general experience and the number of firms followed by the analysts in the same 2-digit SIC industry. As in the previous models, I also include the fundamental and residual parts of consumer sentiment.

Lastly, I analyze the probability of having a larger forecast error after the revision (for those analysts' who revised their forecasts) and use the same explanatory variables as the model with forecast adjustments by analysts, but vector Y includes the indicator variables of *1* and *0*, if the absolute forecast error is bigger or smaller after the revision, respectively.

1.4 Data and Sample Selection

In the analysis five main databases were used: Compustat, CRSP, and Thomson Reuters I/B/E/S, First Call, and Insider Filings.

Compustat

Compustat is a database on accounting, and some market information on active and inactive public and private companies, but for the latter to be included in the database a number of years of history as a public company is required. The data provides

the information obtained from firms' income statements, balance sheets, statements of cash flow, market and supplemental data items. It is common to distinguish two databases within Compustat - Compustat North America and Compustat International (or Compustat Global). The Compustat North America database gathers accounting information on US and Canadian firms at the annual and quarterly frequency, and covers over 14,650 active companies and over 16,950 inactive companies.

From this database I take the quarterly data of US firms on earnings per share excluding extraordinary items, operating income, depreciation, revenues, costs, cash, capital expenditures, income taxes, pretax income, interests paid, income before extraordinary items available to common stock holders, common stockholder equity, depreciation, non-controlling equity, total assets, total liabilities, long-term debt and debt in current liabilities.

CRSP

The Center for Research in Security Prices (CRSP) US stock database contains stock market data on more than 20000 stocks from the major stock exchanges, i.e. NYSE, AMEX, and NASDAQ. The data set contains data on security prices and price quote data, holding period returns and excess returns, market capitalization and shares outstanding, trading volume and market indices, corporate actions and security delisting information. The data are available at the daily, monthly, quarterly, and annual frequencies. From the CRSP data set prices, returns, number of shares outstanding, trading volumes, and CRSP value-weighted index dividend yield are taken for my analysis.

I/B/E/S

The Institutional Brokers' Estimate System (I/B/E/S) database gathers information on the brokerage analysts' historical estimates of major accounting indicators such as earnings per share, cash flow, revenues, and long-term growth projections, as well as stock recommendations. The detail history file contains the detail information on the analysts' individual forecasts. The summary file contains the consensus estimates including mean, median, standard deviation, number of forecasts, etc. The database covers more than 30000 global companies. For my analysis, I collect the analyst-by-analyst earnings per share forecast from the detail history file of I/B/E/S.

First Call

The First Call Historical Database file includes company-issued guidance data such as quarterly and annual management earnings forecasts and earnings preannouncements. The database covers more than 6,000 North American companies and 2,000 global companies

and contains earnings guidance in the form of point estimates, range of estimates (forecasts upper and lower bounds), and qualitative disclosure providing the direction of the earnings guidance (positive, negative, or neutral). From this database, I collect the managers' quarterly point estimates and their forecasts' lower and upper bounds.

Thomson Reuters Insider Filings

The Insider Filings database gathers line-by-line detail information on trades in equity and other securities by individuals and institutions, which are defined as "insiders" by the US Securities and Exchange Commission (SEC), and includes insiders' activity as reported on SEC Forms 3, 4, 5 and 144. This database provides the flow or data on transactions (buying and selling of stock) rather than the stock of insiders' holdings. In addition, the database also checks the reported values for inaccuracy, which may arise mostly due to reporting inconsistencies within the SEC documents from which the data are pulled, and provides so called "cleansed" value for comparison. This database was used for collecting information on the insiders' buying and selling of the securities.

Other databases

For controlling the impact of market expectations on the analysts and managers, the Michigan consumer sentiment index was downloaded from the Federal Reserve Bank of St. Louis Economic Research website for which data are available from June 1978. To obtain the predicted values from consumer sentiment, the WRDS web database was used to obtain such data as US GDP growth, consumption growth, labor income growth, yields on Baa and Aaa rated corporate bonds, 10 year yields on US government bonds; and yields on one month and three month Treasury bills.

Sample Selection

For comparison of the distributions of forecast errors I am considering all quarterly earnings forecasts, which were produced within a given fiscal quarter (over the last three months by the end of the quarter) and were released by the end of the fiscal quarter. The sample for the analysis of the analysts' and managers' forecast accuracy is restricted, respectively, as to whether the managers produced their forecasts. This sample is restricted further for the analysts' revisions sample as to whether the analyst revised her forecast after the managers' forecast release. Since I want also to check the managers' responses to the existing analysts' forecast bias, in the managers' forecast model for constructing the analysts' bias and predicted forecast error I consider only those analysts' forecasts which were released by the managers' forecast announcements. For each model, in order to avoid the forecast error being inflated when calculating the forecast error I drop those

observations with the mean price below one dollar (since the forecast error was calculated as the difference between the actual and forecasted levels scaled by the mean price over the last 10 trading days prior to the appropriate forecast release).

In order to avoid the impact of outliers, I drop the observations in the following ways. For the comparison of the distribution of the analysts' forecast errors, I trim all the forecast errors on the 1st and 99th percentiles. In the regression analysis, I use the blocked adaptive computationally efficient outlier algorithm proposed by Billor, Hadi, and Velleman (2000), which is believed to be a more efficient way of detecting the outliers in the multivariate data.

The final data sample spans from March 1993 to September 2010 and represents 2852 different firms and 10289 analysts. For the analysis of the analysts' forecast errors I have 77,478 firm-quarters observations in my sample. In this sample, I have 6,613 observations for the low signal group, and 20,908 and 7,939 for the mixed and high signal groups respectively. For the analysis of the managers forecast errors I have 66,763 observations for the whole sample, and low, mixed and high signals groups were represented by 5,510, 17,489, and 7,698 observations respectively. The analysis of the forecast adjustments of analysts and their accuracy after adjustments was made with 50,257 observations for the whole sample, of which 4,502 observations belonged to the low signal group, and 10,880 and 8,120 to the mixed and high signal groups.

1.5 Statistical Comparison of Analysts' Forecast Errors

1.5.1 The Effect of Signal Groups

If analysts are influenced by financial indicators, their combinations, and/or their signs (positive (high) versus negative (low) signals), it is natural to suspect that the distribution of their forecast errors will be different across these types of firms. In my analysis, I decided to compare the distribution of 4 main groups:

- firms with mixed signals versus the rest of the firms;
- firms with mixed signals versus firms with low signals;
- firms with mixed signals versus firms with high signals;
- firms with low signals versus firms with high signals.

Table 1.1: Distribution parameters of the subgroups

Group	***Mean***	***Median***	***SD***	***Variance***	***Skewness***	***Kurtosis***
Low signal group	-0.55	-0.04	2.32	5.40	-4.49	30.90
Mixed signal group	-0.30	0.03	2.11	4.46	-5.41	42.44
High signal group	-0.05	0.04	1.21	1.48	-5.51	64.22
Group with no changes in the scores	-0.27	0.04	2.06	4.22	-5.84	50.11
Group with changes in the scores	-0.23	0.03	1.77	3.13	-5.68	51.06
Group with only negative changes	-0.31	0.03	2.01	4.03	-5.93	47.92
Group with only positive changes	-0.12	0.05	1.50	2.25	-5.66	57.22
Group with a high number of negative changes and no positive changes	-0.20	0.04	1.66	2.75	-5.51	55.43
Group with a high number of positive changes and no negative changes	-0.02	0.08	1.20	1.43	-5.76	73.55
Group with equal an number of positive and negative changes	0.05	0.09	1.01	1.01	-0.99	10.26

The Kolmogorov-Smirnov test shows that the distributions of forecast errors are not the same for each of the subgroups above. The comparison of distribution parameters (the data are provided in Table 1.1) indicates that the mean forecast error in absolute value is the highest for the low signal group. In level terms, the mean is the lowest for the low (-0.55) and the highest for the high signal groups (-0.05), with the mixed signal group being between these values (-0.30). This implies that the analysts tend to overestimate the most future performance for the lowest signal group[11]. The values of medians keep the same ordering of the groups: medium is the smallest for the low signal group (-0.04) and the highest for the high signal group (0.04), with the mixed signal group being between these two values (0.03).

The standard deviation (variance) of the forecast errors is the highest for the low signal group (2.32) and the spread of the forecast errors is the smallest for the group with high signals (1.21). From comparison of skewness, one can see that the distribution is skewed to the left and the skewness to the left is the highest for the firms in the high

[11]This inference comes from the construction of the variable forecast error which equals the difference between the actual and forecasted value of the earnings per share scaled by price and multiplied by 100.

signal group (-5.51) and the lowest for the low signal group (-4.49). The negative skewness in our context implies that the analysts' forecasts frequently undershoot the actual value of earnings per share, though at times the forecasts are extremely overoptimistic. Kurtosis also signals that the tails of distribution are the fattest for the high signal firms (64.22) and the thinnest for the firms with low signals (30.90), which in turn implies that the chances of extreme outcomes (forecast errors) are the highest for the high signal group. Overall, we may conclude that biases in analysts' forecasts depend on the types of firms and that their forecast errors are not homogeneous across firms.

1.5.2 The Effect of Changes in Signals

It is definitely interesting to examine whether the analysts are confused by multidirectional signals. Nevertheless, it might be the case that sooner or later market participants (and especially sophisticated participants such as analysts) can infer the source of their confusion and adjust their information processing. This may result in more precise forecasts, even for firms with a confusing component. Motivated by these considerations, I decided to compare the distribution of the analysts' forecast errors depending on the changes in the scores. Further, analysts may react asymmetrically depending on whether there were positive changes (for example when the score changed its value from 0 to 1) versus negative changes (for example when the score changed its value from 1 to 0). At this stage, I compare the distribution of the forecast errors for the following groups:

- firms without changes versus those with changes in the scores;
- firms without changes versus those with only negative changes;
- firms without changes versus those with only positive changes;
- firms with positive changes versus those with negative changes.

The Kolmogorov-Smirnov test shows that these subgroups do not have the same distribution functions. From Table 1.1, one can see that the mean forecast error for the subgroup which had no changes in the signals is even more negative (-0.27) than that for firms which had some changes (-0.23), while the medians are almost the same for both groups (0.04 and 0.03 respectively). The standard deviation, unexpectedly, is higher for the subgroups with no changes in the signals (2.06 versus 1.77). The forecast errors are also more skewed to the left for the group without changes (-5.84 versus -5.68), but kurtosis is smaller for

this type of firms compared to firms which had some changes in the signals (50.11 versus 51.06).

Comparing the groups with only negative changes versus positive changes, the mean forecast error for the subgroup with only negative changes is more negative (-0.31 versus -0.12) and the standard deviation is higher for this subgroup (2.01 versus 1.50). The subgroup with only negative changes is more skewed to the left (-5.93 versus -5.66) but has lower kurtosis (47.92 versus 57.22). The higher kurtosis for the latter group suggests that the analysts tend to be more either over- or undershooting and the lower standard deviation for this group indicates that they are more aligned in doing so.

1.5.3 The Effect of Asymmetry of Signal Changes: Positive versus Negative Changes

To check the asymmetry in the analysts' responses to the positive and negative changes in the financial indicators, I test the equality of forecast errors' distributions of firms which had:

- a high number of positive changes and no negative changes versus the rest of the sample;
- no positive changes and a high number of negative changes versus the rest of the sample;
- an equal number of positive and negative changes versus the rest of the sample;
- a high number of positive changes and no negative changes versus no positive changes and a high number of negative changes;
- a high number of positive changes and no negative changes versus those with an equal number of positive and negative changes;
- no positive changes and a high number of negative changes versus those with an equal number of positive and negative changes.

Again, the Kolmogorov-Smirnov test shows that these subgroups do not have the same distribution functions. The mean forecast error (Table 1.1) in absolute value is the largest for the subgroup with a high number of negative changes in the signals (-0.20), and the lowest for firms with a high number of positive changes in the signals (-0.02), which may

imply that the analysts underreact the most to negative changes in the balance sheet of the firms. We can also see that the standard deviation in the forecast errors is the highest for firms which had a high number of negative changes (1.66) and the lowest for the firm with an equal number of positive and negative changes in the signals (1.01). The forecast errors for the subgroup with a high number of positive changes are skewed to the left the most (-5.76) and have the highest kurtosis (73.55) compared to the subgroup with an equal number of positive and negative changes with the lowest left-skewness (-0.99) and kurtosis (10.26). The highest skewness to the left and highest kurtosis for the group with a high number of positive and negative changes leads to either higher overshooting or undershooting of analysts' forecasts. This also suggests that analysts may often extrapolate the positive changes too much, but also frequently underestimate them. The lowest standard deviation for the subgroup with an equal number of positive and negative number of changes may suggest that changes in signals in both directions can neutralize each other, preventing from either overshooting or undershooting (the kurtosis is the smallest for this group), and lead to more aligned forecasts.

1.6 Results

1.6.1 Are Analysts' Perception of Earnings the Same across Groups?

In order to further test the heterogeneity of the analysts' perception of different signal groups, I run the models of analysts' forecast inaccuracy and forecast precision for the whole sample, consisting of all firms in my sample, and separately for each of the signal groups. Since I am also interested in how the combination of the signals and the uncertainly associated with them affect the analysts' accuracy, I include my total score and the standard deviation of the scores. The full specification of the model is as follows:

$$\begin{aligned} FcErr_{i,j,t}(AbsFcErr_{i,j,t}) = \beta_0 + \beta_1 TotScore_{j,t} + \beta_2 sdScores_{j,t} + \\ + \beta_3 MomEarn_{j,t} + \beta_4 RevEarn_{j,t} + \boldsymbol{\beta P} + \eta_{i,j,t} \end{aligned} \tag{1.3}$$

where $FcErr_{i,j,t}$ and $AbsFcErr_{i,j,t}$ - the forecast error of analyst i for firm j in quarter t and its absolute value respectively multiplied by 100, where the forecast error is calculated as the difference between the forecasted level and actual earnings per share, scaled by

the mean stock price over 10 trading days before the day of the forecast announcement; $TotScore_{j,t}$ and $sdScores_{j,t}$ - the sum and standard deviation of the scores of the key financial ratios; $MomEarn_{j,t}$ - the momentum of the previous period earnings change, which is equal to the change in earnings between $t-2$ and $t-1$ if the change is of the same sign as the change in the current period, between time interval $t-1$ and t, and 0 otherwise; $RevEarn_{j,t}$ - the reversal of the previous period earnings change, which is equal to the change in earnings between $t-2$ and $t-1$ if the change is of the opposite sign as the change in the current period, in a time interval between $t-1$ and t, and 0 otherwise; $\boldsymbol{P}$ is the matrix of other control variables; and $\eta_{i,j,t}$ - the error term.

The estimation results of the analysts' forecast accuracy model are presented in Table 1.2. Panel A contains the results of the model of the direction of analysts' forecast inaccuracy, while Panel B contains the results of analysts' forecast precision model. Here the estimates next to variables including the total score, standard deviation of scores, momentum and reversal in the earnings changes are of primary interest. From the regression for the whole sample, I find that the estimates of the total score and standard deviation of scores are both significant and positive. Since the total score variable can signal the future earnings of the firm, the positive sign of the coefficient next to it implies that the analysts tend to underestimate the earnings with the increase in the signals. The positive sign next to the estimate of the standard deviation of the scores I explain as the analysts' tendency to restrain themselves from being too optimistic observing multidirectional signals.

Comparing the estimates across low, mixed and high signal groups, I find that the estimate of the total score is significant and positive for the mixed signal groups, but it is significant and negative to for the low signal group. This suggests that the analysts tend to underestimate and overestimate the earnings for the mixed and low signal groups respectively with an increase in the total score. At the same time, an increase in the total score was not found to impact the direction of analysts' inaccuracy for the high signal group. The estimates next to the standard deviation of the scores is significant and positive for all signal groups. This might result from the fact that analysts are trying to avoid too optimistic forecasts observing the increase in heterogeneity of the signals.

The estimates of momentum and reversal of earnings change were found to be significant for all groups and were not found to differ across the groups. The positive sing next to the momentum in the earnings change implies underestimation of earnings due to momentum. On the other hand, the significant and negative estimate of the reversal leads rather to

Table 1.2: Analysts' forecast errors

VARIABLES	whole sample	low	mixed	high
Panel A. Direction of analysts' forecast inaccuracy				
TotScore	0.01***	-0.02***	0.01***	0.00
	(0.00)	(0.01)	(0.00)	(0.00)
sdScores	0.65***	0.74***	0.66***	1.03***
	(0.08)	(0.28)	(0.16)	(0.19)
MomEarn	0.64***	0.68***	0.79***	0.72***
	(0.03)	(0.10)	(0.06)	(0.05)
RevEarn	-0.37***	-0.31***	-0.45***	-0.37***
	(0.02)	(0.04)	(0.03)	(0.07)
Other controls	X	X	X	X
Observations	77,478	6,613	20,908	7,939
Adjusted R-squared	0.061	0.060	0.091	0.127
Panel B. Analysts' forecast precision				
TotScore	-0.00	0.02***	-0.00	0.00
	(0.00)	(0.01)	(0.00)	(0.00)
sdScores	-0.69***	-0.78***	-0.74***	-0.70***
	(0.08)	(0.26)	(0.15)	(0.18)
MomEarn	-0.18***	-0.37***	-0.17***	-0.08
	(0.03)	(0.07)	(0.05)	(0.05)
RevEarn	0.04***	0.11***	0.04	-0.04
	(0.01)	(0.02)	(0.03)	(0.07)
Other controls	X	X	X	X
Observations	77,478	6,613	20,908	7,939
Adjusted R-squared	0.024	0.048	0.027	0.053

Note:FcErr and *AbsFcErr* - the forecast error and absolute value of forecast error multiplied by 100, where the forecast error is calculated as the difference between the actual and forecasted level of earnings per share, scaled by the mean stock price over 10 trading days before the day of the forecast announcement; *TotScore* and *sdScores* - the sum and standard deviation of the scores of the key financial ratios; *MomEarn* - the momentum of the earnings change in the previous period, which is equal to the change in the earnings between the previous two quarters if the change is of the same sign as the change in the current quarter; *RevEarn* - the reversal of the earnings change of the previous period, which is equal to the change in earnings between the change in the previous two quarters if the change is of the opposite sign as the change in the current quarter, and 0 otherwise. Definition of other control variables is provided in Appendix 1.A. Robust standard errors are provided in parentheses. *** p<0.01, ** p<0.05, * p<0.1

overestimation.

The estimation results of the submodel of analysts' forecast precision are presented in Panel B of Table 1.2. The estimate of the total score for the analysts' forecast precision model is significant and positive only for the the low signal group. Since the dependent variable for this model is defined as the absolute value of a forecast error, the positive sign of the estimate implies that analysts' forecast precision for this group decreases as the total score increases. From this I conclude that an increase in the total score leads to a decrease in analysts' forecast precision errors for the low signal group, while the mixed and high signal groups are not affected. The estimates of the standard deviation of the scores in the analysts' forecast precision model are significant for the whole sample and all the signal groups. What is interesting to see is that the sign is negative, which again implies that analysts tend to produce more precise forecasts with an increase in heterogeneity in the information signals. I hypothesize that this may result from a possible representative bias. Observing the signals which point in the same direction, analysts may produce too optimistic or too pessimistic forecasts, and vice versa, if they observe more heterogeneous signals more diligence or attention is invested, and it may lead to more precise forecasts.

This explanation can also be consistent with my finding that the estimates of the momentum are significant and negative for the whole sample, as well as the low and mixed signal groups, while the estimates of the reversal are significant and positive for the whole sample and low signal group. The positive sign of the reversal in earnings may imply that analysts extrapolate the momentum in earnings surprise too much, which decreases analysts' forecast precision when reversal in the earnings happens. It is also interesting to see that, while analysts' forecast precision for the low signal group is affected by both the momentum and reversal in the earnings, analysts' forecast precision for the high signal group was not found to be affected by either of them.

1.6.2 Do Managers' Forecast Biases Differ across Groups?

Since I hypothesize that the managers' may realize the analysts' heterogeneity in the treatment of the signal groups, I further study the managers' forecast accuracy. For these purposes, I use the following model (the full specification of which is provided in equation 1.8 in Appendix 1.A):

$$ManFcErr_{j,t}(AbsManFcErr_{j,t}) = \beta_0 + \beta_1 TotScore + \beta_2 sdScores_{j,t} + \\ + \beta_3 AnFcErrPred_{j,t} + \beta_4 AnBias_{j,t} + \beta_5 sdAnFc_{j,t} + \boldsymbol{\beta P} + \omega_{j,t} \quad (1.4)$$

where $ManFcErr_{j,t}$ and $AbsManFcErr_{j,t}$ - the managers' forecast error or its absolute value, where the forecast error is defined as the difference between the actual and the forecasted level, scaled by the mean price over 10 trading days prior to the managers' forecast announcement date and multiplied by 100; $TotScore_{j,t}$ and $sdScores_{j,t}$ - the sum and standard deviation of the scores of the key financial ratios; $AnFcErrPred_{j,t}$ and $AnBias_{j,t}$ - the explained part and the mean of the residual part from the analysts' forecast precision model 1.3; $sdAnFc_{j,t}$ - the standard deviation of the analysts' forecasts for firm j in quarter t known to the market on the day of the managers' forecast release; and $\boldsymbol{P}$ is the matrix of other control variables; and $\omega_{j,t}$ - the error term with zero mean and constant variance.

Table 1.3 provides the estimation results of the model of the direction of managers' forecast inaccuracy (Panels A) and the model of managers' forecast precision (Panel B) respectively. There are 5 main estimates of primary interest: the total score, standard deviation of scores, standard deviation of analysts' forecasts, analysts' bias, and predicted parts of analysts' absolute forecast errors.

For the submodel of the direction of managers' forecast inaccuracy (Panel A in Table 1.3), all of the variables of interest have different effects on the forecast releases of managers across different types of firms (all of the estimates were found to differ across the groups). The estimates results suggest that the managers of the low signal group tend to overestimate the earnings per share with an increase in the total score. One of the possible reasons might be managers' attempts to avoid stocks underpricing, which leads them to driving the analysts' expectations slightly upwards. For the mixed signal group, an increase in the total score leads rather to managers' underestimation. The managers' forecast error for the high signal group is not affected by the change in the total score.

The standard deviation of the scores should reveal an impact of uncertainty associated with the key financial ratios. Here I also find asymmetry in the managers' forecasts between managers of the low, mixed and high signal group. An increase in the standard deviation of the scores cannot explain the managers' forecast errors for the high signal group. In contrast, the managers of the low and mixed signal groups underestimate future

Table 1.3: Managers' forecast errors

VARIABLES	whole sample	low	mixed	high
Panel A. Direction of managers' forecast inaccuracy				
$TotScore$	0.00***	-0.05***	0.02***	-0.00
	(0.00)	(0.01)	(0.00)	(0.00)
$sdScores$	0.17***	0.52**	1.99***	0.17
	(0.03)	(0.21)	(0.15)	(0.14)
$AnFcErrPred$	0.04	-0.08	0.21***	0.61***
	(0.03)	(0.07)	(0.03)	(0.05)
$AnBias$	-0.13***	-0.31***	-0.13***	-0.07***
	(0.01)	(0.03)	(0.02)	(0.01)
$sdAnFc$	-0.74***	-1.62**	-0.33	-0.16
	(0.14)	(0.68)	(0.23)	(0.16)
Other controls	X	X	X	X
Observations	66,763	5,510	17,489	7,698
Adjusted R-squared	0.205	0.504	0.211	0.320
Panel B. Managers' forecast precision				
$TotScore$	-0.01***	0.00	-0.03***	-0.01***
	(0.00)	(0.01)	(0.00)	(0.00)
$sdScores$	-0.26***	-0.20	-1.41***	-0.26**
	(0.03)	(0.19)	(0.13)	(0.10)
$AnFcErrPred$	-0.05*	0.35***	-0.16***	-0.69***
	(0.03)	(0.06)	(0.03)	(0.04)
$AnBias$	0.13***	0.33***	0.15***	0.11***
	(0.01)	(0.02)	(0.01)	(0.01)
$sdAnFc$	1.56***	3.12***	1.20***	0.85***
	(0.13)	(0.61)	(0.21)	(0.13)
Other controls	X	X	X	X
Observations	66,763	5,510	17,489	7,698
Adjusted R-squared	0.192	0.574	0.193	0.239

Note: $ManFcErr$ and $AbsManFcErr$ - the managers' forecast error and its absolute value, where the forecast error is defined as the difference between the actual and the forecasted level, scaled by the mean price over 10 trading days prior to the managers' forecast announcement date and multiplied by 100; $TotScore$ and $sdScores$ - the sum and standard deviation of the scores of the key financial ratios; $AnFcErrPred$ and $AnBias$ - the explained part and the mean of the residual part of the analysts' forecast precision model 1.3; $sdAnFc_{j,t}$ - the standard deviation of the analysts' forecasts for firm j in quarter t known to the market on the day of the managers' forecast release. Definition of other control variables is provided in Appendix 1.A. Robust standard errors are provided in parentheses. *** p<0.01, ** p<0.05, * p<0.1

earnings with an increase in the heterogeneity in the signals and the underestimation is higher for the mixed signal group (the estimates for the low and mixed signal groups are not equal at the 5% significance level).

With an increase in the predictable part of the analysts' forecasts, the managers tend to underestimate future earnings per share for the mixed and high signal groups and the underestimation is higher for the high signal group (the estimates are not equal for the groups at the 5% significance level).

With the increase in the analysts' bias (or the mean of the unpredictable part of the analysts' absolute forecast error), the managers tend to overestimate the earnings, and they tend to do so even more for the low signal group (the estimates are not equal across the groups at the 5% significance level).

The standard deviation of the analysts' forecasts was found to be significant and negative only for the low signal group, implying that the managers of the low signal group tend to overestimate the earnings with an increase in the standard deviation of the analysts' forecasts.

Panel B of Table 1.3 contains the estimation results of the managers' forecast precision submodel. The estimates of the total score is significant and negative for the whole sample and the mixed and high signal groups, implying that the managers release more precise forecasts for the latter, with an increase in the total score. The estimate of the standard deviation of the scores is significant and negative for the whole sample and the mixed and high signal groups, implying a higher managers' forecast precision, with an increase in the heterogeneity of informational signals for these groups. This effect is more pronounced for the mixed signal group (the estimates are not equal across the groups at the 5% significance level).

The impact of the predicted part of the analysts' absolute forecast error is also not equal across the groups. While for the low signal group the managers' forecast precision decreases with the increase in the predictable part of the analysts' absolute forecast error, the managers' forecast precision increases for the mixed and high signal groups and the effect is stronger for the high signal group (the estimates were found to differ across the groups at 5% significance level).

The analysts' bias decreases the managers' forecast precision for all of the signal groups and it does so the most for the low signal group (the estimates of the low signal group are not equal to those of the mixed and high signal groups at the 5% significance level; at the same time, the estimates of the mixed and high signal groups were not found to differ at

the 5% significance level).

An increase in the standard deviation of the analysts' forecasts leads to lower managers' forecast precision and the effect is the strongest for the low signal group, the estimate for which was found not to be equal to the estimates of the mixed and high signal groups at the 5% significance level (although the estimates for the mixed and high signal groups do not differ at the 5% significance level).

1.6.3 Do the Analysts' Discount the Managers' Forecasts?

To study the analysts' response to the managers' forecasts, I develop a model of analysts' forecast revision and their forecast accuracy after the revision. In the former model, I use an OLS estimator, where the dependent variable is the level of forecast adjustment. In the later one, using the linear probability model, I estimate the probability of observing the larger absolute value of the forecast error after the revision. The specification of the models is the following:

$$\begin{aligned} AnAdj_{i,j,t}(AnAccRev_{i,j,t}) = \beta_0 + \beta_1 ManFc_{j,t} + \beta_2 ManFcRan_{j,t} + \\ +\beta_3 ManFcRanLow_{j,t} + \beta_4 TotScore_{j,t} + \beta_5 sdScores_{j,t} + \boldsymbol{\beta P} + \varepsilon_{i,j,t} \end{aligned} \tag{1.5}$$

where $AnAdj_{i,j,t}$ - the forecast adjustment of analyst i for firm j in quarter t, where the adjustment is equal to the difference between the new forecast and the old one; $AnAccRev_{i,j,t}$ - the dummy variable which equals 1 if the absolute value of an analyst's i forecast for firm j after revision is larger than that before revision and 0 otherwise; $ManFc_{j,t}$ - the managers' earnings forecast of firm j in quarter t; $ManFcRan_{j,t}$ - the range of managers' earnings forecast and equals the difference between the upper and the lower bound managers' forecast if both estimates are available and zero otherwise; $ManFcRanLow_{j,t}$ - the difference between the point forecast and the lower bound of the managers' forecast if only the point forecast and the lower bound of the forecast are available and zero otherwise; $TotScore_{j,t}$ and $sdScores_{j,t}$ - the sum and standard deviation of the scores of the key financial ratios; $\boldsymbol{P}$ is the matrix of other controls; and $\epsilon_{i,j,t}$ - is the error term with mean zero and constant mean.

Panel A and B of Table 1.4 contain the estimates from the model of analysts' forecast revisions and forecast accuracy upon managers' forecasts respectively. With the increase

Table 1.4: Analysts' forecast revisions

VARIABLES	whole	low	mixed	high
Panel A. Analysts' forecast adjustments				
$ManFc$	0.02***	0.01**	0.02***	0.02***
	(0.00)	(0.00)	(0.00)	(0.00)
$ManFcRan$	-0.03***	0.01	-0.04	-0.08***
	(0.01)	(0.03)	(0.02)	(0.02)
$ManFcRanLow$	0.35***	4.39***	0.61	-0.03
	(0.06)	(0.55)	(0.53)	(0.20)
$TotScore$	-0.00	-0.00**	-0.00**	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)
$sdScores$	0.01***	0.03*	0.00	0.01
	(0.00)	(0.02)	(0.02)	(0.01)
Other controls	X	X	X	X
Observations	50,257	4,502	10,880	8,120
Adjusted R-squared	0.206	0.224	0.204	0.171
Panel B: Analysts' forecast accuracy after the revision				
$ManFc$	0.07***	0.11	0.06	0.05
	(0.02)	(0.08)	(0.04)	(0.05)
$ManFcRan$	1.71***	1.26***	2.35***	0.91**
	(0.16)	(0.45)	(0.41)	(0.39)
$ManFcRanLow$	-2.37**	5.87	-14.15	-0.72
	(1.09)	(10.90)	(8.71)	(5.31)
$TotScore$	-0.01***	-0.01	-0.01*	-0.05***
	(0.00)	(0.01)	(0.01)	(0.01)
$sdScores$	-0.08	-2.14***	0.58	-0.95***
	(0.07)	(0.40)	(0.48)	(0.27)
Other controls	X	X	X	X
Observations	50,257	4,502	10,880	8,120
Pseudo R-squared	0.042	0.051	0.049	0.055

Note: *AnAdj* - the analyst's adjustment of her forecast, where the adjustment is equal to the difference between the new forecast and the old one; *AnAccRev* - the dummy variable which equals 1 if the absolute value of the analyst's i forecast for firm j after revision is larger than before revision and 0 otherwise; $ManFc$ - the managers' earnings forecast of firm j in quarter t; $ManFcRan$ - the managers' earnings forecast range and equals the difference between the upper and the lower bound managers forecast if both estimates are available and zero otherwise; $ManFcRanLow$ - the difference between the forecast and the lower bound of the managers' forecast if only the forecast and the lower bound of forecast are available and zero otherwise; $TotScore$ and *sdScores* - the sum and standard deviation of the scores of the key financial ratios. Definition of other control variables is provided in Appendix 1.A. Robust standard errors are provided in parentheses. *** p<0.01, ** p<0.05, * p<0.1

in the managers' earnings estimates, the analysts update their forecasts upwards for the whole sample and all signal groups. The estimates were not found to differ across signal groups. The increase in the managers' forecasts was also found to be positive and significant in the probability model of greater analysts' forecast errors after revision only for the whole sample and the estimates were found insignificant for the all signal groups.

When the managers provide upper and lower bounds of their forecasts, the analysts tend to revise their forecast downwards for the whole sample and the high signal group, with an increase in the managers' forecasts range. The increase in the range of the managers' forecasts also leads to the higher probability of the larger absolute forecast error after the revision for the whole sample and all signal groups and I cannot reject the hypothesis that the estimates are equal across all groups at the 5% significance level. Given the findings from section 1.6.2 showing that managers' forecasts may depend on the signal groups, the equality of the estimates across signal group may suggest that the analysts fail to adjust for the managers' possible forecast biases.

If the managers release a point estimate and only a lower bound for their forecast of future earnings per share, this range between the point estimate and the lower bound affects the analysts' forecast revisions only for the whole sample. The probability of higher absolute forecast error after the revision decreases with the increase in distance between the managers' forecast and its low bound, but only for the whole sample.

The increase in the total score leads to the downward revisions of analysts' forecasts for the low and mixed signal groups and upwards revisions for the high signal group. The probability of having the larger forecast error after revision decreases in the total signal score for the whole sample, and the mixed and high signal groups.

The increase in the heterogeneity of the signals leads analysts to revise upwards for the whole sample and the low signal group. The revisions for the mixed signal group are not affected by an increase in the heterogeneity in signals. As for the precision of the analysts' forecasts after revision, the probability of having higher forecast errors decreases in the heterogeneity in signals for the whole sample, and for the low and high signal groups, but it is not affected for the mixed signal group.

1.7 Conclusion

This paper provided evidence of analysts' forecast biases which are driven by the financial indicators of the firm. While previous research tries to explain the analysts' forecast errors,

I show that the information contained in earnings is perceived differently across firms. The result comes from the fact that when predicting future earnings of the firms, analysts use a set of indicators or information signals. When they obtain signals of the same sign (when all indicators predict prosperous or poor performance of the firm), one would expect that due to lower uncertainty about the firms' future performance, the analysts' forecast errors should be smaller. On the contrary, there is evidence that the analysts actually over- or underreact when creating their forecasts for these types of firms.

Overall, the analysis yields the following findings. Firstly, the paper argues that the distributions of the analysts' forecast errors are not equal across firms with only low, only high, and mixed (with both, low and high) signals.

The paper also analyzes the impact of the analysts' forecast accuracy biases on managers' incentives to release forecasts and manipulate the market. There is evidence that the managers' earnings over- or underestimation is driven by variables including the total signal score, standard deviation of the signals, standard errors of the analysts' forecast errors, analysts' bias and the predicted part of the analysts' forecast errors. The managers' forecasts, in their turn, have an impact on the analysts who may update their forecasts in response to them. While there is no evidence of differences in the effect of managers' point estimates of earnings on the analysts' adjusting their forecast across groups, there is evidence of the different responses of analysts to the earnings uncertainty sent by managers in the form of forecasting lower and upper bounds for future earnings. The managers-analysts responses to each other's forecast releases imply that there may be gaming on disclosure.

Overall, the paper indicates that the analysts' forecast biases depend on the signal group. The managers of the firms try to exploit these biases by releasing their own forecasts and tending to drive the analysts' forecasts. The analysts sometimes fail to realize the managers' biased forecasts and take into account these biases when revising their forecasts.

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1.A Models and Variables Used

Model 1: ***Signal informativeness***

$$\begin{aligned} EPS_{j,t} &= \alpha_0 + \alpha_1 EPS_{j,t-1} + \alpha_2 SPM_{j,t-1} + \alpha_3 TURNA_{j,t-1} + \alpha_4 BVA_{j,t-1} + \alpha_5 BM_{j,t-1} + \\ &+ \alpha_6 L_{j,t-1} + \alpha_7 DE_{j,t-1} + \alpha_8 TOTACR_{j,t-1} + \alpha_9 CAPEXP_{j,t-1} + \alpha_{10} SIZE + \\ &+ \alpha_{11} ETR_{j,t-1} + \alpha_{12} CCR_{j,t-1} + \alpha_{13} INTD_{j,t-1} + \alpha_{14} AG_{j,t-1} + \alpha_{15} CSI_{j,t-1} + \\ &+ \alpha_{16} DA_{j,t-1} + \alpha_{17} MSI_{j,t-1} + \varsigma_{j,t} \end{aligned} \tag{1.6}$$

where $EPS_{j,t}$ ($EPS_{j,t-1}$) - the earnings per share excluding extraordinary items of firm j in quarter t ($t-1$); $SPM_{j,t-1}$ - the sales profit margin and it is equal to operating income after depreciation to sales; $TURNA_{j,t-1}$ - the asset turnover calculated as current sales divided by total assets; $BVA_{j,t-1}$ - the book value-to-assets ratio, calculated as the difference between total assets and total liabilities, scaled by total assets; $BM_{j,t-1}$ - the market-to-book value, which equals to book value divided by the product of the number of shares outstanding and the last available stock price for the appropriate quarter; $L_{j,t-1}$ - the leverage ratio calculated as the sum of long-term debt and debt in current liabilities to total assets; $DE_{j,t-1}$ - the dividends-to-earnings ratio, which is equal to dividends divided by earnings; $TOTACR_{j,t-1}$ - the total accruals, calculated as the change in the total assets minus the change in total liabilities and minus the change in the cash and short-term investments scaled by total assets; $CAPEXP_{j,t-1}$ - the capital expenditures calculated as the ratio of yearly capital expenditures to total assets; $SIZE_{j,t-1}$ - the natural logarithm of total assets; $ETR_{j,t-1}$ - the effective tax rate, calculated as one year moving average income taxes to pretax income ratio; $CCR_{j,t-1}$ - the correlation between costs and revenues over the last four quarters; $INTD_{j,t-1}$ - the interests to debt ratio calculated as the ratio of interests to the sum of long-term debt and debt in current liabilities; $AG_{j,t-1}$ - the assets growth, which is equal to logarithm of total assets in the current quarter to total assets in the previous quarter; $CSI_{j,t-1}$ - the common stock interest and is equal to income before extraordinary items available to common stock holders divided by common stockholder equity; $DA_{j,t-1}$ - the depreciation-to-assets ratio and is equal to the depreciation scaled by total assets; and $MSI_{j,t-1}$ - the minority stock interest, calculated as the ratio of noncontrolling interests to common stockholder equity; and $\varsigma_{j,t}$ - the error term.

Model 2: *Analysts' inaccuracy*

$$\begin{aligned} FcErr_{i,j,t} \quad (AbsFcErr_{i,j,t}) = \quad & \beta_0 + \beta_1 FcErr_{i,j,t-1}(AbsFcErr_{i,j,t-1}) + \beta_2 TotScore_{j,t} + \beta_3 sdScore_{j,t} + \\ + \quad & \beta_4 MomEarn_{j,t} + \beta_5 RevEarn_{j,t} + \beta_6 FcAge_{i,j,t} + \beta_7 FcFr_{i,j,t} + \\ + \quad & \beta_8 NumFirm_{i,t} + \beta_9 FundSent_t + \beta_{10} ResSent_t + \\ + \quad & \sum_{k=2}^{4} \beta_{k+9} q_k + \eta_{i,j,t} \end{aligned} \tag{1.7}$$

where $FcErr_{i,j,t}$ ($FcErr_{i,j,t-1}$) and $AbsFcErr_{i,j,t}$ ($AbsFcErr_{i,j,t-1}$) - the forecast error of analyst i for firm j in quarter t ($t-1$) and its absolute value, respectively, multiplied by 100, where the forecast error is calculated as the difference between the actual and forecasted level of earnings per share (EPS) scaled by the mean stock price over 10 trading days before the forecast announcement by analyst i (i.e. the economic interpretation of the dependent variable is the forecast error per 1 cent); $TotScore_{j,t}$ and $sdScores_{j,t}$ - the sum and standard deviation of the scores of the key financial ratios; $MomEarn_{i,t}$ - the momentum of the previous period earnings change, which is equal to the change in EPS between $t-2$ and $t-1$ if the change is of the same sign as the change in the current period (i.e. between time $t-1$ and t) and 0 otherwise; $RevEarn_{i,t}$ - the reversal of the previous period earnings change, which is equal to the change in EPS between $t-2$ and $t-1$ if the change is of the opposite sign as the change in the current period (i.e. between time $t-1$ and t) and 0 otherwise*;* $FcAge_{i,j,t}$ - the forecast age or the time interval between the forecast release date of analyst i for firm j and the earnings announcement date; $FcFr_{i,j,t}$ - the forecast frequency or the number of one-quarter ahead forecasts analyst i released for firm j in the previous calendar year; $NumFirm_{i,j,t}$ - the number of firms followed by analyst i in the current quarter in the same 2-digit SIC industry as firm j; $FundSent_t$ and $ResSent_t$ - the fundamental and residual parts of consumer sentiment and it is constructed as the fitted value from the regression of consumer sentiment on GDP growth, consumption growth, labor income growth, default spread (calculated as a difference between Baa and Aaa rated corporate bonds), term spread (calculated as a difference between yields of 10 year government bonds and one month Treasury bills), yields on the three month Treasury bills, consumer price index change, CRSP value-weighted index dividend yield; and $q_i, \forall i = 2, 3, 4$ - the quarter dummy, which is equal to 1 if quarter equals i and 0 otherwise; and $\eta_{i,j,t}$ - the error term.

Model 3: *Managers' guidance*

$$
\begin{aligned}
ManFcErr_{j,t} \quad (AbsManFcErr_{j,t}) = \quad & \beta_0 + \beta_1 TotScore_{j,t} + \beta_2 sdScore_{j,t} + \beta_3 AnFcErrPred_{j,t} + \\
+ \quad & \beta_4 AnBias_{j,t} + \beta_5 sdAnFc_{j,t} + \beta_6 FundSent_t + \beta_7 ResSent_t + \\
+ \quad & \beta_8 Ret_{j,t} + \beta_9 sdRet_{j,t} + \beta_{10} AbnVol_{j,t} + \beta_{11} BASpr_{j,t} + \\
+ \quad & \beta_{12} sdPrc_{j,t} + \beta_{13} InsTrans_{j,t} + \beta_{14} dLossLag_{j,t} + \\
+ \quad & \beta_{15} dBadNews + \beta_{16} dBadNews * News_{j,t} + \beta_{17} dLossFc_{j,t} + \\
+ \quad & \beta_{18} FcHor_{j,t} + \beta_{19} IndConc_{j,t} + \beta_{20} Size_{j,t} + \omega_{j,t}
\end{aligned} \tag{1.8}
$$

where $ManFcErr_{j,t}$ and $AbsManFcErr_{j,t}$ - the managers' forecast error and its absolute value, where forecast error defined as the difference between the actual and the forecasted level, scaled by the mean stock price over 10 trading days prior to the managers' forecast announcement date and multiplied by 100; $TotScore_{j,t}$ and $sdScores_{j,t}$ - the sum and standard deviation of the scores of the key financial ratios; $AnFcErrPred_{j,t}$ and $AnBias_{j,t}$ - the explained part and the mean of residual part of the analysts' forecast precision model from equation (1.7); $sdAnFc_{j,t}$ - the standard deviation of the analysts' forecasts for firm j in quarter t known to the market on the day of the managers' forecast release; $FundSent_t$ and $ResSent_t$ - the fundamental and residual parts of consumer sentiment and it is constructed as the fitted value from the regression of consumer sentiment on GDP growth, consumption growth, labor income growth, default spread (calculated as a difference between Baa and Aaa rated corporate bonds), term spread (calculated as a difference between yields of 10 year government bonds and one month Treasury bills), yields on the three month Treasury bills, consumer price index change, CRSP value-weighted index dividend yield; $R_{j,t}$ and $sdR_{j,t}$ - the returns and the standard deviation of the returns over 10 trading days on firm's j stock in quarter t prior to the managers' forecast announcement date; $AbnVol_{j,t}$ - the mean of daily abnormal trading volume for firm j in quarter t over 10 trading days prior to the managers' forecast announcement, where the daily abnormal trading volume was calculated as the ratio of difference between daily stock trading volume minus the mean daily trading volume over the previous year to the mean daily trading volume over the previous year; $BAS_{j,t}$ - the mean bid-ask spread for the stock of firm j in quarter t over a 10 trading days prior to the managers' forecast announcement; $sdPrc_{j,t}$ - the standard deviation of stock price of firm j over half a year prior to the managers' forecast announcement in quarter t; $InsTrans_{j,t}$ - the value of insiders' transactions of firm j's securities over 10 trading days prior to the managers' forecast announcement date

which is equal to the sum of purchases minus sales; $dLossLag_{j,t}$ - the dummy variable which is equal to 1, if firm j had negative earnings in the previous quarter, and 0 otherwise; $dLossFc_{j,t}$ - the dummy variable of a negative forecast which is equal to 1, if the managers' forecast of firm j is negative, and 0 otherwise; $dBadNews$ - dummy variable of "bad" news, which equals 1 if the managers' forecast is below the analysts' forecast mean and zero otherwise; $dBadNews * News_{j,t}$ - the interaction term of the dummy variable of "bad" news, which equals 1 if the managers' forecast is below the analysts' forecast mean and zero otherwise, and the managers' forecast news, defined as the difference between the analysts' mean forecast and managers' estimate news for firm j in quarter t; $FcHor_{j,t}$ - the time interval between the managers' forecast release day and the fiscal quarter end for firm j in quarter t; $IndCons_{j,t}$ - the industry concentration of sales, measured by the herfindahl index for firm j in quarter t; and $Size_{j,t}$ - the size of firm j in quarter t, which is equal to a natural logarithm of total assets; and $\omega_{j,t}$ - the error term.

Model 4 and 5: *Analysts' adjustment and accuracy after revision*

$$
\begin{aligned}
AnAdj_{i,j,t} \quad (AnAccRev_{i,j,t}) = \quad & \beta_0 + \beta_1 ManFc_{j,t} + \beta_2 ManFcRan_{j,t} + \beta_3 ManFcRanLow_{j,t} + \\
+ \quad & \beta_4 TotScore_{j,t} + \beta_5 sdSc_{j,t} + \beta_6 sdAnFc_{j,t} + \beta_7 FundSent_t + \\
+ \quad & \beta_8 ResSent_t + \beta_9 Ret_{j,t} + \beta_{10} sdRet_{j,t} + \beta_{11} AbnVol_{j,t} + \\
+ \quad & \beta_{12} BASpr_{j,t} + \beta_{13} sdPrc_{j,t} + \beta_{14} InsTrans_{j,t} + \\
+ \quad & \beta_{15} dLossFc_{j,t} + \beta_{16} dBadNews_{j,t} + \beta_{17} dBadNews * News_{j,t} + \\
+ \quad & \beta_{17} FcHor_{j,t} + \beta_{19} IndConc_{j,t} + \beta_{20} Size_{j,t} + \beta_{21} FcAge_{i,j,t} + \\
+ \quad & \beta_{22} FcFr_{i,j,t} + \beta_{23} GenExp_{i,j,t} + \beta_{24} NumFirm_{i,t} + \varepsilon_{i,j,t}
\end{aligned}
\tag{1.9}
$$

where $AnAdj_{i,j,t}$ - the forecast adjustment of analyst i for firm j in quarter t, where the adjustment is equal to the difference between the old and new forecasts; $AnAccRev_{i,j,t}$ - the dummy variable, which equals 1 if the absolute value of the analyst's i forecast for firm j after revision is larger than that before revision and 0 otherwise; $ManFc_{j,t}$ - the managers' earnings forecast of firm j in quarter t; $ManFcRan_{j,t}$ - the managers' earnings forecast range and equals the difference between the upper and the lower bound managers' forecast if both estimates are available and zero otherwise; $ManFcRanLow_{j,t}$ - the difference between the forecast and the lower bound of the managers' forecast if only the forecast and the lower bound of the forecast are available and zero otherwise; $TotScore_{j,t}$ and $sdScores_{j,t}$ - the sum and standard deviation of the scores of the key financial ratios;

$FundSent_t$ and $ResSent_t$ - the fundamental and residual parts of consumer sentiment and it is constructed as the fitted value from the regression of consumer sentiment on GDP growth, consumption growth, labor income growth, default spread (calculated as a difference between Baa and Aaa rated corporate bonds), term spread (calculated as a difference between yields of 10 year government bonds and one month Treasury bills), yields on the three month Treasury bills, consumer price index change, CRSP value-weighted index dividend yield; $R_{j,t}$ and $sdR_{j,t}$ - the returns and the standard deviation of the returns over 10 trading days on firm's j stock in quarter t prior to the analysts' forecast announcement date; $AbnVol_{j,t}$ - the mean of daily abnormal trading volume for firm j in quarter t over 10 trading days prior to the analysts' forecast announcement, where the daily abnormal trading volume was calculated as the ratio of difference between daily stock trading volume minus the mean daily trading volume over the previous year to the mean daily trading volume over the previous year; $BAS_{j,t}$ - the mean bid-ask spread for the stock of firm j in quarter t over 10 trading days prior to the analysts' forecast announcement; $InsTrans_{j,t}$ - the value of insiders' transactions of firm j's securities over 10 trading days prior to the managers' forecast announcement date which is equal to the sum of purchases minus sales; $dLossFc_{j,t}$ - the dummy variable of a negative forecast which is equal to 1, if the managers' forecast of firm j is negative, and 0 otherwise; $dBadNews$ - the dummy variable of "bad" news, which equals 1 if the managers' forecast is below the analysts' forecast mean and zero otherwise; $dBadNews * News_{j,t}$ - the interaction term of the dummy variable of "bad" news and forecast news for firm j in quarter t; $FcHor_{j,t}$ - the time interval between the managers' forecast release day and the fiscal quarter end for firm j in quarter t; $IndCons_{j,t}$ - the industry concentration of sales, measured by the herfindahl index for firm j in quarter t; and $Size_{j,t}$ - the size of firm j in quarter t which is equal to the natural logarithm of total assets; $FcAge_{i,j,t}$ - the forecast age or the time interval between the forecast release date of analyst i for firm j and the earnings announcement date; $FcFr_{i,j,t}$ - the forecast frequency or the number of one-quarter ahead forecasts analyst i released for firm j in the previous calendar year; $GenExp_{i,t}$ - the number of quarters for which analyst i released at least one quarterly forecast prior to the current quarter; $NumFirm_{i,j,t}$ - the number of firms followed by analyst i in the current quarter in the same 2-digit SIC industry as firm j; and $\varepsilon_{i,j,t}$ - the error term.

1.B Signal Informativeness

Table 1.5: *Signal informativeness*

VARIABLES	EPS	Variable description
EPS_lag	0.40***	EPS - earnings per share excluding extraordinary items
	(0.00)	
SPM	0.01***	SPM - the sales profit margin is equal to operating income after depreciation to sales
	(0.00)	
$TURNA$	0.10***	$TURNA$ - the asset turnover is calculated as current sales divided by total assets
	(0.01)	
BVA	-0.09***	BVA - the book value-to-assets ratio, calculated as difference between total assets and total liabilities, scaled by total assets
	(0.01)	
BM	-21.81***	BM - the market-to-book value equals to book value divided by the product of the number of shares outstanding and the last available stock price for the appropriate quarter
	(0.76)	
L	-0.29***	L - the leverage ratio calculated as the sum of long-term debt and debt in current liabilities to total assets
	(0.01)	
DE	0.01***	DE - the dividends-to-earnings ratio equals dividends divided by earnings
	(0.00)	
$TOTACR$	-0.49***	$TOTACR$ - the total accruals, calculated as the change in the total assets minus the change in total liabilities and minus the change in the yearly average cash scaled by total assets
	(0.02)	
$CAPEXP$	0.09***	$CAPEXP$ - the capital expenditures are the ratio of yearly capital expenditures to total assets;
	(0.03)	
$SIZE$	0.05***	$SIZE$ - the natural logarithm of total assets
	(0.00)	
ETR	-0.02***	ETR - the effective tax rate is calculated as income taxes to pretax income ratio
	(0.00)	
CCR	0.02***	CCR - the correlation between costs and sales over the last four quarters;
	(0.00)	
$INTD$	0.00***	$INTD$ - the interests to debt ratio is calculated as the ratio of interests to the sum of long-term debt and debt in current liabilities
	(0.00)	
AG	0.19***	AG - the assets growth is equal to logarithm of total assets in the current quarter to total assets in the previous quarter
	(0.01)	
CSI	0.00***	CSI - the common stock interest equals to income before extraordinary items available to common stock holders to common stock capital
	(0.00)	
DA	-2.10***	DA - the depreciation-to-assets ratio is the depreciation scaled by total assets
	(0.14)	
MSI	-0.00***	MSI - the minority stock interest calculated as the ratio of noncontrolling interests to common stockholder equity
	(0.00)	
$Constant$	-0.09***	
	(0.01)	
Observations	226,736	
Adjusted R-squared	0.221	

Robust standard errors are provided in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Chapter 2

Cross-industry Abnormal Returns and Trading Volume upon Earnings Announcements

Abstract

This chapter investigates how trading activity responds to industry-related earnings announcements and whether this trading activity is informative. While previous research concentrates on the earnings surprise as the main information signal, I find that the abnormal trading volume of the subsequent announcers can explain the abnormal returns on the day of the first and subsequent own announcement and in the post announcement periods. I also show that trading activity upon the first announcement is not driven by the first announcer's earnings surprise, but rather by the history of the earnings surprises of both the first and subsequent announcers. Moreover, the first and subsequent announcers' earnings surprises history was found to have the predictive power of the subsequent announcer's own earnings surprise. I also provide some evidence that upon the first announcement the market tries to incorporate the subsequent announcer's earnings surprise predictability, but fails to do so fully.

2.1 Introduction

Extensive research has shown that the volume of stock trading can serve as a useful information signal about stock performance[1]. Changes in trading activity, in their turn, may be induced by information arrivals (Andersen, 1996; Barber & Odean, 2008; Busse & Green, 2002; Kim & Verrecchia, 1991; etc.), since the new information should be incorporated in the investors' decision making (Bamber, Barron, & Stober, 1997). Keeping this in mind, one might think that on the day of the information arrivals there are at least two information signals. The first is the new information itself and the second is the market reaction to this information signal, reflected in the market's adjustment in trading activity upon observing the new piece of information.

Information signals can arrive to the market in different forms: macroeconomic news, firms' announcements, appearance in the media, etc. Among the particular information signals are the earnings announcements of industry-related firms. Although there are many studies of the responsiveness of trading volume to the former type of information signals, there is a gap in the literature on the impact of intra-industry information transfers on trading activity within the industry. While previous research on intra-industry transfers concentrates mainly on the impact of announcements of the industry-related firms[2], I argue that although these announcements are informative, the market perception of them will be reflected in trading volume and, thus, the latter should be informative as well. Therefore, the aim of this paper is to fill this gap and analyze the informativeness of trading volume on the day of the industry-related earnings announcements. In particular, I concentrate on the impact of the first earnings announcements in the industry on the subsequent announcers.

The reaction to the earnings announcements may also depend on market expectations about the announcing and non-announcing firms. Thus, for example, if the first announcer is a firm which persistently beats the analysts' forecasts, a new earnings surprise may have a different impact on the market compared to that of a firm which did not surprise the market in the past so much. The persistency in the positive surprises may indicate that

[1]The literature on the predictability of stock returns with trading volume, among others, include such studies as Gallant, Rossi, and Tauchen (1992), Campbell, Grossman, and Wang (1992), Conrad, Hameed, and Niden (1994), Lee and Swaminathan (2000), Connolly and Stivers (2003).

[2]Besides earnings announcements, the prior studies on the intra-industry transfer include managers' (Baginski, 1987; Han, Wild, & Ramesh, 1989; Pyo & Lustgarten, 1990) and analysts' (Ramnath, 2002) earnings forecasts, bankruptcy (Lang & Stulz, 1992) and equity offerings announcements (Szewczyk, 1992).

the firm is doing well, or there is something unique driving the firm's revenues and overall performance which is consistently overlooked by the analysts. The irregularity in the earnings surprises may, on the contrary, result from market conditions which are favorable for the firm or earnings management by managers. While the earnings surprise in the new reporting quarter of the firm with persistent surprises might be perceived by the market as less surprising or "normal", the positive earnings surprise of a firm with irregular surprises may be more unexpected. The same logic can be applied to the subsequent announcer: the implication of the first announcer's earnings surprise may depend on how often and by how much the subsequent announcer beat the analysts' forecast in the past.

This paper differs from the papers on the informativeness of the trading volume and intra-industry information transfers in several respects. Contrary to most of previous research, I do not concentrate solely on the analysis of the impact of the industry-related firms' earnings announcements on the non-announcing firms' stock performance, but rather on the study of the trading activity in response to such announcements and whether this trading activity is informative. Secondly, I investigate whether the stock performance and trading activity of non-announcing firms upon the first announcement is also dependent, besides the current quarter first earnings surprises, on the history of earnings surprises of both the first and subsequent announcers.

Consistent with previous research, I find that the first announcer's earnings surprise can explain the non-announcing firms' stock performance upon such announcements, but I contribute to the literature by showing that the trading volume upon the first announcement in the industry is aslo informative. Secondly, I also find that the history of the earnings surprises of both the first and subsequent announcers can explain the stock performance and trading activity upon the first announcement. Thirdly, I find evidence that not only the the first announcer's earnings surprise, but also the earnings surprises history of both the first and subsequent announcers can predict the latter's earnings surprise. Fourthly, the results show that the market does not fully realize the subsequent announcer's earnings surprise predictability, which may be interpreted as some form of market inefficiency. Fifthly, the findings also suggest that the trading volume has a higher persistency upon the first announcement than upon subsequent announcement.

The chapter is organized as follows. The second section is devoted to the discussion of existing research on the topic of this study. In the third section, the methodology is introduced. The fourth section deals with the data and sample selection. In the fifth section I present the results. The final, sixth, section concludes.

2.2 Related Literature

Trading volume is not only informative about the future performance of stocks, but it can also be used for purifying the information contained in other information signals. For example, Schneider (2009) develops a model in which investors learn from private signals, market prices and aggregate trading volume. The author shows that besides being the information signal by itself, trading volume can help investors to evaluate the precision of other information signals, such as private information and asset prices.

The hypothesis of trading volume being an extra information signal is also supported by the findings of Gervais, Kaniel, and Mingelgrin (2001) showing that the high trading volume return premium cannot be explained by the firm's returns autocorrelation, announcements, market risk, or liquidity. The authors explain the high trading volume return premium by the higher visibility of the stock and subsequent demand and price changes, while on the contrary, the lower trading volume can be explained by higher attention distraction (Hirshleifer, Lim, & Teoh, 2009).

In its turn, the visibility of the stocks and demand for them can be affected by industry-related news through at least two channels. Firstly, the literature on the intra-industry information transfer has shown that industry-related firm's earnings announcements may provide valuable information about its peers in the industry (Clinch & Sinclair, 1987; Firth, 1976; Foster, 1981; Freeman & Tse, 1992; Han & Wild, 1990; Thomas & Zhang, 2008)[3]. If the industry-related firm's announcement is perceived by the market as news for its peers, the trading volume of the non-announcing firms in the industry should respond to the first announcement in the industry. This effect can be considered to be direct - the market reacts to the new piece of the information relevant to the the non-announcing firm's future performance. The second, indirect, effect of the first announcer's earnings releases on trading activity in the non-announcing firm's stock will arise as the result of changes in the announcing firm's stock trading activity.

The higher trading volume upon the first announcement can result from the heterogeneity in responses to first announcements. As shown by Kandel and Pearson (1995), investors do not incorporate market information rationally and "agree to disagree". Li (2007) comes to the same conclusion, showing that upon observing the identical information signal all investors use different models of updating their beliefs. In both models, disagreement

[3]Besides earnings announcements, the prior studies on the intra-industry transfer include managers' (Baginski, 1987; Han et al., 1989; Pyo & Lustgarten, 1990) and analysts' (Ramnath, 2002) earnings forecasts, bankruptcy (Lang & Stulz, 1992) and equity offerings announcements (Szewczyk (1992)).

about the implications of the new piece of information may lead to higher dispersion in expectations of the announcing and non-announcing firm's performance. Consequently, due to the increased dispersion in beliefs there will be more investors willing to buy as well as those willing to sell[4], but these changes in demand and supply for the stock may drive the stock returns either up or down.

The other explanations of the increase in trading volume can be previous disagreement before the news arrival. For example, Karpoff (1986) shows that abnormal trading volume can arise even when investors interpret an information signal identically, but had divergent expectations prior to the arrival of the news. This heterogeneity prior to the news arrival and identical interpretation of the new information signal should prompt corrective measures by investors and the changes in the demand for the stock will result in price changes.

Previous research findings suggest that regardless of whether the increased trading volume results from disagreement about the news consistent with Kandel and Pearson (1995) or identical interpretation of the news with previous disagreement as in the Karpoff's (1986) model, trading volume can signal the direction of the stock performance. In the former case, the disagreement may lead to the failure of meeting expectations of some of the investors and subsequently open profitable opportunities due to the corrective actions of the market. The latter case is even more straightforward since it directly implies the corrective market actions due to the previous sub-optimal incorporation of the available information. One example of such expectations prior to the arrival of the news could be short-selling, which has been shown to signal informative trading (Christophe, Ferri, & Angel, 2004).

The increase in trading activity can also be induced by the presence of heterogeneous agents leading to heterogeneous responses to the same information signal. This hypothesis is motivated by the findings of Barber and Odean (2008) who show that individual investors are more likely to buy on high attention days (on days of new information arrivals) while institutional investors are more likely to sell on those days. In our context, this may imply that on the first announcement day in the industry the less sophisticated investors (usually believed to be individual investors) may be more inclined to buy the stock of announcing firms, and more sophisticated investors (usually believed to be institutional

[4]Other research on the increase in trading volume due to the increase in the heterogeneity in beliefs include Shalen (1993), Barron (1995), Bessembinder, Chan, and Seguin (1996), Bamber et al. (1997), Goetzmann and Massa (2005), Buraschi and Jiltsov (2006), etc.

investors) may be more inclined to sell those stocks. This trading activity upon the first announcement might be reinforced by the presence of informed and uninformed traders, since Collin-Dufresne and Fos (2015) show that informed investors tend to trade more actively when uninformed trading activity is quite high. As a result one might expect an increase in the trading volume of the first announcer.

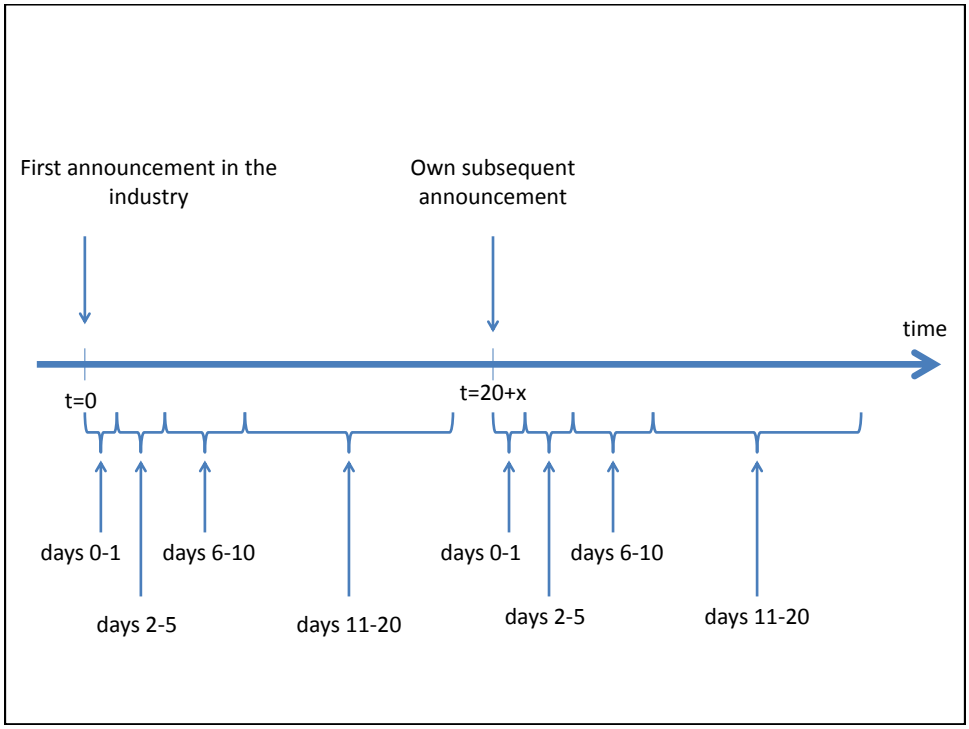
Moreover, one can expect the opposite direction in trading with the non-announcing firms stocks. Ramnath (2002) shows that the underreaction to the first announcer earnings reports of such sophisticated market players as analysts is smaller compared to the market underreaction. Due to this smaller underreaction more sophisticated investors may put higher weights on the non-announcing firms, the earnings surprises for which are not known, but the beliefs about which will be updated based on the first announcer's earnings releases, and, on the contrary, put lower weights on the stocks of the announcing firms. Such trading practices can be profitable since Foster, Olsen, and Shevlin (1984) emphasize that constructing a portfolio based on the foreknowledge of earnings surprises is much more profitable than the one constructed on the known earnings surprises. Based on this reasoning, it might be expected that individual investors are more likely to sell and more sophisticated investors more likely to buy the stock of non-announcing firms. This argument is consistent with the findings of Christophe et al. (2004), who show that short selling reveals the informative trading in the pre-announcement period. Moreover, Diether, Lee, and Werner (2009) show that short-sellers can correctly predict the abnormal negative returns.

Summarizing all the arguments above, the trading volume upon the announcement may contain some extra information besides the announcer's earnings surprise and reflect either heterogeneous beliefs, heterogeneous beliefs updating, and/or the presence of heterogeneous agents, all of which may have an impact on the asset prices. This suggests that upon the first announcement in the industry the market receives at least two information signals concerning the future performance of the subsequent announcer: the earnings surprise of the first announcer and the abnormal trading volume of the first and subsequent announcers upon the first announcement. While the announcing firm's earnings surprise may form the investors' expectations about the non-announcing firm's earnings surprise, the trading volume of both an announcing and non-announcing firm may reflect changes in the demand for the non-announcing firms and consequently impact the stock prices, and thus serve as an additional informational signal about the non-announcing firm's stock performance.

The history of the earnings surprises is also important in my study, since the previous studies have shown that the market rewards companies with persistent positive earnings surprises (Barth, Elliott, & Finn, 1999; Bartov, Givoly, & Hayn, 2002; Kasznik & McNichols, 2002). Moreover, Bartov et al. (2002) also show that the premium for beating the analysts' forecasts in the current quarter can be used as a leading indicator of future performance. On the other hand, Lopez and Rees (2002) show that the market partially discounts the systemic component of the persistent positive earnings surprises since the persistency can be explained to some degree by the managers' efforts aimed at meeting analysts' forecasts (Brown & Caylor, 2005; Burgstahler & Dichev, 1997; Burgstahler & Eames, 2006; Degeorge, Patel, & Zeckhauser, 1999). Even in the absence of earnings management, the persistency in the earnings surprises may be driven by the inability of the analysts to capture some important permanent components of the earnings (Dichev & Tang, 2009), while the irregularity of the earnings surprises may result from the temporal factors or favorable market movements.

In addition, regardless of whether the stream of positive earnings surprises results from the permanent earnings surprises driver omitted by the analysts and/or earnings management by managers, a stream of positive earnings surprises may build market representativeness bias (Alti & Tetlock, 2014; Barberis, Shleifer, & Vishny, 1998; Brav & Heaton, 2002; Gennaioli, Shleifer, & Vishny, 2015; Kahneman & Tversky, 1972; etc.), when the investors tend to extrapolate a series they were observing for a while. As the result of this representativeness bias the market may treat the firms with a long and persistent history of positive earnings surprises differently from those firms which show positive earnings surprises once in a while. For this reason I expect, firstly, that the history of the first announcer's earnings surprises may matter in how the market responds to its announcement, since it may help to filter out the permanent component of the earnings surprises from the temporal one, each of which might have a different impact on updating beliefs about the subsequent announcers. At the same time, the history of the subsequent announcer's earnings surprises may also be important, since even a huge first announcer's earnings surprise and long sequence of positive earnings surprises may not be very relevant for the subsequent announcer with a long history of negative earnings surprises.

Figure 2.1: Timeline of the events



2.3 Methodology and Hypotheses

The purpose of this chapter is to analyze the impact of the first earnings announcements on trading activity and stock responses to it. For these purposes I am going to consider two event windows as depicted in Figure 2.1. The first event window is represented by the time interval around the first announcement date in the industry for a particular fiscal quarter. The second is concentrated around the subsequent announcer's own reporting date for that particular fiscal quarter. In both of the event windows, I consider the different time intervals in order to study the persistency of the impact of the variable of interest over time. Thus the following time intervals are analyzed: days 0-1 (where day=0 is the first announcement or own subsequent announcement date respectively), days 2-5, days 6-10, and days 11-20 upon the first or own subsequent earnings reports respectively[5].

Using these two event windows allows me to more deeply understand the informativeness of the trading volume. Previous research has shown that the first announcements

[5]Although in event studies usually [-n,n] time windows with time 0 being an event date are analyzed, I consciously consider only the post announcement period, starting with the announcement day. This is motivated by the fact that I want to analyze the trading activity and stock responses to the information known to the market. While there might be some information leakage or market anticipation about the earnings announcements several days before the announcement day, the purpose of this study is to analyze the informativeness of the trading volume resulting from the actual earnings releases.

are informative about the non-announcing firms' stock performance. While the first announcer's earnings surprise is valuable for predicting the future of the subsequent announcer, it is rather a noisy signal about the subsequent announcer's performance and there is still some uncertainty associated with this information signal. Nevertheless, the informativeness of the first announcement should be reflected in the trading activity and thus the trading volume on the day of the first announcement in the industry is expected to serve as a purifying signal. If the trading volume is not informative, or the trading adjustments are totally optimal, trading volume should be unable to explain the returns of the non-announcing firms. On the contrary, if the trading volume can predict the stock performance it may signal that there is some irrationality reflected in the trading activity or some extra information contained in it. The latter statement is even stronger for the firm's own subsequent announcements, since in this case its own earnings surprises have a clear implication for the subsequent announcer's performance. The ability of the abnormal trading volume to explain the stock performance upon own announcements will provide even stronger evidence that the abnormal trading volume is informative, since it may reveal the firm specific rather than fundamental financial information (Christophe et al., 2004). Based on these arguments I state the next two hypotheses.

Hypothesis 1. The abnormal trading volume of the subsequent announcing firms upon the first announcement in the industry should be informative about their stock performance around the first announcements.

Hypothesis 2. The abnormal trading volume of the subsequent announcing firms upon their own announcements may be informative about their stock performance around their own announcements.

Moreover, the first announcer's trading volume is expected to be informative about its peers in the industry, i.e. the subsequent announcers. Upon observing the first announcer's earnings report, the investors update their beliefs and adjust their positions accordingly. These adjustments will be reflected in the trading volume of the first announcer. Consistent with Barber and Odean (2008) and Christophe et al. (2004), I expect that less sophisticated investors may start buying the stocks of the announcing firm, while more sophisticated ones may start selling these stocks and buying the stocks of non-announcing firms. These considerations lead me to the following hypothesis.

Hypothesis 3. The first announcer's abnormal trading volume upon its own announcement is informative about subsequent announcing firms stock performance and trading activity around the first announcements.

As was previously found in the literature, the market reacts differently to the same information depending on the history of analysts' forecasts being met. Therefore I also hypothesize that the history of earnings surprises should explain the stock performance and abnormal trading volume. A sequence of positive earnings surprises may serve as a confirmation signal about the stock performance and thus may trigger the trading activity. The other explanation for the history of the earnings surprises as an explanatory factor for the trading activity upon the firm's own announcement is that the firm which constantly beats market expectations at some point should attract market attention, which should lead to higher trading activity in this stock. Therefore, I also hypothesize that the earnings surprises history of both the first and subsequent announcer may play a role in the subsequent announcer's stock, and trading activity responses to the first earnings report in the industry. Based on similar logic, the subsequent announcer's earnings surprises history is expected to be able to explain the stock performance and trading activity upon the firm's own announcements, which motivates me to formulate the following hypothesis.

Hypothesis 4. The earnings surprises history of both the first and subsequent announcers can explain the subsequent announcer's stock performance and trading activity upon the first announcement, and the earnings surprises history of the subsequent announcers can explain their stock and trading activity upon their own announcements.

One could argue that the significance of the abnormal trading volume upon the first announcement is solely determined by the ability of the market to foresee the subsequent announcers' earnings surprises. I also expect that at least some of the market participants will try, upon observing the first announcements, to build their trading strategies based on the updated information set, which will be reflected in the trading volume. Since trading based on foreknowledge of the earnings surprise is more profitable than trading based on the publicly available information, I expect that more informed traders will take the appropriate trading positions upon the first announcement, while taking the offsetting positions upon their own subsequent announcements. Thus, I expect that the abnormal trading volume of both the first and subsequent announcers upon the first announcement should explain the subsequent announcer's abnormal trading volume upon its own announcement.

On the other hand, there is much evidence that the markets are not fully rational. I hypothesize that the market tries to incorporate the new information revealed by the first announcements, but fails to incorporate it fully. Therefore, although the trading activity on the first announcement is driven by the market expectations about the future

performance of the subsequent announcers, the abnormal trading volume still has some incremental power in explaining the stock performance. I formalize this argument in hypotheses 5 and 6.

Hypothesis 5. The market cannot fully incorporate the implication of the first announcements and the subsequent announcer's abnormal trading volume have incremental power in explaining the subsequent announcer's stock performance.

Hypothesis 6. The subsequent announcer's abnormal trading volume upon the first announcement is driven by the market expectations updated upon observing the first announcement.

If the market tries to predict the future subsequent earnings surprises upon the first announcement, it should be the case that the investors take the offsetting position upon the firm's own announcement. Therefore, the trading activity upon the first announcement, as well as the market expectations of the subsequent earnings surprises should be able to explain the trading activity of the subsequent announcer upon its own announcements. I formalize this arguments in hypothesis 7.

Hypothesis 7. The subsequent announcer's abnormal trading volume upon own announcement is driven by its abnormal trading volume upon the first announcement and the market expectations updated upon observing this first announcement.

In order to perform the analysis, I employ two basic models, describing stock performance and trading activity. The general form specifications of the models are as follows:

$$\boldsymbol{Y} = \boldsymbol{\alpha} + \boldsymbol{\beta X} + \boldsymbol{\gamma Z} + \boldsymbol{e}, \tag{2.1}$$

where $\boldsymbol{Y}$ is the vector of dependent variables. The matrix $\boldsymbol{X}$ contains the variables of interest, while the matrix $\boldsymbol{Z}$ consists of the other control variables. The vector $\boldsymbol{e}$ represents the error terms with zero mean and constant variances.

To study the stock performance, I compute the risk-adjusted cumulative average abnormal returns using a four-factor model which includes the Fama and French (1993) risk factors augmented with the Carhart (1997) momentum factor. This factor model is shown in equation (2.2).

$$R_{i,t} = \alpha_i + \beta_{i,MKT} MKT_t + \beta_{i,SMB} SMB_t + \beta_{i,HML} HML_t + \beta_{i,MOM} MOM_t + \varepsilon_t \tag{2.2}$$

I estimate the stock-specific factor betas using daily returns over a 255-day estimation

period window that ends 46 days prior to each respective announcement date. These firm-specific beta estimates allow me to generate the expected returns adjusted for these common risk factors. Then, the abnormal returns are calculated as the difference between these expected returns and the actual values. The abnormal return, $AR_{i,t}$, (or prediction error) for the common stock of firm i on day t is defined in equation (2.3):

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_{i,MKT} MKT_t + \hat{\beta}_{i,SMB} SMB_t + \hat{\beta}_{i,HML} HML_t + \hat{\beta}_{i,MOM} MOM_t), \quad (2.3)$$

where coefficients $\hat{\alpha}_i$, $\hat{\beta}_{i,MKT}$, $\hat{\beta}_{i,SMB}$, $\hat{\beta}_{i,HML}$, and $\hat{\beta}_{i,MOM}$ are the OLS estimates of α_i, $\beta_{i,MKT}$, $\beta_{i,SMB}$, $\beta_{i,HML}$, and $\beta_{i,MOM}$ from equation 2.2.

Further, the cumulative abnormal returns over an interval starting on day $T1$ and ending on day $T2$, $CAR_{T1,T2}$, are calculated according to the equation (2.4):

$$CAR_{T1,T2} = \sum_{t=T1}^{T2} AR_{i,t} \quad (2.4)$$

Finally, the cumulative average abnormal returns over an interval starting on day $T1$ and ending on day $T2$, $CAAR_{T1,T2}$, are obtained according to equation (2.5).

$$CAAR_{T1,T2} = \frac{1}{N} \sum_{t=T1}^{T2} AR_{i,t}, \quad (2.5)$$

where N is the number of days between time $T1$ and $T2$ (i.e. $N = T2 - T1$).

In the analysis of the trading activity, the dependent variable is the abnormal trading volume. Since there is always some level of trading activity, any extra information should rather be reflected in the abnormal trading volume. The abnormal trading volume is defined as following (2.6):

$$ATV_{i,t} = \frac{TV_{i,t} - \sum_{t=-10}^{-375} TV_{it}/365}{\sum_{-10}^{-375} TV_i/365}, \quad (2.6)$$

where $ATV_{i,t}$ is the abnormal trading volume of stock i and time t, and TV_{it} is the trading volume of stock i at time t.

The matrix $\boldsymbol{X}$ of the variables of interest includes: $SAATV_{i,t}$ ($SAATVown_{i,t}$) - the subsequent i announcer's abnormal trading volume on the day of the first (own)

announcement in quarter t; $FAATV_{i,t}$ - the first announcer's abnormal trading volume in quarter t; $SAMES_{i,t}$ and $FAMES_{i,t}$ - the subsequent i announcer's and the first announcer's mean earnings surprises respectively over the previous 20 quarters before the current quarter t, where the earnings surprise was calculated as the difference between the actual quarterly EPS and the mean forecast for that quarter, scaled by the last available stock price in the quarter; $SANPS_{i,t}$ and $FANPS_{i,t}$ - the subsequent i announcer's and first announcer's number of positive earnings surprises respectively over the previous 20 quarters before quarter t; $SAES_{i,t}$ and $FAES_{i,t}$ - the subsequent i announcer's and first announcer's earnings surprise in quarter t.

Previous research on the persistency of earnings surprises takes into account the sequence of the earnings surprises signs, but in this study I am going to consider two aspects of the earnings surprises: how often the firm outbid the analysts' forecasts (measured by the number of the positive earnings surprises over the previous 20 quarters) and by how much on average it did so over the previous 20 quarters (measured by the mean of the earnings surprises over the previous 20 quarters). While the former history may evidence the persistency in the positive earnings surprises, the latter can provide some expected estimate of the earnings surprise.

The matrix $\boldsymbol{Z}$ of the other control variables consists of: $MRET10_{i,t}$ ($MRE10own_{i,t}$) - the subsequent i announcer's mean of the returns excluding dividends over the last 10 trading days before the first (own) announcement in quarter t; $MATV10_{i,t}$ ($MATV10own_{i,t}$) - the subsequent i announcer's mean of the abnormal trading volume over the last 10 trading days before the first (own) announcement in quarter t; $MRET182_{i,t}$ ($MRET182own_{i,t}$) - the subsequent i announcer's mean of returns over the last six months but 10 trading days prior to the first (own) announcement in quarter t; $MV_{i,t}$ - the logarithm of the market value of firm i in quarter t, calculated as the number of shares outstanding at the end of the quarter multiplied by the last available share price for that quarter; $BM_{i,t}$ - the book-to-market value of firm i in quarter t, which is calculated as the logarithm of the ratio of total assets minus depreciation to the market value; and $ACC_{i,t}$ - the accruals of firm i in quarter t, calculated as the change in the working capital from the previous quarter minus depreciation scaled by total assets.

Means of the returns over the last six months and 10 trading days should take into account the long- and short-term price momentum. The mean of the abnormal trading volume over the last 10 trading days is included to remove the short-term trend in trading volume and/or the managers' incentives to trade strategically shortly before the

Table 2.1: Summary statistics of cumulative average abnormal returns, %

Days upon announcement	Announcement	Mean	SD	Min	Max	N of observations
0-1	first	0.02	3.15	-12.87	14.67	53584
	own	0.24	6.37	-23.83	22.83	50374
2-5	first	-0.17	4.49	-17.29	20.24	45891
	own	-0.13	4.64	-17.67	19.34	50374
6-10	first	-0.10	5.24	-20.71	23.23	36308
	own	-0.06	4.61	-17.59	20.08	50374
11-20	first	-0.39	8.03	-28.66	31.21	13479
	own	-0.10	6.35	-24.57	28.55	50374

announcements (Korczak, Korczak, & Lasfer, 2010). Consistent with Thomas and Zhang (2008) such variables as MV and BV are included for the control of previously documented size and book-to-market effects, while ACC is used to account for the investors' failure to incorporate the information contained in the accruals (Sloan, 1996).

2.4 Data and Sample Selection

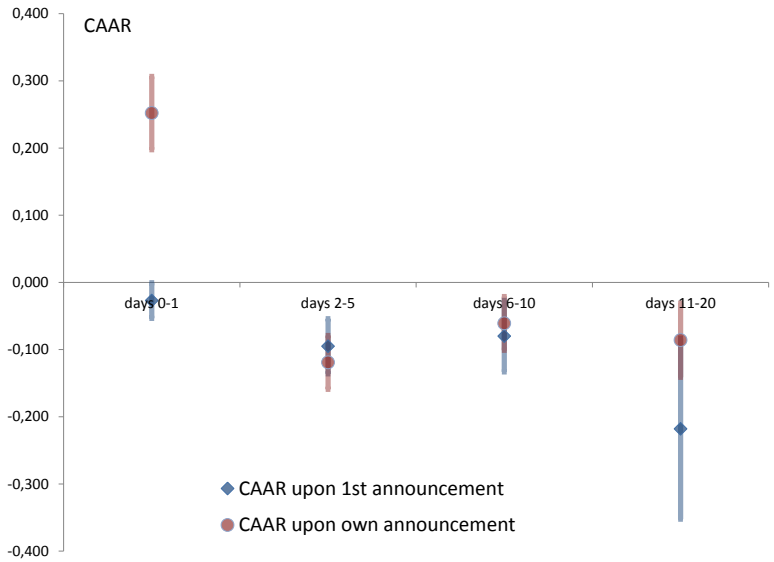
For the analysis of this chapter, I am working with the US stocks. The data on the market variables such as stock prices, trading volume, and returns were taken from CRSP. IBES quarterly data were used to obtain the analysts' forecasts of earnings per share. The accounting information was taken from the Compustat data set[6].

From the IBES summary data file, I take the actual earnings per share (EPS) and the last available mean of EPS forecasts for a given forecast period and consider only the forecasts made for the current quarter. I drop those observations, which have the estimates and/or reporting of the earnings in non-USD currency. Since the reporting dates in IBES are considered to be more precise, the IBES earnings announcement dates were used. I restrict the sample to those firms, which have a standard fiscal quarter end (March 31, June 30, September 31, December 31) to make sure that the first announcing firm and its peers report results for the same fiscal quarter[7]. I discard those observations if a firm reports later than 91 days after the end of a forecast period. I also do not take into account those observations when there is more than 1 firm reporting on the first announcement date.

[6]A more detailed description of these data sets is provided in Chapter 1 of this thesis.

[7]In the whole sample there were 10% of observations with non-standard fiscal quarter ends.

Figure 2.2: Cumulative average abnormal returns 95% confidence intervals of the means



Note: CAAR - cumulative average abnormal return, %

In the analysis of the cumulative average abnormal returns upon the first announcement, for every time window I restrict the sample of subsequent announcing firms to those firms, which report at least 3 days after the end of the appropriate time interval (i.e. in order to be included in the sample for the time window of days 0-1 the subsequent announcer should report no earlier than the 5th day after the first announcement). In doing so I take care of the following. Firstly, I eliminate the confounding effect of the stock reaction to the first in the industry, defined by 2 digit Standard Industrial Classification (SIC) code and own announcements. Secondly, I am avoiding working with a very specific sample. Restricting the sample to those firms reporting after the 20th day after the first announcement (for the purpose of studying the persistency I consider the return windows of up to 20 days after the first announcement) would lead to the very specific sample, since there are only 25% of the firms announcing that late in the reporting season. This, in turn, can also result from the fact that managers postpone the release of bad news (Kothari, Shu, & Wysocki, 2009). At the same time, for the analysis of different return windows upon the firm's own announcement I only require the firms to report at least 3 days after the first announcement.

Calculating the means of the returns and trading volume from the CRSP daily data set, I require the firms to have at least 50% of non-missing observations for a particular interval window, i.e. for calculating the mean over 10, 182, or 365 trading days to be

included in the sample the observations should have non-missing values for at least 5, 63, and 126 trading days respectively.

In order to avoid the impact of the outliers, I winsorize all of the variables below the 1st and above the 99th percentiles respectively[8]. I also discard those observations for which the Cook's distance is equal or greater than one. The descriptive statistics of the cumulative average abnormal returns, abnormal trading volume and the other control variables is provided in tables 2.1, 2.2, and 2.3 respectively.

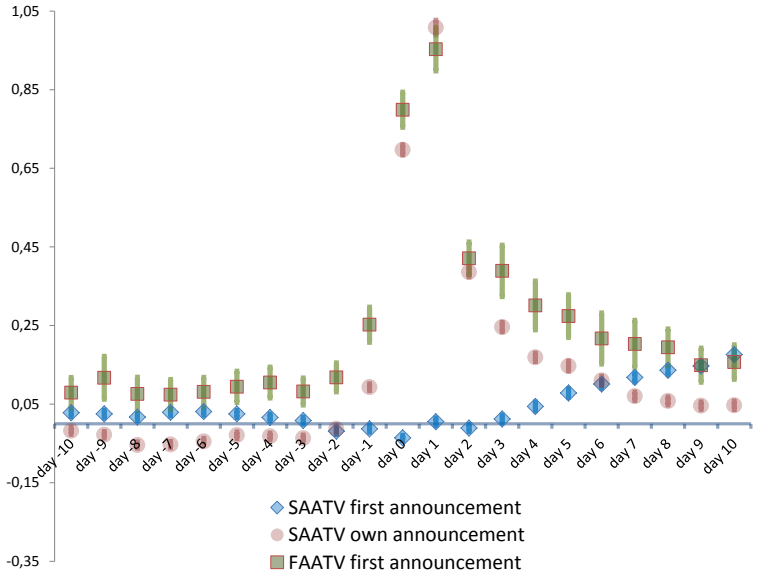
Table 2.2: Summary statistics of the abnormal trading volume

	First announcer			Subsequent announcer					
	1st announcement			1st announcement			Own announcement		
Days	Mean	SD	No of obs.	Mean	SD	No. of obs.	Mean	SD	No of obs.
-10	0.12	1.62	4620	0.05	1.07	53584	-0.02	0.96	50374
-9	0.12	1.93	4620	0.04	1.14	53584	-0.02	0.93	50374
-8	0.07	1.47	4716	0.02	1.03	53584	-0.05	0.86	50374
-7	0.07	1.31	4716	0.03	1.07	53584	-0.05	0.89	50374
-6	0.08	1.31	4717	0.03	1.09	53584	-0.04	0.87	50374
-5	0.09	1.20	4719	0.03	1.02	53584	-0.03	0.89	50374
-4	0.09	1.14	4719	0.02	1.01	53584	-0.03	0.89	50374
-3	0.07	1.15	4719	0.01	1.02	53584	-0.04	0.91	50374
-2	0.11	1.29	4721	-0.02	0.98	53584	-0.01	0.93	50374
-1	0.25	1.55	4722	-0.01	0.99	53584	0.09	0.96	50374
0	0.79	1.54	4722	-0.04	0.75	53584	0.70	1.45	50374
1	0.95	2.95	4722	0.00	1.15	53584	1.01	2.14	50374
2	0.42	1.45	4722	-0.01	1.05	53584	0.39	1.36	50374
3	0.35	2.29	4722	0.01	1.18	53584	0.24	1.32	50374
4	0.30	2.31	4721	0.05	1.31	53584	0.17	1.29	50374
5	0.27	1.91	4721	0.08	1.31	53584	0.14	1.41	50374
6	0.22	2.29	4721	0.10	1.29	53584	0.11	1.26	50374
7	0.20	2.07	4721	0.12	1.35	53584	0.07	1.21	50374
8	0.19	1.65	4721	0.14	1.32	53584	0.06	1.13	50374
9	0.15	1.54	4720	0.15	1.33	53584	0.05	1.08	50374
10	0.15	1.52	4719	0.18	1.41	53584	0.05	1.30	50374

The comparison of the cumulative average abnormal returns upon the first and own announcements (Table 2.1 and Figure 2.2) suggests that the cumulative average abnormal returns are, on average, higher upon the firm's own announcement for the first time

[8]The analysis was also done without dropping any observation, as well as with dropping the observations with the explanatory variables in the lowest and highest percentiles, but the results show the similar pattern.

Figure 2.3: Subsequent and first announcers' abnormal trading volume 95% confidence intervals of the means



Note: $SAATV$ and $FAATV$ - the subsequent and first announcer's abnormal trading volume respectively

window of days 0-1 and the last time window of days 11-20 considered in the study. At the same time I do not find any differences in the behavior of the cumulative average abnormal returns upon the first and own announcements for the time windows of days 2-5 and 6-10.

The summary statistics of the abnormal trading volume of the first and subsequent announcers upon their own announcements (Table 2.2 and Figure 2.3) reveals that for both the first and subsequent announcer it follows the same pattern of increasing 1 day before the firm's own announcement, then jumping on the day of the announcement and the next day after the announcement, and consequently slowly decaying. This pattern is consistent with Chae (2005), since the announcements are the new informational signals about the announcing firms in the first place. That is why these announcements draw market attention to these firms, which may also result in higher trading activity (Hirshleifer et al., 2009). The higher trading volume before the announcement is consistent with the pre-announcement informative trading by short sellers (Christophe et al., 2004). Although the pattern is the same for both first and subsequent announcers, I find some evidence that the abnormal trading volume of the first announcer is, on average, higher for the first announcer compared to the subsequent announcer. I hypothesize that this difference in the trading activity upon the first and subsequent announcements upon their own announcements results from the trading activity in the subsequent announcer stocks

between the first and firm's own subsequent announcements.

Figure 2.3 also provides a graphical comparison of the subsequent announcer's abnormal trading volume upon the first and own announcements. The behavior of the subsequent announcer's abnormal trading volume upon the first announcement does not follow the pattern of the abnormal trading volume upon the firm's own subsequent announcement. Moreover, one can see that the mean abnormal trading volume of the subsequent announcer is, on average, higher before the first announcement than upon the firm's own announcement, which suggests that the trading volume can contain different information, depending on what type of announcement one observes.

Table 2.3: Summary statistics of main control variables

	Mean	SD	Min	Max	N of observations
$SAMES$	-0.00	0.00	-0.03	0.01	53584
$SANPS$	10.68	5.29	0.00	20.00	53584
$FAMES$	0.00	0.00	-0.01	0.01	53584
$FANPS$	11.88	5.42	0.00	20.00	53584
$SAES$	0.00	0.01	-0.04	0.02	50374
$FAES$	0.00	0.00	-0.06	0.02	53584
$MRET10$	0.06	0.83	-3.13	3.29	53584
$MRET10own$	0.06	0.76	-2.83	3.41	50374
$MATV10$	0.02	0.56	-0.73	3.84	53584
$MATV10own$	-0.02	0.50	-0.83	3.43	50374
$MRET182$	0.08	0.22	-0.71	0.91	53584
$MRET182own$	0.08	0.21	-0.72	0.91	50374
MV	13.67	1.53	9.57	17.72	53584
BM	-7.03	0.81	-0.09	-3.68	53584
ACC	-0.01	0.06	-0.27	0.38	53584

Note: $SAMES$ and $FAMES$ - the subsequent and first announcer's mean earnings surprises over the previous 20 quarters, where the earnings surprise was calculated as the difference between the actual quarterly EPS and the mean forecast for that quarter, scaled by the last available stock price in that quarter; $SANPS$ and $FANPS$ - the subsequent and first announcer's number of positive earnings surprises over the previous 20 quarters; $SAES$ and $FAES$ - the subsequent and first announcer's earnings surprise; $MRET10$ and $MRET10own$ - the subsequent announcer's mean of the returns excluding dividends over the last 10 trading days before the first announcement and own announcement respectively; $MATV10$ and $MATV10own$ - the mean abnormal trading volume over the last 10 trading days before the first and own announcement respectively; $MRET182$ and $MRET182own$ - the subsequent announcer's mean of the returns over the last 182 days (or six months) before the first and own announcement respectively; MV - the logarithm of the market value, calculated as the number of shares outstanding at the end of the quarter multiplied by the last available stock price in that quarter; BM - the book-to-market value, which is calculated as the logarithm of the ratio of total assets minus depreciation to the market value; ACC - the accruals calculated as the change in the working capital from the previous quarter minus depreciation scaled by total assets.

The data set covers the time period from January 1994 to March 2013. For the analysis of the cumulative average abnormal returns over the days 0-1, 2-5, 6-10, and 11-20 upon first earnings announcement in the industry I have 53463, 47554, 37707 and 14048 observations respectively, which cover 4597 different firms. For the analysis of the

cumulative average abnormal returns upon subsequent announcers' own reporting I have 52149 observations, which comprise 4467 different firms. The analysis of the abnormal trading volume on the first announcement day and the subsequent announcer's own reporting was done on 53463 and 52149 observations respectively.

2.5 Results

2.5.1 Intra-industry Price Responses upon the First Announcement

For testing the hypotheses of informativeness of the first and subsequent announcers' abnormal trading volume (hypotheses 1 and 3) in the model 2.1 for the cumulative average abnormal returns I include the subsequent and first announcers' abnormal trading volume as the variables of interest. In order to test the informativeness of the earnings surprises history (hypothesis 4) I also include the subsequent and first announcers' means of earnings surprises as well as their numbers of positive earnings surprises over the previous 20 quarters. The full specification of the model for the analysis of the price responses to the first announcement in the industry is the following:

$$\begin{aligned} CAAR_{i,t} &= \beta_o + \beta_1 SAATV_{i,t} + \beta_2 FAATV_{i,t} + \beta_3 SAMES_{i,t} + \beta_4 SANPS_{i,t} \\ &+ \beta_5 FAMES_{i,t} + \beta_6 FANPS_{i,t} + \beta_7 FAES_{i,t} + \boldsymbol{\gamma Z} + \epsilon_{i,t}, \end{aligned} \quad (2.7)$$

where $CAAR_{i,t}$ - the cumulative average abnormal returns of firm i over the appropriate time interval upon the first announcement in quarter t; $SAATV_{i,t}$ and $FAATV_{i,t}$ - the subsequent i and first announcer's abnormal trading volume on the day of the first announcement in quarter t; $SAMES_{i,t}$ and $FAMES_{i,t}$ - the subsequent i and the first announcer's mean of the earnings surprises over the previous 20 quarters before the current quarter t, where the earnings surprise was calculated as the difference between the actual quarterly EPS and the mean forecast for that quarter scaled by the last available stock price in that quarter; $SANPS_{i,t}$ and $FANPS_{i,t}$ - the subsequent i and first announcer's number of positive earnings surprises over the previous 20 quarters before quarter t; $FAES_{i,t}$ - the first announcer's earnings surprise; $\boldsymbol{Z}$ is the matrix of other control variable: $MRET10_{i,t}$, $MATV10_{i,t}$, $MRET182_{i,t}$, $MV_{i,t}$, $BM_{i,t}$, and $ACC_{i,t}$; and $\epsilon_{i,t}$ is the error

term with zero mean and constant variance.

The significance of such estimates as β_1 and β_2 will provide the support of hypotheses 3 and 4 of the informativeness of the subsequent and first announcers' abnormal trading volume about the subsequent announcer's stock performance upon the first announcement. The significance of the estimates β_3, β_4, β_5, and β_6 will be consistent with the hypothesis that the earnings surprise history of both the subsequent and first announcer can explain the subsequent announcer's stock performance upon the first announcement (the first part of hypothesis 4).

Table 2.4 contains the estimation results of the cumulative average abnormal returns model, where I compare the basic model, the model extended for the abnormal trading volume, and the full specification over different time interval windows. For all of the returns windows, except for the last one, I observe that the extended and full models perform better than the basic model - the adjusted R-squared increases.

From the extended and the full specification models I can see that the subsequent announcer's abnormal trading volume on the first announcement in the industry can explain the subsequent announcer's returns over the first three time windows (columns 2, 3, 5, 6, 8 and 9 in Table 2.4), while I do not find evidence of the subsequent announcer's abnormal trading volume being able to explain the abnormal returns over a time interval of days 11-20 since the first announcement. I have three explanations for this pattern. The first is that more sophisticated investors (or better informed ones) may respond to the new information quite fast and adjust their trading activity immediately upon observing the first earnings report. This adjustment will be reflected in the subsequent announcer's abnormal trading volume on the day of the first announcement. Less sophisticated investors, in turn, observing the trading activity of the market may decide to follow the suit of the more sophisticated ones and adjust their own trading activity accordingly.

The second explanation for the fast decaying significance of the subsequent announcer's trading volume is the arrival of new information signals coming from the other reporting firms (those firms which report after the first announcer but before the subsequent announcer in the sample).

The third explanation comes from the point of view that an increase in the trading volume arises as the result of the heterogeneity in the beliefs. Since the market participants may perceive differently the implications of the first announcer's earnings surprise for the subsequent announcer they may adjust their trading activity quite fast and as a result the abnormal trading volume should not be able to explain the abnormal returns over the

Table 2.4: Cumulative average abnormal returns upon the first earnings announcement

Cumulative average abnormal returns over windows (days upon the first announcement)												
	Days 0-1			Days 2-5			Days 6-10			Days 11-20		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SAATV		0.33***	0.33***		0.09***	0.09***		0.07*	0.07*		-0.05	-0.05
		(0.02)	(0.02)		(0.03)	(0.03)		(0.04)	(0.04)		(0.09)	(0.09)
FAATV		0.01	0.01		0.00	0.00		0.03*	0.03*		0.09**	0.08*
		(0.01)	(0.01)		(0.01)	(0.01)		(0.02)	(0.02)		(0.04)	(0.04)
SAMES			-12.65***			6.39			-12.95			30.82
			(4.47)			(6.80)			(8.48)			(19.13)
SANPS			0.00			0.00			0.01*			0.03*
			(0.00)			(0.01)			(0.02)			(0.01)
FAMES			-2.78			2.68			21.41*			29.55
			(5.57)			(8.65)			(11.26)			(28.93)
FANPS			0.00			-0.006			-0.02***			0.00
			(0.00)			(0.004)			(0.01)			(0.01)
FAES	6.15*	6.10*	6.29**	15.64***	15.59***	15.25***	10.96*	10.58*	8.47	-11.03	-12.54	-16.89
	(3.17)	(3.16)	(3.18)	(4.87)	(4.87)	(4.91)	(6.31)	(6.32)	(6.38)	(16.85)	(16.86)	(17.12)
Other controls	X	X	X	X	X	X	X	X	X	X	X	X
Observations	55,463	55,463	55,463	47,554	47,554	47,554	37,707	37,707	37,707	14,048	14,048	14,048
Adj. R-squared	0.006	0.011	0.011	0.007	0.007	0.007	0.006	0.006	0.007	0.004	0.004	0.004

Note: $SAATV$ and $FAATV$ - the subsequent and first announcer's abnormal trading volume on the day of first announcement; $SAMES$ and $FAMES$ - the subsequent and first announcer's mean earnings surprises over the previous 20 quarters, where the earnings surprise was calculated as the difference between the actual quarterly EPS and the mean forecast for that quarter, scaled by the last available stock price in that quarter; $SANPS$ and $FANPS$ - the subsequent and first announcer's number of positive earnings surprises over the previous 20 quarters; and $FAES$ - the first announcer's earnings surprise. *Other controls include*: $MRET10$ - the subsequent announcer's mean of the returns excluding dividends over the last 10 trading days before the first announcement; $MATV10$ - the mean abnormal trading volume over the last 10 trading days before the first announcement; $MRET182$ - the subsequent announcer's mean of the returns over the last 182 days (or six months); MV - the logarithm of the market value, calculated as the number of shares outstanding at the end of the quarter multiplied by the last available stock price for that quarter; BM - the book-to-market value, which is calculated as the logarithm of the ratio of total assets minus depreciation to the market value; ACC - the accruals calculated as the change in the working capital from the previous quarter minus depreciation scaled by total assets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

later time windows. This explanation can also be supported by the finding that the first announcer's abnormal trading volume on the day of the announcement is also significant for two return windows. These findings are consistent with the evidence of Barber and Odean (2008), if the institutional investors are selling while individual investors are buying the stocks of the first announcer, while the opposite may happen to the trading activity in the subsequent announcer's stocks.

The fourth hypothesis states that the history of the earnings surprises of both the first and the subsequent announcer can explain the abnormal returns upon the first announcement in the industry. Contrary to expectations, the subsequent announcer's mean of the earnings surprises is not significant except for the first returns window, while the opposite holds for the number of positive surprises - the estimate is positive and significant except for the last two return windows.

Analyzing the effect of the first announcing surprise history, I can see that both the mean and the number of positive earnings surprises of the first announcer are also significant for the third returns windows. The insignificance of the first announcer's of the mean and number of the earnings surprises over the first two return windows may evidence some lag in the response to the first announcer's earnings report.

2.5.2 Can the Market Foresee the Earnings Surprises?

I am also interested in studying whether the significance of the abnormal trading volume upon the first announcement is not solely determined by the ability of the market to foresee the subsequent announcer's earnings surprises and whether the abnormal trading volume has any additional informational content (hypothesis 5). This analysis may also be considered to be the robustness check for the abnormal trading volume being informative.

If the abnormal trading volume has no additional information besides the subsequent announcer's earnings surprises, then its estimates must be insignificant if I include some expectations of the subsequent earnings surprise into the model for the analysis of cumulative average abnormal returns. In other words, I want to see whether the abnormal trading volume is of any use given that the market has some forecast of the subsequent announcer's earnings surprise. For these purposes I consider two forecast models: the perfect forecast model and the imperfect forecast model.

The first model I call the perfect forecast model, which I obtain by modifying model 2.7 and including the yet unknown earnings surprise of the subsequent announcer. Since

the perfect forecast is desirable, but not achievable, I want to compare the models with the perfect forecast to that with imperfect forecast.

The subsequent announcer's earnings surprise imperfect forecast model takes into account the history of both the first and the subsequent announcers and the first announcer's earnings surprise in the current quarter. While the history of both the first and subsequent announcers is supposed to take into account the persistency in the earnings surprise history, the first announcer's earnings surprise accounts for the new information for the current quarter. In addition, I also include the mean and standard deviation of the subsequent announcer's earnings forecast for the current quarter. The mean of the forecast is supposed to take into account the degree to which the managers are able to manage the current quarter earnings if there is any earnings management. I expect that the higher the mean forecast the harder is it for the managers to beat the analysts' expectations. The standard deviation of the earnings forecasts for the current quarter is included in order to control for the disagreement between the analysts - the higher the disagreement the fewer incentives the managers may have to beat the mean of the analysts' forecasts. I also expect the standard deviation of the forecasts to have negative impact on the earnings surprise since the higher agreement between the analysts could imply that it is much easier to produce the forecast, the smaller should be the earnings surprise. Another explanations of why the mean forecast and the standard deviation of the analysts' forecast being able to explain the earnings surprise is the findings of Doukas, Kim, and Pantzalis (2006) who show that the investors preferences for a particular stock are driven by the combination of the analysts being pessimistic or optimistic about the firm and the level of their divergence in the opinions. The managers may realize this and adjust their earnings management accordingly. The specification of this model is the following:

$$\begin{aligned} SAES_{i,t} &= \alpha_0 + \alpha_1 SAMES_{i,t} + \alpha_2 SANPS_{i,t} + \alpha_3 FAMES_{i,t} + \alpha_4 FANPS_{i,t} +, \\ &+ \alpha_5 FAES_{i,t} + \alpha_6 SAMF_{i,t} + \alpha_7 SASDF_{i,t} + u_{i,t} \end{aligned} \tag{2.8}$$

where $SAES_{i,t}$ and $FAES_{i,t}$ are the subsequent i and first announcer's earnings surprises in quarter t, calculated as the difference between the actual EPS and mean forecast scaled by the last available stock price in quarter t; $SAMES_{i,t}$ and $FAMES_{i,t}$ - the subsequent i and first announcer's mean earnings surprises over the previous 20 quarters before quarter

Table 2.5: The predictability of the subsequent announcer's earnings surprise

VARIABLES	SAES	SAES
SAMES	0.31***	0.30***
	(0.01)	(0.01)
SANPS	0.00***	0.00***
	(0.00)	(0.00)
FAMES		0.04***
		(0.01)
FANPS		0.00***
		(0.00)
FAES		0.03***
		(0.01)
SAMF	-0.02***	-0.02***
	(0.00)	(0.00)
SASDF	-0.59***	-0.60***
	(0.01)	(0.01)
Constant	0.00***	0.00
	(0.00)	(0.00)
Observations	93,749	93,749
Adj. R-squared	0.076	0.076

Note: $SAES$ and $FAES$ - the subsequent and first announcer's earnings surprise; $SAMES$ and $FAMES$ - the subsequent and first announcer's mean earnings surprise over the previous 20 quarters, where the earnings surprise was calculated as the difference between the actual quarterly EPS and the mean forecast for that quarter, scaled by the last available stock price in that quarter; $SANPS$ and $FANPS$ - the subsequent and first announcer's number of positive earnings surprise over the previous 20 quarters; $SAMF$ and $SASDF$- the subsequent announcer's mean and standard deviation of the EPS forecast for the current quarter respectively. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

t; $SANPS_{i,t}$ and $FANPS_{i,t}$ - the subsequent i and first announcer's numbers of positive earnings surprises over the previous 20 quarters before quarter t; $SAMF_{i,t}$ and $SASDF_{i,t}$ - the subsequent i announcer's mean and standard deviation of the EPS forecasts for the current quarter respectively; and $u_{i,t}$ is the error term with mean zero and constant variance.

The estimation results of the imperfect forecast model are presented in Table 2.5, where I compare two models: one with only the subsequent announcer's own history (column 1 of Table 2.5) and the other with the history of both first and subsequent announcer as well as the first announcer's earnings surprise in the current quarter.

The first inference is that the history of the subsequent announcer is able to predict the subsequent earnings surprise. The mean and standard deviation of the EPS forecast are also significant and of the expected sign. The results of column 2 of Table 2.5 provide

evidence that it is not only that the first announcer's earnings surprise can predict the current quarter subsequent announcer's earnings surprise, but also that the history of the first announcer can predict the subsequent announcer's earnings surprise. In other words, the results suggest that the history of both the first and subsequent announcers can predict the earnings surprises of the subsequent announcers.

The fully rational market agents should be able to exploit and incorporate the predictable part of the subsequent announcer's earnings surprise in their actions. This implies that the predicted part of model 2.8 cannot explain the cumulative average abnormal returns if the investors are fully rational. On the contrary, the significant estimate next to the predictive part of the subsequent announcer's earnings surprises will provide evidence of market inefficiency in incorporating the available information.

In order to study the market efficiency more deeply, I also compare the perfect and imperfect forecast models. The full specification of these models is as follows:

$$\begin{aligned} CAAR_{i,t} &= \beta_o + \beta_1 SAATV_{i,t} + \beta_2 FAATV_{i,t} + \beta_3 FAES_{i,t} + \\ &+ \beta_4 FOREC_{i,t} + \boldsymbol{\gamma Z} + \epsilon_{i,t} \end{aligned} \tag{2.9}$$

where $CAAR_{i,t}$ - the cumulative average abnormal returns of firm i over the appropriate time interval upon the first announcement in quarter t; $SAATV_{i,t}$ and $FAATV_{i,t}$ - the subsequent i and first announcer's abnormal trading volumes on the day of the first announcement in quarter t; $FAES_{i,t}$ - the first announcer's earnings surprise in quarter t, calculated as the difference between the actual EPS and mean forecast scaled by the last available stock price in that quarter; $FOREC_{i,t}$ - the forecast of the earnings surprise; $\boldsymbol{Z}$ is the same matrix of other control variables specified above, and $\epsilon_{i,t}$ is the error term with zero mean and constant variance.

Depending on the model, the variable $FOREC_{i,t}$ can obtain the following values:

- *for the perfect forecast model* $FOREC_{i,t} = SAES_{i,t}$, i.e. the forecast is the subsequent announcer's earnings surprise itself;
- *for the imperfect forecast model* $FOREC_{i,t} = PSAES_{i,t}$, where $PSAES_{i,t}$ - is the predicted part of the subsequent i announcer's earnings surprise in quarter t obtained from model 2.8;
- *for the imperfect forecast model with a forecast error* $FOREC_{i,t}$ is the vector of the

variables consisting of $PSAES_{i,t}$ and $USAES_{i,t}$, where $PSAES_{i,t}$ and $USAES_{i,t}$ are the predicted and unpredicted parts of the subsequent i announcer's earnings surprise in quarter t obtained from model 2.8.

Table 2.6 contains the estimation results from three models: one with the perfect forecast of the subsequent announcer's earnings surprise, and imperfect forecast models with and without the forecast error.

Firstly, I find that in all three models - even in the model with the perfect forecast - the estimate of the abnormal trading volume is significant and of the same magnitude when I did not have any forecasts of the subsequent announcer's earnings surprises (Table 2.4). Thus I conclude that even taking into account the subsequent announcer's earnings surprise, the abnormal trading volume upon the first announcement is informative, which again supports hypothesis 1 of the subsequent announcer's trading volume being informative about its stock performance upon first announcement.

Further, I compare the estimates of the subsequent announcer's earnings surprise and its predicted value. The findings show that for the first return window the estimate of the perfect and imperfect forecasts (columns 1 and 3 of Table 2.6) are significant and of the opposite sign, being positive for the former and negative for the latter. The negative sign of the predicted part of the subsequent announcer's earnings surprise for the first return window (Table 2.6 column 3) I explain as the efforts of some market agents to exploit the predictability of the subsequent announcer's earnings surprise. On the other hand, the positive sign of the earnings surprise itself (Table 2.6 column 1) is rather driven by the unpredictable part of the earnings surprise, which is supported by its significant and positive estimate (Table 2.6 column 2). In the later return windows, the results suggest that both the foreknowledge of the subsequent announcer's earnings surprise and the imperfect forecast can explain the subsequent announcer's cumulative average abnormal returns upon the first announcement. Moreover, I do not find any statistical difference of the perfect and imperfect forecasts in being able to explain the subsequent announcer's abnormal trading volume upon the first announcement. Taken together, these results support the hypothesis 5 that the market participants are not fully rational.

Comparing the models with perfect and imperfect forecasts (columns 1 and 3, 4 and 6, 7 and 9, and 10 and 12 of Table 2.6), I conclude that the model with imperfect forecast still performs well - the adjusted R-squared is almost the same as in the model with the perfect forecast.

Table 2.6: Market efficiency and cumulative average abnormal returns upon the first announcement in the industry

Cumulative average abnormal returns over windows (days upon the first announcement)												
	Days 0-1			Days 2-5			Days 6-10			Days 11-20		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SAATV	0.33***	0.33***	0.33***	0.09***	0.09***	0.09***	0.07*	0.07*	0.07*	-0.05	-0.05	-0.04
	(0.02)	(0.019)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.09)	(0.09)	(0.09)
FAATV	0.01	0.010	0.01	0.00	0.00	0.00	0.03	0.03*	0.03	0.09**	0.09**	0.08*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.04)	(0.04)	(0.04)
SAES	12.54***			20.42***			52.75***			138.8***		
	(2.71)			(4.08)			(5.04)			(11.13)		
PSAES		-25.79***	-31.14***		33.65***	27.43**		39.71***	22.73		136.7***	99.59***
		(7.99)	(7.93)		(12.13)	(12.05)		(15.18)	(15.12)		(34.73)	(34.78)
USAES		15.75***			19.31***			53.83***			138.9***	
		(2.78)			(4.19)			(5.18)			(11.46)	
FAES	5.78*	7.12**	7.16**	15.14***	14.67***	14.65***	9.25	9.72	9.78	-15.10	-15.02	-16.45
	(3.16)	(3.170)	(3.17)	(4.87)	(4.89)	(4.89)	(6.31)	(6.33)	(6.34)	(16.77)	(16.82)	(16.91)
Other controls	X	X	X	X	X	X	X	X	X	X	X	X
Observations	55,463	55,463	55,463	47,554	47,554	47,554	37,707	37,707	37,707	14,048	14,048	14,048
Adj. R-squared	0.011	0.012	0.011	0.008	0.008	0.007	0.009	0.009	0.007	0.015	0.015	0.005

Note: $SAATV$ and $FAATV$ - the subsequent and first announcer's abnormal trading volume on the day of first announcement; $SAES$ and $FAES$ - the subsequent and first announcer's earnings surprise; $PSAES$ and $USAES$ - the predicted and unpredicted parts of the subsequent announcer's earnings surprise. *Other controls include*: $MRET10$ - the subsequent announcer's mean of the returns excluding dividends over the last 10 trading days before the first announcement; $MATV10$ - the mean abnormal trading volume over the last 10 trading days before the first announcement; $MRET182$ - the subsequent announcer's mean of the returns over the last 182 days (or six months); MV - the logarithm of the market value, calculated as the number of shares outstanding at the end of the quarter multiplied by the last available stock price in that quarter; BM - the book-to-market value, which is calculated as the logarithm of the ratio of total assets minus depreciation to the market value; ACC - accruals calculated as the change in the working capital from the previous quarter minus depreciation scaled by total assets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

2.5.3 Drivers of the Abnormal Trading Volume upon the First Announcement

The second part of hypothesis 3 states that the first announcer's abnormal trading volume is informative about the trading activity of the subsequent announcer, while the second part of hypothesis 4 states that the history of both the first and subsequent announcers' earnings surprises histories are informative about the trading activity of the subsequent announcer. To test the second part of hypotheses 3 and 4, I study the drivers of the trading activity of the subsequent announcing firms upon the first announcement in the industry. For the purposes of this analysis I build a basic model and compare the results with the model with the earnings surprise forecast.

The basic model of the subsequent announcer's abnormal trading volume, first of all, includes the first announcer's earnings surprise as a piece of new information. Since I want to test whether the first announcer's trading volume leads to the changes in the trading activity in the subsequent announcer's stocks, I also include the first announcer's abnormal trading volume. I also expect that, depending on the earnings surprises history, the market is going to treat the firms differently: the investors may have different incentives to trade in the stocks with a long history of positive earnings surprises compared to the firms with irregular positive earnings surprises. This might be the case since, for example, the firms with a strong positive earnings surprise history may be perceived as good investment firms, while the firms with an irregular earnings surprise history may be considered as more risky. I also expect that the history of both the first and subsequent announcers would matter and therefore I include the earnings surprise history of both into the basic model.

Since I also expect that the market participants try to update their beliefs based on the new information observed, these updated beliefs should be reflected in the trading activity (the hypothesis 6). In order to test this hypothesis, I study whether the perfect and imperfect forecasts can explain the subsequent abnormal trading volume upon the first announcement.

The general forms of the full specification of the basic model and the model with the earnings forecast are as follows respectively:

$$SAATV_{i,t} = \beta_o + \beta_1 FAATV_{i,t} + \beta_2 SAMES_{i,t} + \beta_3 SANPS_{i,t} \quad (2.10)$$

$$+ \quad \beta_4 FAMES_{i,t} + \beta_5 FANPS_{i,t} + \beta_6 FAES_{i,t} + \boldsymbol{\gamma Z} + \epsilon_{i,t},$$

and

$$\begin{aligned} SAATV_{i,t} &= \beta_o + \beta_1 FAATV_{i,t} + \beta_2 FAES_{i,t} + \\ &+ \beta_3 FOREC_{i,t} + \boldsymbol{\gamma Z} + e_{i,t} \end{aligned} \tag{2.11}$$

where $SAATV_{i,t}$ and $FAATV_{i,t}$ - the subsequent i and first announcer's abnormal trading volumes on the day of the first announcement in quarter t; $SAMES_{i,t}$ and $FAMES_{i,t}$ - the subsequent i and the first announcer's mean earnings surprises over the previous 20 quarters before the current quarter t, where the earnings surprise was calculated as the difference between the actual quarterly EPS and the mean forecast for that quarter scaled by the last available stock price in that quarter; $SANPS_{i,t}$ and $FANPS_{i,t}$ - the subsequent i and first announcer's number of positive earnings surprises over the previous 20 quarters before quarter t; $FAES_{i,t}$ - the subsequent announcer's i and first announcer's earnings surprise in quarter t; $FOREC_{i,t}$ - the forecast of the earnings surprise; $\boldsymbol{Z}$ is the same matrix of other control variables specified above; and $\epsilon_{i,t}$ and $e_{i,t}$ are the error terms with zero mean and constant variance. In a similar manner to the above, depending on whether I have the perfect or imperfect forecast model, the variable $FOREC_{i,t}$ can be either $SAES_{i,t}$ or the vector consisting of $PSAES_{i,t}$ and $USAES_{i,t}$ respectively.

Table 2.7 contains the estimation results of three models: the basic model with the history of the first and subsequent announcers' earnings surprises (column 1), the model with the history of the earnings surprises and the perfect forecast of the earnings surprises (column 2), and the model with the imperfect forecast (i.e., the predicted and unpredicted parts) of the subsequent announcer's earnings surprise (column 3).

The first finding, supported by the estimation results from all the three models, is that the first announcer's earnings surprise does not have any impact on the trading activity in the stocks of the subsequent announcer. I interpret the inability of the first announcer's earnings surprise to explain the trading activity in the subsequent announcer's stocks as the further evidence of trading volume being the extra information signal.

All the three models show that the abnormal trading volume of the subsequent announcer is increasing in the first announcer's abnormal trading volume upon its own (first announcer's) earnings report. I explain the positive sign of the estimate by the

Table 2.7: Abnormal trading volume upon the first announcement

		SAATV	
VARIABLES	(1)	(2)	(3)
SAES		-0.21	
		(0.59)	
PSAES			-3.47**
			(1.73)
USAES			-0.09
			(0.60)
FAATV	0.02***	0.02***	0.02***
	(0.00)	(0.00)	(0.00)
FAES	-0.75	-0.74	-0.48
	(0.69)	(0.69)	(0.69)
SAMES	0.51	0.56	
	(0.97)	(0.98)	
SANPS	-0.00**	-0.00**	
	(0.00)	(0.00)	
FAMES	3.04**	3.04**	
	(1.20)	(1.20)	
FANPS	-0.00***	-0.00***	
	(0.00)	(0.00)	
Other controls	X	X	X
Observations	55,463	55,463	55,463
Adjusted R-squared	0.184	0.184	0.183

Note: $SAATV$ and $FAATV$ - the subsequent and first announcer's abnormal trading volume upon the first announcement; $PSAES$ and $USAES$ - the predicted and unpredicted parts of the subsequent announcer's earnings surprise; $SAMES$ and $FAMES$ - the subsequent and first announcer's mean earnings surprises over the previous 20 quarters, where the earnings surprise was calculated as the difference between the actual quarterly EPS and the mean forecast for that quarter, scaled by the last available stock price in that quarter; $SANPS$ and $FANPS$ - the subsequent and first announcer's number of positive earnings surprises over the previous 20 quarters; $SAES$ and $FAES$ - the subsequent and first announcer's earnings surprise. *Other controls include*: $MRET10$ - the subsequent announcer's average returns excluding dividends over the last 10 trading days before the first announcement; $MATV10$ - the mean abnormal trading volume over the last 10 trading days before the first announcement; $MRET182$ - the subsequent announcer's average returns over the last 182 days (or six months); MV - the logarithm of the market value, calculated as the number of shares outstanding at the end of the quarter multiplied by the last available stock price in that quarter; BM - the book-to-market value, which is calculated as the logarithm of the ratio of total assets minus depreciation to the market value; and ACC - the accruals calculated as the change in the working capital from the previous quarter minus depreciation scaled by total assets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

heterogeneity of the beliefs or the presence of heterogeneous agents, which is in line with the previous literature. Consistent with the findings of Barber and Odean (2008) the institutional investors may be selling the stocks of the first announcer and individual investors are more likely to buy them upon the first announcement date. At the same time I expect that the institutional investors are more likely to buy the subsequent announcers' stocks on the first announcement, since according to Boehmer and Kelley (2009) they may be more efficient in incorporating the new information about the future subsequent announcers based on the first announcer's report.

I also find evidence that the history of the earnings surprises of both the first and subsequent announcers can explain the abnormal trading volume of the subsequent announcer upon the first announcement. But while the mean of the subsequent announcer's earnings surprises is insignificant in explaining the subsequent announcer's trading volume, the first announcer's mean of earnings surprises is significant. Moreover, the number of positive earnings surprises in the past of both announcers is significant and negative. I interpret the negative sign of these two estimates in the following way. The probability of observing the subsequent announcer's positive earnings surprise in the current quarter is increasing in both the number of positive surprises in the past of the first and subsequent announcers, which is consistent with the model of predicting the subsequent announcer's earnings surprise from Table 2.5. Realizing this, the market agents may be more inclined to hold those subsequent announcers' stocks with higher probability of a positive surprise, which results in lower trading activity in the stocks of these firms.

The estimation results also show that the perfect forecast (column 2 Table 2.7) cannot explain the subsequent announcer's trading activity. On the contrary, the predicted part of the subsequent announcer's earnings surprise is significant and negative (column 3 Table 2.7), which is expectable: if the market is expecting the higher earnings surprise of the subsequent announcers, there will be fewer participants willing to trade in this stock.

Comparing all the models of abnormal trading volume, I can infer that the abnormal trading volume of the subsequent announcer is driven rather by market expectations of the subsequent announcer future performance than just solely by the news from the first announcer, since the first and subsequent announcers earnings surprises are insignificant, while the predicted part of the subsequent announcer can explain its earnings surprise. So these findings also support the hypothesis that at least some of the market agents will try to trade strategically based on the updated beliefs upon the first announcement.

2.5.4 Price Responses upon Own Announcement

The main idea is that the abnormal trading volume upon the first announcement should serve as additional information for purifying the information content to the implication of the first announcer's earnings surprise for the subsequent announcer. On the other hand, upon the firm's subsequent own announcement the market receives a clear information signal about the subsequent announcer's performance. If the abnormal trading volume has only incremental informative power for purifying the noisy signals, the subsequent announcer's abnormal trading volume upon its own announcement should be unable to explain the cumulative average abnormal returns upon own announcement. On the contrary, the findings that the subsequent announcer's abnormal trading volume upon its own announcement are able to explain the stock performance can be considered as stronger evidence of trading volume informativeness (hypothesis 2). Moreover, I also expect that the subsequent announcer's history of own earnings surprises can explain the stock performance of the subsequent announcer upon its own announcement (hypothesis 4).

For testing these hypotheses, I again consider three models: the basic model, the model with the history of subsequent announcers' earnings surprises, and that with the imperfect forecast of the earnings surprise. The full specification of these models is as follows:

The basic model of cumulative average abnormal returns upon own announcement:

$$\begin{aligned} CAARown_{i,t} &= \beta_o + \beta_1 SAATVown_{i,t} + \beta_2 SAMES_{i,t} + \beta_3 SANPS_{i,t} + \\ &+ \beta_4 SAES_{i,t} + \beta_5 FAES_{i,t} + \boldsymbol{\gamma Zown} + \epsilon_{i,t}, \end{aligned} \tag{2.12}$$

The cumulative average abnormal returns model with the imperfect forecast of the earnings surprises

$$\begin{aligned} CAARown_{i,t} &= \beta_o + \beta_1 SAATVown_{i,t} + \beta_2 PSAES + \beta_3 USAES_{i,t} +, \\ &+ \beta_4 FAES_{i,t} + \boldsymbol{\gamma Zown} + \epsilon_{i,t} \end{aligned} \tag{2.13}$$

where $CAARown_{i,t}$ - the subsequent i announcer's cumulative average abnormal returns

Table 2.8: Cumulative average abnormal returns upon own subsequent announcement

	Cumulative average abnormal returns over windows (days upon the first announcement)											
	Days 0-1			Days 2-5			Days 6-10			Days 11-20		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
SAATVown	-0.05***	-0.05***	-0.05***	0.03**	0.03*	0.03**	0.02	0.02	0.02	-0.00	-0.00	-0.00
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
SAMES		-64.26***			-17.19**			-13.16*			-23.21**	
		(9.24)			(6.95)			(6.94)			(9.58)	
SANPS		0.013**			0.02***			0.02***			0.01*	
		(0.01)			(0.00)			(0.00)			(0.01)	
SAES	293.5***	298.5***		40.87***	41.04***		20.15***	19.93***		3.83	5.09	
	(5.65)	(5.72)		(4.25)	(4.30)		(4.24)	(4.29)		(5.86)	(5.93)	
PSAES			250.1***			39.03***			15.58			-10.59
			(16.46)			(12.37)			(12.35)			(17.05)
USAES			297.1***			41.02***			20.53***			5.01
			(5.79)			(4.36)			(4.35)			(6.00)
FAES	3.26	3.17	4.74	-12.26**	-12.85***	-12.20**	-0.96	-1.59	-0.80	13.36**	13.06**	13.85**
	(6.42)	(6.43)	(6.45)	(4.83)	(4.83)	(4.85)	(4.82)	(4.82)	(4.84)	(6.66)	(6.66)	(6.68)
Other controls	X	X	X	X	X	X	X	X	X	X	X	X
Observations	52,149	52,149	52,149	52,149	52,149	52,149	52,146	52,146	52,146	52,095	52,095	52,095
Adj. R-squared	0.056	0.057	0.056	0.010	0.011	0.010	0.005	0.006	0.006	0.010	0.010	0.010

Note: $SAATVown$ - the abnormal trading volume on the day of the own announcement; $SAMES$ - the subsequent announcer's mean earnings surprises over the previous 20 quarters, where the earnings surprise was calculated as the difference between the actual quarterly EPS and the mean forecast for that quarter, scaled by the last available stock price in that quarter; $SANPS$ - the subsequent announcer's number of positive earnings surprises over the previous 20 quarters; $SAES$ and $FAES$ - the subsequent and first announcer's earnings surprise; $PSAES$ and $USAES$ - the predicted and unpredicted parts of the subsequent announcer's earnings surprise. *Other controls include*: $MRET10own$ - the subsequent announcer's mean of the returns excluding dividends over the last 10 trading days before the own announcement; $MATV10own$ - the mean abnormal trading volume over the last 10 trading days before the own announcement; $MRET182own$ - the subsequent announcer's mean of the returns over the last 182 days (or six months); MV - the logarithm of the market value, calculated as the number of shares outstanding at the end of the quarter multiplied by the last available stock price in that quarter; BM - the book-to-market value, which is calculated as the logarithm of the ratio of total assets minus depreciation to the market value; and ACC - the accruals calculated as the change in the working capital from the previous quarter minus depreciation scaled by total assets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

over the appropriate time interval upon the own announcement, $SAATVown_{i,t}$ - the subsequent i announcer's abnormal trading volume on the day of the firm's own announcement in quarter t; $SAMES_{i,t}$ - the subsequent i announcer's mean earnings surprises over the previous 20 quarters before quarter t; $SANPS_{i,t}$ - the subsequent i announcer's numbers of positive earnings surprises over the previous 20 quarters before quarter t; $SAES_{i,t}$ - the subsequent i announcer's earnings surprise, which was calculated as the difference between the actual quarterly EPS and mean forecast scaled by the last available stock price in quarter t; $PSAES_{i,t}$ and $USAES_{i,t}$ - the predicted and unpredicted parts of the subsequent i announcer's earnings surprise in quarter t; $\boldsymbol{Zown}$ is the matrix of other control variables, namely $MRET10own_{i,t}$, $MATV10own_{i,t}$ $MRET182own_{i,t}$, $MV_{i,t}$, $BM_{i,t}$, and $ACC_{i,t}$; and $\epsilon_{i,t}$ is the error term with zero mean and constant variance.

Table 2.8 contains the estimation results of the cumulative average abnormal returns upon the subsequent announcer's own reporting. Firstly, according the results the abnormal trading volume upon the subsequent own announcement is significant for the first two return windows. What is interesting is that the abnormal trading volume changes its sign from negative for the first return window to positive for the second return window. I explain this in the following way. Since the firm's announcement draws the market attention to the announcing firm, the market may overreact to the new information, resulting in higher trading activity and lower returns, but then this overreaction is quickly offset, which is consistent with the reversal of the sign of the estimate of the abnormal trading volume. The findings also show that the significance of the abnormal trading volume is more persistent upon the first announcement than upon the firm's own subsequent announcement. The higher persistency of the trading volume upon the first announcement can result from the fact that upon the first announcement the market receives more noisy signals, explaining why it might take longer for its informativeness to disappear or be incorporated fully.

The extended model shows us that the earnings surprise history of the subsequent announcer can also explain the subsequent announcer's price responses upon its own announcement. I observe that the two measures of history are perceived differently by the market. The significant and negative estimate of the mean of the earnings surprises I explain as the market overreaction to the history of the stock. Upon observing the subsequent announcer's own report the market participants may realize the predictive power of the mean of the past positive earnings surprises and take appropriate corrective steps. On the other hand, the significant and positive estimate of the number of positive

earnings surprise for all the returns window provides evidence that the market underreacts to the sequence of positive earnings surprises.

To get more insights into the efficiency of the market, I also compare how the subsequent announcer's earnings surprise itself and its imperfect forecast, available at the first announcement, can explain the subsequent announcer's stock performance upon its own announcement (Table 2.8). The estimates of the subsequent announcer's earnings surprise as well as the predicted and unpredicted parts of the forecast model are positive and significant. The positive and significant estimate of the subsequent announcer's earnings surprise is consistent with previous research and suggests the market underreacts to the earnings surprise. Moreover, the results also provide further evidence of market inefficiency (the first part of hypothesis 5) since the estimates of the earnings surprise and the predicted and unpredicted parts are not economically or statistically different from each other.

The findings also show that the underreaction to the unpredicted part persists a while longer - the estimate of the unpredicted part is still significant and positive for the third return window, while it is not significant for the predictive part. Since the estimate of the subsequent announcer's earnings surprise is also significant and positive for the third return window, I believe this significance is driven by the unpredicted part. These findings are also quite reasonable and can be interpreted such that it takes less time to adjust to something more expectable than to something less expectable, which is consistent with the literature on representativeness bias as the explanation of market inefficiencies (Barberis et al., 1998; Brav & Heaton, 2002; Alti & Tetlock, 2014; Gennaioli et al., 2015).

2.5.5 Trading Volume and Own Announcement

As the last step in the analysis, I study the driving forces on the abnormal trading volume upon own announcement. The second part of hypothesis 4 states that the subsequent announcer's abnormal trading volume is driven by its own history of the earnings surprises. Moreover, in hypothesis 7 I state that the subsequent announcer's abnormal trading volume is also driven by the beliefs updated upon observing the first announcement.

To test these hypotheses I compare three models: the basic model, the model with the earnings surprise history, and the imperfect forecast model of earnings surprise. These models have the following specifications:

Table 2.9: Abnormal trading volume upon own subsequent announcement

	SAATVown		
VARIABLES	(1)	(2)	(3)
SAATV	0.04***	0.04***	0.04***
	(0.01)	(0.01)	(0.01)
FAATV	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)
SAMES		7.91***	
		(2.05)	
SANPS		0.02***	
		(0.00)	
SAES	7.61***	5.59***	
	(1.26)	(1.27)	
PSAES			33.37***
			(3.66)
USAES			5.48***
			(1.29)
FAES	3.05**	2.42*	2.18
	(1.43)	(1.43)	(1.44)
Other controls	X	X	X
Observations	52,149	52,149	52,149
Adjusted R-squared	0.110	0.113	0.111

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Note: $SAATVown$ - the abnormal trading volume upon own announcement; $SAES$ and $FAES$ - the subsequent and first announcer's earnings surprise; $PSAES$ and $USAES$ - the predicted and unpredicted parts of the subsequent announcer's earnings surprise; $SAATV$ and $FAATV$ - the subsequent and first announcer's abnormal trading volume upon the first announcement; $SAMES$ - the subsequent announcer's mean earnings surprises over the previous 20 quarters, where the earnings surprise was calculated as the difference between the actual quarterly EPS and the mean forecast for that quarter, scaled by the last available stock price in that quarter. *Other controls include*: $MRET10own$ - the subsequent announcer's mean of the returns excluding dividends over the last 10 trading days before the own announcement; $MATV10own$ - the mean abnormal trading volume over the last 10 trading days before the own announcement; $MRET182own$ - the subsequent announcer's average returns over the last 182 days (or six months); MV - the logarithm of the market value, calculated as the number of shares outstanding at the end of the quarter multiplied by the last available stock price in that quarter; BM - the book-to-market value, which is calculated as the logarithm of the ratio of total assets minus depreciation to the market value; ACC - the accruals calculated as the change in the working capital from the previous quarter minus depreciation scaled by total assets. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The basic model of the abnormal trading volume upon own announcement

$$\begin{aligned} SAATVown_{i,t} &= \beta_0 + \beta_1 SAATV_{i,t} + \beta_2 FAATV_{i,t} + \beta_3 SAMES_{i,t} + \\ &+ \beta_4 SANPS_{i,t} + \beta_5 SAES_{i,t} + \beta_6 FAES_{i,t} + \boldsymbol{\gamma Zown} + \varepsilon_{i,t}, \end{aligned} \tag{2.14}$$

The model of the abnormal trading with the imperfect forecast of earnings surprises

$$\begin{aligned} SAATVown_{i,t} &= \beta_0 + \beta_1 SAATV_{i,t} + \beta_2 FAATV_{i,t} + \beta_3 PAES_{i,t} + \\ &+ \beta_4 USAES_{i,t} + \beta_5 FAES_{i,t} + \boldsymbol{\gamma Zown} + \varepsilon_{i,t}, \end{aligned} \tag{2.15}$$

where $SAATVown_{i,t}$ - the subsequent i announcer's abnormal trading volume on the day of the own announcement in quarter t; $SAATV_{i,t}$ and $FAATV_{i,t}$ - the subsequent i and first announcer's abnormal trading volume on the day of the first announcement in quarter t; $SAMES_{i,t}$ - the subsequent i announcer's mean earnings surprises over the previous 20 quarters before quarter t; $SANPS_{i,t}$ - the subsequent i announcer's number of positive earnings surprise over the previous 20 quarters before quarter t; $FAES_{i,t}$ and $SAES_{i,t}$ - the first and subsequent i announcer's earnings surprises, which were calculated as the difference between the actual quarterly EPS and mean forecast scaled by the last available stock price in quarter t; $PSAES_{i,t}$ and $USAES_{i,t}$ - the predicted and unpredicted parts of the subsequent i announcer's earnings surprise in quarter t; $\boldsymbol{Zown}$ is the matrix of other control variables specified above, and $\varepsilon_{i,t}$ is the error term with zero mean and constant variance.

The estimation results are reported in Table 2.9. The significance of the subsequent announcer's abnormal trading volume upon the first announcement supports hypothesis 7. The positive estimate of the subsequent announcer's abnormal trading volume is in line with the reasoning that at least some of the market participants may see the profitable opportunities on the day of the first announcement (which is also supported by the findings in section 5.3) take the appropriate trading positions and then subsequently take the offsetting trading position upon the subsequent announcer's own earnings reporting. As discussed in section 5.3, the more sophisticated market players such as institutional investors may buy the subsequent announcers' stocks on the day of the first announcement, that is why I expect that on their subsequent own announcement these market players

may take the offsetting position. I expect the opposite for the trading activity for the first announcer and as a result the trading activity in the first announcer's stock on the first announcement has the predictive power in explaining the subsequent announcer's trading activity.

I also find that both aspects of the history of earnings surprises - the mean and number of positive earnings surprises - are positive and significant. Taking into account that the mean of the earnings surprises was significant and negative for the cumulative average abnormal returns upon own announcement for the first return window, the significance of the mean of the earnings surprise in the regression of the abnormal trading volume upon own announcement can be considered as further evidence of the market overreaction to this measure of earnings surprise history. The trading activity upon own announcement also increases in the number of positive earnings surprises. This suggests that the market is aware of the predictability of the subsequent announcer's earnings surprise, but underreacts to this measure of the earnings surprise history, given the significant and positive estimate of the number of positive earnings surprises in the regression of the cumulative average abnormal returns for all of the returns window from section 2.5.4 (Table 2.8).

Comparing the models with the earnings surprise itself and the imperfect forecast, I can conclude that the trading activity upon own announcement is driven by the earnings surprise. At the same time I also find that the predictive part of the earnings surprise has a much stronger impact on trading activity than the unpredicted part. This larger trading activity response to the predicted part can also explain the faster decay of the significance of the predicted part in the regression of the cumulative average abnormal returns discussed in section 2.5.4.

2.6 Conclusion

The main finding of this chapter suggests that abnormal trading volume can serve as an additional information signal. Moreover, I find that the abnormal trading volume is informative not only upon the first announcement, but also upon the subsequent announcer's own report date.

Comparing the impact of the abnormal trading volume on the cumulative average abnormal returns upon the first and subsequent own announcement, I can summarize the following. Upon the own announcement, the significance of the abnormal trading volume disappears faster than upon the first announcement. I rationalize it as follows.

Upon observing the first announcement in the industry the market participants may try to produce or update their forecast of the subsequent announcer's earnings surprise. It is natural to expect that their forecast is not going to be perfect. That is why the trading volume will reflect the imperfect forecast and market participants' trading activity will be driven by the forecast update. So the abnormal trading volume serves as the purifying information signal about a subsequent announcer's earnings surprise upon the first announcement in the industry, but the informativeness of the abnormal trading volume is incorporated much faster upon the subsequent own earnings announcement.

I also show that the first and subsequent announcers' history of the earnings surprises is informative about the stock performance and trading activity of the subsequent announcer. The results suggest that both of the measures of the earnings surprise history are important - by how much the firm surprised the market (measured by the mean of the earnings surprises over the previous 20 quarters) and how often it did so in the past (measured by the number of positive earnings surprises over the previous 20 quarters). At the same time I provide evidence that the mean of the earnings surprises has much lower power in explaining the cumulative average abnormal returns and trading volume than the number of positive earnings surprises. This suggests that the market, firstly, considers these two components of the history differently and, secondly, that there is a stronger underreaction to the sequence of positive earnings surprises compared to the mean value in the past.

Besides, I also show that the history of both the first and subsequent announcers' earnings surprises is valuable for predicting the subsequent earnings surprise. I further use this predictability to test the market efficiency and find that although the market tries to incorporate this predictability of the subsequent announcer's earnings surprise, it fails to fully do so at once.

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Chapter 3

The EU members' International Portfolio Investment Positions[1]

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Abstract

(with Yuko Hashimoto)

This chapter studies the international portfolio flows of European Union members. We find evidence that the EU members' shares of the total portfolio investments at the destination tend to move together, which may result from the higher financial integration between the countries. At the same time, there is still a diversity among the country-members in the level of financial development and sophistication, which may lead to the differences in the investment strategies employed by the countries. Our analysis includes two dimensions of the EU members' investment strategies: (1) the level of countries' portfolio investment concentration (those who invest evenly among counterparties versus those who invest more heavily in some counterparties) and (2) the share of total portfolio investment assets invested at the destination. We find that portfolio investment positions respond differently to macroeconomic variables depending on the level of investment concentration and the share of invested assets. We also find evidence of the crisis period affecting both the co-movements of the EU members' investment shares at destination and the macrovariables driving international portfolio investments. In particular, variables of the health of the financial system become important determinants for portfolio investment during the crisis.

3.1 Introduction

Financial integration is one of the fundamental goals of the EU, as it may provide competitive advantages and bring prosperity to the member states (Guiso, Jappelli, Padula, & Pagano, 2004; Pagano & Von Thadden, 2004; Masten, Coricelli, & Masten, 2008). One of the outcomes of higher financial integration might be that the financial markets of all the EU members act as a single market. If that is the case then the international portfolio investments stemming from the EU countries will show a high degree of co-movements. This might be of special concern in the case when a destination country is hit by a shock. During a period of turbulence the correlation of the assets risk and returns rises (Chesnay & Jondeau, 2001; Ang & Bekaert, 2002; Butler & Joaquin, 2002; Forbes and Rigobon 2002), which increases the exposure of investing countries to common risk factors. The increase in common risk factors may result in an even higher degree of co-movements of the EU members' shares of the total portfolio investments. This, in turn, may have an amplifying and significant effect on international portfolio outflows and financial stability of the country-destination, since the fully integrated financial market of the EU countries by size can be compared that of the US (Guiso et al., 2004).

At the same time, the full financial integration of the EU members is still not achieved, mainly due to the diversity in the level of financial development and financial sophistication. This may result in different motives, preferences and investment strategies of the international portfolio allocation. In particular, the EU countries may differ in their preferences for diversification versus concentration. The benefits of international diversification are well studied (Ang & Bekaert, 2002; Khoury, 2003; Das & Uppal, 2004; Flavin & Panopoulou, 2006; Driessen & Laeven, 2007; De Santis & Sarno, 2008), but the concentration might still be attractive for investors since it enables the building of an information advantage (Kacperczyk, Sialm, & Zheng, 2005; Ivkovic, Sialm, & Weisbenner, 2008; Huij & Derwall, 2011).

As the consequence of differences in motivation to invest internationally, and the investment strategies employed by the EU countries, one may expect correspondingly heterogeneous responses to the same changes in the investment environment. Although there is an extensive literature on the relative benefits of diversification and concentration, studies are scarce on the specific question of how the choice of one or the other can explain changes in international portfolio investment positions. Moreover, while most of the studies on the diversification and concentrations analyze individual portfolios, we, in

contrast, consider how the preferences for one of these, aggregated at the country level can explain the international portfolio investments. To fill this gap in the literature, the present study tries to determine whether an investment strategy aggregated at the country level matters for a country's international investment reallocation. Investment strategy is characterized by two dimensions: investment type - low or high concentration - of the source countries; and investment share at the destination. Investment concentration measures the extent to which a source country has concentrated its investments; that is, a country that invests more evenly among many counterparties is considered a low-concentration country, whereas a country that invests heavily in only a few counterparties is considered a high-concentration country. One may think of the investment concentration as an investment style of forming the portfolio, which we measure by the concentration index and detail later in the text, while investment share at destination describes the asset allocation decision into a particular country-destination.

We contribute to the literature in several ways. Firstly, we study to what extent the EU members' shares of the total international portfolio investments exhibit a tendency to co-move together, which might be useful for policy makers in their attempts to assess the risk associated with the international portfolio investments' volatility. Secondly, we study the role of the EU members' diversity in the international portfolio allocation, by looking at how different investment types (high- or low-concentration) of the EU countries and the investment share at the destination affects the countries' portfolio investment decisions. This diversity, on the one hand, may suggest some extra benefits for the EU members themselves, especially during increased financial turbulence (Guiso et al., 2004), since it may serve as an extra buffer. For the reasons discussed above, it also might actually matter much more for the country-recipients.

Firstly, our empirical results show that the EU members' shares of the total portfolio investments are highly correlated. However, the correlation of the co-movements of the EU members' investment shares depend on the country destinations: the co-movements of EU members' investment shares into the non-EU member destination countries are more aligned compared to the EU member's investment shares into the EU member destination countries. This correlation of the co-movements of the EU members' shares of the total portfolio investments decreases for the subsample of the non-EU member destination countries during the crisis, while there is some evidence of a small and almost negligible change in the explanatory power of common factors of the co-movements of the EU members' shares of the total portfolio investments for the sub-sample of the EU

member destination countries.

Secondly, the estimation results of this study suggest that the EU members' investment type (high- or low-concentration) plays a role in explaining changes in international portfolio investment positions. The results also show that low-concentration countries respond in the opposite direction relative to the high-concentration type: when the portfolio flows exhibit a negative reaction to the changes in the macro variables for the high-concentration type, the low-concentration type reaction to such variables is less negative or even positive; conversely, the positive reaction of the high-concentration type is accompanied by a less positive reaction of the low-concentration type. Moreover, the analysis reveals that the crisis changes the set of the variables that elicit these differing responses from the two types: before the crisis, the types mainly differ in their responses to the general macroeconomic conditions (GDP growth, CPI, unemployment, government debt, etc.), while during the crisis the types put different weights on the variables that can signal the health of the financial system (short- and long-term interest rates, stock index and stock index growth). We believe that our findings can help policymakers to predict and manage severe capital outflows that can occur when a country faces unexpected (exogenous) market liquidity shocks and contagion.

The chapter is organized as follows. In the second section we discuss the related literature and state our hypotheses. The third section introduces the methodology. The main variables and data sources are discussed in the fourth section. The main empirical results are discussed in the fifth section. The sixth section concludes.

3.2 Related Literature and Hypotheses

It is believed that when all agents of the financial markets across the EU member states face identical financial regulation rules and have equal access to the financial sector instruments and services, which is the goal pursued by the European Commission, financial integration may be achieved. According to the European Financial Integration report of 2009 (The European Commision, 2009) there was substantial progress in that direction since the Lisbon European Council summit in 2000. The complete financial integration of the EU countries may lead to the creation of a single continent-wide financial market. On the one hand, the creation of the single financial market may imply that the member countries have equal excess to the financial markets within the union as well as to the global financial system and may get huge benefit from this as shown by Guiso et al. (2004), Pagano and

Von Thadden (2004), Masten et al. (2008). On the other hand, this may also imply that the countries are exposed to the same risk due to higher financial interdependence among the countries (Arezki, Candelon, & Sy, 2011; Syllignakis & Kouretas, 2011; Alter & Schüler, 2012). As a consequence one might consider the international portfolio investments originated from the EU member states as such coming from the single entity or single market. If that is the case, one might expect that the international portfolio investments of the EU members will exhibit a high degree of co-movements. These arguments led us to the following hypothesis.

Hypothesis 1: The EU members' shares of total portfolio investment into the country-destinations are driven by the common factors.

We also expect that the co-movements of the EU members' shares of the total portfolio investments will not be stable over time in our sample. We have two competing explanations for this instability. The first is motivated by the analysis of the European Financial Integration report of 2009 (The European Commision, 2009) according to which there was an increase in the segmentation of the financial markets across the EU members as a response to the global financial crisis. The increased financial segregation may lead to the lower explanatory power of the common factors driving the EU members' shares of total portfolio investments, which may imply a lower degree of co-movements of the EU members' shares of the portfolio investments.

The second explanation comes from a steady increase in the correlation of returns and risk among countries due to the globalization and global economic integration. Moreover, the correlation of the asset returns across countries increases sharply during economic slowdowns (Chesnay & Jondeau, 2001; Ang & Bekaert, 2002; Butler & Joaquin, 2002; Forbes & Rigobon, 2002; Hartmann, Straetmans, & De Vries, 2004; Cappiello, Engle, & Sheppard, 2006). These findings suggest that all the EU countries' exposure to the common factors may increase in response to the global financial crisis, which may lead to higher co-movements in the EU members' shares of the total portfolio investments. Although it is not clear which effect will dominate – the increase in the financial segregation or the increase in the exposure to the common factors – it is expected that either of them will have an impact on the co-movements of the EU members' shares of the total portfolio investments. These considerations motivated us for the following hypothesis.

Hypothesis 2: The common factors of the co-movements of EU members' shares of the total portfolio investments will have different explanatory power for the two subsamples, consisting of the years 2001-2006 and 2007-2010 respectively.

Although, there is evidence of the increasing financial integration of the EU members, as discussed above, it is not fully complete and may remain less than complete in the long run. Grossman and Leblond (2011) argue that the financial integration is less uniform than the EU regulation evolution would suggest. Moreover, the authors argue that one should distinguish between regulatory and market integration, pointing out that the EU financial market integration is lagging behind the regulatory one. Besides that, there is a high degree of diversity in the financial development and financial sophistication among the EU member states. As of 2013, the financial system deposit to GDP ratio ranged from 32% for Romania to 329% in Luxembourg, the stock market capitalization to GDP ratio - from 4% for Latvia to 119% for Luxembourg, and the stock market turnover ratio - from 0.18% for Luxembourg to 172% for Italy[2].

This diversity in financial development and sophistication together with the incomplete financial integration may also suggest that the investment strategies of the EU countries, as well as international portfolio choices, will differ depending on their individual financial market's characteristics (Calvet, Campbell, & Sodini, 2009; Feng & Seasholes, 2005; Lane, 2000; Mendoza, Quadrini, & Rios-Rull, 2007). Heterogeneity between EU members may mainly result in the different goals of international portfolio investments pursued by the countries. There are two main goals of international investments: international diversification and potentially higher returns compared to the returns on the home assets.

While it is well known that investing internationally provides opportunities for diversification[3], investors do not use these opportunities fully. Among the reasons for not doing so are information asymmetry (Brennan & Cao, 1997; Ahearne, Griever, & Warnock, 2004; Van Nieuwerburgh & Veldkamp, 2009, 2010), preferences for home assets or optimism about home assets (French & Poterba, 1991; Coval & Moskowitz, 1999; Strong & Xu, 2003), barriers to international investments such as taxes on holding foreign assets and transaction costs (Black, 1974; Stulz, 1981), low risk-aversion (Cooper & Kaplanis, 1994), political risk (Frankel, 1991). All these factors determine international investors' motivation to invest abroad and, consequently, their investment strategies. Thus, for example countries with higher risk aversion could be expected to diversify more, while countries with lower risk aversion might exploit more risky strategies by specializing more

[2]The data were obtained from the World Bank Global Financial Development database.

[3]This point was expressed earlier by Grubel (1968), Levy & Sarnat, 1970 and Solnik (1974), and then called into question by the increase in the correlation of assets returns by Butler and Joaquin (2002), Ang and Bekaert (2002), and Chesnay and Jondeau (2001). Nevertheless, Ang and Bekaert (2002), Khoury (2003), Das and Uppal (2004), Flavin and Panopoulou (2006), Driessen and Laeven (2007), and De Santis and Sarno (2008) show that there are still benefits from international diversification.

and forgoing the benefits of diversification. It is also documented that the investors' wealth and risk tolerance tend to show a positive relationship (Riley Jr & Chow, 1992; Schooley & Worden, 1996; Shaw, 1996; Grable & Lytton, 1999; Bernheim, Skinner, & Weinberg, 2001; Hallahan, Faff, & McKenzie, 2004). Aggregated on the country level, one might expect that richer countries may be more inclined to tolerate the risk, including the risk related to the international portfolio.

The higher returns on the foreign portfolio as the second most important motive of the international investments may be achieved through concentration of the portfolio on the subset of the available financial assets or, in our case, destination countries. On the one hand, by forming more concentrated portfolios, investors may forgo the benefits of international diversification, while on the other they may enjoy an information advantage by investing in a limited set of assets (Kacperczyk et al., 2005; Ivkovic et al., 2008; Huij & Derwall, 2011). This information asymmetry between the countries with lower and higher levels of concentration may trigger different responses to the changing macrovariables of a destination country. This argument is also supported by the findings of Goldstein, Li, and Yang (2014), who show that different trading opportunities of the traders in the same market may lead to different trading motives and trading activities.

Based on the arguments above, we are going to differentiate two investment types of countries - those countries who prefer to invest more evenly among country-destinations (low concentration type) and those who prefer to concentrate their portfolio on a subset of the country-destinations (high concentration type). We further expect that the portfolio investment reallocation in response to the changes in the macrovariables may differ across the EU countries depending on the investment type, which we formalize in the following hypothesis.

Hypothesis 3: The changing investment environment may trigger different responses in the international portfolio investments among the low and high concentration investment types of the EU countries.

While the investment type of the countries, as argued above, will play a role in the international portfolio investments, the story is not fully complete. The other side of the investment strategy of the country-origin might be the share of the invested assets into a particular country-destination. The investment share at the destination measures the proportion of a source country's total portfolio investment that is invested in the destination country. This measure highlights the importance and exposure of a source country to the destination countries. The hypothesis is that the investment type is driven

by particular investment motives and considerations, while the second dimension (the share of the portfolio a country invests in a counterparty) might be rather driven by non-economic reasons, such as investor's preferences for particular sectors, asset types, or a particular country. This is motivated by previous research showing that the larger bilateral international portfolio positions are associated with such non-economic determinants as the informational (Massa & Simonov, 2006;Lane & Milesi-Ferretti, 2008), geographical (Portes & Rey, 2005; Grinblatt & Keloharju, 2001), and cultural proximity (Grinblatt & Keloharju, 2001; Beugelsdijk & Frijns, 2010; Aggarwal, Kearney, & Lucey, 2012). This suggests that the EU members' responses to the changes in the investment environment may depend on the investment share at the destination. We formalize these considerations in the following hypothesis.

Hypothesis 4: The investment share at the destination may play its role in the international portfolio reallocation.

The time effect will also matter in our study. Brennan and Cao (1997) show that due to the domestic information advantage of the domestic investors, investors tend to buy foreign assets during periods when they offer high returns, and sell during the periods when they offer low returns. This may imply that during the economic slowdown or crisis, the foreign investors most probably will sell foreign equity investments, at the same time increasing the investment into the debt securities as the stock-bond returns tend to decouple during the turbulence periods (Gulko, 2002; Connolly, Stivers, & Sun, 2005). This argument may also be consistent with the findings of Coeurdacier and Gourinchas (2011), who show that the international equity investments are conditional on the bond returns. Moreover, the portfolio positions could be affected considerably, as the risk-aversion rises during the crisis (Guiso & Paiella, 2008), which is the distinctive feature of our later subsample. While these changes in risk aversion and risk appetite during an economic slowdown have an impact on portfolio rebalancing (Fu, 1993; Kumar & Persaud, 2002; Coudert, Gex, et al., 2006; and Caceres, Guzzo, & Segoviano Basurto, 2010), the impact of the changing investment environment may depend on the investment strategies of the countries since they will differ in the level of risk tolerance in the first place.

Hypothesis 5: The EU countries' responses to the changing macroeconomic conditions (crisis versus no crisis) will depend on the investment type and investment share at destination.

3.3 Model and Methodology

There are two main goals in our analysis. Firstly, we want to study whether the EU members' shares of the total portfolio allocations into a particular country-destination co-move, and to which degree these co-movements can be explained by common factors. Secondly, we are going to investigate how the international portfolio investments of the EU members respond to the changing macroeconomic conditions and whether these changing conditions may receive heterogeneous responses depending on the investment strategies employed by the EU members.

To deal with the first task, we are going to implement the principal component analysis (PCA). The PCA will allow us to study how the co-movements of the portfolio investments of the EU members can be explained by common factors (hypotheses 1 and 2). In particular, we are going to study how the EU members' share of the total portfolio investments in the particular country-destinations can be explained by common factors, i.e. we want to study how the shares of total portfolio investments, for example, from Austria, Belgium, and other EU members into the Unites States, Japan, and Switzerland can be explained by common factors. This actually implies that our variables, the co-movements of which we will try to explain with common factors, are the EU members' shares of the total portfolio investments into the country-destinations and our individuals or observations are the country-destinations[4]. If the EU members' shares of total portfolio investments move independently, then we can infer that the motivation to invest abroad is driven by differences in characteristics of the country-origins (e.g., preferences for investing into a particular country may differ across the countries due to heterogeneity in the historical, cultural and economic linkages between the country-origin and country-destination). If they move together, then we can infer that portfolio investments originated from the EU countries are subject to the common driving forces.

To test hypotheses 3, 4 and 5, we develop a dynamic panel model, which includes both macroeconomic variables and the uncertainty of these macroeconomic variables in a given year, since uncertainty will play a crucial role in the international investment decision. Our basic dynamic panel model of international portfolio investment positions is represented by equation (3.1).

[4]We restrict our sample of the destination side. We disregard those observations where the investment destination is either territories with special rights, separate financial centers, or international organizations, since we want to study how the common factors of the investment environment (or in other word, macroeconomic conditions) drive the co-movements of the portfolio investments rather than such motives as tax-evasion, which may have a high explanatory power for the financial centers, for example.

$$Y_{i,j,t} = \alpha + \rho Y_{i,j,t-1} + \beta' X_{j,t} + \mu_{i,j} + \eta_t + e_{i,j,t}, \tag{3.1}$$

where subscripts i, j, and t denote the country of origin, the country of destination, and time respectively. $Y_{i,j,t}$ is the vector of dependent variables; $Y_{i,j,t}$ is the vector of either the logarithm of the ratio of total portfolio assets, equity securities, or debt securities invested by country i into country j in year t evaluated at the market value to GDP. $Y_{i,j,t-1}$ is the vector of the logarithm of the portfolio investment to GDP ratio in the previous year, and it is included in the estimation equation in order to take into account the persistence of the series. $X_{j,t}$ is the matrix of control variables for country j in year t and consists of the following variables: short-term interest rate and standard deviation of short-term interest rate, long-term interest rate and standard deviation of long-term interest rate, stock index and standard deviation of stock index, stock index growth and standard deviation of stock index growth, unemployment rate and standard deviation of unemployment rate, consumer price index growth and standard deviation of consumer price index growth, real effective exchange rate, GDP growth, the ratio of current account to GDP, and government debt to GDP ratio. $\mu_{i,j}$ represents the vector of unobservable fixed effect between countries i and j such as culture, history, geography, economic or social interconnection. η_t denotes the vector of common time-specific unobservable effects. $e_{i,j,t}$ is the vector of the error term with zero mean and constant variance.

Several econometric problems are of potential concern with the estimation of equation (3.1). First, our model is a persistent series, and the first lag of the dependent variable may give rise to autocorrelation in the error term. Second, the time-invariant fixed effect can be correlated with other explanatory variables and omitting it would lead to bias. Third, there is a large number of source-destination pairs and a short time span. Fourth, our panel data are imbalanced, and the macro variables in our model are endogenous in the sense that the right-hand variables and the dependent variable affect each other.

The endogeneity problem implies that changes in the portfolio flows move short- and long-term interest rates: the outflows move rates up because fewer funds are available for borrowing (i.e., excess demand for money increases) and inflows move them down (Kouri & Porter, 1974; Warnock & Warnock, 2009), but changes in the short- and long-term interest rates also determine the decision to invest. Fluctuations in portfolio outflows and inflows also contribute to the fluctuations of the short- and long-term interest rates

and, conversely, fluctuation in the interest rate affects investment decisions. The increase in the interest rate results in an increase in the borrowing costs of the economic agents and the firms' decision to hire new workers which raises the unemployment rate. The higher unemployment rate results in lower GDP growth, which is reflected in the asset returns. This also implies that the changes in interest rates affect government debt through borrowing costs, making government debt also endogenous.

The same reasoning can be applied to the stock index and growth of stock index: the higher demand for domestic assets (the increase in the portfolio inflows) moves asset prices up (capital gains will also move up), and portfolio reshaping will also contribute to the asset price fluctuations and uncertainty about returns. We also consider the current account to GDP ratio to be endogenous, since the capital inflows also increase the current account deficit. The increase in government debt increases the demand for funds and increases borrowing costs of the agents, which moves the interest rates. This reasoning implies that through the changes in the interest rates, the government debt will also be endogenous.

To overcome these econometric issues, we use the system dynamic panel GMM estimator developed by Arellano and Bond (1991) and extended by Blundell and Bond (1998). To solve the endogeneity problem, Arellano and Bond (1991) suggest using the lags, starting from the second one, as instruments for the endogenous variables in the first difference equation. The system dynamic panel provides efficiency by estimating both the equations in levels and in the first differences. In the equation in the levels, the estimator uses the lags of first differences of the endogenous variables, while in the equation in differences, the second lag of the endogenous variables is used as an instrumental variable. For the lags and the lags of first differences of the variable to be the appropriate instruments for the endogenous variables, the following conditions should hold:

For the equation in levels:

$$E[\Delta Y_{i,j,t-1}(\mu_{i,j} + e_{i,j,t})] = 0 \quad and \quad E[\Delta X_{j,t-1}(\mu_{i,j} + e_{i,j,t})] \;=\; 0 \tag{3.2}$$

For the equation in first differences:

$$E[Y_{i,j,t-2}\Delta e_{i,j,t}] = 0 \quad and \quad E[X_{j,t-2}\Delta e_{i,j,t}] \;=\; 0 \tag{3.3}$$

for t≥3[5].

In order to test hypothesis 3, we are going to differentiate between two investment types - high- and low-concentration types. In order to do that, we use the approach of Kacperczyk et al. (2005) to construct the concentration index. We calculate the concentration index according to the following formula:

$$CI_{i,t} = \sum_{j}^{N} (\omega_{i,j,t} - \overline{\omega}_{j,t})^2, \tag{3.4}$$

where $\omega_{i,j,t}$ is the share of total portfolio investment assets of country i invested into country j in year t and $\overline{\omega}_{j,t}$[6] is the average share of total assets invested in country j by the EU members[7].

Our concentration index should reflect how the portfolio of a particular country deviates from the benchmark portfolio. If we find evidence supporting hypothesis 1 about the common factors driving the EU members' shares of portfolio investments, the average share of the total international portfolio investments into a particular country-destination may be perceived as representative for the EU. Thus, any deviation from this benchmark can signal the country-origin's investment preferences or investment strategies.

There are two main reasons for using this index. First, it is adjusted for a country's attractiveness for investments (i.e. if the country is perceived to offer better investment opportunities, the average weight of investments in this country will be higher). Second, it takes into account the time-varying optimal investment share. The second feature is especially topical during periods of turbulence since the flight to quality and higher capital inflows into such countries as Germany and the United States are very likely. Thirdly, by squaring the deviation of the invested share from its mean we guarantee that positive and negative deviations from the mean do not cancel each other[8].

[5]Although the longer lags are also valid instruments in the system GMM, we use only the first lag of differences in the level equation and the second lag of the endogenous variables in the difference equation. By doing this, we restrict the number of instrumental variables, since Roodman (2009) shows that even being valid separately, the large number of instruments can collectively be invalid because they may overfit endogenous variables.

[6]To calculate the concentration index, we exclude such destinations marked in CPIS as "International Organizations + SEFER (CPIS)", "International Organizations", "Other Countries Confidential", and "Other Countries, not Specified".

[7]After merging different data sets and due to data limitations of some macro variables, the set of destination countries includes Australia, Austria, Belgium, Bulgaria, Canada, Hong Kong, Denmark, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, South Africa, Spain, Sweden, Switzerland, United Kingdom, and United States.

[8]To show the argument more explicitly, let us consider the following example. Suppose the allocation choice is limited only to country-destinations X, Y, and Z. The average investment shares

Once the concentration index is calculated for all sample countries, the countries are classified either as a high- or low- concentration type. Countries with a concentration index equal to or higher than the 65th percentile are classified as high-concentration. The low-concentration investment types are those countries with the concentration index equal to or below the 35th percentile[9]. The time trend of the concentration index is shown in Figure 1.

In order to test whether high- and low-concentration types differ in their responses to the changes in the macroeconomic variables, we modify equation (3.1) and estimate equation (3.5):

$$Y_{i,j,t} = \alpha + \rho Y_{i,j,t-1} + \beta' X_{j,t} + \gamma' d_{low} * X_{j,t} + \eta_t + e_{i,j,t}, \tag{3.5}$$

where d_{low} is a dummy variable and equals 0 if the data come from the sub-sample of the high concentration type and 1 if the data are for the sub-sample of the low concentration type. The significance of γ's estimates will provide evidence that the two investment types differ in the responses to the macro variables.

In order to test hypothesis 4, we further re-estimate our full specification model in equation (3.5) for the separate sub-groups, depending on the investment share at the destination. For these purposes, we divide the sample into the subset of the destination countries with the share of invested assets equal to or below 1 percent, in the range between 1 and 7 percent, and equal to or above 7 percent[10].

In order to test hypothesis 5, we are also going to consider two separate time periods: the pre-crisis period of years 2001 to 2006 and the crisis period of 2007-2010[11].

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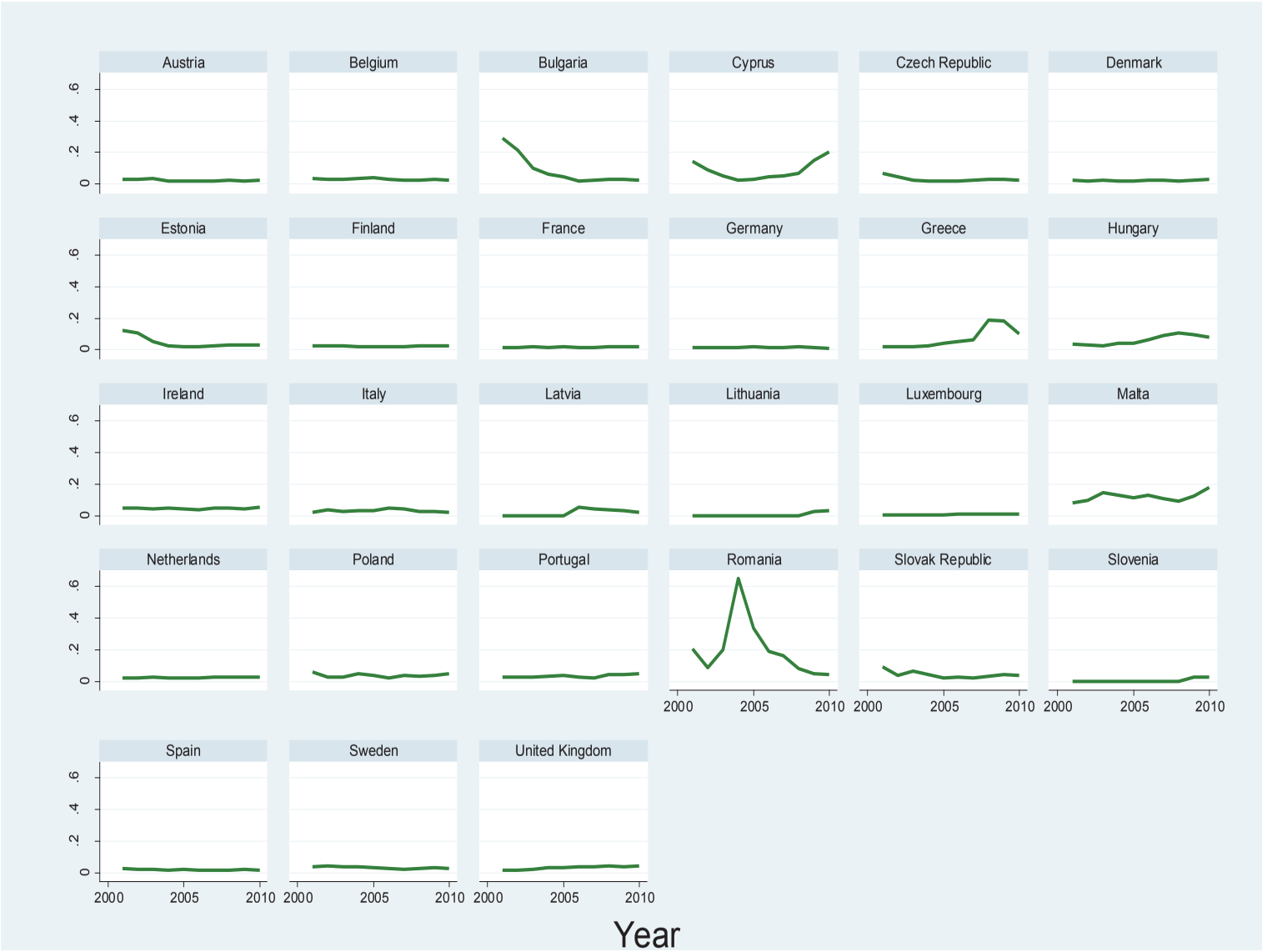
into these countries are presented by the vector $[\bar{\omega}_X = 0.5;\ \bar{\omega}_Y = 0.3;\ \bar{\omega}_Z = 0.2]$. The allocation decisions of country A and country B into these destination countries are presented by the vectors $\left[\omega_X^A = 0.6;\ \omega_Y^A = 0.4;\ \omega_Z^A = 0.0\right]$ and $\left[\omega_X^B = 0.2;\ \omega_Y^B = 0.5;\ \omega_Z^B = 0.3\right]$ respectively. Country B clearly deviates from the average investment shares more for every destination country and our concentration index confirms this - $CI^A = 0.06 < CI^B = 0.14$. The deviation in both sides is important, given the fact that all the shares should sum up to one, by investing more heavily into country Y in our example, country B has also to invest less into country X. The simple sum of the deviation from the mean (without squaring) would give 0 for both.

[9]To group low- and high-concentration types, we also considered approaches of dividing the sample based on the 25th and 75th percentiles, or the 30th and 70th percentiles, but our empirical results qualitatively do not change. In this study, we are presenting the results from grouping based on the principle of the 35th and 65th percentiles, since we believe such an approach is most objective: an average ("normal", "standard", or "representative") country will have the index within the 35th and 65th percentiles, while those countries which significantly differ from an average country will fall out of these bounds.

[10]This division does not have any theoretical background, but this way of grouping also allows us to divide the sample into the more or less equal sub-samples.

[11]Although the crisis fully evolved in 2008, the first warning signals were already observed in 2007.

Figure 3.1: Time trend of the concentration index by country



3.4 Data and Main Variables

Main Data Sets

We use several data sources in our study, among which are the Coordinated Portfolio Investment Survey (CPIS), World Economic Outlook (WEO), and IMF International Financial Statistics (IFS) and Global Data Source (GDS).

CPIS

The data on the international investment positions are obtained from the Coordinated Portfolio Investment Survey (CPIS), in which data are available on an annual basis since 2001. The CPIS is the database collected by the IMF on the voluntary provisions by the countries. The data set provides bilateral cross-country data for individual countries, i.e. the international portfolio investment of country i in country j, in addition to the global (aggregated) annual data. Data are available for the total portfolio investment positions and are also broken down by asset type: equity securities and debt securities. For debt securities, data are further classified into long- and short-term debt.

The CPIS data provide two dimensions - the asset side and the liability side - for total portfolio assets, equity and debt securities. For both of the dimensions and for every concept (i.e. every class of assets provided by the database), the CPIS contains two data entries. The asset side data represent residents' holding of securities issued by nonresidents (outward investment), i.e., portfolio investment by country i in country j is recorded as portfolio investment assets of country i. The liability side data include securities issued by residents and owned by nonresidents (inward investment), i.e., portfolio investment by country j into country i is recorded as portfolio investment liabilities of country i[12].

The cross border positions collected on an economy's holdings (i.e. from the assets side) are usually considered to be more reliable since the holder (investor) most probably will know what securities in each country he holds. These entries in the CPIS data set are defined as the asset side. On the other hand, the issuer of the security may not always know the residence of the holder (investor) since the securities might be held not directly by the investor but rather through an intermediary. Given that the asset side is believed

Since investors tend to overreact to negative news, we consider 2007 as being the first year of financial crisis.

[12]Not all the participants of the CPIS report the liability side. Nevertheless, the IMF derives the liabilities of non-reporters using the data collected by CPIS participating economies. If country i does not report its liabilities to country j, but country j reports its investments in country i, the missing value on the liability side of country i (due to non-reporting) is substituted with the data reported by country j and defined as "derived liabilities".

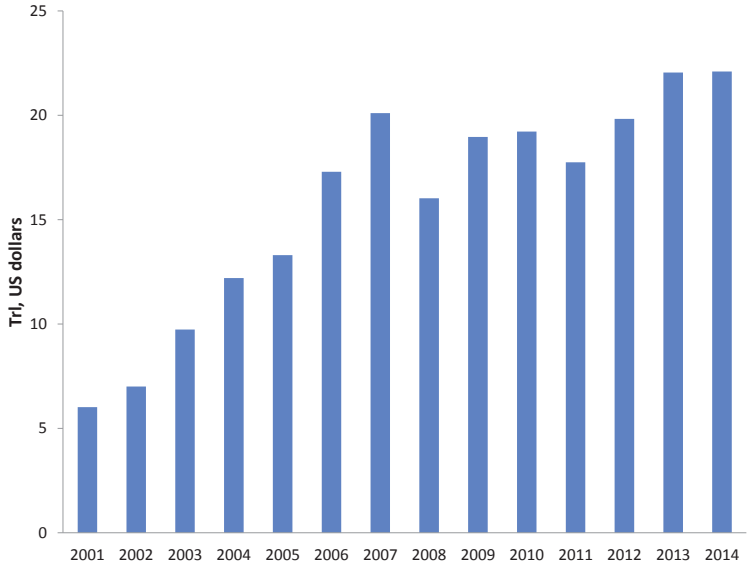
to be more precise, for our analysis we use the asset side of the CPIS database.

In our analysis we consider three concepts from the CPIS data set: total portfolio investments, portfolio investments into equity, and portfolio investments into debt securities. For our analysis, we focus on the yearly data on the portfolio investments of the European Union members as the country-investors. The set of countries includes Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden, and United Kingdom. For all of the countries except Latvia, Lithuania, and Slovenia we have the data for the full time span of years 2001-2014. The data on the portfolio investment for Latvia are available from 2006 and for Lithuania and Slovenia starting from 2009. As a consequence, in our PCA analysis of the investment shares co-movements (where the investment share was calculated as the ratio of portfolio investment into a particular destination to the total sum of portfolio investments), we exclude Latvia and Lithuania for 2001-2005 and Slovenia for 2001-2008.

The CPIS data set has quite a substantial number of missing values, which would make it impossible for us to implement the PCA. To overcome this problem, we proceed in the following way. Firstly, for each country and each year we sum up all the investment shares over all destinations. If the weights sum up to at least 0,999999, we replace the missing values with 0. Although the IMF instructs participating countries to report 0 in case of no investments and missing values in case of non-available data, our analysis shows that the weights over all destinations sum up to 1 in the majority of cases, which implies that some countries just leave the entry empty even when there is no investment in a country-destination. We also allow a threshold of 0,999999 to be equivalent to 1 since the portfolio investments below a certain level are entered as 0 in the CPIS data set. For those observations, for which the investment share weight in a particular year sums up to lower than 0,999999, we take the average country's share at the destination over the whole time span and substitute the missing value.

The data show that the aggregated portfolio investments of all the EU members were steadily growing over time up to 2007 (Figure 3.2). In 2008 there was a sharp decrease in the total portfolio investment, which we explain as the response to the global financial crisis. We also observe the recovery in the total portfolio investments starting from 2009. Nevertheless, there is evidence of crisis impact persistency on the portfolio investments of the EU members, since the aggregated portfolio investments recovered to the level of 2007

Figure 3.2: Total portfolio investments of the EU members, trn US dollars



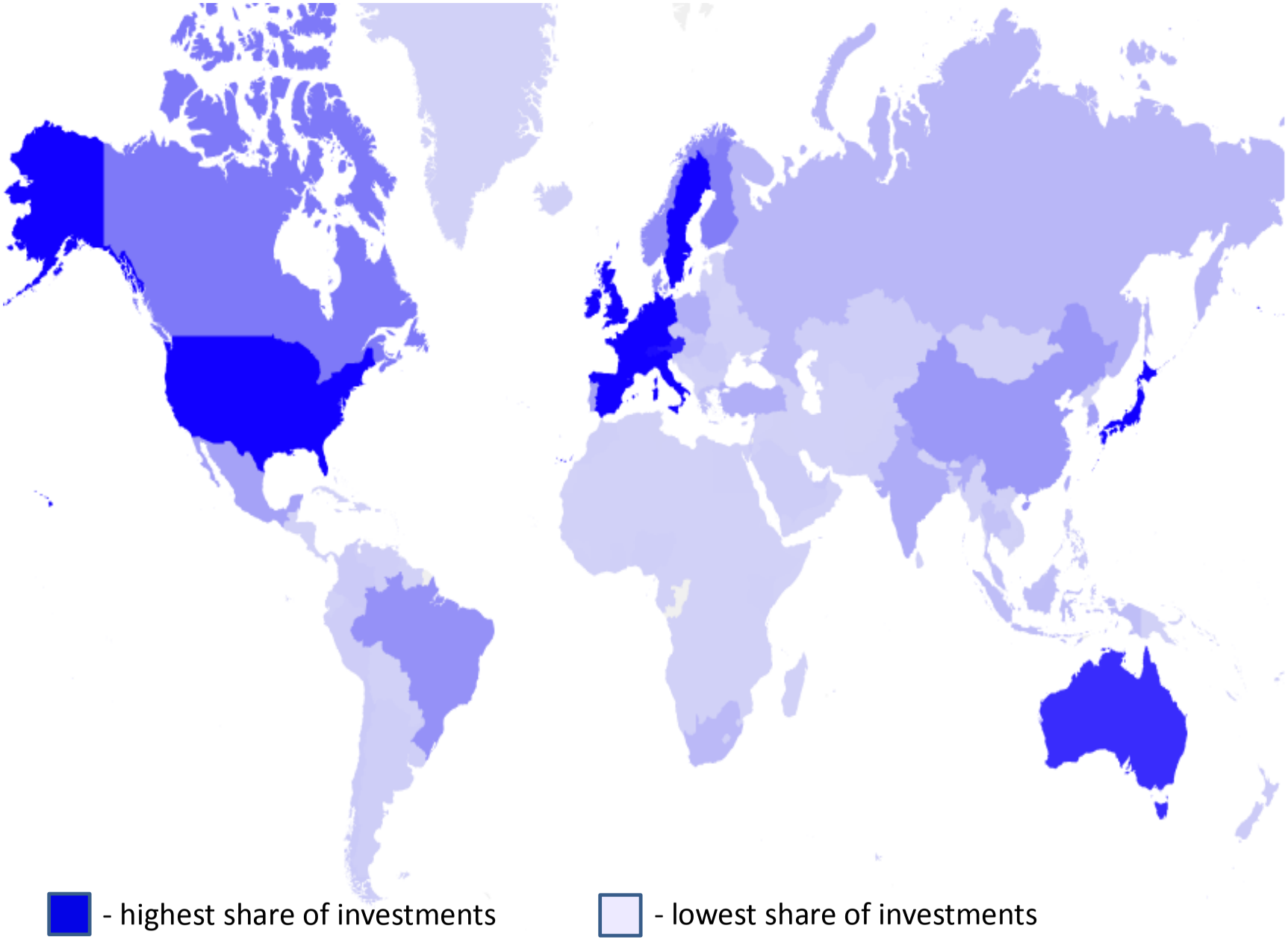
only by 2013.

Figure 3.3 depicts the country destination by the amount of total portfolio investments from the EU members as of 2014. The top main destination countries (in the descending order) as of 2014 are United States, Luxembourg, France, Germany, United Kingdom, Netherlands, Italy, Ireland, Spain, and Japan. Such countries as the United States, Germany, United Kingdom and France always preserve their top 5 positions as country-destinations over the whole time span, which is consistent with the expectations that these countries are considered to be a safe haven. At the same time, we also see that Italy is among the top five destination countries during 2001-2006. During 2007-2008 Italy is replaced by Luxembourg as the destination country, which we explain as a result of the economic troubles facing Italy as the crisis evolved.

IMF IFS and GDS

The IMF International Financial Statistics (IMF IFS) database provides data on exchange rates and real exchange rates, money and consumer prices, commodity prices, trade and production, government finance, interest rates, the balance of payments and key national accounts aggregates for around 200 countries and regional groups. The database is available at the monthly and quarterly frequencies. From the IFS database we retrieve the quarterly data on seasonally adjusted CPI and relative effective exchange rates. We gather the quarterly data of the short- and long-term interest rates, stock index, and unemployment rate from the Global Data Source (GDS) data set.

Figure 3.3: EU members' intentional portfolio investments over the World as of 2014



WEO

The World Economic Outlook Database (WEO) contains the selected macroeconomic data series such as national accounts, inflation, unemployment rates, balance of payments, fiscal indicators, trade for countries and country groups (aggregates), and commodity prices, and covers more than 180 nations. The data are available at the yearly frequency and collected as times series from 1980 onwards. From this data set we collect the annual data on GDP, government debt, and current account balance.

Control Variables

The set of control macroeconomic variables includes short-term interest rate, long-term interest rate, stock index, growth of stock index, unemployment rate, the growth of seasonally adjusted consumer price index (inflation), real effective exchange rate, GDP growth, the ratio of current account to GDP, and government debt to GDP ratio[13]. To take into account the uncertainty associated with the macro variables, we also include the standard deviations during a given year of such variables as short- and long-term interest rate, stock index and growth of stock index, unemployment rate and seasonally adjusted consumer price index growth.

We include the short-term interest rate because it can signal market liquidity (Bomfim et al., 2003; Chordia, Roll, & Subrahmanyam, 2001) and reveal the spread and the cost of offsetting the position by the security issuer or trader (Aiyagari & Gertler, 1999). The change in the short-term interest rate results in the profitability of the investment and subsequently in the motivation to invest in or withdraw from a country. Besides, a change in the short-term interest rate may be perceived as a change in monetary policy and an increase (decrease) in interest rates pushes stock prices and yields to maturities down (up) (Rigobon & Sack, 2004), which results in portfolio outflows (inflows). The standard deviation of the short-term interest rate will proxy for the uncertainty of market liquidity.

Long-term interest rates are usually used by investors to discount the future cash flows that determine asset prices. Thus, a change in the long-term interest rate results in asset price movements and capital gains or losses from the investments, while the volatility of long-term interest rates contributes to the risk of asset returns. Gagnon, Raskin, Remache, Sack, et al. (2011) show that a decline in the long-term interest rate may signal a reduction in the risk premium, which will also have an impact on portfolio withdrawals.

[13]The data sources and construction of all the variables are provided in Table 3.4.

Because our dependent variable is the international portfolio investment position - total portfolio assets, equity securities, or debt securities - at market value, we also include the change in the stock index which should control for the changes in the asset valuations[14] as well as for the changes in the position itself. The standard deviation of the stock index is used to control for the volatility of the asset prices.

It might be pointed out that stock index is not perfect proxy for asset valuation changes, but we believe that our inference can withstand this critique since, in empirical analyses of portfolio allocation, there is always a dilemma of how to treat valuation changes[15]. In estimating the impact of international portfolio investment positions, it is important to separate valuation changes from actual changes in investment positions. Simply taking a difference of two time series end-period investment positions does not fully reveal information on a country's investment strategy because these data include changes in asset prices (valuation changes). Asset price changes could mask the actual transaction values, especially when the market is volatile, and could lead to a misleading interpretation of shifts in investment positions. In order to measure valuation changes, detailed data such as asset type, maturity, and prices are necessary. However, it is difficult to make an an accurate estimation of valuation changes, mainly due to the lack of such data. The IIP and CPIS data provide information on the broad composition of assets held in the form of equity and debt securities, but they do not provide details such as maturity and currency. Also, data on returns and bond indices are limited. One way to handle valuation changes is to include macroeconomic variables that proxy volatility in estimation equations[16]. Interpretations of these variables are as follows. The first is to consider valuation changes as noise in the market and inclusion of macroeconomic variables as control variables can separate out the noise. The second is to view asset prices as being part of the outcome of the portfolio allocation decision. When demand

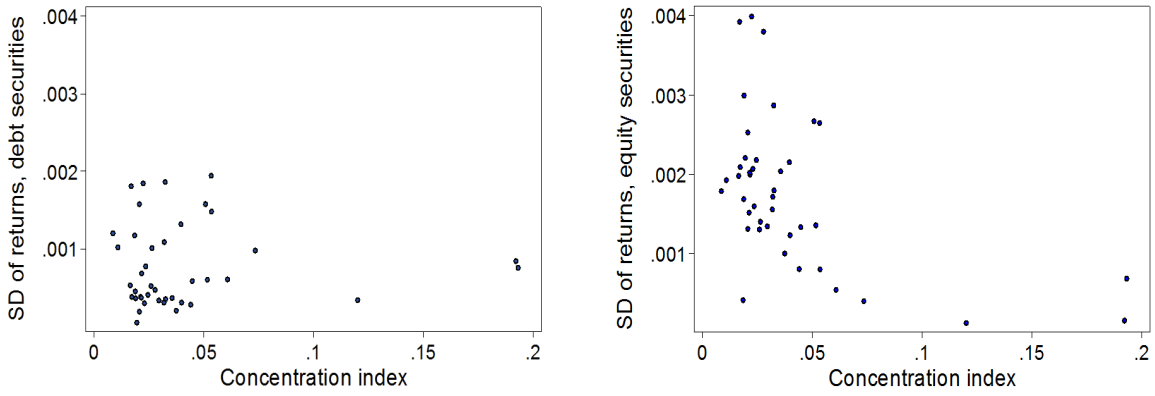
[14]We are aware of the fact that a bond market index might be a better proxy for debt asset valuation changes, but the data on bond indices are too scarce, which makes our sample too small and can bias results. On the other hand, the correlation between stock and bond prices was established by previous research and was shown to be time-varying. Among the factors determining the sign of stock-bond return correlation (Andersson, Krylova, & Vähämaa, 2008; Chiang & Li, 2009; Li, 2002) are inflation expectations, stock market uncertainty, and interest rate. By including such variables as consumer price index and standard deviation of the stock market, we control for the time-varying component of stock and bond price co-movements.

[15]We would like to acknowledge the helpful advice from Steven Phillips who suggested raising the important issue of valuation changes.

[16]This is actually taken into account in our estimation model by inclusion of the standard deviations of the short- and long-term interest rates, stock index and stock index growth, unemployment and CPI growth.

for a certain type of asset increases, its price goes up as a consequence of that portfolio choice, so that portfolio reallocation is achieved in part by valuation changes, rather than by actual flows.

Figure 3.4: Standard deviation (SD) of returns on portfolio investments



A. SD of returns on debt securities

B. SD of returns on equity securities

Investors' decisions to invest or disinvest are also influenced by the returns they earn from investing in a particular country (Brennan & Cao, 1997). The bilateral data on the portfolio returns are not available, but the balance of payments provides the total income on the portfolio investment for a country. We construct a new variable, which is calculated as the yearly portfolio income divided by the assets at the end of the previous year, and call it the returns on assets. This variable should measure the profitability of countries' portfolio investments, while the standard deviation is supposed to signal the risk of the investments.

Figure 3.4 depicts the relation between the standard deviation of returns and the concentration index. Firstly, comparing our measure of returns on assets for the debt and equity assets, we see that the standard deviation of our return on assets measure is higher for equity investments, which is fully consistent with standard finance theory. Secondly, one might observe that for both debt and equity securities, both concentration types can experience high and low volatility in their investment returns and we do not find any clear evidence of any of the investment types being more risky than the other. We explain this by the absence of the difference in the riskiness of the investment types, which is in line with previous research that the concentration may help to build the information advantage (Huij & Derwall, 2011; Ivkovic et al., 2008; Kacperczyk et al., 2005) and if so there might be no increase in the risk relative to a more diversified portfolio. Our second explanation

is the aggregation of the data and as a result some of the more risky investment strategies of the country (employed, let's say, by institution investors) may be offset by low risk investment strategies (employed by individual investors). We would like to do a deeper analysis in this direction, but due to the data limitation we are restricted from doing so.

Since the bilateral data on the portfolio returns are not available, in order to control for the attractiveness of the investments we use instead the growth of the stock index. The inclusion of the growth of the stock index is motivated by the fact that passive strategies are optimal and one cannot outperform the market (Malkiel, 2003; Monnier & Rulik, 2012). The standard deviation of the growth of the stock index will also be a proxy for the risk of returns.

The unemployment rate is included as a leading indicator of stock performance, because the higher unemployment today implies lower GDP tomorrow and, as a result, lower stock returns (Boyd, Hu, & Jagannathan, 2005; Flannery & Protopapadakis, 2002); the standard deviation of the unemployment rate will also reflect the uncertainty of the stock performance. Inflation is included as a lagging indicator for the security analysis; the standard deviation of this variable should also take into account the risk of the asset returns.

As one of the explanatory variables, we also include the government debt to GDP ratio. An increase in government debt drives up the demand for financing, which results in higher interest rates and consequently in higher borrowing costs, lower profit margins, and lower returns on assets. Moreover, an increase in the government debt motivates the government to increase the government bond supply which affects, as shown by Greenwood and Vayanos (2014), market liquidity and the returns that investors require.

In our analysis, we also use the time dimension because investing countries face different global macroeconomic conditions. We provide evidence in Figure 3.5 which represents the comparison of distributions of the main variables used in the analysis, before and after the crisis.

As one would expect, the mass of distribution of short-term interest rate shifts towards the right, which implies that more of the destination countries were facing liquidity constraints that pushed the short-term interest rate upwards. What is interesting is that there was also a shift of the mass of the distribution to the left. We believe that could happen due to capital reallocation whereby some countries enjoyed capital inflows as the result of "flight-to-quality". This hypothesis can also be supported by the leftward shifts of the mass in the long-term interest rate, which can proxy for the yields on long-term

government debt instruments. The increased demand for these instruments could push prices up and yields (long-term interest rate) downwards. These shifts also tell us that the countries became more heterogeneous in the level of short- and long-term interest rates during the crisis.

We also find the evidence of shift of the distribution to the left of such variables as the unemployment rate, consumer price index growth, government debt to GDP ratio, while there is also the evidence of the shift to the right of the mass of the distribution of the stock index growth and GDP growth. Figure 3.5 also gives evidence of an increase in all our measures of risk: there was a shift to the right in the mass of the distributions of such variables as the standard deviation of short- and long-term interest rates, the standard deviation of stock index and stock index growth, the unemployment rate and inflation.

3.5 Results

3.5.1 Common Factors in the Co-Movements of Investments Shares

In order to test hypotheses 1 and 2 we employ the principal component analysis (PCA), the estimation results of which are provided in Table 3.1 and Figure 3.6 Panel A. The table contains the proportion explained by each of the first three principal components and the cumulative proportion explained by the first two and three factors respectively and the number of observations used for the analysis.

The PCA shows that the EU members' shares of total portfolio investors into different destinations are moving together to a considerable extent. For the whole sample, covering from 2001 to 2014, the proportion of the co-movements explained by the first component is 59,66% (Table 3.1, Panel A). The first three principal components can explain up to 70,91%. We also further consider the time evolution of the proportion of the EU members' investment shares explained by the common factors components.

From Figure 3.6 Panel A we can observe the following trends of the evolution of the proportion of the co-movements explained by the first three principal components from 2001 to 2014. The proportion explained by the first three principal components stays approximately the same over 2001-2005. While the minimum proportion explained by the first common factor for this period is 63,21%, the first three common factors can explain at least 78,16% of the co-movements in the shares of total portfolio investments during this period. We also observe a decline in explanatory power of the first and first three

Figure 3.5: Distribution comparison of main variables before and during the crisis

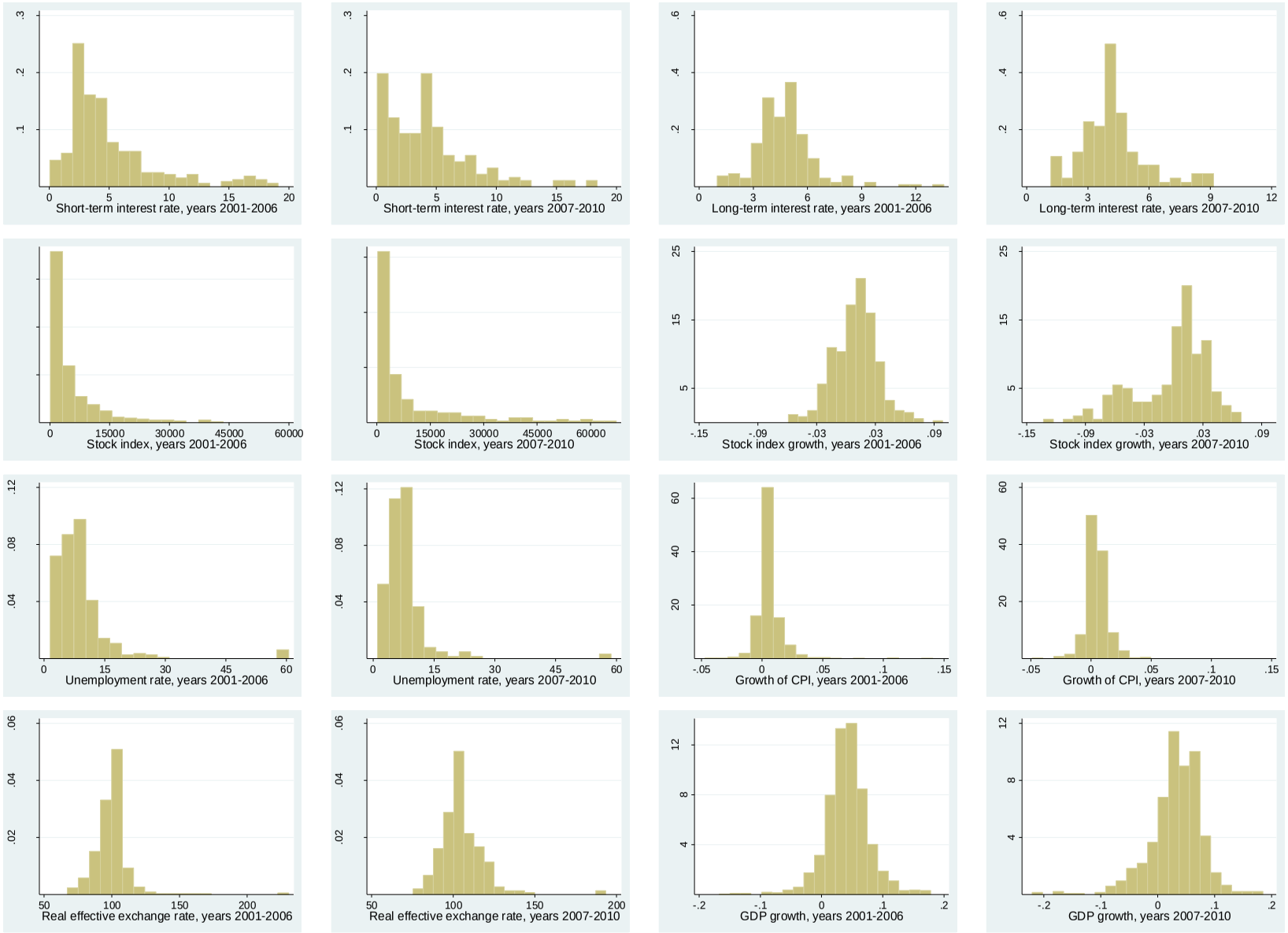


Figure 3.5 (continued): Distribution comparison of main variables before and during the crisis

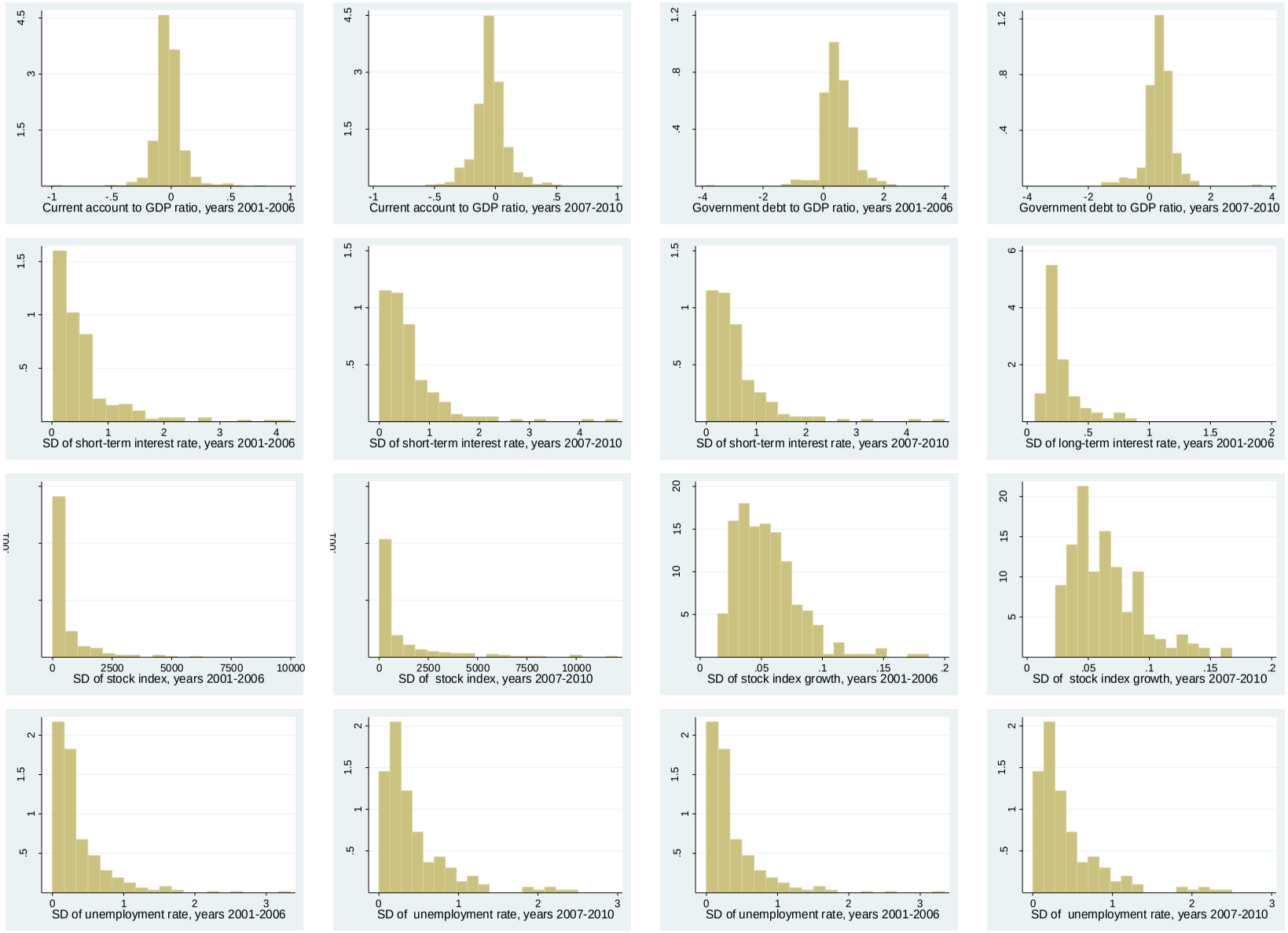
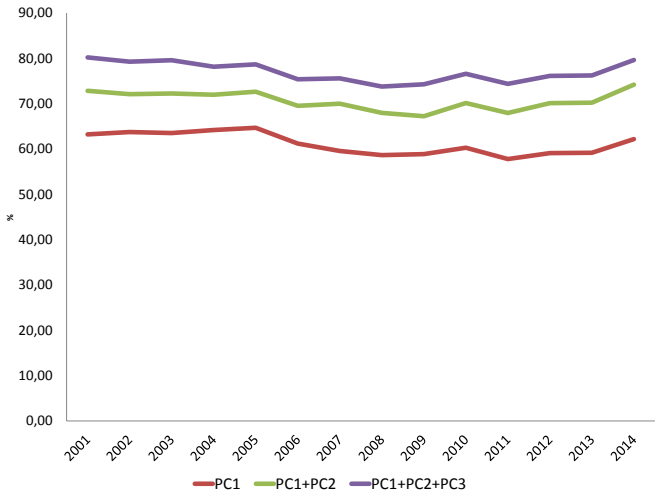
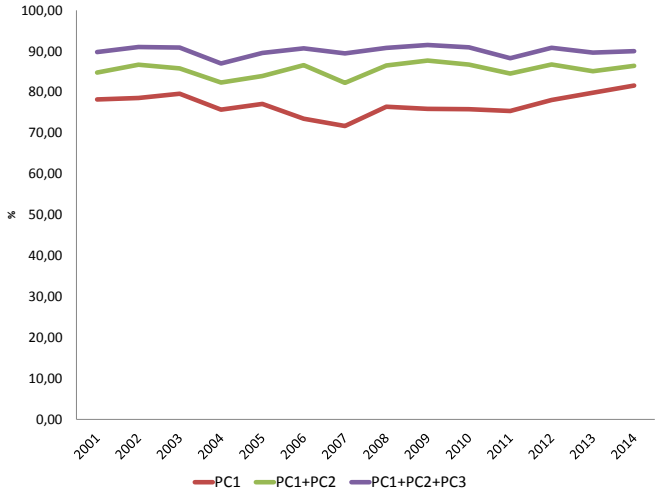


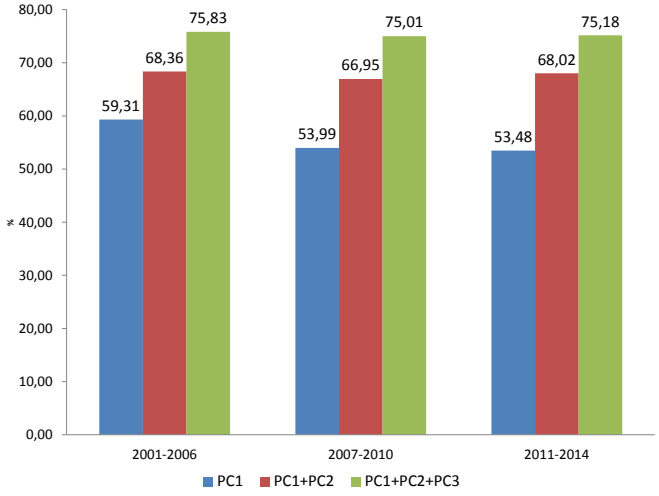
Figure 3.6: Co-movements of the EU members' investments shares



A. All country destinations



B. Non-EU country destinations



C. EU country destinations

Table 3.1: Co-movements of the EU members' investments shares, all destination countries

Principal component	Year	Proportion, % expl.	cum.	N obs.	Year	Proportion, % expl.	cum.	N obs.
PC1		57,66	57,66	3280				
PC2	2001-2014	7,96	65,62					
PC3		5,29	70,91					
PC1		63,21	63,21	233		58,64	58,64	235
PC2	2001	9,63	72,83		2008	9,30	67,97	
PC3		7,38	80,21			5,84	73,78	
PC1		63,74	63,74	233		58,88	58,88	235
PC2	2002	8,36	72,10		2009	8,34	67,23	
PC3		7,17	79,27			7,04	74,27	
PC1		63,51	63,51	234		60,28	60,28	234
PC2	2003	8,74	72,25		2010	9,87	70,14	
PC3		7,34	79,59			6,46	76,60	
PC1		64,18	64,18	234		57,77	57,77	235
PC2	2004	71,96	71,96		2011	10,18	67,95	
PC3		78,16	78,16			6,42	74,37	
PC1		64,69	64,69	234		59,10	59,10	235
PC2	2005	7,93	72,63		2012	11,02	70,12	
PC3		6,04	78,66			6,39	76,12	
PC1		61,19	61,19	234		59,16	59,16	235
PC2	2006	8,33	69,52		2013	11,05	70,21	
PC3		5,85	75,38			6,02	76,23	
PC1		59,57	59,57	234		62,18	62,18	235
PC2	2007	10,41	69,98		2014	12,02	74,20	
PC3		5,59	75,57			5,44	79,63	

common factors in 2006. It might result from the increase in risk appetite before the crisis and extra profit seeking (González-Hermosillo, 2008). As a result, the EU member countries were less aligned in their choices of the portfolio reallocation.

During the main crisis period of years 2007-2008, we observe a further decrease in the ability of the first principal component and the first three principal components to explain the co-movements of the EU members' shares of total international portfolio investments. This may result from the higher segregation of the EU members during the crisis.

Starting from 2009 we observe the tendency towards the increase in the role of the first three principal components in the co-movements of the EU members' investment shares, but the pre-crisis explanatory power of the first principal components were not reached even by 2014.

As can be noticed from Figure 3.3, among the main destination countries are the EU member states themselves. Consequently, one may argue that our results that the shares of the total portfolio investments are driven by the common factors are solely due to the fact that a significant portion of portfolio investments in our sample are directed to the member states themselves. In order to test the robustness check, we firstly, divide our sample into a sub-sample consisting of the non-EU member destination countries and the EU member destination countries. After that, we repeat our PCA analysis for both sub-samples separately, the estimation results of which are presented in Table 3.2 and 3.3 and Figure 3.6 Panel B and Panel C respectively.

The estimation results on the sample consisting of the non-EU member destination countries (Table 3.1) confirm our previous finding, discussed above. Moreover, we also obtain evidence that the co-movements of the investment shares into non-EU member countries are even stronger compared to the whole sample. For this sub-sample, we observe a stable explanatory power of the first three principal components of the investment shares co-movements till 2003. There was a slight decrease in the ability of the first and the first three principal components to explain the investment shares' co-movements in 2004, which we explain with the accession of the new EU members. The highest decrease in the degree of the co-movements of the investments shares was found in 2007, which we explain with the high turbulence in the market in response to Lehman's failure in September 2007. In the after crisis period, we observe a tendency towards an increase in the first principal component to explain the investment shares co-movements, which rises from 75,92% in 2009 to 81,60% in 2014. At the same time the proportion explained by the first two and the first three components remains more or less stable over this period. This suggest that the EU members' portfolio investments into the non-EU member countries became more aligned.

Table 3.3 and Panel C of Figure 3.6 contain the results for the sub-sample with the EU destination countries. Due to the fact that we want to study the principal components driving the portfolio investment from the EU members into the EU members, we cannot do it separately for each year, since by doing so we would have too few observations[17]. Thus, we study three sub-periods: 2001-2006, 2007-2010, and 2011-2014 respectively.

From the estimation of the EU member destination countries (Table 3.3), we further

[17]For the stable solution in the PCA, it is usually required that there are at least 5-10 observations per each variable (Bandalos & Boehm-Kaufman, 2009; Bryant & Yarnold, 1995; Garson, 2008; MacCallum, Widaman, Zhang, & Hong, 1999; Velicer & Fava, 1998).

Table 3.2: Co-movements of the EU members' investments shares, non-EU destination countries

Principal component	Year	Proportion, % expl.	cum.	N obs.	Year	Proportion, % expl.	cum.	N obs.
PC1		68,23	68,23	2902				
PC2	2001-2014	6,77	75,00					
PC3		4,10	79,10					
PC1		78,20	78,20	206		76,44	76,44	208
PC2	2001	6,58	84,78		2008	10,07	86,52	
PC3		5,01	89,80			4,30	90,81	
PC1		78,56	78,56	206	2009	75,92	75,92	208
PC2	2002	8,13	86,70			11,79	87,71	
PC3		4,34	91,04			3,82	91,53	
PC1		79,61	79,61	207	2010	75,83	75,83	207
PC2	2003	6,18	85,79			10,91	86,74	
PC3		5,10	90,89			4,21	90,95	
PC1		75,73	75,73	207		75,39	75,39	208
PC2	2004	6,61	82,34		2011	9,15	84,53	
PC3		4,67	87,01			3,77	88,30	
PC1		77,11	77,11	207		78,07	78,07	208
PC2	2005	6,82	83,93		2012	8,68	86,75	
PC3		5,62	89,57			4,10	90.85	
PC1		73,49	73,49	207		79,85	79,85	208
PC2	2006	13,12	86,60		2013	5,27	85,12	
PC3		4,08	90,69			4,55	89,66	
PC1		71,73	71,73	207		81,60	81,60	208
PC2	2007	10,53	82,26		2014	4,82	86,42	
PC3		7,20	89,46			3,61	90,03	

Table 3.3: Co-movements of the EU members' investments shares, EU destination countries

Principal component	Years	Proportion, %		N obs.
		expl.	cum.	
PC1	2001-2014	53,95	53,95	378
PC2		11,59	65,54	
PC3		7,05	72,60	
PC1	2001-2006	59,31	59,31	162
PC2		9,05	68,36	
PC3		7,47	75,83	
PC1	2007-2010	53,99	53,99	108
PC2		12,97	66,95	
PC3		8,06	75,01	
PC1	2011-2014	53,48	53,48	108
PC2		14,55	68,02	
PC3		7,15	75,18	

find evidence that the common factors are important in the co-movements of the EU members' share of total portfolio investments. The proportion explained by the first principal component varies from 53,48% to 59,31% and the proportion explained by the first three principal components varies from 75,18% to 75,83%. Firstly, although the common factors are still very important for this sub-sample of the country destinations, we observe that the co-movements are lower than those for the non-EU destinations countries. Secondly, we also find that the impact of the crisis on the explanatory power of the first three principal components is not so strong compared to the sub-sample consisting of the non-EU destination countries: there was an almost negligible decrease in the proportion of investment shares co-movements explained by the first principal components, from 59,31% in the pre-crisis period to 53,99% in the crisis period, and further decrease in the post-crisis period to 53,48%. There was also a small change in the proportion of the investment shares co-movements explained by the first three components: from 75,83% in the pre-crisis period to 75,01% in the crisis period and subsequently to 75,18% in the post-crisis period. We have two explanations for this. Firstly, the EU countries may perceive the EU members' financial markets as the home markets. As a result, the crisis may not have so big an impact on the international portfolio reallocation within the EU members.

We also have one more explanation for the heterogeneous explanatory power of the common factors in the EU members' shares portfolio investments between the sample

with the non-EU member destination countries and that of the EU member destination countries. While the EU members most probably face equal access to the financial markets outside of the union, the preferences for the EU member destination countries can be driven by tighter links due to historical or cultural reasons, geographical or informational proximity (Aggarwal et al., 2012; Beugelsdijk & Frijns, 2010; Grinblatt & Keloharju, 2001; Lane & Milesi-Ferretti, 2008; Portes & Rey, 2005). For example, such countries as the Czech Republic and Slovakia may be more inclined to invest into each other as these countries used to be a single country. The Vysegrad group[18] of countries may also be more likely to invest into each other as the consequence of the higher economic and cultural cooperation between the group members. That is why the portfolio investments preferences into the EU member destination countries may be more heterogeneous among the EU members. Moreover, as is argued in the European Financial Integration Report of 2009 (The European Commision, 2009) the investors showed a tendency to focus on the home markets during the high turbulence. If that is the case and for the reasons mentioned above, the Slovak investors, for example, may perceive the Czech financial market as a home one and their responses to the changing macroeconomic conditions in the Czech Republic might differ from, let us say, those of Swedish investors.

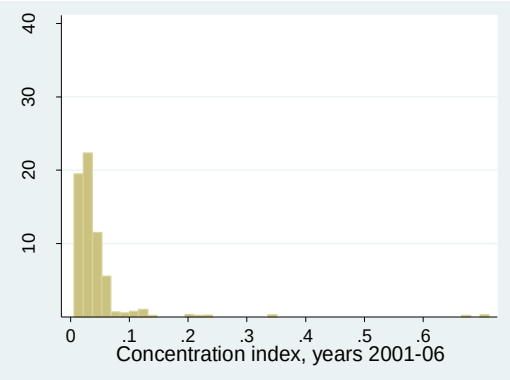
3.5.2 Responses of the Portfolio Investments to Changing Macroeconomic Conditions

Firstly, we compare our concentration index before and during the crisis (Panel A and Panel B of Figure 3.7 respectively). Figure 3.7 supports our results from the PCA. Firstly, we see that the concentration index is more skewed to the right in the pre-crisis period, which implies that during this period the portfolio investments of the EU members do not deviate much from the average investment shares at the destination. This might serve as further evidence that the portfolio investments of the EU countries are more aligned and show a high degree of co-movements. At the same time, we observe high dispersion in the concentration index in the pre-crisis period, which can serve as further evidence of the diversity of the EU member countries' investment preferences or investment strategies.

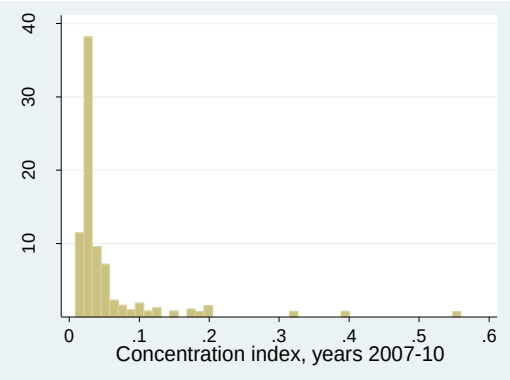
During the crisis, the distribution becomes less skewed to the right and also more dispersed. Firstly, the increase in the dispersion would result from the lower correlation

[18]The Visegrad Group is also known as Visegrad Four or V4 consist of the Czech Republic, Hungary, Poland, and the Slovak Republic, the main goal of cooperation among which is to assist each other in the number of common interests within the EU integration.

Figure 3.7: Distribution of concentration index before and during the crisis



A. Before the crisis



B. During the crisis

of the portfolio allocation during the crisis, which is also in line with our PCA results. Secondly, the increase in the kurtosis during the crisis results from the shift of the mass of the distribution a little to the right, which may signal the divergence of the portfolio allocation. This is also consistent with our finding of the PCA of the decreases in the explanatory power of the common factors for the sub-sample of the EU member destination countries. Moreover, by construction of the concentration index, the rightward shift may happen if the countries re-allocated their portfolios employing different investment strategies and deviating more from the mean region portfolio[19].

The estimation results of our full specification model from equation (3.5) for the full time span (2001-2010) are presented in Table 3.8. The first three columns (columns 1, 2, and 3) of the table provide the estimates of equation (3.5), where the dependent variable is total portfolio investment assets, assets invested in equity securities, and assets invested in debt securities respectively. The last three columns (columns 4, 5, and 6) are the estimates of γ's from equation (3.5).

Tables 3.9, 3.10, and 3.11 represent the estimation results of equation (3.5) for the full time span but for the subset with the share of invested assets equal to or below 1 percent, in the range between 1 and 7 percent, and equal to or above 7 percent, respectively. Tables 3.12–3.15 provide the estimation results for 2001-2006 using the full sample, and

[19]Our investment type measure (or concentration index) is time-dependent. Depending on the concentration types, we can distinguish five kinds of country-investors: 1) a country that before and during the crisis is high type; 2) a country that before and during the crisis is low type; 3) a country that is high type before the crisis, but low type during the crisis; 4) a country that is low type before the crisis, but high type during the crisis; 5) a country that changes its type in both pre-crisis and crisis periods. The classification of countries according to this principle is provided in Table 3.5.

the sub-samples with the share of invested assets below or equal to 1 percent, between 1 and 7 percent, and equal or above 7 percent, respectively. Tables 3.16–3.19 contain the estimation results for 2007–2010 for the full sample, and with a share of invested assets less or equal to 1 percent, in the range of 1 and 7 percent, and equal to or above 7 percent, respectively . We also provide the map for the significant γ's and their signs for the full time span, for 2001-2006, and for 2007-2010, respectively, in Tables 3.20, 3.21, and 3.22.

The estimation results can be summarized as follows. First, the investment type determines the changes in international portfolio investment positions in response to the changes in the macroeconomic variables. Whenever the estimates are negative for the high-concentration type, they are less negative or positive for the low-concentration type, and, vice versa: whenever the estimates are positive for the high-concentration type, they are less positive or negative for the low-concentration type. This result is in line with the finding of Goldstein et al. (2014), showing that different trading motives, which stem from different trading opportunities may lead to the opposite direction in response to the same information in the same markets. We also find that the share of invested assets also triggers different responses to the changes in the macro variables: on average, there are more differences in the responses for the sub-samples with shares smaller than 7 percent. This is consistent with the finding that higher international portfolio positions can be rather explained by non-economic determinants such as history, culture, and geography (Aggarwal et al., 2012; Beugelsdijk & Frijns, 2010; Grinblatt & Keloharju, 2001; Lane & Milesi-Ferretti, 2008; Portes & Rey, 2005). The time dimension also plays a role: the low and high-concentration types differ in the responses to the macro variables in the pre-crisis and during the crisis periods, but the sets of the variables in which they differ are not the same in the pre-crisis and crisis periods.

Effect of Investment Type

From the estimation of equation (3.5) with the full sample (Table 3.8), we find that the responses of the high- and low-concentration types are different to variables that represent economic growth. The variables include stock index and growth of stock index, inflation and standard deviation of inflation, real effective exchange rate, GDP growth, debt-to-GDP ratio, and standard deviation of long-term interest rate. In particular,

• The stock index is significant and negative for the high-concentration type, while the interaction term is positive for the low-concentration type. This implies that the

low-concentration type reacts more positively to a stock index rise.

• The estimate of the growth of the stock index is significant and positive (for equity securities) but the interaction term is significant and negative (for debt securities). This suggests that the low-concentration type reallocates the portfolio more slowly in response to the increase in the growth of the stock index.

We performed the same comparison analysis for the sub-samples with different shares of invested assets and across time dimensions.

• The low-concentration type countries tend to underreact or react in the opposite direction relative to the reaction of the high-concentration type countries.

Effect of Share of Invested Assets

Comparing Tables 3.9, 3.10, and 3.11 for the full time span (2001-2010) we see that the share of assets invested plays a role in determining differences in portfolio investment allocation between the concentration types. Having relatively low shares of invested assets into the destination countries, the types tend to respond in different ways to changes in risk factors, whereas, having high shares of invested assets, the types' portfolio investment decisions are not driven in a similar way in the response to both risk and growth factors.

• For the sub-sample with the share of invested assets equal to or below 1 percent, the key variables, which trigger differences in the asset allocation decisions, are those that measure risks, such as standard deviation of the long-term interest rate, standard deviation of the stock index, and standard deviation of inflation, as well as long-term interest rate.

• For the sub-sample with the share of invested assets above 1 percent and below 7 percent, determinants of dissimilarity in the portfolio investment decisions between the types are those related to growth: for example, short- and long-term interest rates, stock index growth, inflation, real effective exchange rate, GDP growth, and current account to GDP ratio.

• For the sub-sample with the share of assets invested equal to or above 7 percent, both risk and growth factors play a role in decoupling investment decisions of the types. The list of variables with the significant estimates of the interaction terms includes long-term interest rate, growth of stock index, real effective exchange rate, GDP growth, standard deviation of stock index and stock index growth, and standard deviation of unemployment rate.

Time Effect

The estimation for the pre-crisis period (2001-2006, Tables 3.12–3.15) and during the crisis years (2007-2010, Tables3.16–3.19) show slightly different results for the determinants of portfolio investment.

• For the pre-crisis period, in general, variables which reflect macroeconomic conditions are the key determinants which trigger different responses in the portfolio investment allocations of low- and high-concentration types. Among such key determinants are inflation, unemployment, real effective exchange rate, current account to GDP ratio, government debt to GDP ratio, and standard deviation of unemployment rate.

• During the crisis period, variables which are informative about the profitability of financial instruments and the health of the financial system have different impacts on the asset allocation decisions of low- and high- concentration type countries. This set of variables includes short- and long-term interest rates, stock index and stock index growth, standard deviation of long-term interest rate, standard deviation of stock index and stock index growth.

Policy Implications and Possible Extensions

The portfolio investments deserve high attention of policy makers since they were found to be more volatile and are more prone to capital outflow. This volatility may be reinforced during financial instability or economic slowdowns, and the outflows of the international portfolio investments may amplify such economic troubles. While the investment of one small EU country may be considered as negligible or not so influential, when aggregated over all the EU members' portfolio investments it can be quite substantial (Guiso et al., 2004). Our analysis provides evidence that the EU members shares of the total portfolio investments co-move together to a high degree. This actually implies that the recipient countries may consider the portfolio investments coming from different EU countries as originated from a single investor. This, in turn, should suggest to the policy makers of the recipient countries that the portfolio capital outflows by the EU members will show a high degree of correlation.

At the same time, we should stress the importance for policymakers of understanding what types of EU investors a country attracts. Because the international portfolio inflows may move in different directions, depending on the different types of country-investors, we may expect that those destination countries that have both types of investors (high-

and low-concentration) may benefit from these differences. On the other hand, we may expect that destination countries with only one type of investors may suffer from a severe capital outflow.

Consider a scenario in which a country has a high proportion of low-concentration type country-investors. If a crisis or shock hits the economy and the main macroeconomic variables exhibit higher than average volatility, it may trigger the withdrawal of capital by low-concentration countries. This, in turn, may create an additional severe impact on the macro variables and lead to a spiral of capital flight. On the other hand, the high-concentration type tends to be more tolerant of the risk factors, which is why if the country has both types of investors, the severe effect initiated by one type may be offset by the different behavior in the response to macro variable changes of the other type.

These arguments suggest that one of possible extensions could be to test whether there is an asymmetry in financial stability during the crisis between those countries that had only high-concentration type investors versus those who had only low- concentration type investors, and those who had both types. The second possible extension is to analyze which type of country-investors introduces more volatility to the market and accelerates financial contagion.

3.6 Conclusion

This chapter provides evidence that the EU members' shares of the total portfolio investments have a high correlation in the co-movements due to common factors. There was some divergence in the co-movements during the financial crisis, which might have resulted from higher segregation in the aftermath of the crisis.

At the same time, this chapter argues that there is some diversity in the investment behavior of the EU members. In particular, we show that the investment type matters in the EU members' international portfolio investments. We find evidence that the international portfolio investments of high-concentration countries (which invest heavily in a particular subset of countries) and low-concentration countries (which invest in a broader set of countries) respond differently to changes in macro variables. This fact can be driven by differences in the investment strategies adopted. For example, high-concentration investment type countries may look for more profitable opportunities and are more inclined to tolerate risk in anticipation of earning higher returns. Low-concentration investment type countries, on the other hand, may look for diversification in the first place. Since the

strategies and motives are different across the investment types, one could expect different responses to changes in the macroeconomic environment.

There is also evidence that the differences in responses depend on the share of invested assets in the country of destination. We explain this finding by the fact that the share will play a different role in the portfolio of different types of country-investors. For example, the countries with a high share of invested assets are strategically important for the high-concentration investment type because they represent the core of their portfolio. In contrast, for the low-concentration type countries, the potential risk coming from the countries with a high share of invested assets may be offset by diversified investments.

Finally, the differences in responses to changes in macroeconomic variables are especially important during a crisis period: the two types of countries differ in both pre-crisis and crisis periods, but the set of variables in which they differ varies for both of these periods.

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3.A Variables Construction and Data Sources

Table 3.4: The variables construction and sata sources

Variable	Description	Source
Dependent variable - portfolio investment position	Log of of total portfolio investment assets, or equity securities, or debt securities to GDP ratio in year$t$	CPIS
Short-term interest rate	Mean of quarterly short-term interest rate in year t, percent per annum	GDS
Long-term interest rate	Mean of quarterly long-term interest rate in year t, percent per annum	GDS
Stock index	Mean of quarterly benchmark stock index in year$t$	GDS
Growth of stock index	Log of the ratio of mean of quarterly stock index in year t to mean of quarterly stock index in year $t-1$	GDS
Unemployment rate	Mean of quarterly unemployment rate in year t, percent	GDS
CPI growth	Mean of logarithm of the ratio of seasonally adjusted consumer price index in the quarter to the consumer price index in the previous quarter	IMF
Real effective exchange rate	Mean of quarterly real effective exchange rate in year t	IMF
GDP growth	Log of real GDP in year t to real GDP in year $t-1$	WEO
Current account of GDP ratio	Current account balance to GDP ratio in current prices in year t	WEO
Government debt to GDP ratio	Ratio of government debt to GDP in current prices in year t	WEO
SD of short-term interest rate	Standard deviation over the year of quarterly short-term interest rate in year t	GDS
SD of long-term interest rate	Standard deviation over the year of quarterly long-term interest rate in year t	GDS
SD of stock index	Standard deviation over the year of quarterly benchmark stock index in year t	GDS
SD of stock index growth	Standard deviation over the year of quarterly benchmark stock index growth in year t	GDS
SD of unemployment rate	Standard deviation over the year of quarterly unemployment rate in year t	GDS
SD of CPI growth	Standard deviation over the year of CPI growth in year t	IMF

CPIS - Coordinated Portfolio Investment Survey
WEO - World Economic Outlook
GDS - Global Data Source

3.B Investment Types across Countries

Table 3.5: Investment types across countries

Countries that always stays high-concentration type	**Countries that always stays low-concentration**
Cyprus Hungary Ireland Malta Portugal Romania Spain	Denmark Finland France Germany Lithuania Luxembourg Netherlands Slovenia
Countries that are high concentration type before the crisis and low concentration type during the crisis	**Countries that are low concentration type before the crisis and high concentration type during the crisis**
Belgium Bulgaria Sweden	None

Countries that change their type both during pre-crisis and crisis period

Austria	low type	years: 2004, 2005, 2007, 2008, 2009, and 2010
	high type	years: 2003
Czech Republic	low type	years: 2003, 2004, 2005, and 2006
	high type	years: 2001, 2002
Greece	low type	years: 2001, 2002, and 2003
	high type	years: 2004-2010
Italy	low type	years: 2001, 2009, and 2010
	high type	years: 2002, 2004, 2006, and 2007
Latvia	low type	years: 2010
	high type	years: 2006-2008
Poland	low type	years: 2006
	high type	years: 2001, 2004, 2005, 2007, 2009, and 2010
Slovak Republic	low type	years: 2007
	high type	years: 2001-2004, 2008-2010
United Kingdom	low type	years: 2001-2003
	high type	years: 2005-2010

3.C Correlation Matrix

Table 3.6: Correlation matrix

Variables	total assets to GDP	equity sec. to GDP	debt sec. to GDP	short-term int. rate	long-term int. rate	stock index	growth of stock index	unempl. rate	CPI growth	real effec. ex.. rate
total assets to GDP	1.00									
equity securities to GDP	0.85***	1.00								
debt securities to GDP	0.93***	0.66***	1.00							
short-term int. rate	-0.11**	-0.08***	-0.11***	1.00						
long-term int. rate	0.03*	-0.01	0.05***	0.71***	1.00					
stock index	-0.08***	-0.05***	-0.09***	0.28***	0.18***	1.00				
growth of stock index	-0.01	0.02**	-0.03***	0.05***	-0.07***	0.02**	1.00			
unemployment rate	-0.05***	-0.04***	-0.05***	0.17***	0.51***	0.13***	0.11**	1.00		
CPI growth	-0.07***	-0.06***	-0.08***	0.045***	0.21***	0.15***	0.34***	0.09***	1.00	
real effec. exch. rate	-0.08***	-0.04***	-0.09***	0.00	-0.18***	0.22***	-0.10***	-0.01	0.02***	1.00
GDP growth	-0.07**	-0.02**	-0.06***	-0.02**	0.01	0.04***	0.06***	0.06***	0.19***	-.04***
current account to GDP	-0.05***	-0.00	-0.09**	-0.07***	-0.38***	-0.10***	0.08***	-0.16***	0.01	-0.04***
government debt to GDP	0.03***	0.05***	0.03***	0.43***	-0.02*	0.44***	0.05***	0.18***	0.11***	-0.02**
SD of short-term int. rate	-0.07***	-0.05***	-0.07***	0.75***	0.46***	0.04***	0.06***	0.13***	0.25***	0.07***
SD of long-term int. rate	0.00	-0.00	0.00	0.16***	0.045***	0.02*	-0.12***	0.22***	0.04***	0.06***
SD of stock index growth	-0.06***	-0.07***	-0.05***	0.33***	0.13***	-0.01**	-0.33***	0.15***	0.02***	0.12***
SD of stock index	-0.08	-0.06***	-0.09***	0.31***	0.25***	0.73***	-0.01	0.15***	0.10***	0.18***
SD of unempl. rate	-0.03	-0.04***	-0.01*	0.22***	0.38***	0.09***	0.09***	0.22***	0.01	0.13***
SD of CPI growth	-0.06	-0.07***	-0.05***	0.48	0.05***	0.01*	0.04***	0.14**	0.25***	0.02***

*** p<0.01, ** p<0.05 * p<0.1

Table 3.6 (continued): Correlation matrix

Variables	GDP growth	current account to GDP	government debt to GDP	SD of short-term int. rate	SD of long-term int. rate	SD of stock index growth	SD of stock index	SD of unempl. rate	SD of CPI growth
GDP growth	1.00								
current account to GDP	0.04***	1.00							
government debt to GDP	-0.10***	-0.33***	1.00						
SD of short-term int. rate	-0.22***	0.02**	0.33	1.00					
SD of long-term int. rate	-0.09***	-0.15***	0.15***	0.22***	1.00				
SD of stock index growth	-0.26***	-0.10***	0.11***	0.39***	0.27***	1.00			
SD of stock index	-0.3***	-0.09***	0.44***	0.10***	0.21***	0.16***	1.00		
SD of unempl. rate	-0.26***	-0.11***	0.01	0.29***	0.27**	0.29***	0.11***	1.00	
SD of CPI growth	0.04***	-0.09***	0.26***	0.54***	0.19***	0.35***	0.07***	0.18***	1.00

*** p<0.01, ** p<0.05 * p<0.1

3.D Descriptive Statistics of the Variables

Table 3.7: The descriptive statistics of the variables

VARIABLES	observations	mean	standard deviation	minimum	maximum
total portfolio assets to GDP ratio	11518	91.23	1461.20	-17.05	57077.25
equity securities to GDP ratio	9952	50.77	701.43	-15.53	27500.21
debt securities to GDP ratio	10333	52.51	889.87	-20.87	30981.24
short-term interest rate	1121	4.81	5.69	0.05	78.40
long-term interest rate	7305	4.41	1.50	0.99	11.73
stock index	11019	7289.21	11157.06	80.45	67276.90
growth of stock index	10966	0.02	0.05	-0.17	0.38
unemployment rate	12121	8.36	7.00	1.05	60.60
CPI growth	12983	0.01	0.01	-0.05	-0.14
real effective exchange rate	12983	101.73	12.53	70.69	230.79
GDP growth	12983	0.03	0.04	-0.19	0.19
current account to GDP ratio	12983	0.01	0.07	-0.30	0.27
government debt to GDP ratio	9347	0.44	0.66	-1.74	3.79
SD of short-term interest rate	11170	0.63	1.31	0.00	21.08
SD of long-term interest rate	7305	0.30	0.21	0.06	2.16
SD of stock index growth	10993	0.06	0.03	0.02	0.19
SD of stock index	11019	801.47	1496.83	3.28	12106.44
SD of unemployment rate	12121	0.38	0.41	0.00	3.34
SD of CPI growth	12983	0.01	0.01	0.00	0.46

3.E Portfolio Investments Estimation Results

Table 3.8: Portfolio investments, 2001-2010

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	-0.91***	0.92***	0.92***	–	–	–
	(0.02)	(0.02)	(0.02)			
short-term interest rate	-0.08	-0.09	-0.03	0.05	0.05	-0.02
	(0.06)	(0.08)	(0.04)	(0.07)	(0.09)	(0.05)
long-term interest rate	0.12	0.11	0.06	-0.12	-0.09	-0.02
	(0.09)	(0.09)	(0.06)	(0.09)	(0.11)	(0.07)
stock index	-0.00*	0.00	-0.00***	0.00	-0.00	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	2.89	9.49***	1.72	-2.69	-0.14	-4.05*
	(2.21)	(3.24)	(2.11)	(2.31)	(3.37)	(2.12)
unemployment rate	-0.01	-0.02	-0.01	0.01	0.02	0.02
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
CPI	-22.37*	-38.08*	-7.98	36.06**	58.22***	10.39
	(12.04)	(19.82)	(10.93)	(14.01)	(21.48)	(12.56)
real effective exchange rate	-0.00	-0.00	-0.01	0.00	0.01**	-0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GDP growth	-3.79*	-0.19	-5.29***	3.43	-1.31	4.51***
	(1.88)	(1.92)	(1.88)	(2.20)	(2.37)	(1.945)
current account to GDP ratio	-0.39	-0.01	-0.54	0.78	0.06	0.79
	(0.62)	(0.77)	(0.68)	(0.77)	(0.88)	(0.95)
government debt to GDP ratio	-0.09	-0.07	-0.06	0.17	0.05	0.07
	(0.08)	(0.08)	(0.09)	(0.12)	(0.10)	(0.12)
SD of short-term interest rate	-0.15	0.00	-0.06	0.402	-0.01	0.17
	(0.21)	(0.28)	(0.22)	(0.27)	(0.34)	(0.27)
SD of long-term interest rate	-0.13	0.01	-0.44*	0.11	0.07	0.49***
	(0.23)	(0.29)	(0.26)	(0.28)	(0.35)	(0.31)
SD of stock index growth	1.27	1.42	1.36	0.76	-3.28	0.13
	(2.02)	(2.41)	(1.96)	(2.61)	(3.170)	(2.45)
SD of stock index	0.00	-0.00	0.00	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	-0.02	-0.07	0.09	0.08	0.22	-0.17
	(0.13)	(0.145)	(0.12)	(0.19)	(0.198)	(0.16)
SD of CPI growth	-5.23	82.91**	-36.82	-45.87	-84.46**	7.81
	(27.37)	(35.61)	(25.99)	(32.86)	(41.48)	(28.79)
N observations	3,078	2,774	2,885			
N of country-country id	537	511	518			
N instruments	521	521	521			
AR (1) p-value	0.00	0.00	0.000			
AR (2) p -value	0.75	0.73	0.62			
Hansen p-value	0.80	0.94	0.95			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.9: Portfolio investments, 2001-2010, share below or equal to 1%

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.88**	0.89**	0.895***			
	(0.02)	(0.02)	(0.02)	–	–	–
short-term interest rate	-0.09	-0.07	0.02	0.05	0.06	0.11
	(0.08)	(0.11)	(0.05)	(0.09)	(0.14)	(0.07)
long-term interest rate	0.18	0.11	0.04	-0.11	-0.12	0.15
	(0.11)	(0.15)	(0.08)	(0.13)	(0.18)	(0.10)
stock index	-0.00	0.00	-0.00***	0.00	-0.00	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	3.42	10.29**	4.83	0.82	6.41	-4.91
	(3.43)	(5.25)	(3.68)	(3.85)	(5.78)	(3.31)
unemployment rate	0.00	-0.01	0.00	-0.00	0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
CPI	-13.28	0.75	2.98	25.21	21.40	-5.91
	(18.50)	(26.74)	(19.30)	(18.64)	(29.43)	(19.69)
real effective exchange rate	-0.00	-0.00	-0.00	0.00	0.01	-0.00
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
GDP growth	-1.26	0.37	-1.23	1.83	2.37	-0.19
	(2.38)	(2.82)	(2.63)	(2.62)	(3.77)	(2.66)
current account to GDP ratio	0.47	1.10	1.38	0.15	-0.79	-1.24
	(0.84)	(1.13)	(1.02)	(1.04)	(1.28)	(1.37)
government debt to GDP ratio	-0.06	-0.05	0.03	0.00	-0.01	-0.19
	(0.09)	(0.12)	(0.104)	(0.11)	(0.14)	(0.14)
SD of short-term interest rate	0.02	-0.11	0.09	0.25	0.23	-0.01
	(0.29)	(0.35)	(0.35)	(0.34)	(0.43)	(0.43)
SD of long-term interest rate	-0.78**	-0.099	-1.22***	0.91*	0.19	1.55***
	(0.37)	(0.65)	(0.44)	(0.48)	(0.81)	(0.52)
SD of stock index growth	1.68	-0.04	1.91	3.36	0.28	1.23
	(3.13)	(4.02)	(3.82)	(4.12)	(5.67)	(4.72)
SD of stock index	0.00	-0.00*	0.00	-0.00	0.00	-0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	-0.14	-0.19	0.03	0.08	0.23	-0.17
	(0.15)	(0.17)	(0.17)	(0.19)	(0.25)	(0.22)
SD of CPI growth	30.88	108.00**	-0.87	-87.38**	-103.10**	-19.88
	(33.11)	(46.56)	(33.62)	(39.18)	(51.26)	(35.65)
N observations	1,447	1,213	1,276			
N of country-country id	323	287	301			
N instruments	478	473	475			
AR (1) p-value	0.00	0.00	0.00			
AR (2) p -value	0.99	0.15	0.69			
Hansen p-value	1.00	1.00	1.00			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.10: Portfolio investment, 2001-2010, share in the range of 1% and 7%

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.87***	0.91***	0.89***			
	(0.02)	(0.02)	(0.02)	–	–	–
short-term interest rate	0.02	0.06	0.03	-0.09*	-0.04	-0.15***
	(0.04)	(0.08)	(0.04)	(0.05)	(0.08)	(0.06)
long-term interest rate	0.01	0.04	-0.02	0.07	0.08	0.18**
	(0.06)	(0.08)	(0.07)	(0.07)	(0.09)	(0.09)
stock index	0.00	0.00	0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	3.44	16.31***	3.02	-3.88***	-9.50***	-4.27**
	(2.22)	(3.72)	(2.18)	(2.07)	(3.84)	(2.09)
unemployment rate	-0.01	-0.01	-0.01	-0.01	-0.04	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
CPI	-1.40	-38.19	16.64	6.89	64.57**	6.98
	(11.43)	(27.82)	(10.67)	(13.57)	(28.25)	(15.81)
real effective exchange rate	0.00	0.01	-0.01	0.01*	0.01*	0.00
	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)
GDP growth	8.43*	10.67***	0.99	-3.10	-9.41**	1.56
	(4.51)	(3.74)	(2.53)	(4.59)	(3.69)	(2.53)
current account to GDP ratio	1.62*	-0.46	0.74	-1.34	0.79	-2.22*
	(0.84)	(1.14)	(0.94)	(0.93)	(1.28)	(1.17)
government debt to GDP ratio	-0.19	-0.15	-0.44**	0.18	0.13	0.35
	(0.18)	(0.14)	(0.20)	(0.20)	(0.16)	(0.23)
SD of short-term interest rate	-0.08	0.13	0.08	0.20	-0.37	-0.12
	(0.19)	(0.36)	(0.21)	(0.27)	(0.41)	(0.24)
SD of long-term interest rate	0.21	0.25	0.15	-0.11	-0.08	-0.26
	(0.21)	(0.25)	(0.22)	(0.26)	(0.27)	(0.26)
SD of stock index growth	5.35**	4.70	7.13***	-3.77	-3.96	-4.54
	(2.33)	(3.24)	(2.59)	(3.03)	(3.60)	(3.02)
SD of stock index	0.00	0.00	0.00	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	0.85**	0.85*	0.22	-0.59	-0.52	-0.17
	(0.35)	(0.44)	(0.16)	(0.41)	(0.47)	(0.21)
SD of CPI growth	-9.44	48.69	-19.60	-0.51	-17.15	-17.02
	(32.29)	(41.82)	(34.85)	(34.35)	(53.96)	(38.85)
N observations	1,091	1,018	1,072			
N of country-country id	274	262	269			
N instruments	496	490	496			
AR (1) p-value	0.00	0.00	0.00			
AR (2) p -value	0.47	0.96	0.43			
Hansen p-value	1.00	1.00	1.00			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.11: Portfolio investments, 2001-2010, share equal to or above 7%

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.82***	0.91***	0.92***			
	(0.04)	(0.02)	(0.02)	–	–	–
short-term interest rate	-0.05	-0.03	-0.04	0.00	0.04	0.00
	(0.09)	(0.09)	(0.07)	(0.09)	(0.09)	(0.06)
long-term interest rate	0.48*	0.43*	0.17	-0.18	-0.48*	0.09
	(0.26)	(0.26)	(0.19)	(0.25)	(0.26)	(0.16)
stock index	0.00*	0.00*	0.00	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	11.35**	17.30***	-2.43	-10.58**	-18.03***	0.45
	(5.40)	(5.44)	(3.79)	(4.62)	(4.79)	(3.44)
unemployment rate	0.04	-0.01	0.05	-0.03	0.01	-0.04
	(0.04)	(0.03)	(0.04)	(0.04)	(0.03)	(0.04)
CPI	-15.82	-23.67	-32.35*	12.10	33.34	25.91
	(19.64)	(25.60)	(17.86)	(18.60)	(25.01)	(19.82)
real effective exchange rate	-0.02***	-0.03***	-0.01	0.02*	0.03***	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
GDP growth	0.44	15.64***	-4.73	-2.65	-18.20***	5.77
	(4.78)	(5.33)	(3.07)	(5.12)	(4.88)	(4.16)
current account to GDP ratio	-1.06	3.35	-0.49	0.39	-1.90	0.08
	(1.98)	(2.29)	(1.67)	(2.22)	(2.43)	(1.79)
government debt to GDP ratio	-0.73	-0.34	-0.06	0.23	0.63	-0.41
	(0.46)	(0.37)	(0.34)	(0.45)	(0.59)	(0.38)
SD of short-term interest rate	-0.43	-0.21	0.15	0.34	0.34	0.03
	(0.41)	(0.39)	(0.38)	(0.47)	(0.41)	(0.44)
SD of long-term interest rate	-0.59	-0.26	-0.48	-0.05	0.41	0.54
	(0.47)	(0.45)	(0.35)	(0.61)	(0.48)	(0.36)
SD of stock index growth	2.76	5.92	-3.76	-0.91	-10.11**	4.08
	(4.31)	(3.96)	(3.25)	(5.11)	(5.06)	(3.87)
SD of stock index	0.00	0.00	-0.00	-0.00	-0.00*	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	0.66	1.07***	0.07	-0.71	-1.03**	-0.05
	(0.46)	(0.40)	(0.19)	(0.48)	(0.43)	(0.22)
SD of CPI growth	-38.01	104.30	-77.68	-75.97	-87.56	1.74
	(56.11)	(68.72)	(57.37)	(66.54)	(69.97)	(66.91)
N observations	540	543	537			
N of country-country id	124	129	124			
N instruments	255	258	254			
AR (1) p-value	0.07	0.07	0.05			
AR (2) p -value	0.55	0.35	0.36			
Hansen p-value	1.00	1.00	1.00			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.12: Portfolio investments, 2001-2006

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.88***	0.89***	0.91***			
	(0.03)	(0.02)	(0.03)	–	–	–
short-term interest rate	0.11	0.05	0.03	-0.14*	-0.11	-0.03
	(0.07)	(0.09)	(0.05)	(0.08)	(0.11)	(0.07)
long-term interest rate	-0.04	-0.07	0.01	0.02	0.09	-0.01
	(0.09)	(0.11)	(0.08)	(0.09)	(0.13)	(0.09)
stock index	0.00	0.00	0.00	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	6.33**	15.95***	4.63	-5.13	-3.03	-5.69
	(3.21)	(3.94)	(3.04)	(3.75)	(4.96)	(3.71)
unemployment rate	-0.01	-0.04	-0.01	0.03	0.05	0.02
	(0.02)	(0.03)	(0.02)	(0.03)	(0.04)	(0.03)
CPI	-10.75	-24.30	15.38	51.26	67.86	-1.42
	(33.55)	(45.89)	(23.11)	(42.79)	(57.55)	(27.02)
real effective exchange rate	-0.01	-0.01	-0.00	0.01**	0.01	0.00
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
GDP growth	2.92	-0.07	0.86	-4.01	-2.63	-1.89
	(4.41)	(3.97)	(4.46)	(5.19)	(4.81)	(5.25)
current account to GDP ratio	2.49**	1.03	0.49	-2.06*	-0.86	-0.11
	(1.03)	(1.36)	(1.14)	(1.27)	(1.44)	(1.55)
government debt to GDP ratio	0.14	0.13	0.02	-0.06	-0.13	0.01
	(0.10)	(0.11)	(0.13)	(0.13)	(0.13)	(0.16)
SD of short-term interest rate	-0.89**	-0.57	-0.29	1.47***	0.79	0.45
	(0.45)	(0.53)	(0.37)	(0.55)	(0.66)	(0.44)
SD of long-term interest rate	1.07	0.74	-0.02	-0.74	-0.58	0.97
	(0.83)	(1.06)	(0.72)	(0.95)	(1.17)	(0.81)
SD of stock index growth	4.59	5.85	4.06	-3.63	-6.61	-1.47
	(3.33)	(4.34)	(2.79)	(3.66)	(5.50)	(3.17)
SD of stock index	-0.00	-0.00	-0.00	0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	-0.09	0.31	-0.04	-0.13	-0.36	-0.29
	(0.34)	(0.42)	(0.26)	(0.45)	(0.51)	(0.36)
SD of CPI growth	15.33	131.80*	-57.68	-100.70*	-152.50*	13.91
	(43.84)	(67.28)	(42.50)	(55.09)	(80.54)	(45.60)
N observations	1,547	1,384	1,448			
N of country-country id	495	457	467			
N instruments	322	320	322			
AR (1) p-value	0.00	0.00	0.00			
AR (2) p -value	0.44	0.24	0.10			
Hansen p-value	0.40	0.58	0.23			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.13: Portfolio investments, 2001-2006, share below or equal to 1%

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.87***	0.89***	0.89***			
	(0.03)	(0.02)	(0.03)	–	–	–
short-term interest rate	0.12	0.17	0.08	-0.21	-0.23	-0.14
	(0.11)	(0.16)	(0.09)	(0.14)	(0.19)	(0.14)
long-term interest rate	0.02	-0.10	0.06	0.09	0.13	0.07
	(0.12)	(0.18)	(0.11)	(0.15)	(0.23)	(0.16)
stock index	-0.00	-0.00	-0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	10.95*	20.06***	15.77**	-6.52	6.12	-14.20*
	(6.08)	(7.49)	(6.55)	(7.15)	(9.39)	(6.57)
unemployment rate	0.03	-0.02	0.03	-0.04	0.04	-0.02
	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)
CPI	7.20	79.69*	39.86	19.40	-60.25	-29.18
	(45.54)	(45.07)	(41.28)	(49.03)	(60.34)	(46.14)
real effective exchange rate	-0.01	-0.00	-0.00	0.01	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
GDP growth	1.77	-1.49	-0.56	-4.81	-3.17	-6.58
	(7.63)	(7.08)	(8.46)	(9.42)	(8.77)	(10.73)
current account to GDP ratio	4.23**	5.46**	2.50	-4.24*	-6.43**	-2.35
	(1.89)	(2.51)	(1.84)	(2.41)	(2.98)	(2.78)
government debt to GDP ratio	0.19*	0.23	0.11	-0.33*	-0.31	-0.26
	(0.12)	(0.17)	(0.14)	(0.18)	(0.25)	(0.22)
SD of short-term interest rate	-0.55	-0.60	-0.05	1.04*	1.18*	0.09
	(0.51)	(0.45)	(0.59)	(0.61)	(0.61)	(0.75)
SD of long-term interest rate	-1.17	0.11	-1.49	2.76*	0.48	3.71***
	(1.25)	(1.34)	(1.18)	(1.59)	(1.57)	(1.33)
SD of stock index growth	9.73	-3.26	7.83	-7.04	1.39	-3.17
	(6.68)	(9.29)	(5.66)	(8.58)	(12.26)	(7.91)
SD of stock index	-0.00	-0.00	-0.00	0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
SD of unemployment rate	-0.38	-0.03	-0.27	0.19	-0.27	-0.07
	(0.39)	(0.39)	(0.46)	(0.51)	(0.49)	(0.64)
SD of CPI growth	27.89	165.20**	-94.28	-111.50	-191.50**	49.98
	(60.96)	(82.73)	(63.69)	(76.63)	(97.54)	(73.19)
N observations	691	570	607			
N of country-country id	261	222	230			
N instruments	231	255	230			
AR (1) p-value	0.00	0.01	0.00			
AR (2) p -value	0.27	0.35	0.71			
Hansen p-value	0.97	1.00	0.98			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.14: Portfolio investments, 2001-2006, share in the range of 1% and 7%

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.878***	0.89***	0.91***			
	(0.02)	(0.02)	(0.02)	–	–	–
short-term interest rate	0.14	0.08	0.00	-0.10	-0.02	-0.07
	(0.09)	(0.15)	(0.07)	(0.10)	(0.15)	(0.08)
long-term interest rate	-0.15	-0.18	0.11	0.09	0.06	0.01
	(0.16)	(0.21)	(0.09)	(0.14)	(0.19)	(0.09)
stock index	0.00	0.00	-0.00	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	8.58**	30.60***	2.12	-1.07	-19.72**	1.76
	(4.17)	(6.89)	(3.56)	(4.69)	(8.97)	(4.12)
unemployment rate	-0.02	-0.04	-0.02	0.01	0.02	0.00
	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)
CPI	-25.01	-127.50*	-24.78	59.2**	176.40**	21.25
	(22.10)	(72.97)	(22.09)	(30.12)	(82.03)	(30.65)
real effective exchange rate	-0.01	-0.029*	-0.01	0.01**	0.012*	0.01*
	(0.01)	(0.02)	(0.01)	(0.00)	(0.01)	(0.00)
GDP growth	14.80***	6.67	10.19***	-5.71	-2.81	-7.43
	(5.72)	(5.17)	(4.41)	(5.04)	(6.19)	(4.94)
current account to GDP ratio	1.77	-1.95	1.77	-0.72	3.79*	-3.44**
	(1.27)	(1.99)	(1.32)	(1.40)	(2.15)	(1.69)
government debt to GDP ratio	0.17	-0.09	0.12	-0.15	0.14	-0.26
	(0.21)	(0.21)	(0.20)	(0.23)	(0.25)	(0.23)
SD of short-term interest rate	-0.49	0.262	0.20	1.01**	-0.04	-0.36
	(0.34)	(0.81)	(0.34)	(0.49)	(0.98)	(0.47)
SD of long-term interest rate	1.31	3.54*	-0.27	-2.23	-3.80*	0.17
	(1.78)	(2.14)	(0.86)	(2.06)	(2.31)	(0.98)
SD of stock index growth	1.07	5.64	-0.65	0.13	-2.11	3.45
	(3.97)	(5.84)	(3.65)	(4.37)	(6.12)	(4.43)
SD of stock index	-0.00	0.00	0.00*	0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	1.62***	1.58***	0.25	-1.39**	-1.57**	-0.21
	(0.46)	(0.62)	(0.44)	(0.55)	(0.66)	(0.50)
SD of CPI growth	90.39	49.33	1.67	25.26	91.74	-31.27
	(56.83)	(73.23)	(53.69)	(40.96)	(74.70)	(32.37)
N observations	567	522	555			
N of country-country id	230	217	225			
N instruments	246	240	246			
AR (1) p-value	0.03	0.00	0.00			
AR (2) p -value	0.55	0.97	0.30			
Hansen p-value	0.99	1.00	0.99			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.15: Portfolio investments, 2001-2006, share equal to or above 7%

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.85***	0.90***	0.90***			
	(0.03)	(0.03)	(0.02)	–	–	–
short-term interest rate	-0.01	-0.26	0.16	-0.04	0.06	-0.09
	(0.19)	(0.21)	(0.14)	(0.11)	(0.14)	(0.09)
long-term interest rate	0.34	0.64	-0.19	-0.14	0.04	0.09
	(0.42)	(0.44)	(0.26)	(0.28)	(0.28)	(0.20)
stock index	0.00	-0.00	0.00	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	15.72**	20.92**	-6.30	-13.83*	-6.93	-0.69
	(7.31)	(8.97)	(4.76)	(7.40)	(8.77)	(4.74)
unemployment rate	-0.00	-0.05	0.00	-0.03	-0.02	0.02
	(0.05)	(0.04)	(0.02)	(0.06)	(0.06)	(0.03)
CPI	5.76	25.12	-86.54**	-5.58	13.64	75.97*
	(76.88)	(55.39)	(37.00)	(82.79)	(63.11)	(40.60)
real effective exchange rate	-0.02	-0.04**	-0.00	0.02	-0.00	-0.00
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.09)
GDP growth	13.10	7.68	4.77	-16.74	-14.84	-5.28
	(11.06)	(10.52)	(5.54)	(13.50)	(12.98)	(7.21)
current account to GDP ratio	-0.28	1.04	1.20	-0.59	3.09	-2.99
	(2.22)	(3.11)	(2.14)	(2.36)	(3.35)	(1.91)
government debt to GDP ratio	-0.38	-0.57	0.34	0.88	2.27*	-0.83
	(0.33)	(0.51)	(0.41)	(0.80)	(1.18)	(0.51)
SD of short-term interest rate	-1.61***	-0.60	-0.91*	1.47*	0.82	0.88
	(0.61)	(0.68)	(0.53)	(0.78)	(0.83)	(0.67)
SD of long-term interest rate	-0.09	0.84	-0.78	-0.91	0.94	0.29
	(1.28)	(1.57)	(0.96)	(0.98)	(1.58)	(0.83)
SD of stock index growth	5.44	5.75	-1.63	1.08	-6.49	6.63
	(7.18)	(5.94)	(4.23)	(9.38)	(8.82)	(6.56)
SD of stock index	0.00	0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	1.55***	2.08***	-0.27	-1.77**	-2.09***	0.26
	(0.52)	(0.50)	(0.55)	(0.72)	(0.66)	(0.65)
SD of CPI growth	-9.27	-81.26	14.70	-149.10	-72.06	-47.96
	(110.40)	(93.24)	(97.25)	(124.90)	(104.40)	(105.70)
N observations	289	292	286			
N of country-country id	108	113	107			
N instruments	126	129	126			
AR (1) p-value	0.04	0.03	0.02			
AR (2) p -value	0.65	0.62	0.11			
Hansen p-value	0.99	0.99	1.00			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.16: Portfolio investments, 2007-2010

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.91***	0.94***	0.91***			
	(0.02)	(0.02)	(0.02)	–	–	–
short-term interest rate	-0.15*	-0.19	-0.05	0.19	0.24	0.06
	(0.09)	(0.12)	(0.05)	(0.12)	(0.16)	(0.07)
long-term interest rate	0.25*	0.27	0.14	-0.31	-0.39	-0.15
	(0.15)	(0.19)	(0.11)	(0.20)	(0.26)	(0.14)
stock index	-0.00**	-0.00	-0.00**	0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	-1.00	6.64	-1.19	0.91	4.68	-1.79
	(3.44)	(5.19)	(3.17)	(3.76)	(5.75)	(3.47)
unemployment rate	-0.02	-0.02	-0.01	0.02	0.02	0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
CPI	-32.22***	-47.03**	-31.18**	36.14**	51.77**	21.74
	(12.37)	(20.26)	(15.49)	(15.57)	(23.40)	(19.78)
real effective exchange rate	-0.01*	-0.00	-0.01*	0.00	0.01*	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GDP growth	-0.84	4.01*	-4.40*	2.36	-3.87	6.33**
	(2.29)	(2.41)	(2.32)	(2.56)	(2.72)	(2.48)
current account to GDP ratio	-0.96	-0.68	-0.09	1.55	0.76	0.43
	(0.83)	(1.14)	(0.90)	(1.09)	(1.42)	(1.26)
government debt to GDP ratio	-0.11	0.19	-0.02	0.23	0.25	0.05
	(0.10)	(0.14)	(0.11)	(0.15)	(0.17)	(0.15)
SD of short-term interest rate	0.35	0.35	0.15	-0.17	-0.42	0.07
	(0.23)	(0.35)	(0.29)	(0.28)	(0.44)	(0.36)
SD of long-term interest rate	-0.57*	-0.39	-0.63**	0.41	0.63	0.52
	(0.29)	(0.39)	(0.29)	(0.39)	(0.52)	(0.34)
SD of stock index growth	-1.57	-0.37	-1.14	4.57	-1.19	2.90
	(3.05)	(3.56)	(3.12)	(3.73)	(4.58)	(4.09)
SD of stock index	0.00	-0.00	0.00	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	0.08	-0.08	-0.01	0.06	0.29	0.20
	(0.13)	(0.14)	(0.16)	(0.17)	(0.19)	(0.20)
SD of CPI growth	-7.37	54.66	6.56	4.38	-25.56	17.08
	(30.46)	(49.62)	(33.54)	(38.79)	(60.85)	(43.77)
N observations	1,531	1,390	1,437			
N of country-country id	491	464	470			
N instruments	365	362	268			
AR (1) p-value	0.00	0.00	0.00			
AR (2) p -value	0.38	0.45	0.54			
Hansen p-value	0.23	0.59	0.32			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.17: Portfolio investments, 2007-2010, share below or equal to 1%

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.87***	0.89***	0.88***			
	(0.03)	(0.03)	(0.02)	–	–	–
short-term interest rate	-0.19*	-0.22	-0.02	0.24*	0.27	-0.02
	(0.11)	(0.15)	(0.08)	(0.13)	(0.19)	(0.089)
long-term interest rate	0.37**	0.34	0.13	-0.37	-0.41	0.01
	(0.18)	(0.28)	(0.14)	(0.23)	(0.30)	(0.16)
stock index	-0.00	0.00	-0.00***	0.00	-0.00	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	-3.91	6.20	-0.98	8.98*	12.29*	-0.40
	(4.74)	(7.47)	(4.41)	(5.30)	(7.45)	(4.65)
unemployment rate	-0.02	-0.02	-0.01	0.02	0.01	-0.02
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
CPI	-24.66	-33.61	-7.43	12.84	40.25	-12.90
	(19.22)	(27.31)	(22.17)	(24.24)	(29.54)	(28.09)
real effective exchange rate	-0.01*	-0.01	-0.00	0.01	0.01	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
GDP growth	-0.69	4.26	-0.90	4.23	0.43	3.05
	(2.65)	(2.95)	(3.12)	(2.93)	(3.74)	(3.32)
current account to GDP ratio	-0.15	0.07	1.61	0.76	0.40	-1.68
	(0.99)	(1.38)	(1.24)	(1.29)	(1.59)	(1.58)
government debt to GDP ratio	-0.02	-0.19	0.15	-0.07	0.12	-0.32*
	(0.09)	(0.14)	(0.12)	(0.13)	(0.16)	(0.17)
SD of short-term interest rate	0.49	0.25	0.35	-0.19	-0.35	-0.06
	(0.31)	(0.47)	(0.41)	(0.37)	(0.54)	(0.51)
SD of long-term interest rate	-1.09**	-0.75	-1.43***	0.82	0.69	1.31**
	(0.43)	(0.82)	(0.47)	(0.53)	(0.93)	(0.58)
SD of stock index growth	-3.56	-0.01	-4.12	11.27**	4.07	7.35
	(3.86)	(4.70)	(4.39)	(4.89)	(6.31)	(5.59)
SD of stock index	0.00	-0.00*	0.00	-0.00	0.00**	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	-0.03	0.02	-0.06	-0.06	0.05	0.18
	(0.18)	(0.15)	(0.20)	(0.20)	(0.195)	(0.26)
SD of CPI growth	92.13***	78.86	92.33**	92.33**	-59.82	-89.19*
	(35.58)	(60.78)	(42.90)	(42.90)	(72.01)	(53.98)
N observations	756	643	669			
N of country-country id	274	246	253			
N instruments	250	247	249			
AR (1) p-value	0.00	0.03	0.00			
AR (2) p -value	0.62	0.26	0.82			
Hansen p-value	0.95	0.96	0.98			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.18: Portfolio investments, 2007-2010, share in the range of 1% and 7%

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.86***	0.93***	0.88***			
	(0.03)	(0.02)	(0.03)	–	–	–
short-term interest rate	0.09*	-0.07	0.14**	-0.18**	-0.01	-0.29***
	(0.06)	(0.08)	(0.06)	(0.08)	(0.09)	(0.08)
long-term interest rate	-0.14	0.07	-0.23**	0.32***	0.06	0.51***
	(0.09)	(0.13)	(0.09)	(0.13)	(0.15)	(0.14)
stock index	0.00	-0.00	0.00	-0.00	0.00	-0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	2.14	11.69***	4.32*	-2.92	-1.14	-8.01***
	(2.49)	(4.32)	(2.53)	(2.51)	(4.07)	(2.88)
unemployment rate	-0.02	-0.04	0.03	0.00	-0.01	-0.04
	(0.02)	(0.03)	(0.02)	(0.03)	(0.04)	(0.03)
CPI	0.17	-34.57	-14.47	-21.42	46.64	-20.92
	(13.31)	(27.40)	(13.15)	(15.08)	(32.39)	(18.98)
real effective exchange rate	0.01	0.02***	-0.01	-0.00	-0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
GDP growth	1.91	3.55	-0.95	2.26	-1.30	4.01
	(5.82)	(3.34)	(3.16)	(5.99)	(3.66)	(2.95)
current account to GDP ratio	-0.42	-2.05*	0.02	0.86	1.74	-0.23
	(0.88)	(1.12)	(1.09)	(1.06)	(1.29)	(1.32)
government debt to GDP ratio	-0.36	-0.18	-0.73***	0.35	0.10	0.70**
	(0.23)	(0.22)	(0.25)	(0.25)	(0.24)	(0.28)
SD of short-term interest rate	0.23	0.17	0.38	-0.29	-0.59	-0.30
	(0.23)	(0.31)	(0.29)	(0.29)	(0.41)	(0.37)
SD of long-term interest rate	0.28	0.21	0.31	-0.44	-0.19	-0.71**
	(0.25)	(0.28)	(0.25)	(0.33)	(0.33)	(0.29)
SD of stock index growth	4.48	1.13	11.43***	-3.38	-1.28	-11.95**
	(2.93)	(4.88)	(3.98)	(3.78)	(6.00)	(4.79)
SD of stock index	0.00	0.00	-0.00	-0.00	-0.00	0.00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	0.33*	0.11	0.25	-0.17	0.24	-0.18
	(0.17)	(0.23)	(0.17)	(0.23)	(0.29)	(0.23)
SD of CPI growth	-27.83	6.90	-35.30	25.26	91.74	-31.27
	(42.10)	(50.13)	(39.12)	(40.96)	(74.70)	(52.37)
N observations	524	496	517			
N of country-country id	215	207	213			
N instruments	299	252	252			
AR (1) p-value	0.03	0.00	0.03			
AR (2) p -value	0.96	0.37	0.09			
Hansen p-value	1.00	1.00	0.99			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.19: Portfolio investments, 2007-2010, share equal to or above 7%

	high concentration			interaction term		
	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
portfolio investment	0.89***	0.96***	0.90***			
	(0.03)	(0.03)	(0.03)	–	–	–
short-term interest rate	-0.18*	0.15	-0.20*	0.16	-0.16	0.18
	(0.11)	(0.15)	(0.12)	(0.10)	(0.14)	(0.12)
long-term interest rate	0.34	-0.79	0.47	-0.16	-0.04	-0.24
	(0.28)	(0.36)	(0.33)	(0.27)	(0.37)	(0.34)
stock index	0.00*	0.00	0.00	-0.00*	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
growth of stock index	6.57	13.99	0.37	-8.53	-17.55*	-3.97
	(9.34)	(9.99)	(9.89)	(7.69)	(9.17)	(9.15)
unemployment rate	0.09	0.01	0.11	-0.09	0.00	-0.11
	(0.07)	(0.02)	(0.07)	(0.07)	(0.03)	(0.07)
CPI	-38.29	-22.09	-29.58	39.92	24.25	23.23
	(23.97)	(28.71)	(23.53)	(27.57)	(28.90)	(27.05)
real effective exchange rate	-0.01	-0.00	-0.01	0.01	0.02	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.014)	(0.01)
GDP growth	6.42	8.78	6.50	-2.91	-10.09*	-3.21
	(6.09)	(6.81)	(8.00)	(4.41)	(5.54)	(6.45)
current account to GDP ratio	-4.87	2.15	-4.24	4.23	-2.08	3.55
	(3.43)	(3.66)	(3.96)	(3.58)	(3.58)	(4.09)
government debt to GDP ratio	-2.03*	0.11	-1.87	1.56	-0.21	1.42
	(1.06)	(0.73)	(1.14)	(1.05)	(0.72)	(1.14)
SD of short-term interest rate	0.54	0.07	0.83	-0.29	-0.01	-0.43
	(0.53)	(0.63)	(0.58)	(0.49)	(0.66)	(0.52)
SD of long-term interest rate	-0.48	0.19	-0.72	0.44	-0.11	0.93
	(0.49)	(0.75)	(0.59)	(0.48)	(0.78)	(0.64)
SD of stock index growth	3.65	5.74	2.74	-4.93	-11.68	-5.73
	(6.94)	(9.03)	(7.89)	(8.08)	(9.27)	(9.01)
SD of stock index	0.00*	0.00	0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
SD of unemployment rate	-0.38	0.23	-0.29	0.37	-0.38	0.29
	(0.43)	(0.30)	(0.39)	(0.39)	(0.36)	(0.36)
SD of CPI growth	-18.94	234.60**	-74.26	-50.39	-124.10	-24.06
	(54.79)	(97.19)	(67.05)	(62.24)	(101.00)	(71.01)
N observations	251	251	251			
N of country-country id	97	97	97			
N instruments	133	133	133			
AR (1) p-value	0.11	0.11	0.08			
AR (2) p -value	0.36	0.83	0.54			
Hansen p-value	0.99	1.00	0.99			

Robust standard errors are in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.20: Interaction terms, 2001-2010

	full sample			share $\leqslant$ 1%			share $>$ 1% and $<$ 7%			share $\geqslant$ 7%		
	total	equity	debt	total	equity	debt	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
short-term interest rate							_*		_***			
long-term interest rate									+**		_*	
stock index			+*			+*						
growth of stock index			_*				_***	_***	_***	_**	_**	
unemployment rate												
CPI growth	+**	+***						_**				
real effective exchange rate		+**					+*	+**		+*	+***	
GDP growth			+**					_**			_***	
current account to GDP									_*			
government debt to GDP												
SD of short-term interest rate												
SD of long-term interest rate			+*	+*		+***						
SD of stock index growth											_**	
SD of stock index						_*					_*	
SD of unemployment rate											_**	
SD of CPI growth		_**		_**	_**							

*** p<0.01, ** p<0.05, * p<0.1

Table 3.21: Interaction terms, 2001-2006

	full sample			share $\leqslant 1\%$			share $> 1\%$ and $< 7\%$			share $\geqslant 7\%$		
	total	equity	debt	total	equity	debt	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
short-term interest rate	−*											
long-term interest rate												
stock index												
growth of stock index						−**		−**		−*		
unemployment rate												
CPI growth							+**	+**				+*
real effective exchange rate	+**						+**	+*	+*			
GDP growth												
current account to GDP	−*			−**	−**			+*	−*			
government debt to GDP											+*	
SD of short-term interest rate	+***						+**			+*		
SD of long-term interest rate				+*		+***		−*				
SD of stock index growth												
SD of stock index												
SD of unemployment rate							−**	−**	−**	−***		
SD of CPI growth	−*	−*			−**							

*** p<0.01, ** p<0.05, * p<0.1

Table 3.22: Interaction terms, 2007-2010

	full sample			share $\leqslant$ 1%			share $>$ 1% and $<$ 7%			share $\geqslant$ 7%		
	total	equity	debt	total	equity	debt	total	equity	debt	total	equity	debt
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
short-term interest rate				+*			–**		–***			
long-term interest rate							+**		+***			
stock index						+***			–***	–*		
growth of stock index				+*	+*				–***		–*	
unemployment rate												
CPI growth	+*	+**										
real effective exchange rate		+**										
GDP growth			+**								-*	
current account to GDP												
government debt to GDP						–*			+**			
SD of short-term interest rate												
SD of long-term interest rate						+**			–**			
SD of stock index growth				+**					–**			
SD of stock index					+*				+*			
SD of unemployment rate				–**		–**						
SD of CPI growth												

*** p<0.01, ** p<0.05, * p<0.1