CLOSING (SCIENTIFIC) REPORT

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The Interaction between Foreign Investors' Trading, Stock Market Returns and Macroeconomic Activity in European Emerging Markets

Dr. Numan Ülkü
(Principal Investigator)

Dr. Ebru Demirci
Enikó Gabor

Dr. Eva Porras
Peter Farkas

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SUMMARY

Despite the project period shortened from 22 months to 9 months, and deep problems in accessing the desired data, we have managed to finalize the project in full content as promised in the project proposal, obtaining all desired outcomes in a timely manner. In addition, we have completed and submitted 4 other papers which are byproduct of the project work. 3-4 papers, the output of the main project work, are to follow.

The riskiest phase of the project was data collection. We have managed to find exact data on net foreign trading from 6 stock exchanges: 2 of them were contaminated by non-regular market transactions (Romania and Russia), 1 was an earlier-period sample (Slovenia), 1 was unrepresentative for a special reason (Spain), 2 were clean (Turkey and Greece). For CEE markets Hungary, Poland, Czech Republic and Austria, we used data from the Balance of Payment statistics of the respective Central Banks after detailed discussions with Central Banks officials. For Croatia, we use ownership data from the Central Clearing and Custody Company. Thus, we have covered 11 European stock markets in Part I (The Interaction between Foreign Investors' Trading and Stock Market Returns), and we focused on 5 markets, where we had reliable data of sufficient sample size, in Part II (The Interaction between Net Foreign Equity Portfolio Flows and Macroeconomic Activity) combining foreign flows data with macroeconomic data. All these data are at the monthly frequency (with quarterly aggregation for GDP analysis), but in an extension of the project we also analyzed daily data from Turkey (the first and only daily data from a sizeable European stock market) and compared to Korea and Taiwan (Ülkü and Weber, 2010).

Using structural VAR methodology, we obtained the following findings which are new to the worldwide literature:

Part I: 1) Foreign investors do engage in positive feedback trading at the daily frequency, but in negative feedback trading at the monthly frequency. This finding is uniform across many countries and geographies. 2) Negative feedback trading at the monthly frequency exhibits an asymmetry (foreigners sell following rises, but not buy following falls) typically in economies with large external (or twin) deficits (Turkey, Hungary, Romania, Czech Republic, Spain; in contrast to Korea, Taiwan, Poland). 3) Negative feedback trading is absent in Euro-area markets (Austria, Greece; Spain an exception). 4) Foreign investors' trading appears to be positively correlated with information which implies that domestic investors' trading is negatively correlated with information. 5) Developing a new methodology, we reached results that pose strong doubt on the standard interpretation of price impact of foreign investors' trading. It is more likely that their trading follows rather than leads returns. It appears that what has been described in the extant literature as the contemporaneous price impact of foreign flows at the daily frequency may in fact be, to a large extent, foreigners responding to the same information which market prices already have adjusted (Ülkü and Weber, 2010).

Part II: 6) While macroeconomic data are quite noisy and results are not uniform, an overall conclusion is that both global stock market returns and net foreign flows (after controlling for the former) are positively associated with current and mostly future macroeconomic activity. 7) We interpret our evidence as net foreign flows mainly *forecast* rather than *cause* macroeconomic activity in European emerging markets. This mostly applies to EU members who have access to sources of financing from EU institutions. However, in Turkey where credit availability is a major bottleneck, we have found evidence that foreign flows may cause macroeconomic activity. In particular, domestic credit volume is significantly positively forecasted by net foreign flows. 8) Global stock market returns have a significant positive impact on domestic macroeconomic activity in European emerging markets, which has to be interpreted as *causing* (usually, the impact comes at lags but remains permanently). 9) We have obtained no convincing evidence to support the hypothesis that foreign investors spur a "reflexive" process in emerging economies. They may have such a role only in case of economies with capital shortage (Turkey), however their impact still appears to be more consistent with responding to available information than causing future information. This conclusion implies that the most effective way of avoiding the undesirable effect of sudden outflows while benefiting from inflows is to engineer a positive information set (i.e., a sound and proactive management of the domestic economy) rather than imposing capital flow restrictions.

I. IMPLEMENTATION OF THE WORK PLAN

I.A. Overview

The search for data on foreign investor flows was the most tedious and riskiest part of the project (being aware of the difficulties involved, we had realistically planned 7-8 months for the data collection process out of the 9 month total duration of the project).[1] Several initial attempts failed (details of the data search process are explained in Section I.B below), raising pessimism about availability of desired data. Taking into consideration the risk of ending up with no useful data, I followed a prudent strategy of developing alternative research ideas utilizing what we already had while simultaneously continuing the data search where success was not under my control.

At the end, this challenging situation led us to produce an extraordinary outcome: While we obtained useful data just in the last few months of the project duration that enabled us to conduct the project as promised in the proposal, the additional ideas I have developed in the meantime enabled us to complete four additional papers which can be considered as the by-product or extensions of the project. These four papers have been completed within an extraordinarily short time period and submitted to high-ranked international journals:

1) İkizlerli D. and N. Ülkü. (2010). "Political Risk and Foreigners' Trading: Evidence from an Emerging Stock Market." submitted to *Emerging Markets Finance and Trade* (SSCI, impact factor: 0.43). Revision requested.

2) Ülkü, N. (2010). "Big Players' Aggregated Trading and Market Returns in Istanbul Stock Exchange." submitted to *Applied Financial Economics* (ranked Nr. 44 worldwide)

3) Ülkü, N. and E. Weber (2010) "Bigger Fish in Small Pond: The Interaction between Foreigners' Trading and Emerging Stock Market Returns under the Microscope." submitted to *Journal of Financial and Quantitative Analysis* (a FT40 journal ranked Nr.4 worldwide, SSCI impact factor: 1.23)

4) Ülkü, N. and E. Demirci (2011) "Joint Dynamics of Foreign Exchange and Stock Markets in Emerging Europe" submitted to *Journal of International Money and Finance* (ranked Nr. 21 worldwide, SSCI impact factor: 0.93).

The main outcome of the project work is yet to follow in addition. We expect to produce 3-4 more major papers with high-ranked journal submissions out of the main project work. As the bulk of the project work has been completed during December 2010 and January 2011, bringing this work into journal submission quality will obviously take some more time; we will submit these papers during Spring 2011 months. In fact, this exactly conforms to the time schedule projected in the proposal. I hope to finalize all submissions within the first half of 2011. Thus, I am proud to report that while the main objectives of the project are completely fulfilled in line with the planned time schedule (although the project duration was shortened to 9 months from 22 months), we have produced and already submitted four additional important papers as listed above.[2]

[1] The duration was revised from 22 months in the original proposal to 9 months.

[2] Paper number (4) above is at the status of "incomplete submission" (i.e. we are doing final checks) as of the date I am writing this report. Most likely, it will have been submitted when the reviewers are reading this report.

I.B. The Data Search Process:

Before we started this project, we knew that only Istanbul, Bucharest and Madrid Stock Exchanges publish data on foreign flows at the monthly frequency in their websites. At the first step, I contacted the stock exchange administrations of many CEE markets, and tried to arrange an interview with the officials of the statistics departments of stock exchanges. I have personally visited Budapest, Warsaw, Zagreb and Bucharest Stock Exchanges, and corresponded via e-mail with Prague, Moscow (RTS) and Vienna Stock Exchanges. One of the team members, Dr. Eva Porras, provided us data from Madrid Stock Exchange. The outcome of the first step was quite disappointing. We have received only a short sample of data from Moscow (RTS Stock Exchange), which is not in adequate form as it does not sort out non-regular market transactions such as trading by strategic investors, IPO's, block transactions, etc. In interviews with Budapest and Warsaw Stock Exchange officials, I was informed that in these two markets as well as in Prague, which are the main focus of our study, the Stock Exchanges do not collect any data on foreigners' trading except for asking member brokers about an annual or semi-annual estimate of the trading volume performed on behalf of nonresident clients. During detailed personal interviews, they suggested (though with little hope) me to contact Financial Supervision Agencies and/or Clearing Corporations / Central Registries.

In the second step, I contacted Financial Supervision Agencies and/or Clearing Corporations / Central Registries. We have found the desired data only from the Croatian Central Depository Company in the form of the value of shares held by foreign, domestic individual and domestic institutional investor groups, and purchased these data.[3] Czech, Polish and Austrian authorities came up with disappointing replies. Within this step, I made a special effort on Hungary as the project was funded by OTKA, and personally contacted PSZAF and KELER, the financial supervision authority and the clearing corporation, respectively. While KELER has not responded in a meaningful way, PSZAF provided an official response stating that they neither compiled nor are allowed to share such data, referring us to MNB.

In the third step, we started to explore Central Bank data starting with MNB. A promising preliminary analysis with quarterly MNB Financial Account data and a series of detailed interviews with officials of MNB statistics department, in particular Mr. Lasslo Varga, has been the turning point in our desperate data search process. We learned that, within the monthly Balance of Payments (BoP) statistics, MNB compiles (but does not make publicly available) equity portfolio flows via bank's reports of international money transfers sorted by the objective of money transfer up to 2008, and using KELER data from 2008 on. A nice feature of these data is that it excludes *direct* investment flows, where a direct investor is defined to hold or trade 10% or more of the company stock. This was a big problem in Bucharest Stock Exchange data where direct investor flows were not sorted out. In a preliminary analysis using BoP data from Hungary, we obtained very similar results

[3] Part of these data are published in their website (www.skdd.hr), while part was compiled for us subject to a fee.

to those on Turkey. MNB provided us a long monthly series starting from 1995. This big achievement motivated us to make an extensive search for Central Bank data.

In the fourth step, we have performed an extensive scanning of all emerging European Central Bank data. At this stage, Dr. Ebru Demirci, a post-doc intern invited by CEU Business School joined the team, and provided invaluable contribution by making an extensive internet search during the last 2 months of the project duration. In this period, we have managed to prepare useful data from Polish, Czech, and Austrian Central Banks. She also scanned all European stock exchanges' websites and discovered adequate monthly data from Athens Stock Exchange, and an old-dated sample from Ljubljana Stock Exchange (Slovenia). Thus, we managed to access a sufficiently rich data set to reach the stated objectives of the project.

At the early stages of this search process, I discovered a good proxy for daily foreign flows data for Turkey, using foreign ownership percentages reported by Central Registry Agency of Turkey. This discovery is quite important as it enables the first and only study of foreigners' trading in a European emerging market at the daily frequency. The major papers of foreign investors' trading in the literature focus on Asian markets where daily data are available. However, emerging European stock markets differ in that foreign investors hold about 72% of market capitalization in Hungary, 70% in Turkey while the same ratio is only 31.60% in Taiwan, 32.65% in Korea, 36% in Indonesia, and 28% in Japan. That is, in Richards' (2005) words, the "big fish" is actually in emerging Europe. Hence, this effort brought us a unique opportunity to assess the generalizability of previous studies' results on Asian markets in contrast to a European emerging market with large external deficit, and led to a paper submitted to a top-ranked journal (Nr. 3 in the above list).

To provide a useful guide for researchers in the future, details of availability, source, nature, and inherent problems of foreign flows data in all European markets is described country-by-country in Section I.C below. Details on the nature of available data are important as those details may alter the empirical analysis, and reporting results without mentioning them would confound the accuracy of the study.

Section 1.C. Summary Report on the Outcome of the Data Search Process

Hungary: Budapest Stock Exchange (BSE) does not compile any data except for asking member brokers about the estimated trading volume performed on behalf of nonresident clients on a semi-annual basis. Monthly data from MNB (Magyar Nemzeti Bank) BoP statistics have been compiled from January 1995. The data have been collected from commercial banks' monthly reports of money transfers of nonresidents classified by the purpose of the transfer up to 2008, and from KELER (Hungarian Central Clearing and Custody Company) thereafter. The data exclude all direct investment flows (of those investors who hold or trade 10% or more of the company shares), however cannot exclude trading in shares not quoted in BSE, yet such flows are estimated to be minor. While exact trading dates could not be confirmed, we have not detected any problems. These data are not published, we acquired them upon application.

Turkey: Monthly data from Istanbul Stock Exchange (ISE) can be freely accessed at www.imkb.gov.tr . Detailed trading data in individual stocks are also available. Compiled from monthly compulsory reports of member brokers. The cleanest and most reliable data in our sample.

Daily data from CRAT are available from May 2004 at www.mkk.com.tr (the earlier part of the sample available from the website of the Clearing Custody bank, www.takasbank.com.tr.) The percentage of number of shares and market capitalization (i.e. two different series) held by nonresident investors are reported. After some data cleaning, we used the first difference of these series as a proxy for daily net foreign flows in Ülkü and Weber (2010) –we are the first and only users of this data set in the literature-. We externally verified the accuracy of our data by aggregating our proxy into monthly frequency and comparing to the original monthly flows data provided by ISE. The correlation between the two is +0.845, which suggests that our proxy is highly reliable.

Poland: Warsaw Stock Exchange (WSE) does not compile any data except for asking member brokers about the estimated (to be accurate, *guessed*) trading volume performed on behalf of nonresident clients on a semi-annual basis. They check the reported figures only for salient inconsistencies (i.e. sudden big changes). We use monthly data from NBP (Narodowy Bank Polski) BoP statistics. These data exclude direct investment flows, and include trading only in quoted shares. However, based on our conversation with WSE officials, we are unable to confirm the reliability of such data. For example, some non-regular market transactions such as IPO's may have been included in these figures. These data are available from www.nbp.pl.

Czech Republic: Prague Stock Exchange does not compile any information on foreigners' trading. Due to the unorganized structure of the stock market, any healthy statistics on foreigners' activities are very hard to find. We use monthly data from CNB BoP statistics. Unlike Poland and Hungary, CNB does not know the content of BoP net foreign flows data, takes the aggregated numbers as reported by the custodian, hence is unable to identify direct investment flows or to comment on outliers. IPO's, merger and acquisitions may distort the data. We had to remove 2 outlier observations. We are unable to confirm the reliability of the data. These data are available from www.cnb.cz .

Russia: RTS Stock Exchange keeps monthly statistics of foreigners' total purchases and sales for reporting to Russian Supervisory Agency. The data include non-regular market transactions (i.e. primary, third and fourth markets) thus we cannot confirm their reliability. We obtained these data by private correspondence.

Romania: Bucharest Stock Exchange publishes the data on its website. However, the data include non-regular market transactions (i.e. primary, third and fourth markets) thus we cannot confirm their reliability. In fact, there are big outliers in the data, and we spent months to enquire about them. We obtained the full story related to a few outlier observations using personal communications, which firmly dictated exclusion of the observation (for example, a foreign company forming a Romanian branch, a Romanian legal entity, and transferring its shares to this branch appears as a big net outflow number). We could not obtain official

information from the Bucharest Stock Exchange, and we tackled the problem by removing all suspicious outliers.[4] Data are available at www.bvb.ro.

Slovenia: Monthly data from Ljubljana Stock Exchange are available at www.ljse.si only for the period January 1999 – January 2005. Exchange officials did not respond to our repeated e-mails asking whether more recent data are available.

Croatia: Zagreb stock exchange does not compile any data on foreigners. However, the Croatian Central Clearing and Custody Company (SKDD) has been reporting the total value of shares held by non-residents in monthly bulletins since January 2009 (www.skdd.hr). The data from February 2006 can be purchased from SKDD. However, these data turned out to be not helpful, as ownership figures in terms of value of shares held may change for reasons other than trading, in particular due to relative price changes of individual stocks. Moreover, there are some jumps in the data, and SKDD declined to comment on them.

Greece: Monthly data from March 2004 are available from the website of Hellenic Exchanges group (www.helex.gr). One of the cleanest and most comprehensive data sets. Exchange officials kindly provided us the link to manually type earlier data from bulletins.

Austria: Vienna Stock Exchange does not compile any statistics except for foreigners' total trading volume. We use monthly data from Österreichische Nationalbank (ONB) BoP statistics. Monthly data start from January 2007. The summary figures reported on the website do not distinguish unquoted and mutual fund flows, we obtained the full breakdown upon application. The figures may also include IPOs, capital increases etc., it is not possible to isolate regular market trades.

Spain: We extracted monthly data on Madrid Stock Exchange (MSE) from January 2001 to December 2008 from monthly bulletins of MSE. We have also obtained data on individual stocks from Ministry of Commerce of Spain. The Spain data is accurate, but subject to a unique problem. Between 2001 and 2006, net outflows equal to 25% of market capitalization have been recorded. Our enquiries about this have not provided a definitive explanation, one hypothesis we were offered is that these outflows are due to liquidation by foreigners who were paid in shares of acquiring Spanish companies in international acquisitions of foreign firms by Spanish firms.

I.D. Extended Literature Review:

While performing this tedious data search, I have also extended the literature review in order to 1) make sure that this project is the first to study foreign investors in European emerging markets 2) search for any clues on

[4] Officials of the Bucharest Stock Exchange were not helpful, they have not responded to my repeated efforts (via e-mail, phone calls and personal visits). At the end, I found out that these data are compiled by combining several different segments of the market such as Regular Transactions (REGS), deals, public offerings (POF), unlisted (UNLS), etc. (Bucharest Stock Exchange has 9 such categories), and asked them to provide the REGS component in isolation. We are still waiting for this since December.

data availability 3) to design the details of our planned study of foreign flows – macroeconomic activity interaction, which was a new field for me. This extended literature review led me to discover the following papers, in addition to those I have already cited and reviewed in the project proposal.

i) Searching for any available study on foreign investors' trading in European emerging markets

My extensive scanning of the literature confirmed that there is no published work that studies foreigners' trading in European emerging stock markets using complete data compiled at the destination, as argued in the proposal. Several studies use pooled data on a large number of markets but from one source country (Bekaert et al., 2002, using monthly US *Treasury Capital International* data reporting only flows originating from the US) or from one custodian (Froot et al., 2001, using daily *State Street* data), and report only pooled results. Such incomplete data have been shown to be vulnerable to biases, for example Pavabutr and Yan (2007) have shown that the correlation between actual foreign flows data in Thailand and that derived from US Treasury's bulletin is merely +0.43.

However, I have discovered one working paper (Alemanni and Ornelas, 2007) that has a similar motivation of using data compiled at the destination and employs monthly data from 14 emerging markets across the world including European emerging markets. They obtain data for the 2000-2005 period from the following sources: for Bulgaria, Estonia, Hungary, Lithuania, Poland from the respective central banks; for Romania from the Stock Exchange. Their sample countries include Brazil, South Africa and Asian markets studied before. However, they only report pooled results, hence it is impossible to distinguish results on European emerging markets. Their main result is the finding of positive feedback trading by foreigners using local currency returns and negative feedback trading using USD returns. However, this finding is not plausible as it implies stock markets move in the opposite direction of the domestic currency; Ülkü and Demirci (2011) document that this is not the case. We tried to replicate their finding on Turkey and Hungary where we have most reliable data: The negative feedback trading with respect to local returns remains robust no matter whether local currency returns or foreign currency denominated returns are used, both in Turkey and in Hungary. The major problem in Alemanni and Ornelas (2007) is the lack of any explanation on how the data are compiled: the authors report that they compiled the data from a website search. In Section I.B and I.C above, we mentioned the inconsistencies among different countries' data sources. For example, in Romania foreign flows data are distorted by frequent lump-sum non-regular market transactions that are absolutely irrelevant to foreign equity trading (for example, in a month a net outflow figure 20 times bigger than average absolute value of net foreign flows resulted from a foreign company which was holding 40% of a Romanian publicly traded firm, starting a Romanian-resident subsidiary and transferring its shares to this local firm). It is well-known that regression results are highly sensitive to outliers, and in the particular case of Romanian data simply removing 4 outliers drastically change results. Therefore, we have spent 6 months to get compiled the only-regular-market-trading component of Romanian foreign flows data from the Bucharest Stock Exchange.

Similarly, Central Bank data compilation procedures are not uniform. For example, Hungarian and Polish Central Banks compile monthly equity flows under BoP excluding direct investors (those who have or trade shares more than 10% of the firm), while Czech National Bank is unable to identify the trader and to sort out direct investors. Further, due to the decentralized feature of Czech and Polish stock markets, the data from these countries may not be completely accurate. Some Central Bank's equity flow figures include mutual fund flows and a breakdown is not available on their websites. Such crucial issues cannot be clarified without having detailed discussions with Central Bank or Stock Exchange officials, and pooling data across countries may be severely misleading due to such differences.

On Hungary, which is of particular importance in this project, I have noticed one paper which studies foreign investors' trading behavior in Forint foreign exchange and Hungarian government bond markets. Using MNB data that are not available to public, Csavas and Varga (2006) distinguish two types of non-resident traders: those who originate from US and UK and others (non-Anglo-Saxon's). They find that Anglo-Saxon's exhibit positive feedback trading in Forint foreign exchange market during the January 2003 – June 2004 period when the Forint fluctuated within a wide band, and negative feedback trading between July 2004 – December 2005 when the Forint fluctuated within a relatively narrower range. Whereas non-Anglo-Saxons exhibited negative feedback trading during both subsamples. They also find that foreigners (as a whole group) exhibit positive feedback trading between January 2001 and May 2003, but their trading was unrelated to previous day's returns during the subsequent two years. These results based on much more detailed data are consistent with our conclusions that foreigners are sophisticated traders who trade on information rather than conditioning their trades naively on past returns.

ii) *A Literature Review on Stock Market – Real Economy Interaction*

Part II of this research project involves the first study in the literature of the interaction between foreign equity portfolio flows and domestic macroeconomic activity in emerging markets, hence there is no study to follow in terms of methodology or structure. However, there is a large literature on the interaction between stock prices and the real economy. As it was a new area for me as well, I started by reviewing this literature, which guides the design of the second part of this project.

A link between net foreign flows into the stock market and the domestic macroeconomic activity requires two connections: A positive connection between stock market returns and macroeconomic activity and a positive connection between foreign flows and stock market returns.[5] Hence, to explore the possibility of any interaction between foreign flows and macroeconomic activity in emerging markets, one has to first

[5] A direct connection between foreign flows and macroeconomic activity, absent a connection between stock returns and macroeconomic activity, would imply an extraordinary situation where stock markets are distracted from the reality and foreign investors can freely exploit their information without having a price impact. This could only be explained by extreme irrational behavior of domestic investors who dominate the local emerging stock market.

establish a connection between stock market returns and macroeconomic activity. There is a wide literature on the latter, and the conclusions of this literature are summarized below.

Fama (1990) finds that future growth rates of production, as a proxy for shocks to future cash flows, can explain about 43% of annual stock return variability in the US (value-weighted NYSE index returns). Schwert (1990) confirms the same result on a longer time-series and using alternative industrial production indices.

Canova and De Nicolo (1995) perform the first replication of studies on stock market – output growth association outside US, employing reduced form regressions as in Fama (1990) and Schwert (1990). Using quarterly real stock returns for the 1973-91 period from US, UK, Germany, France, Italy, they find future European (but not US) growth explains European returns. The strength of the association between stock returns and output growth depends on how future expected cash flows respond to the disturbances. International linkages emerge because foreign variables contain information about the future path of domestic variables. Employing Johansen cointegration tests, Nasseh and Strauss (2000) find a significant, long-run relationship between stock prices and domestic and international economic activity in six European economies. The economic activity variables they employ are industrial production, business surveys of manufacturing orders, short- and long-term interest rates. Variance decomposition methods support the strong explanatory power of macroeconomic variables in contributing to the forecast variance of stock prices. They conclude that stock prices are determined by macroeconomic activity. Cheung and Ng (1998) reach similar results employing the real oil price, real consumption, real money, and real output from Canada, Germany, Italy, Japan, and the U.S as economic activity variables. Employing a VAR model, Gjerde and Sættem (1999) find on Norway that stock market shows a delayed response to changes in domestic real activity.

As to results on European emerging markets, using data from the 1993-99 period, Hanousek and Filer (2000) find that stock markets in Hungary and Poland respond to macroeconomic variables with lags, while the Czech market does not. Patra and Poshakwale (2006) find on 1990-99 Greece data that short-run dynamic and long-run relationship exists between inflation, money supply, and stock prices, but do not find evidence of any short- or long-run relation between exchange rates and stock prices. They conclude that public information about macroeconomic variables can be used in predicting stock prices. Bilson et al. (2001) find a moderate explanatory power of local macroeconomic variables on emerging stock market returns. They also find little evidence of identical sensitivities collectively, but some at the regional level.

iii) Literature on The Effects of Foreign Capital Flows on The Domestic Economy

There is a literature that employs total foreign capital flows without breaking down the equity, bond, money market and FDI components, to focus on the effects of capital flows on domestic macroeconomic variables. Using data from Turkey and Mexico, Alper (2002) finds that capital flows (especially long-term) are strongly pro-cyclical (he estimates a supply-driven model of the domestic economy). Using monthly data from Turkey

for the 1992:01 – 2001:06 period and employing a recursive VAR model, Berument and Dinçer (2004) find that positive innovations in capital inflows appreciate the domestic currency, increase output and money supply, decrease interest rates and inflation in the short run.[6] The major shortcoming of these papers is failure to control for global effects.

Some papers aim at assessing the benefits of capital account liberalization, hence focus on long-term effects. Pooling 94 countries over the 1955-2004 period, Quinn and Toyoda (2008) find that capital account liberalization had a positive association with growth in both developed and emerging markets. Ferreira and Laux (2009) find that both inflows and outflows are predictive of GDP growth, but for less developed countries the effect of inflows is especially strong. Wang and Shen (1999) find that entry of foreign investors in Taiwan stock market lead to a positive influence on exchange rate volatility and a mild positive influence on stock market volatility. See Lane and Milesi-Ferretti (2007) for an excellent review of international investment positions of CEE economies.

II. EMPIRICAL ANALYSIS PART I: FOREIGN FLOWS – EMERGING STOCK MARKET RETURNS INTERACTION

II.A. Data

In Hungary, Czech Republic, Poland and Austria we use Balance of Payments – Financial Account – Equity Portfolio Flows - Liabilities data; in Greece, Spain, Russia, Romania and Slovenia we use Stock Exchange data; and in Croatia we use ownership data from Central Depository and Clearing Company. All the data used in this study are at the monthly frequency. Sample periods for each country, dictated by the data availability, and the currency in which foreign flows are reported are listed below.

Turkey: January 1997 – September 2010 (n=165) Source: Istanbul Stock Exchange.

Hungary: January 1999 – November 2010 (n = 143) in EUR Source: MNB BoP statistics

(we exclude the 1995-98 period as data from earlier periods were less reliable; though results are unchanged upon inclusion of the 1995-98 period)

Poland: January 2000 – November 2010 (n = 131) in Zl Source: NBP BoP statistics

[6] Cimenoglu and Yentürk (2005) discuss the long-term effects of capital flows. Capital inflows can trigger both private consumption and investment expenditures. Increased consumption demand results in an increase of relative prices of nontradable sectors with respect to tradable sectors, leading to a change in the composition of investment in favor of nontradable which does not contribute to FX earnings capacity and makes the economy more vulnerable to currency shock.

Czech Republic: January 2003 – November 2010 (n = 95) in CzKr. Source: CNB BoP statistics
(2 outliers removed)
Romania: January 2000 – December 2010 (n = 132) in USD. Source: Bucharest Stock Exchange
(4 outliers removed)
Russia: August 2005 – November 2010 (n = 64) in Ruble. Source: RTS Stock Exchange
Croatia: February 2006 – October 2010 (n = 56) Source: Croatian Central Depository and Clearing Company.
Slovenia: January 1999 – January 2005 (n = 73) Source: Ljubljana Stock Exchange
Greece: March 2004 – December 2010 (n = 82) in EUR source: Hellenic Exchanges Group
Austria: January 2007 – November 2010 (n = 47) in EUR Source: Österreichische Nationalbank BoP statistics
Spain: January 2001 – December 2008 (n = 96) in EUR Source: Madrid Stock Exchange

Net foreign flows are normalized by dividing by market capitalization (expressed in the same currency as net foreign flows) at the end of the respective month.

We represent local markets by the most-publicized index of the local market: ISE-100 in Turkey, BUX-12 in Hungary, WIG-20 in Poland, PSI in Czech Republic, RTSI in Russia, BET in Romania, Crobex-10 in Croatia, IBEX-35 in Spain, Athens General Index in Greece and SBI-20 in Slovenia. We represent global stock markets by the MSCI-Europe and MSCI Emerging Markets index. The use of a double index model is one of our innovations accomplished during this project, as we document MSCI Emerging Markets index returns to bear additional explanatory power on BUX and ISE index returns (Ülkü, 2010a) and on net foreign flows in Turkey (Ülkü and Weber, 2010). The reason for choosing MSCI Europe index instead of MSCI-World index or US indices is that using daily data, trading hour differences might blur the analysis, especially the contemporaneous and first lag interaction. As the monthly return correlation between MSCI World and MSCI Europe indices is 0.944, this choice does not distract us from picking worldwide market information. Moreover, ISE-100's correlation is stronger with MSCI-Europe index than with other global developed market proxies.[7] All stock index returns are the first differences of natural logs of index values. We express all stock market index returns in local currency terms, avoiding currency fluctuations clouding stock market returns. Local returns are adjusted for inflation whenever the currency has experienced annual inflation exceeding 10% during any part of the sample. thus, we used inflation adjusted local returns for Hungary, Poland, Czech Republic, Romania, Russia and Croatia, but not for Spain, Austria, Greece and Slovenia, nor for global stock market index returns.

One of the innovations of this project is to use time-zone adjusted MSCI Emerging Markets index we constructed using the original components of MSCI index. Use of MSCI Emerging Markets index requires special care at the daily frequency given that it covers a range of time zones across the world. In particular,

[7] Over the 1997-2010 sample period, the monthly return correlation of ISE-100 with the MSCI Europe index was 0.572, while it was 0.569 with the MSCI World index, 0.530 with the S&P500 index and 0.550 with the FTSE-100 index.

Latin American components, which have high correlations with European emerging markets, contain global (developed) market information that is not available at European closing time. Using the same-dated index values would thus cause US market information from later Latin American trading hours to appear like current emerging market information, thus lead to overstating the impact of emerging markets on European markets at the expense of next day MSCI Europe index's impact, and may even distort contemporaneous flow-return estimations. To avoid this problem, we created a time-zone-adjusted Emerging Markets index by using values from *t*-1 of Latin American components and same-dated values of all other (Asia, Europe, Middle East, Africa) components of the MSCI Emerging Markets index, such that its value only reflects globally available information as of European closing time. This critical issue has not been mentioned in earlier papers that experimented with the MSCI Emerging Markets index.

II.B. Methodology

We implemented the methodology in the same way as described in the proposal. Our analysis is based on VAR methodology, which portrays the dynamic relationship between flows and returns.[8] We augment the bivariate-VAR model with the developed and emerging global market returns that are affected only by their own lags. In other words, we define global returns as endogenous variables in the VAR system, however we restrict the coefficients of local variables in the equations for global returns to be zero. The advantage of utilizing this specification instead of a conventional VAR is that none of the lags of foreign flows in ISE and local returns affect the world returns, but contemporaneous values of them are affected by the instantaneous and lag values of world returns.

Specifically, the following SVAR specification is estimated:

$$A(L)\,y_t = \varepsilon_t \qquad (2.1)$$

where *A(L)* is an *n* x *n* matrix polynomial in the lag operator, $\boldsymbol{y}' = [E, EM, F, R]$, $\varepsilon(t)$ is the 4x1 vector of structural disturbances. *E, EM, R* are the log returns of the MSCI Europe index, MSCI Emerging Markets index (adjusted for time-zone differences at the daily frequency) and local stock market index, respectively, and *F* is normalized net foreign purchases. The matrices in (2.1) are specified as follows:

$$y(t) = \begin{bmatrix} E_t \\ EM_t \\ F_t \\ R_t \end{bmatrix} \quad A(L) = \begin{bmatrix} A_{11}(L) & 0 & 0 & 0 \\ A_{21}(L) & A_{22}(L) & 0 & 0 \\ A_{31}(L) & A_{32}(L) & A_{33}(L) & A_{34}(L) \\ A_{41}(L) & A_{42}(L) & A_{43}(L) & A_{44}(L) \end{bmatrix} \quad \varepsilon(t) = \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix} \qquad (2.2)$$

where the assumptions are that $\varepsilon(t)$ is uncorrelated with past $y(t-p)$ for $p>0$, and the coefficient matrix of L^0, A_0, is non-singular. The block exogeneity is represented by zero entries in *A(L)*, and implies that *E* and *EM*

[8] Hasbrouck (1991) was the first to suggest the interaction between returns and flows be modeled as a VAR system.

are exogenous to local variables *F* and *R* both contemporaneously and at lags.[9] This set of restrictions reflect a plausible hypothesis that conditions in developed markets as well as the general appetite towards emerging markets as a whole affect the domestic emerging stock markets, however domestic market variables are unlikely to affect world indices.[10] Omission of this plausible restriction might result in inaccurate impulse response coefficients and variance decompositions. Major papers employing VAR methodology in this line of literature (Griffin et al., 2004; Richards, 2005) employ similar restrictions only contemporaneously to enable identification of contemporaneous impulse response coefficients. In Ülkü and Weber (2010), we performed a sensitivity analysis by comparing the results with and without restrictions on lagged VAR coefficients. We have noted some small differences whereby the impact of flows on local returns at some lags operates via their relation to global market indices. In further analysis, we have documented that in particular returns of emerging European currencies like Turkish Lira, Hungarian Forint and Polish Zloty can predict major reversals in global stock markets (see Ülkü and Demirci, 2011). The key insight is that, without the restrictions on lag coefficients described above, impulse responses may incorporate a spurious transmission effect whereby a lead by local variables over global indices may appear like a direct causal relationship between two local variables, which might entail misleading inferences, in particular an overstatement of lagged price impact and the extent of positive feedback trading with respect to local returns.

All variables entering the VAR system are stationary and unit root test results are available upon request (not reported to save space). We chose a generous uniform lag order of 4.[11] Impulse response functions (IRF) are derived based on the structural factorization as defined in Equation (2), which implies *E* to be ordered first, followed by *EM*, and then the block of local variables. Note that by ordering *EM* after *E*, we are measuring the incremental contribution of global emerging markets index over and above the global developed market index. The system is estimated via Maximum Likelihood. For inference, we compute bootstrapped error bands for impulse responses using the percentile method (Hall, 1992).

A central issue in the literature has been the ordering between flows and returns in Cholesky factorization to enable contemporaneous identification. While the common treatment in the literature has been to place flows first, we show in Ülkü and Weber (2010) that the assumption underlying this choice is not justified for Turkey, not even at the daily frequency. However, as the daily data foreign flows data are not available for any European market other than Turkey, and the structural conditional correlation (SCC) methodology developed by Weber (2010) is not applicable to monthly data, we have no chance to enquire about the validity of this assumption in our pan-European sample. Although we believe that this assumption is

[9] Note that the above specification allows *E* to affect *EM*, but not vice versa.

[10] This hypothesis would hold true except for contagious emerging market crises like Mexico-94, Thailand-97 or Russia-98; and no such crises have taken place in Turkey during our sample period.

[11] By doing so, we avoid imposing doubtful restrictions at the expense of losing some degrees of freedom. This helps us uncover borderline significant individual responses at some lags.

not likely to be valid, here we leave this critical issue aside and follow the standard ordering assumption in the literature by restricting the contemporaneous response of *F* to *R* to zero.

All SVAR estimations have been performed on *JMulti* (www.jmulti.de) .

II.C. Results

We present results by studying IRFs. IRFs track the dynamic response of a variable to a shock in another variable until the effect of the shock dies down. Hence, they provide a tool to distinguish temporary and permanent effects, to simultaneously analyze contemporaneous[12] and lagged responses, and to quantify the cumulative effect. By portraying the trajectory of the lagged responses, they also enable measurement of economic significance of forecast ability. To enable an assessment of the relative played by each variable to explain the variation in other variables in the system, we present variance decomposition tables.

In IRF graphs to follow, we track the response to a one-standard deviation shock (the solid line in the middle). Thus, we focus on the effect of the surprise (unexpected) component of the variables in the system. Bootstrapped 90% confidence bands are also provided to help a visual inspection of the significance of the results (dashed red lines around the solid line). Throughout the text below, we will use the variable names in abbreviated form as defined above.

As precise data are available only from Turkey, we first present results on Turkey which will serve as a benchmark to compare other countries.

II.C.1. Turkey Results

The first (upper-left) IRF in Figure II.TR.1 suggests a strongly positive contemporaneous response of *F* (net foreign flows in ISE) to *E* (global developed market returns). The lagged responses are positive and borderline significant in some of the subsequent months. The response to *EM* (global emerging market returns) is similarly significantly positive, though with a smaller magnitude contemporaneously, but stronger at lags, even significant up to 4th month. Thus, global emerging market returns are an important determinant of foreign flows into ISE, significant even after controlling for global developed market returns. This is a new finding, suggesting that portfolio rebalancing following price changes in source markets may not be the only global driver of foreign flows into emerging markets. An additional factor, either portfolio rebalancing among emerging markets or an information factor correlated with emerging market returns, must exist.

In unreported results without controlling for *EM*, we find that the lagged responses of *F* to itself are significantly positive, implying strong persistence, which might be considered as an indication of herding as the alternative explanation, market-wide order splitting across months, is to be ruled out here. However, once sufficient lags of global emerging market returns are controlled for, its magnitude and significance visibly

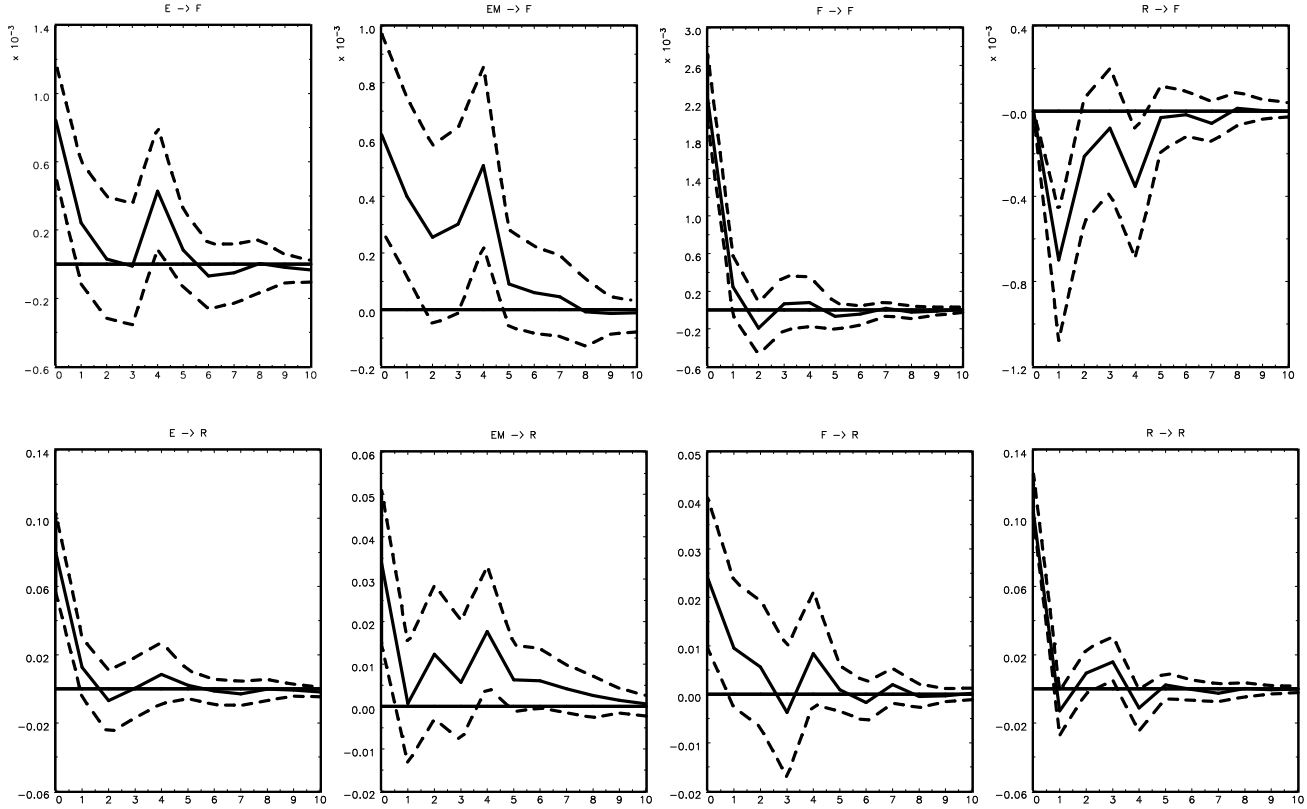
[12] Concerning contemporaneous effects, they reflect the factorization imposed.

diminish, as seen in Figure II.TR.1 below (third graph in the upper row). Thus, lagged global emerging market returns account for a large portion of persistence in net foreign flows.

A key finding, already documented by İkizlerli and Ülkü (2010) is the negative feedback trading with respect to local market returns at the monthly frequency. Here, we show that this finding is robust to controlling for global emerging market returns (the fourth graph in the upper row). The negative lagged response of net foreign flows to local returns at the monthly frequency would be consistent with portfolio rebalancing whereby international investors reduce their holdings gradually over time after a particular emerging market has outperformed to bring their portfolio weights back to previous levels. Note that although the lagged response of net foreign flows to global returns is significantly positive, the negative response to local returns rules out two alternatives: a naïve, mechanic positive feedback trading strategy and sentiment trading.

IRFs in the lower row suggest that ISE returns show some borderline-significant lagged response to global emerging market returns and net foreign flows, implying some forecastability. In particular, the cumulative lagged response of *R* to *EM* is noteworthy.

Figure II.TR.1: Monthly Impulse Reponses of *F* and *R*



The upper row shows impulse responses (IR) of net foreign flows (*F*) to a 1-standard deviation shock in MSCI-Europe index returns (*E*), MSCI Emerging Markets index returns (*EM*), itself, and ISE-100 index returns (*R*), respectively. The lower row shows impulse responses of ISE-100 returns (*R*) to a 1-standard deviation shock in MSCI-Europe index returns (*E*), MSCI Emerging Markets index returns (*EM*), net foreign flows (*F*) and itself, respectively. Each graph is described by a notation on its top where the letter before the arrow stands for the impulse (shock) variable and the letter after the

arrow represents the response variable. The solid line in the middle represents IR coefficients and the dashed lines around it represent bootstrapped 90% confidence band. X-axis shows the months. 0 is the contemporaneous month.

Forecast error variance decompositions based on the same specification are presented in Table II.TR.1 below to assess the relative role played by variables in our VAR system in explaining foreign flows and local returns. Global emerging market returns have a significant explanatory power in determining net foreign flows that operates with lags of several months. It is also noteworthy that a significant portion of the variance in *F* (unlike that in *R*) is accounted for by lagged variables in the system.

Table II.TR: Variance Decompositions for Turkey (Monthly Frequency)

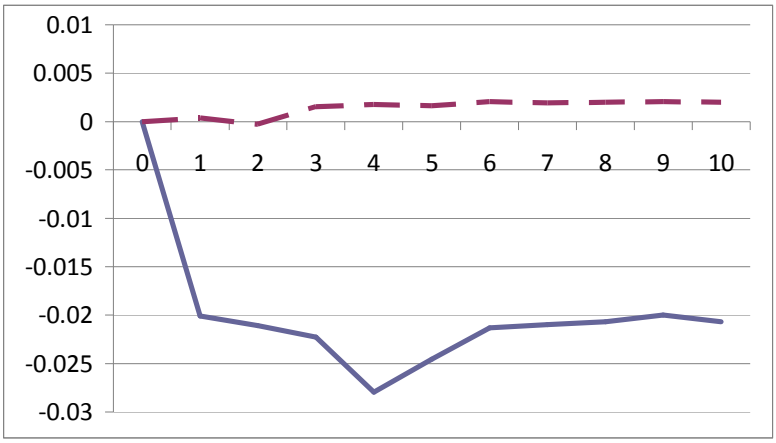
Proportions of forecast error in **F** accounted for by:					Proportions of forecast error in **R** accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**	forecast horizon	**E**	**EM**	**F**	**R**
1	0.12	0.06	0.82	0.00	1	0.35	0.07	0.03	0.55
2	0.11	0.08	0.74	0.07	2	0.34	0.07	0.04	0.55
3	0.11	0.08	0.74	0.07	3	0.34	0.07	0.04	0.55
4	0.11	0.09	0.73	0.07	4	0.34	0.08	0.04	0.55
5	0.13	0.12	0.68	0.08	5	0.33	0.09	0.04	0.54
6	0.13	0.12	0.68	0.08	6	0.33	0.09	0.04	0.53
7	0.13	0.12	0.68	0.08	7	0.33	0.10	0.04	0.53
8	0.13	0.12	0.68	0.08	8	0.33	0.10	0.04	0.53
9	0.13	0.12	0.68	0.08	9	0.33	0.10	0.04	0.53
10	0.13	0.12	0.68	0.08	10	0.33	0.10	0.04	0.53

Next, we provide additional break-downs using dummy variables to partition the data. Specifically, by employing dummy variables, we estimate different coefficients for a particular right-hand-side variable (including all lags) depending on its current sign. In Figure II.TR.2, we compare the cumulative impulse responses of net foreign flows to local return shocks when returns are negative or positive.[13] There is a pronounced asymmetry: negative feedback trading appears only following positive local returns. This rules out a mechanic portfolio rebalancing strategy and especially sentiment trading. In Figure II.TR.3, we compare the cumulative impulse responses to positive and negative net foreign flows. Panel A shows that net flows are more persistent at long lags following net inflows, whereas they are more volatile (persistent at lag 1, but reverse later) following net outflows. In unreported results, we also find that both net inflows, but in particular net outflows, exhibit contrarian market timing with respect to local returns. Panel B shows that ISE returns exhibit more lagged response to *F* when foreign capital flows out whereas the price impact in case of net inflows is mainly contemporaneous and partly reversed later. Together these results may be indicative of an ingenious timing strategy whereby foreigners build up long positions smoothly over time, and take advantage of bullish sentiment among domestic investors, after initially riding it, to exit the market well ahead of bad

[13] As the standard deviation in cases of positive and negative values of the variables might differ, in asymmetry checks we track impulse responses to a 1-unit rather than 1-standard deviation shock for better comparability.

times, successfully avoiding a contemporaneous price impact.[14] As we shall see below, daily results also support this interpretation.

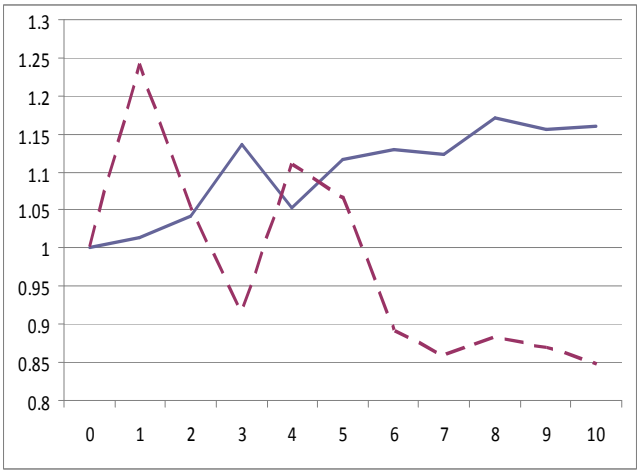
Figure II.TR.2: Asymmetry in Feedback Trading



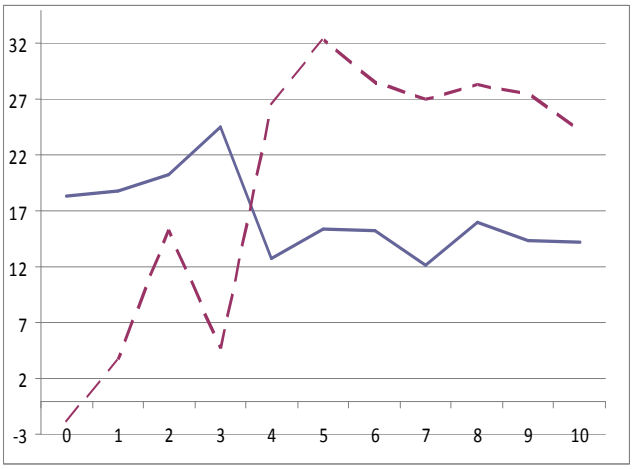
The solid-blue (dashed-red) line shows cumulative impulse responses of net flows to a 1% return shock when returns are positive (negative). 0 is the contemporaneous period.

Figure II.TR.3: Asymmetry with respect to Net Inflows versus Net Outflows

Panel A: Response of *F* to positive versus negative *F*



Panel B: Response of *R* to positive versus negative *F*



In Panel A, the solid-blue (dashed-red) line shows cumulative impulse responses of net flows to a unit net flow shock when it is inflow (outflow). In Panel B, the solid-blue (dashed-red) line shows cumulative impulse responses of local returns (in per cent) to a unit net flow shock when it is inflow (outflow). 1-unit net flow is 1 % of market capitalization. 0 is the contemporaneous period.

In unreported analysis, we compare our results by replicating the same specification on Korea and Taiwan. The negative feedback trading at the monthly frequency is common (i.e. net flows respond to local returns significantly negatively at the first and second month lags) in both Korea and Taiwan, as in Turkey.

[14] An alternative interpretation based on the relative easiness of implementing portfolio rebalancing following a rise in the local market (in the form of profit taking) would not be consistent with the lagged price impact of net outflows.

This suggests quite uniform behavior of foreign investors across geographies and qualifies results of some previous studies that report positive feedback trading at the monthly frequency.[15] However, the asymmetry (i.e., negative feedback trading following bullish but not bearish months) is most visible in Turkey, quite moderate in Taiwan and absent in Korea. This may be consistent with an argument that large external deficits might make foreign investors more alert at good times and hesitant to finance at bad times. This is an interesting hypothesis which shall be further investigated below to see whether it can be generalized.

II.C.2. Hungary Results

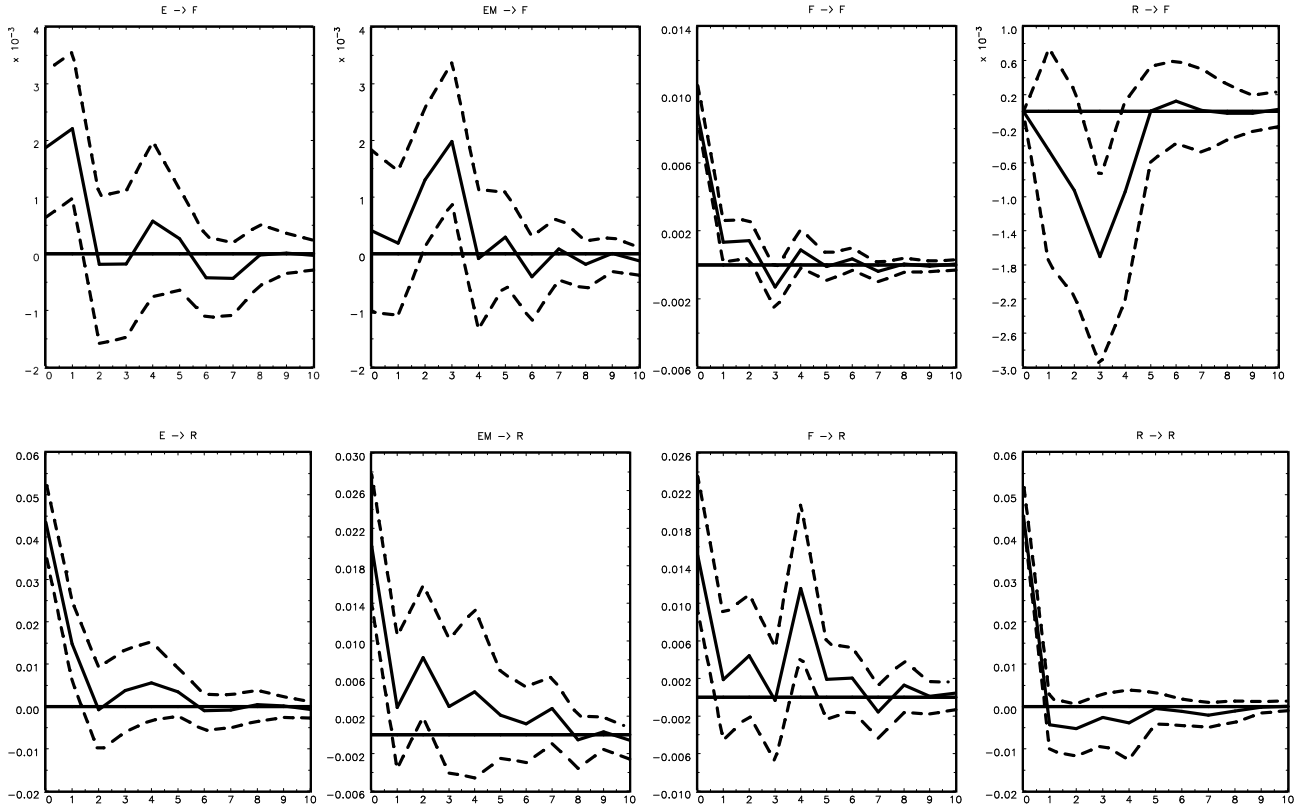
Figure II.HU.1 below portrays a basically similar picture to that of Turkey. Net foreign flows in Hungary display strong positive response to *E*, but one difference is that the lagged response in the next month following the shock is even stronger than the contemporaneous response. Another difference is that *F*'s contemporaneous response to *EM* is insignificant in Hungary, which may be a reflection of the effect of EU membership European benchmarks more relevant at the expense of global emerging market factors.[16] Yet, global emerging markets exert a cumulative lagged positive effect which is significant at the third and fourth lags. The persistence of net foreign flows (seen in the third graph of the upper row) is relatively small compared to that in Korea and Taiwan. Hence a smaller persistence in foreign *F* appears to emerge as a common characteristic of European emerging markets. The higher persistence in Asian markets can be traced to trading restrictions imposed on foreigners. One of the strongest results is seen in the forth graph of the upper row: The significant negative response of net foreign flows to local returns at the second and third lags implies negative feedback trading, a result which was equally strong in Turkey, as well as in Korea and Taiwan. Hence, negative feedback trading at the monthly frequency emerges as a common behavior of foreign investors in European markets as well. Looking at Table II.HU we see that while *E* accounts for the largest portion of the forecast error variance, one of the largest lagged effects comes from the negative feedback trading with respect to local returns.

The second row of Figure II.HU.1 shows that BUX returns (R) display a strong positive contemporaneous response to both *E* and *EM*. As we order *EM* after *E* contemporaneously, this means that global emerging market index returns bear significant incremental explanatory power on BUX returns. The response of *R* is completed faster than that of *F*, which may be an indication of the "following rather than leading" character of net foreign flows. *EM* appears to have some effect at longer lags as well, which we interpret as a reflection of long-lasting relative trends of emerging markets. The association between *F* and *R* is mainly contemporaneous (i.e. 5% out of 6% of forecast error variance in *R* accounted for by *F* comes in the contemporaneous period), which we allocate as *F*'s impact on *R* by assumption. So, we do not know whether

[15] Those earlier results may be due to failure to properly control for global developed and emerging market returns, and short samples covering post-liberalization periods with partial restrictions on foreigners' trading.
[16] Hungary constitutes around 0.4% of the MSCI Emerging Markets index (Turkey 1.7%).

this contemporaneous association is *F*'s impact on *R* or just reflects intraperiod positive feedback trading by foreigners. The significant positive response of *R* to F at the fourth-month lag is economically not very significant (can account for about only 1% of the forecast error variance in *R*). The last graph in the lower row shows a small degree of negative autocorrelation in BUX returns.

Figure II.HU.1: Impulse Reponses of *F* and *R*



The upper row shows IRs of net foreign flows (*F*) to a 1-standard deviation shock in MSCI-Europe index returns (*E*), MSCI Emerging Markets index returns (*EM*), itself, and BUX index returns (*R*), respectively. The lower row shows impulse responses of BUX returns (*R*) to a 1-standard deviation shock in MSCI-Europe index returns (*E*), MSCI Emerging Markets index returns (*EM*), net foreign flows (*F*) and itself, respectively. Each graph is described by a notation on its top where the letter before the arrow stands for the impulse (shock) variable and the letter after the arrow represents the response variable. The solid line in the middle represents IR coefficients and the dashed lines around it represent bootstrapped 90% confidence band. X-axis shows the months. 0 is the contemporaneous month.

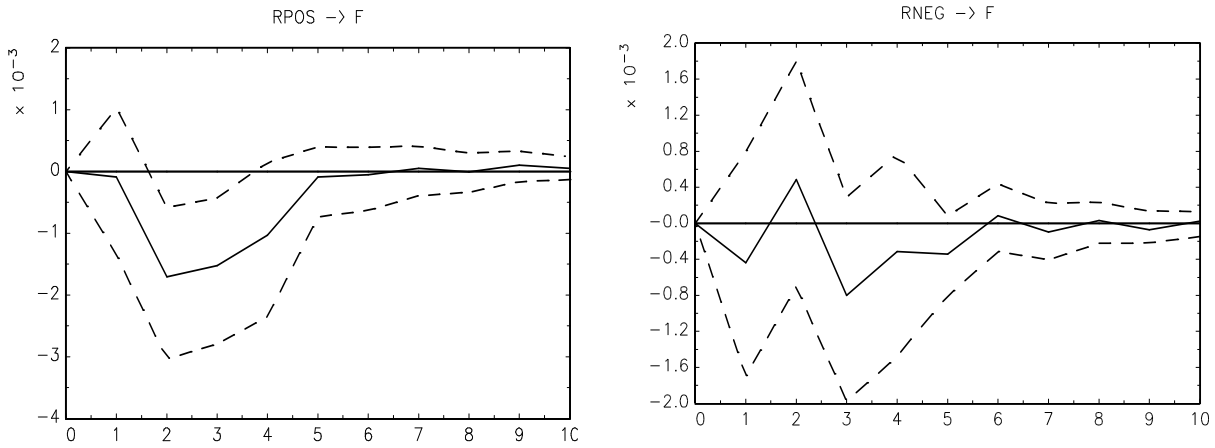
Table II.HU: Variance Decompositions for Hungary

Proportions of forecast error in F accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.04	0.00	0.96	0.00
2	0.10	0.00	0.90	0.00
3	0.09	0.02	0.87	0.01
4	0.08	0.06	0.82	0.04
5	0.09	0.06	0.81	0.04
6	0.09	0.06	0.81	0.04
7	0.09	0.06	0.81	0.04
8	0.09	0.06	0.80	0.04
9	0.09	0.06	0.80	0.04
10	0.09	0.06	0.80	0.04

Proportions of forecast error in R accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.42	0.10	0.05	0.44
2	0.45	0.09	0.05	0.41
3	0.44	0.10	0.05	0.41
4	0.44	0.10	0.05	0.41
5	0.44	0.10	0.06	0.40
6	0.44	0.10	0.06	0.40
7	0.44	0.10	0.06	0.40
8	0.44	0.10	0.06	0.40
9	0.44	0.10	0.06	0.40
10	0.44	0.10	0.06	0.40

Figure II.HU.2 below shows that the negative feedback trading is asymmetric with respect to the sign of the past monthly returns, just as in Turkey, and contrary to findings in Korea and Taiwan where negative feedback trading was found irrespective of the sign of past local returns. Specifically, negative feedback trading occurs only following rising markets. This provides support to one of the main findings of this project: foreign investors may be more alert at good times in markets with large external deficits. The upper-left graph in Figure II.HU.3 below suggests that this asymmetry cannot be explained by a negative autocorrelation in net flows following net inflows.

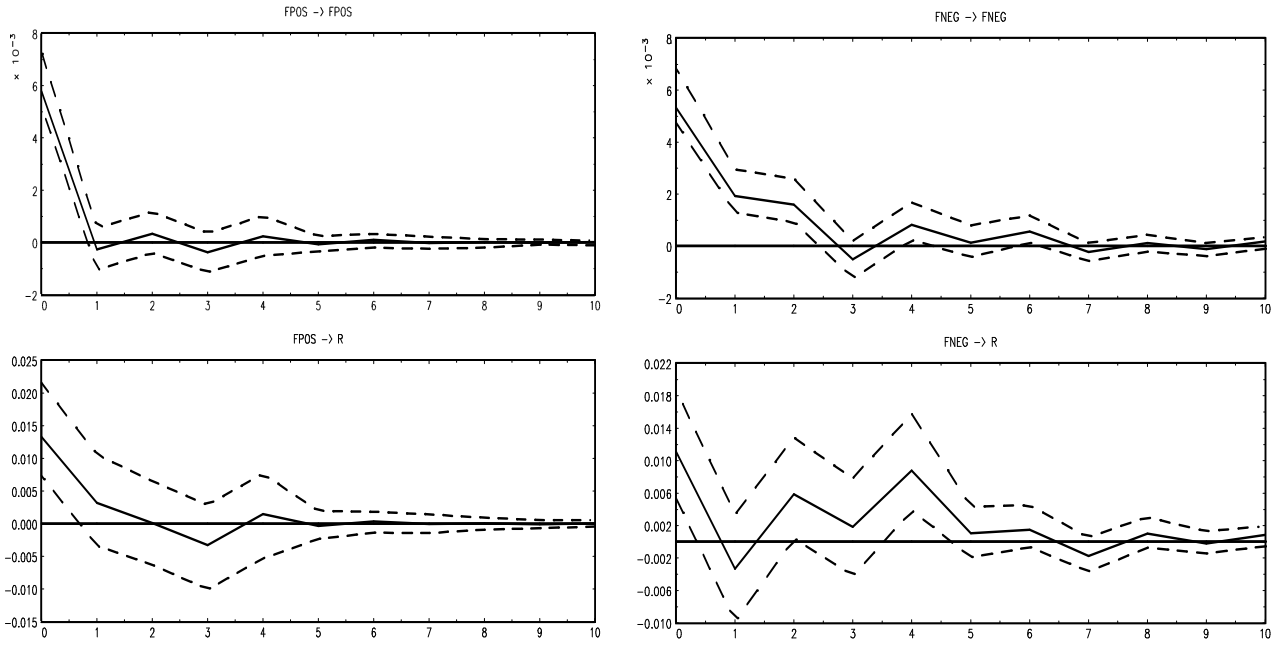
Figure II.HU.2: Asymmetry in Feedback Trading



The left panel shows net foreign flows' (F) response to positive local returns (RPOS), and the right panel shows *F*'s response to negative local returns (RNEG).

The upper row of Figure II.HU.3 shows that net outflows are more persistent. The contemporaneous of net flows with local returns is significant both in case of net inflows (F>0) and in case of net outflows (F<0), albeit a bit stronger in the former case. However, net outflows seem to have more forecast power on future local returns.

Figure II.HU.3: Asymmetry with respect to Net Inflows versus Net Outflows

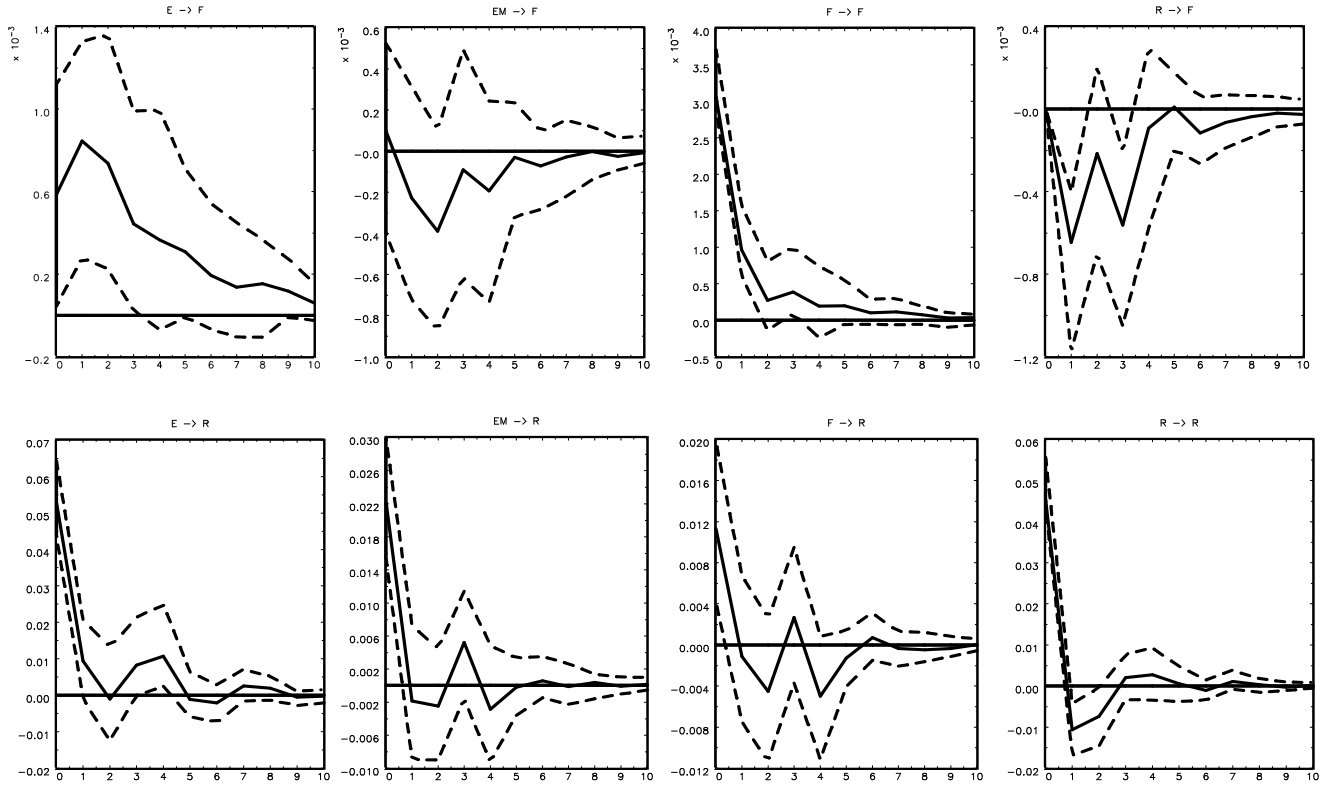


The upper-left panel shows the response of *F* to itself when $F > 0$, and the lower left panel shows the response of *R* to *F* when $F > 0$. The upper-right panel shows the response of *F* to itself when $F<0$, and the lower left panel shows the response of *R* to *F* when $F < 0$.

II.C.3. Poland Results

The first graph in the upper row of Figure II.PL.1 below shows that net foreign flows in Poland display a sustained positive lagged response to *E* following the typical positive contemporaneous response, both significant economically as well as statistically. *E* can account for 15% of the forecast error variance in *F*, 12% out of which comes at lags. Poland's stock market appears to be more responsive to *E* than the Hungarian and Turkish stock markets (51% of the forecast error variance of WIG returns accounted for by *E*). Although there are some statistically significant positive responses at lags (the first graph in the lower row), most this response is completed contemporaneously (*R*'s lagged response can only account for 1% of the forecast error variance). WIG returns are contemporaneously affected by emerging market returns, which can account for 9% of the forecast error variance in *R*), however net foreign flows do not significantly respond to *EM*. The third graph in the upper row suggests a slightly stronger degree of persistence in F. The last graph in the upper row shows that negative feedback trading by foreign investors is also common in Poland. The third graph in the lower row suggests that net foreign flows have little forecast ability of future WIG returns. The negative autocorrelation in local returns is present also in Poland.

Figure II.PL.1: Impulse Reponses of *F* and *R*



See explanations below Figure II.HU.1.

Table II.PL: Variance Decompositions for Poland

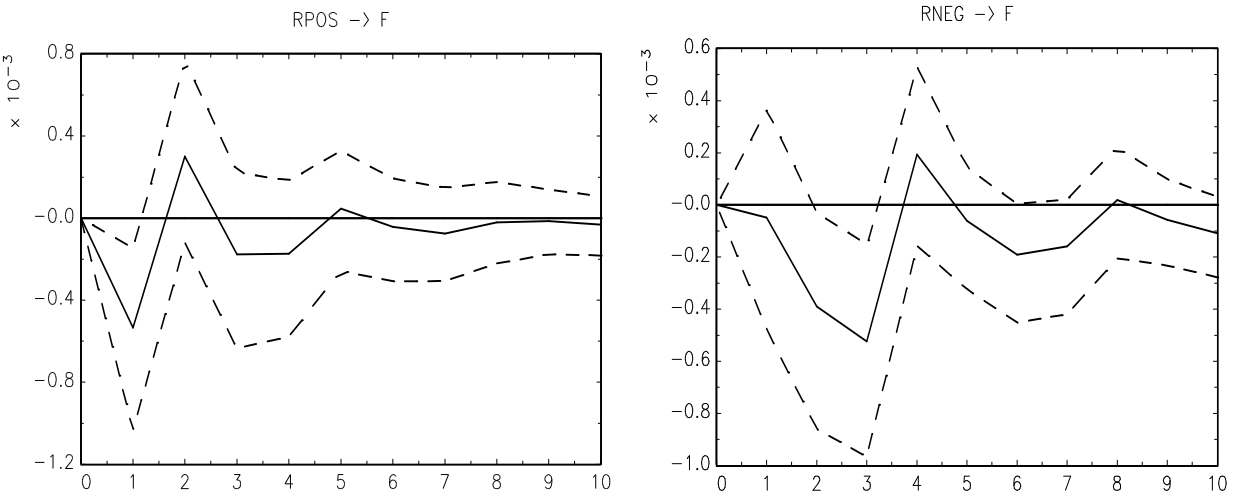
Proportions of forecast error in F accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.03	0.00	0.97	0.00
2	0.08	0.00	0.88	0.04
3	0.12	0.01	0.83	0.04
4	0.13	0.01	0.80	0.06
5	0.14	0.01	0.79	0.06
6	0.14	0.01	0.78	0.06
7	0.14	0.01	0.78	0.06
8	0.14	0.01	0.78	0.07
9	0.15	0.01	0.78	0.07
10	0.15	0.01	0.78	0.07

Proportions of forecast error in R accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.51	0.09	0.02	0.38
2	0.51	0.09	0.02	0.39
3	0.50	0.09	0.03	0.39
4	0.50	0.09	0.03	0.38
5	0.51	0.09	0.03	0.37
6	0.51	0.09	0.03	0.37
7	0.51	0.09	0.03	0.37
8	0.51	0.09	0.03	0.37
9	0.51	0.09	0.03	0.37
10	0.51	0.09	0.03	0.37

In Poland, we observe negative feedback both following positive returns (left panel of Figure II.PL.2) and following negative returns (right panel of Figure II.PL.2). In other words, negative-feedback-trading asymmetry is absent in Poland, as in Korea and Taiwan. We hypothesize that this asymmetry is a consequence of large external deficits leading to a lowered confidence of foreign investors to keep them from buying at bad times and being more alert at good times. For our hypothesis to remain valid, we should be able to explain foreigners' differential behavior in Poland by the relative stability of Poland. A brief inspection suggests that over the last seven years the average current account deficit / GDP ratio has been 6.5% in Hungary, 4.4% in Turkey, and 3.1% in Poland. Poland also fares better in terms of public debt level and deficits: Public debt /

GDP ratio has averaged around 52% over the last 9 years in Poland, 67% in Hungary and Turkey. The average government budget deficit over the last 9 years has been around 6.2% in Hungary vs. 4.2% in Poland.[17] Hence, our hypothesis remains robust in the face of evidence from Poland.

Figure II.PL.2: Asymmetry in Feedback Trading

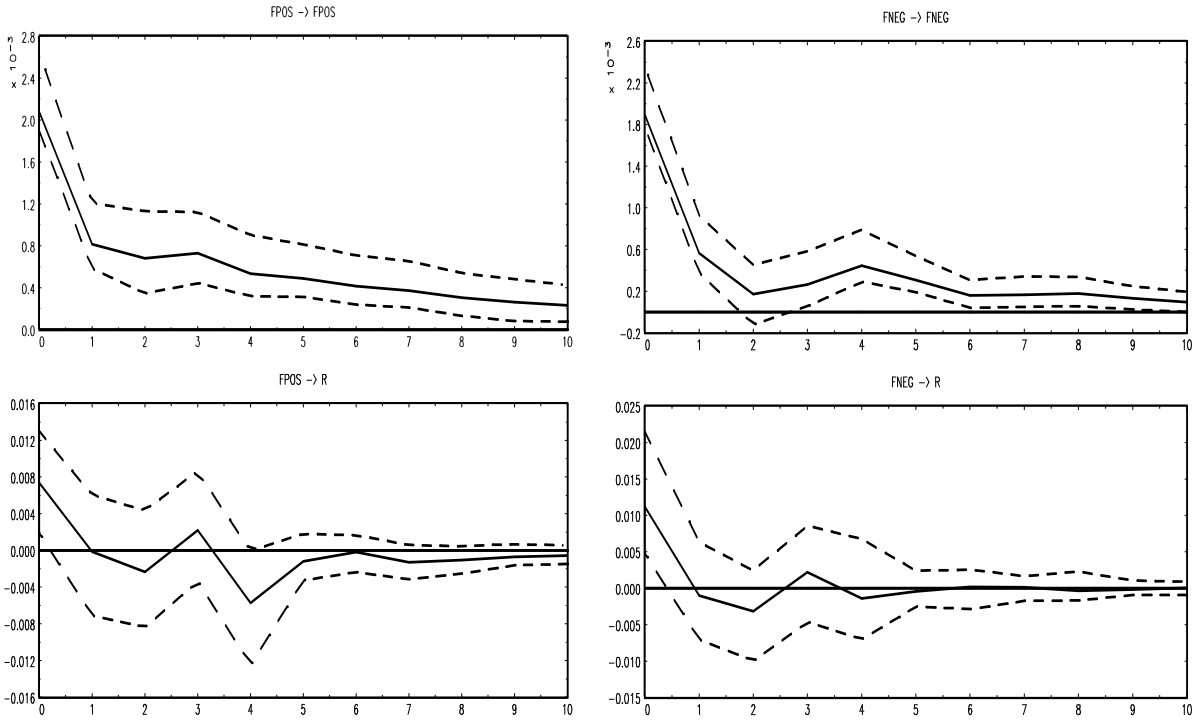


The left panel shows net foreign flows' (F) response to positive local returns (RPOS), and the right panel shows *F*'s response to negative local returns (RNEG).

The upper row of Figure II.PL.3 suggests that net foreign flows in Poland are more persistent when they are positive than when they are negative.

Figure II.PL.3: Asymmetry with respect to Net Inflows versus Net Outflows

[17] Turkey's government budget deficit numbers are inflated by high interest payments in the first half 2000's with nominal interest rates ranging between 40-80%, hence Turkish officials focused on a primary surplus target of 6% of GDP, which is not comparable to figures of Hungary and Poland.



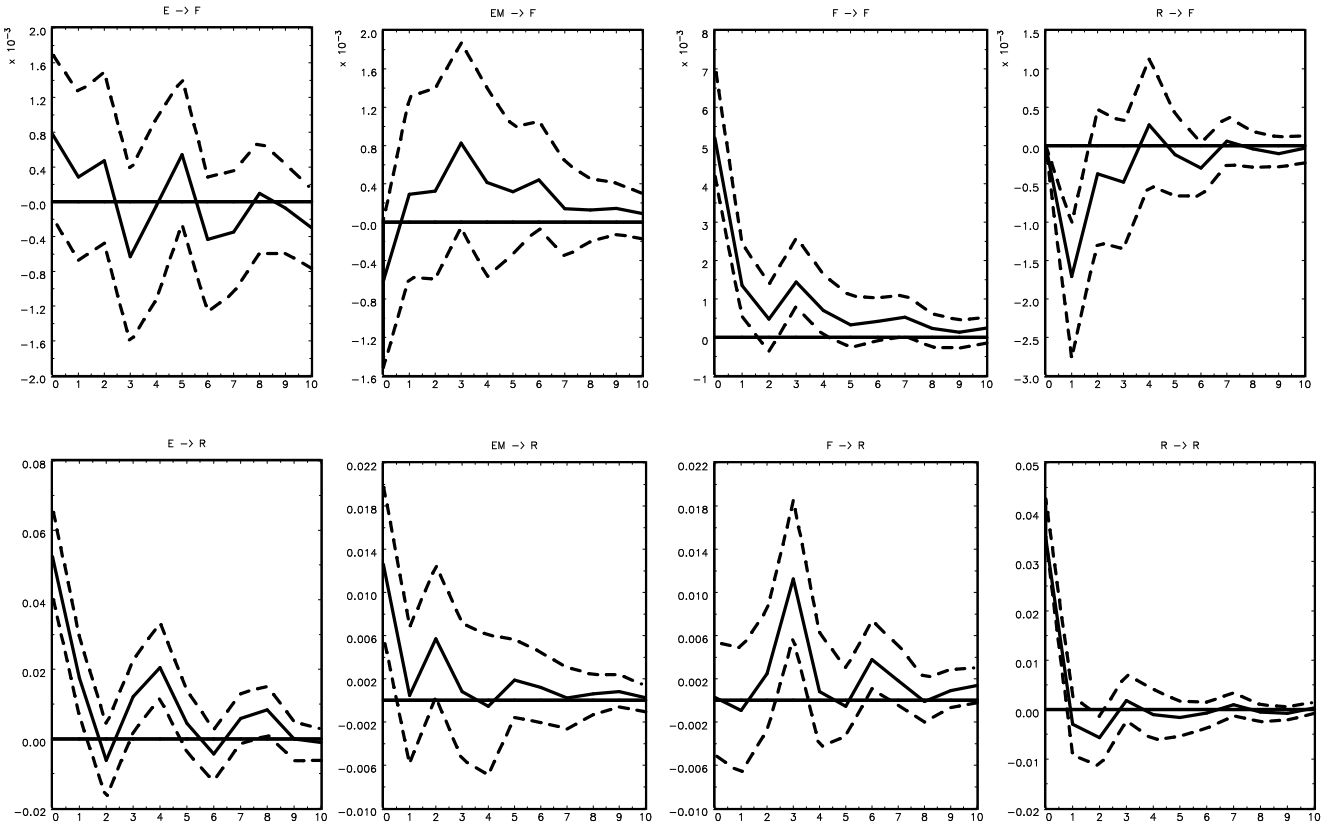
The upper-left panel shows the response of *F* to itself when $F > 0$, and the lower left panel shows the response of *R* to *F* when $F > 0$. The upper-right panel shows the response of *F* to itself when $F<0$, and the lower left panel shows the response of *R* to *F* when $F < 0$.

II.C.4. Czech Republic Results:

The first graph in the upper row of Figure II.CZ.1 suggests that net foreign flows' response to *E* is much weaker in the Czech stock market, compared to that in Hungary, Poland and Turkey. This is despite the fact that local returns are strongly related to *E* with 70% of the forecast error variance of Prague Stock Exchange (PSE) index returns accounted for by *E*. *EM* appears to negatively associated with contemporaneous net flows, but to have a positive lagged impact. The net effect appears to be insignificant. Third graph in the upper row suggests persistence in net foreign flows. So, we observe a high level of persistence in *F* in Poland and Czech Republic while a lower level of persistence in Hungary and Turkey. As the fourth graph in the upper row suggests, the negative feedback trading by foreigners is also significant in the Czech stock market. The second graph in the lower row shows that PSE index positively responds to *EM*. The third graph in lower row provides a quite interesting result as PSE index returns displays a significant positive response to net foreign flows only in the third month following the shock. This third-lag response can account for approximately 3% of the forecast error variance on PSE index returns. Czech stock market is unique in that the contemporaneous association between *F* and *R* is negligible. We interpret this as strong evidence in favor of the hypothesis, emerging out of this project work, that the contemporaneous positive association between *F* and *R* reflects foreigners' response to information contained in returns rather than foreigners having a strong price impact.

Czech stock market is know to be only weakly linked to fundamentals (see for example Hanousek and Filer, 2000 among others), hence it is striking to note that the contemporaneous price impact of net foreign flows is estimated to be around zero uniquely in a market with this characteristic.

Figure II.CZ.1: Impulse Reponses of *F* and *R*



See explanations below Figure II.HU.1.

Table II.CZ: Variance Decompositions for Czech Republic

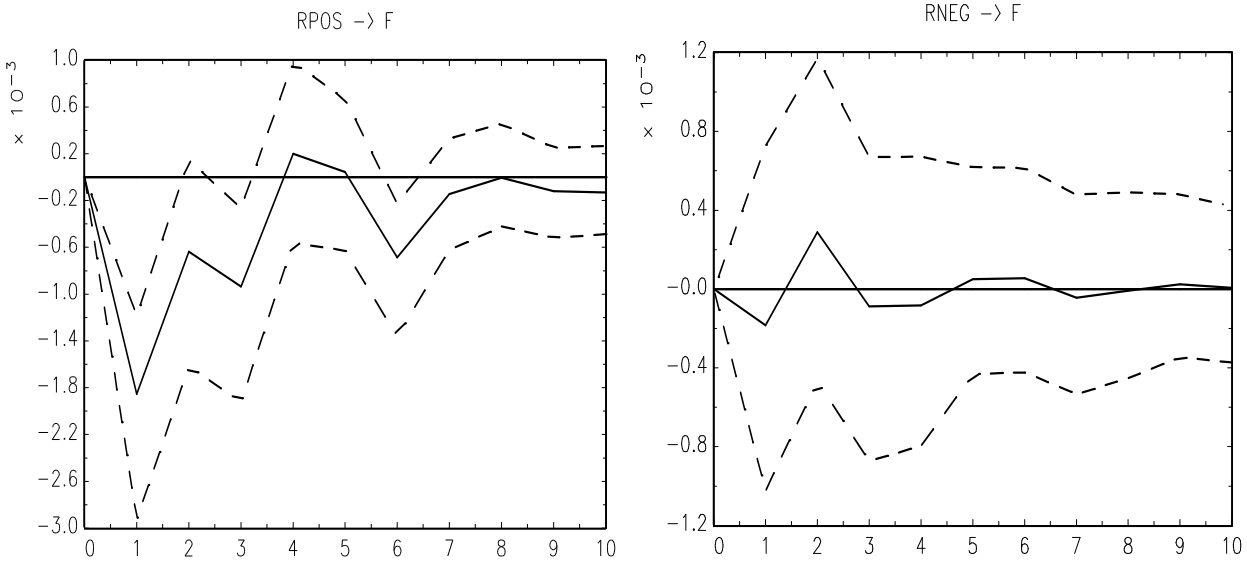
Proportions of forecast error in F accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.02	0.01	0.96	0.00
2	0.02	0.01	0.88	0.09
3	0.03	0.02	0.87	0.09
4	0.04	0.03	0.84	0.09
5	0.03	0.04	0.84	0.09
6	0.04	0.04	0.83	0.09
7	0.05	0.04	0.82	0.09
8	0.05	0.04	0.82	0.09
9	0.05	0.04	0.82	0.09
10	0.05	0.04	0.82	0.09

Proportions of forecast error in R accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.67	0.04	0.00	0.29
2	0.69	0.04	0.00	0.27
3	0.68	0.04	0.00	0.27
4	0.67	0.04	0.03	0.26
5	0.70	0.04	0.03	0.24
6	0.70	0.04	0.03	0.24
7	0.70	0.04	0.03	0.24
8	0.70	0.04	0.03	0.24
9	0.70	0.04	0.03	0.23
10	0.70	0.04	0.03	0.23

Figure II.CZ.2 below shows that the negative feedback trading asymmetry is significantly present in Czech stock market as well. Foreigners sell following rises (left panel) but do not buy following falls (right

panel). In order for our hypothesis to remain valid, Czech economy should suffer from large external deficits and/or public debt. The average current account deficit / GDP ratio over the last seven years has been 3.9%, public debt / GDP ratio 35.9% and government budget deficit / GDP ratio 3.6%. Hence, results from Czech Republic do not support our hypothesis that the feedback trading asymmetry is driven by large external deficits or by twin deficits. However, unique characteristics of the Czech stock may also have lead to this outcome, hence we do not think that results on Czech Republic are sufficient to play down our hypothesis.

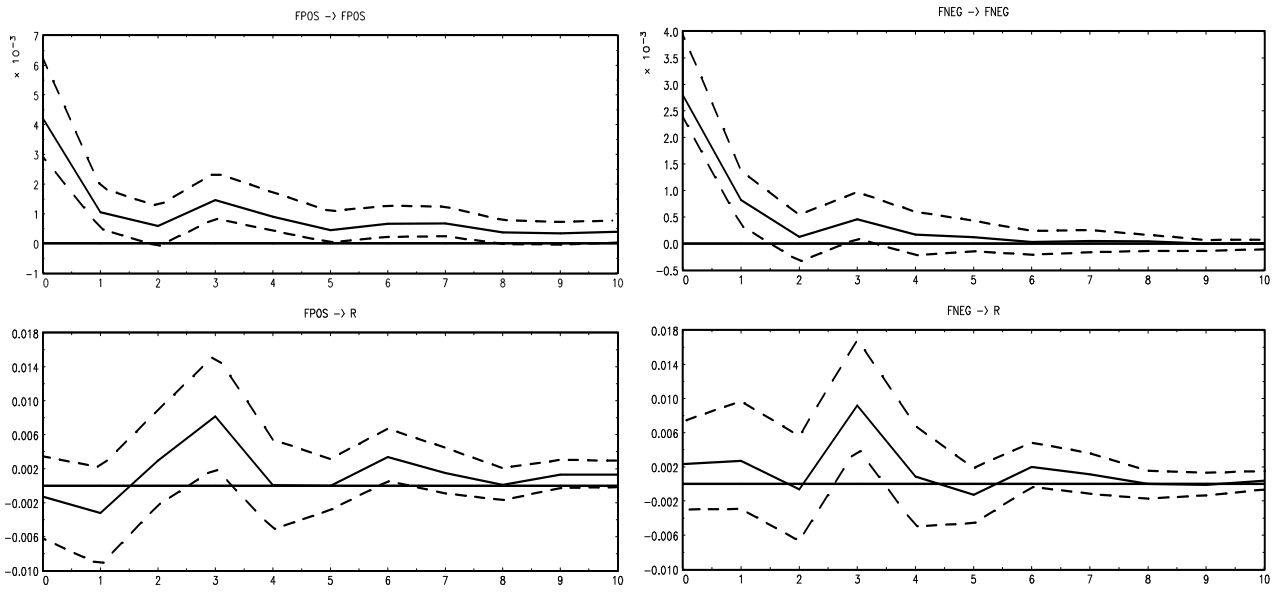
Figure II.CZ.2: Asymmetry in Feedback Trading



The left panel shows net foreign flows' (F) response to positive local returns (RPOS), and the right panel shows *F*'s response to negative local returns (RNEG).

The upper row of Figure II.CZ.3 below suggests that net flows are slightly more persistent when they are positive than when they are negative. The lower row shows that the intriguing lagged response of *R* to *F* at the third-month lag is significant both in case of net buying and in case of net selling by foreigners. Looking at the contemporaneous association, we note that, albeit insignificantly, net inflows (outflows) are negatively (positively) associated with local returns.

Figure II.CZ.3: Asymmetry with respect to Net Inflows versus Net Outflows

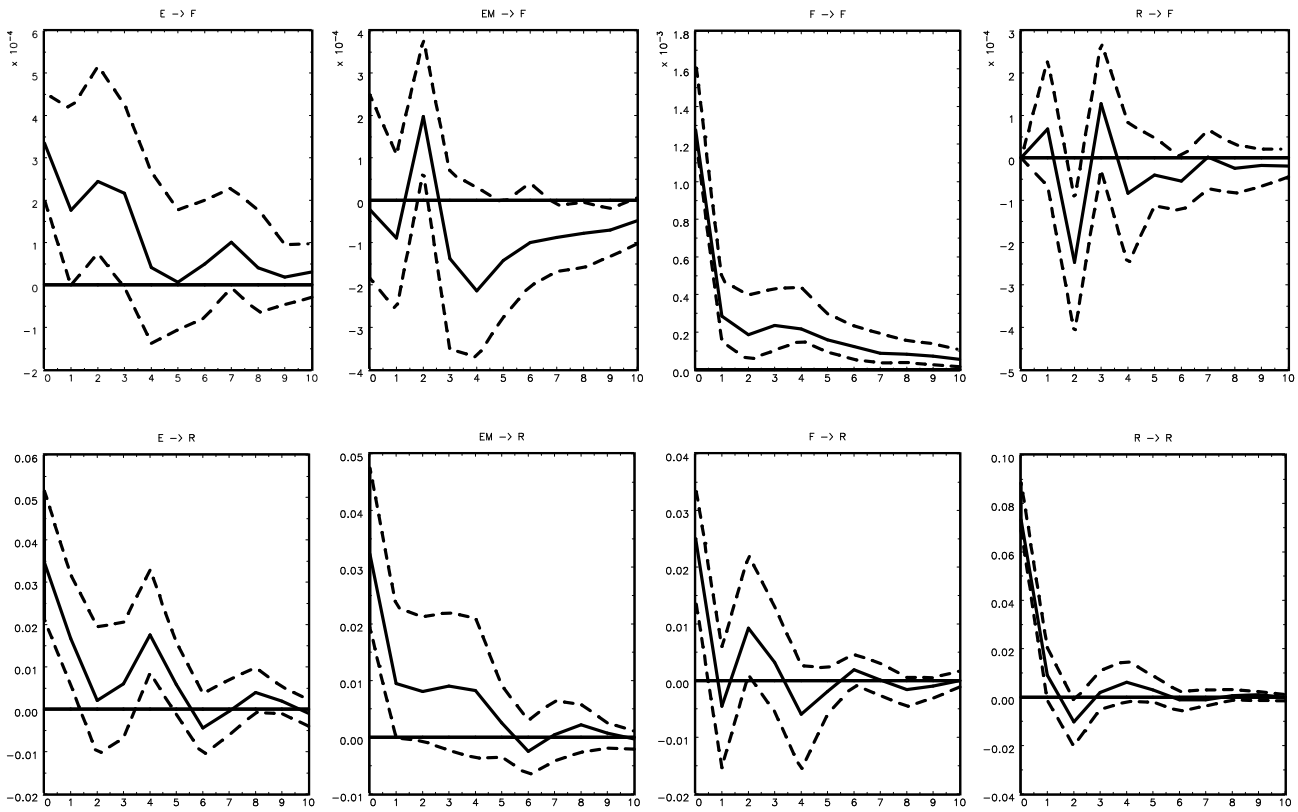


The upper-left panel shows the response of *F* to itself when $F > 0$, and the lower left panel shows the response of *R* to *F* when $F > 0$. The upper-right panel shows the response of *F* to itself when $F<0$, and the lower left panel shows the response of *R* to *F* when $F < 0$.

II.C.5. Romania Results

First, recall that Romanian data are contaminated as they also include non-regular market transactions (i.e. possible direct equity investment flows, IPOs, etc.). The results significantly improve when we remove 4 outlier observations in *F* series. However, we are unable to identify and remove other non-regular market transactions. Assuming that such transactions are random, we can still get meaningful results though our estimates may be nosier. The first graph in the upper row of Figure III.RO.1 below suggests that net foreign flows significantly positively respond to *E* both contemporaneously and at lags. *F*'s response to *EM* seen in the second graph appears to be quite volatile and we cannot interpret reliably (the zigzags get smoother when we remove 3 more outliers). The third graph in the upper row shows that persistence in net foreign flows is similar in Romania as in other markets. The negative feedback trading by foreigners is in Romanian stock market can barely be recognized amid a noisier response pattern. The results in the lower row are easier to interpret as returns data is not subject to noise: BET index returns exhibit a positive response to both *E* and *EM* both contemporaneously and at lags. Net foreign flows are positively associated with BET returns in the contemporaneous period (third graph in the lower row).

Figure II.RO.1: Impulse Reponses of *F* and *R*



See explanations below Figure II.HU.1.

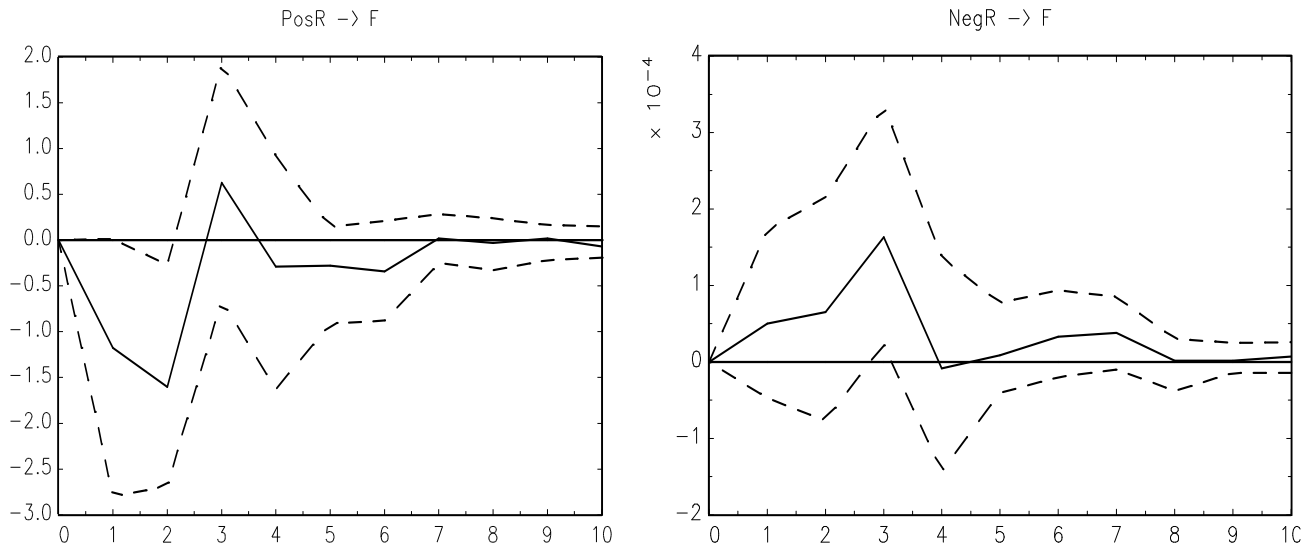
Table II.RO: Variance Decompositions for Romania

Proportions of forecast error in F accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.06	0.00	0.94	0.00
2	0.08	0.00	0.92	0.00
3	0.10	0.02	0.85	0.03
4	0.11	0.03	0.82	0.04
5	0.11	0.05	0.80	0.04
6	0.11	0.06	0.80	0.04
7	0.11	0.06	0.79	0.04
8	0.11	0.06	0.79	0.04
9	0.11	0.06	0.79	0.04
10	0.11	0.07	0.79	0.04

Proportions of forecast error in R accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.15	0.13	0.08	0.65
2	0.17	0.13	0.07	0.63
3	0.17	0.13	0.08	0.62
4	0.17	0.14	0.08	0.61
5	0.19	0.14	0.08	0.59
6	0.19	0.14	0.08	0.58
7	0.20	0.14	0.08	0.58
8	0.20	0.14	0.08	0.58
9	0.20	0.14	0.08	0.58
10	0.20	0.14	0.08	0.58

Figure II.RO.2 below uncovers an interesting case. The full-sample negative feedback trading was barely recognizable. However, when we break down *F*'s response to positive and negative past returns, we see negative feedback trading following positive returns and positive feedback trading following negative returns. This makes the most extreme example of the feedback trading asymmetry in Romania.

Figure II.RO.2: Asymmetry in Feedback Trading



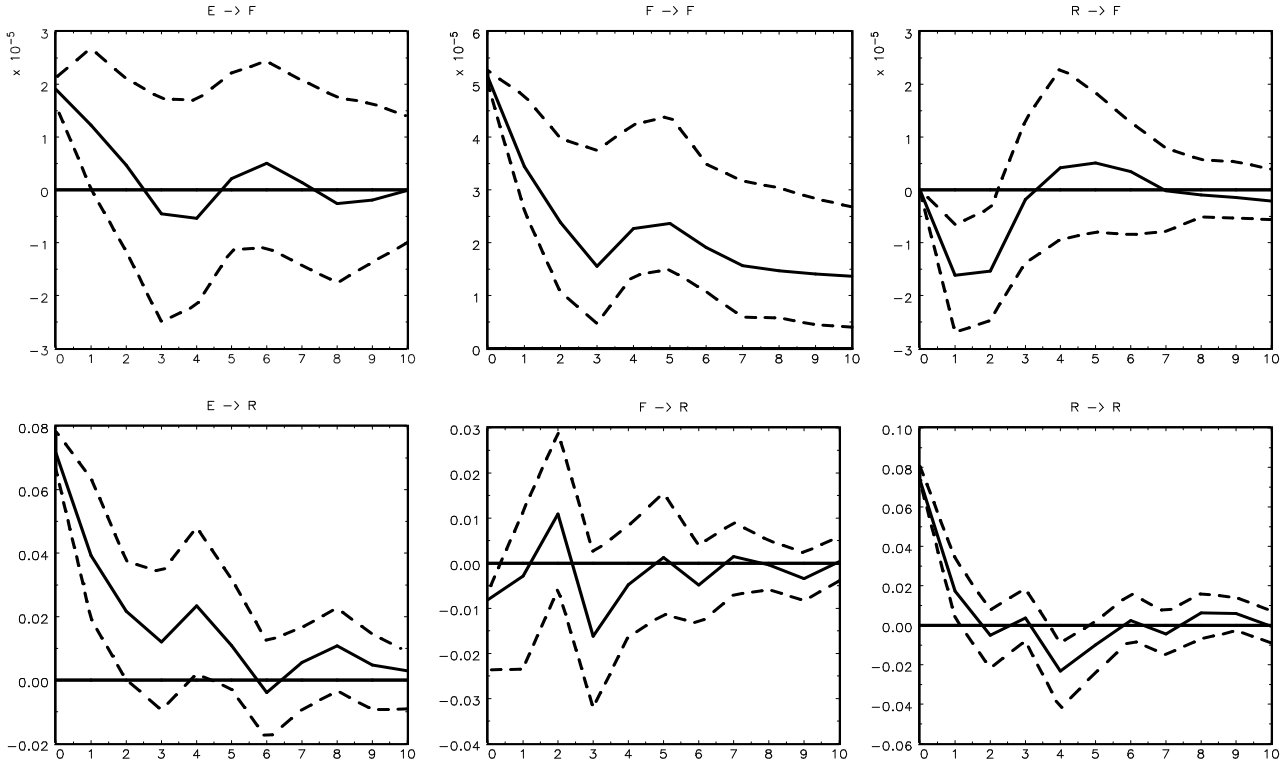
The left panel shows net foreign flows' (F) response to positive local returns (PosR), and the right panel shows *F*'s response to negative local returns (NegR).

II.C.6. Russia Results:

As in Romania, we are unable to sort out non-regular market transactions in Russia. Given the shorter sample, these results require caution in interpretation. Also for this reason, we do not perform the breakdowns. Another issue is that Russia is a relatively large component of MSCI Emerging Markets index constituting 7.0% of the index as of Feb.2, 2011. (This compares to Turkey, the second largest European constituent of the index, whose share is only 1.6%). As one might suspect, the correlation between RTS returns and *EM* is +0.86, the highest correlation between any emerging stock index and any global index in our sample, making the estimation vulnerable to multicollinearity. To avoid this problem, we drop *EM* here and estimate a trivariate VAR model. The first graph in the upper row of Figure II.RU suggests that net foreign flows significantly positively respond to *E* in the contemporaneous month and the following month. RTS index returns display a positive but quite prolonged response to *E* (the first graph in the lower row). We attribute this prolonged response to the possibility that *E* is a good predictor of demand for Russian energy and commodity products. Indeed, in Ülkü and Demirci (2011) we show that RTS index returns positively respond commodity price index (CI) after controlling for *E* and CI itself positively responds to *E*. The second graph in the upper row suggests strong persistence in net foreign flows in Russia.[18] Once again, we obtain significant negative feedback trading with respect to local returns (third graph in the upper row). Negative feedback trading is economically significant as it can explain 9% of forecast error variance in *F*. The second graph in the lower row suggests that local returns are not significantly affected by foreign flows.

[18] *E* and *F* series in our Russia data reject the null of a unit root just below 1% level of significance, hence we performed a robustness check by using the first difference of *E* and *F*. The persistence in *F* naturally disappeared (but this does not have an economic implication), and the persistence in the response of *R* to *E* has diminished, but the response at the first and fourth month lags remained significant. All other results remained the same, in particular the negative feedback trading became more significant at the 1-month lag.

Figure II.RU: Impulse Reponses of *F* and *R*



See explanations below Figure II.HU.1.

Table II.RU: Variance Decompositions for Russia

Proportions of forecast error in F accounted for by:			
forecast horizon	**E**	**F**	**R**
1	0.12	0.88	0.00
2	0.11	0.83	0.06
3	0.10	0.81	0.09
4	0.10	0.81	0.09
5	0.09	0.82	0.08
6	0.09	0.83	0.08
7	0.08	0.84	0.08
8	0.08	0.84	0.07
9	0.08	0.85	0.07
10	0.08	0.85	0.07

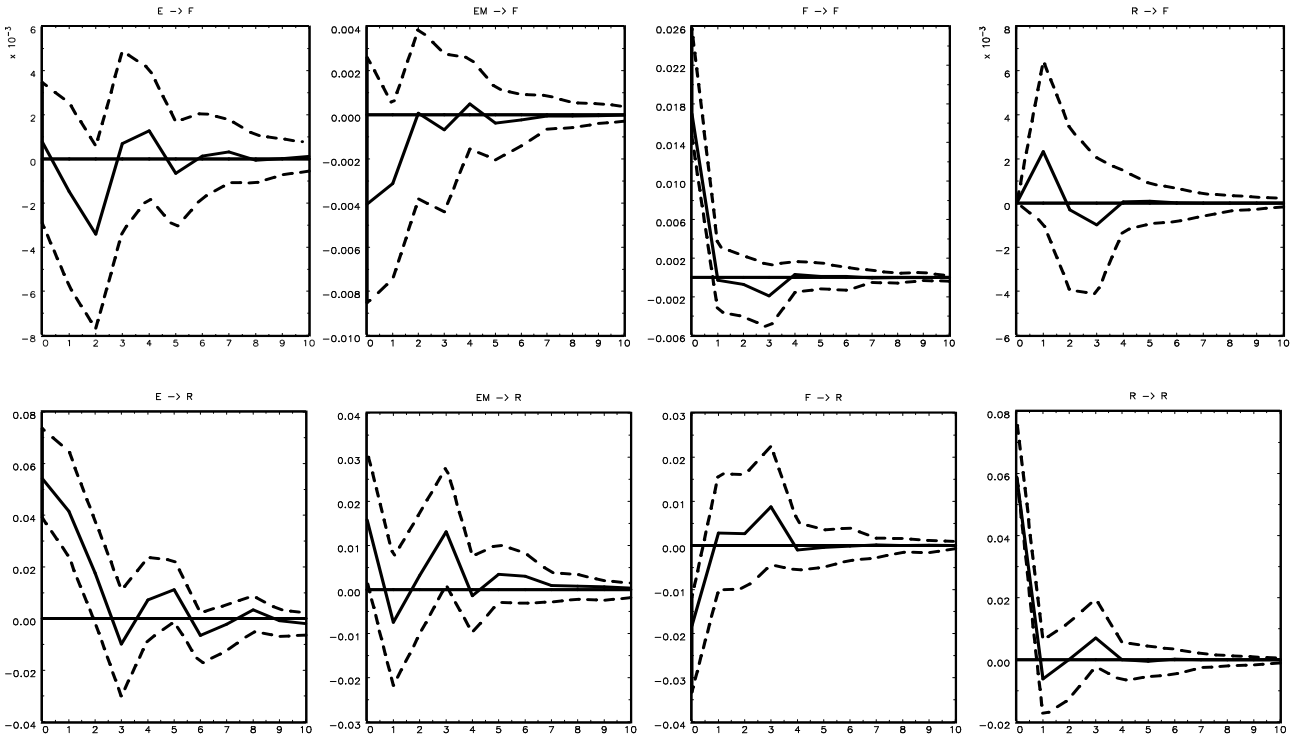
Proportions of forecast error in R accounted for by:			
forecast horizon	**E**	**F**	**R**
1	0.48	0.01	0.51
2	0.53	0.01	0.46
3	0.55	0.01	0.44
4	0.54	0.03	0.43
5	0.54	0.03	0.43
6	0.54	0.03	0.43
7	0.53	0.03	0.43
8	0.54	0.03	0.43
9	0.54	0.03	0.43
10	0.54	0.03	0.43

II.C.7. Croatia Results:

Recall that Croatian data were obtained from the ownership ratios reported by the Central Depository and Clearing Company. A major problem with this type of data is that ownership ratios may change for reasons other than trading. While non-trading transfers are not likely to frequently take place between accounts of residents and nonresidents (as we know from our experience with daily data from Turkey), relative price changes of stocks held by residents versus nonresidents may significantly affect ownership ratios. It may even create a systematic bias as foreigners are known to hold relatively larger stocks. This problem can be much

more severe in Croatia as the number stocks traded actively is very small. Hence, we suspect that our *F* series may be contaminated by relative price changes, and unlike our experience with daily data from Turkey (where in Ülkü and Weber (2010) we validated our daily data by aggregating it into monthly and found a correlation of +0.845 with actual monthly net flows) we have no chance to check the accuracy of our data externally. Hence, we refrain from reaching conclusions based on the results in the upper row of figure II.CR below. The lack of a meaningful relationship of *F* with our variables *E*, *EM*, and *R* and lack of any persistence in *F* may result either from measurement errors in *F* series or from the unusual behavior of a tiny stock market.

Figure II.CR.1: Impulse Reponses of *F* and *R*



See explanations below Figure II.HU.1.

Table II.CR: Variance Decompositions for Croatia

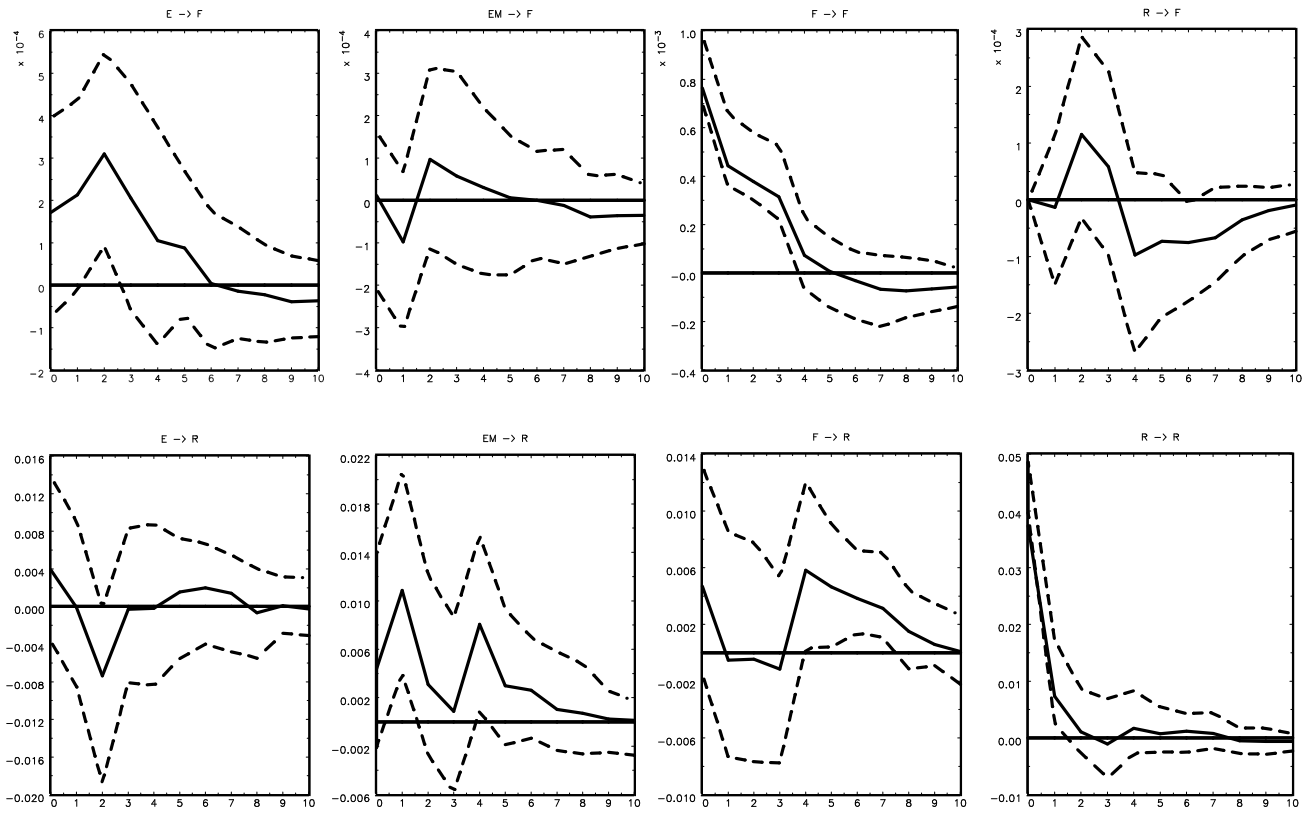
Proportions of forecast error in F accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.00	0.05	0.94	0.00
2	0.01	0.08	0.89	0.02
3	0.04	0.08	0.86	0.02
4	0.04	0.08	0.86	0.02
5	0.05	0.08	0.85	0.02
6	0.05	0.08	0.85	0.02
7	0.05	0.08	0.85	0.02
8	0.05	0.08	0.85	0.02
9	0.05	0.08	0.85	0.02
10	0.05	0.08	0.85	0.02

Proportions of forecast error in R accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.42	0.04	0.05	0.50
2	0.53	0.03	0.04	0.40
3	0.54	0.03	0.04	0.38
4	0.53	0.05	0.04	0.37
5	0.53	0.05	0.04	0.37
6	0.54	0.05	0.04	0.36
7	0.54	0.05	0.04	0.36
8	0.54	0.05	0.04	0.36
9	0.54	0.05	0.04	0.36
10	0.54	0.05	0.04	0.36

II.C.8. Slovenia Results

The first two graphs in the upper row of Figure II.SL indicate that net foreign flows in Slovenia positively respond to *E* but not to *EM*. Interestingly, the first two graphs in the lower row suggest that local returns in Slovenia are positively associated with *EM* but not with *E*. This alone would provide evidence in favor of rebalancing hypothesis (i.e. foreigners buy (sell) following rises (falls) in their home markets to bring portfolio weights back to original levels) and against our hypothesis that foreigners' trading reflects information, which we are trying to promote in this research program. However, recall that Slovenia data pertain to the 1999-2005 period (so our sample corresponds to a period during information costs were relatively higher), and further Slovenia is a very small market so that global informed traders would not choose to be active. Hence, we find it interesting (and encouraging for our hypothesis) that this exceptional result is obtained in one of the smallest markets in our sample. The third graph in the upper row suggests strong persistence in *F*. The fourth graph in the upper row is the first in our sample to suggest absence of negative feedback trading. Note that Griffin et al. (2004) find negative feedback trading in Slovenia at the daily frequency, the only exceptional result among the six markets analyzed in their study using daily data. -Note that in Ülkü and Weber (2010) we reach a strong conclusion using 10-14 years of monthly and 7-11 years of daily data on Turkey, Korea and Taiwan that foreigners positive feedback trade at the daily frequency but negative feedback trade at the monthly frequency.- We suspect that both our and Griffin et al.'s result may have been driven by the absence of active international short term investors in the Ljubljana stock exchange. The third graph in the lower row suggests that local returns are positively associated with net foreign flows significantly only between 4^{th} and 7^{th} month lags.

Figure II.SL: Impulse Reponses of *F* and *R*



See explanations below Figure II.HU.1.

Table II.SL: Variance Decompositions for Slovenia

Proportions of forecast error in F accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.05	0.00	0.95	0.00
2	0.09	0.01	0.90	0.00
3	0.15	0.02	0.82	0.01
4	0.17	0.02	0.80	0.01
5	0.17	0.02	0.79	0.02
6	0.18	0.02	0.78	0.02
7	0.17	0.02	0.78	0.03
8	0.17	0.02	0.78	0.03
9	0.17	0.02	0.78	0.03
10	0.17	0.02	0.78	0.03

Proportions of forecast error in R accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.01	0.01	0.02	0.96
2	0.01	0.08	0.01	0.89
3	0.04	0.09	0.01	0.86
4	0.04	0.09	0.01	0.86
5	0.04	0.12	0.03	0.81
6	0.04	0.12	0.04	0.80
7	0.04	0.12	0.05	0.79
8	0.04	0.12	0.06	0.78
9	0.04	0.12	0.06	0.78
10	0.04	0.12	0.06	0.78

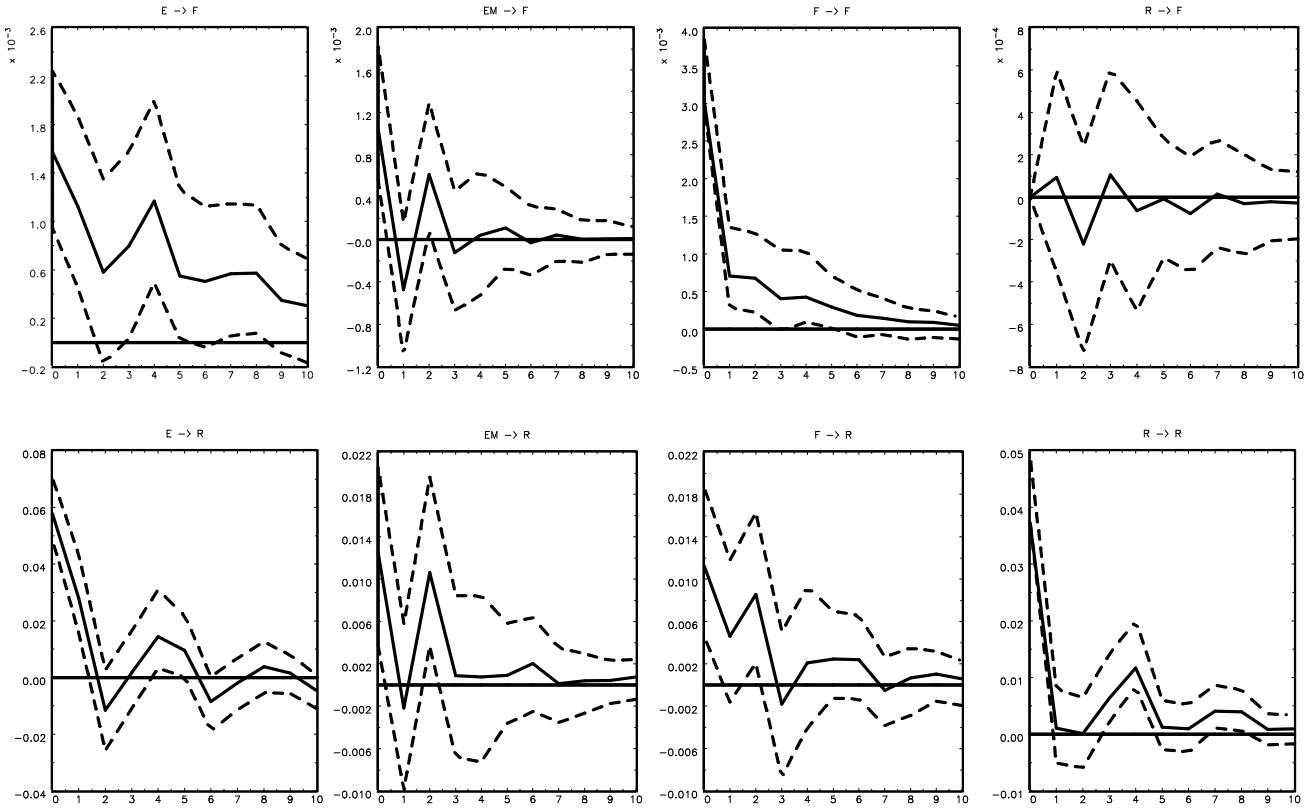
II.C.9. Greece Results

Greece has been classified as a developed market rather than emerging market for about half a decade. Hence, we tried two versions of our model, one including and one excluding *EM*. We find that both *F* and *R* exhibit some significantly positive response to *EM* contemporaneously and at the third lag. *EM* can account for 9% and 4% of the forecast error variance of *F* and *R*, respectively, which is comparable to what obtained in other major markets in our sample. Hence, Greece appears to still display some emerging market characteristics. All

other results are qualitatively identical under both versions, and to conserve space we only report results with the four-variable model which includes *EM*.

Net foreign flows in Greece display a prolonged positive response to *E* (first graph in the upper row), whereas local returns complete most of their adjustment to *E* by the first month-lag (first graph in the lower row). Third graph in the upper row suggests that *F* is persistent. The fourth graph in the first row is so far the first evidence in a major market on the absence of a negative feedback trading. As data from Greece is precise data obtained from the stock exchange, this result is highly reliable. We will discuss about this finding later below. The third graph in the lower row suggests that local returns are not only positively associated with contemporaneous net flows, but also display a significantly positive lagged response to them, even though the forecast ability contained in *F* does not seem to be economically significant as lagged responses of *R* to *F* can only account for 1% of the forecast error variance in *R*.

Figure II.GR.1: Impulse Reponses of *F* and *R*



See explanations below Figure II.HU.1.

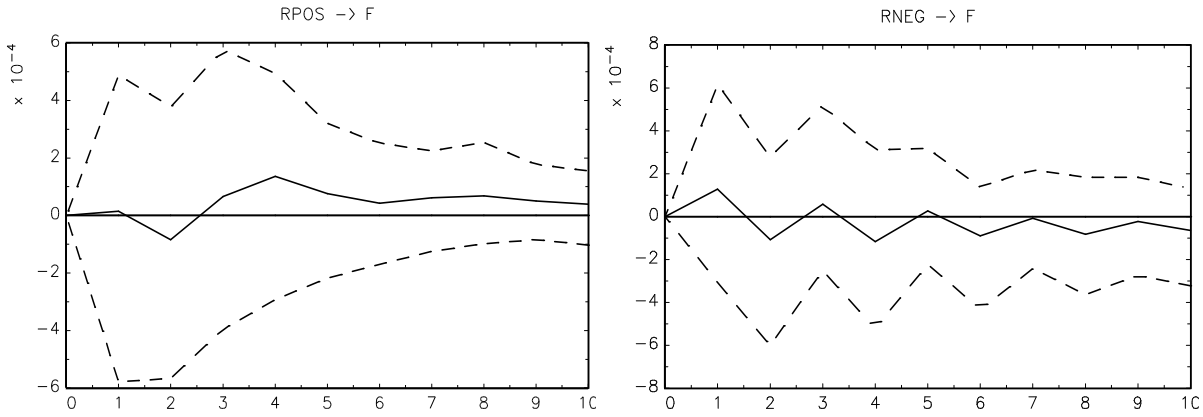
Table II.GR: Variance Decompositions for Greece

Proportions of forecast error in F accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.19	0.09	0.72	0.00
2	0.25	0.09	0.66	0.00
3	0.26	0.11	0.63	0.00
4	0.28	0.10	0.61	0.00
5	0.33	0.09	0.57	0.00
6	0.34	0.09	0.56	0.00
7	0.35	0.09	0.56	0.00
8	0.36	0.09	0.55	0.00
9	0.37	0.09	0.54	0.00
10	0.37	0.09	0.54	0.00

Proportions of forecast error in R accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**
1	0.67	0.03	0.03	0.28
2	0.71	0.03	0.03	0.24
3	0.69	0.04	0.04	0.23
4	0.69	0.04	0.04	0.23
5	0.68	0.04	0.03	0.24
6	0.69	0.04	0.04	0.24
7	0.69	0.04	0.04	0.23
8	0.69	0.04	0.04	0.24
9	0.69	0.04	0.04	0.24
10	0.69	0.04	0.04	0.24

Figure II.GR.2 suggests that absence of any feedback trading is valid following both positive and negative returns in Greece.

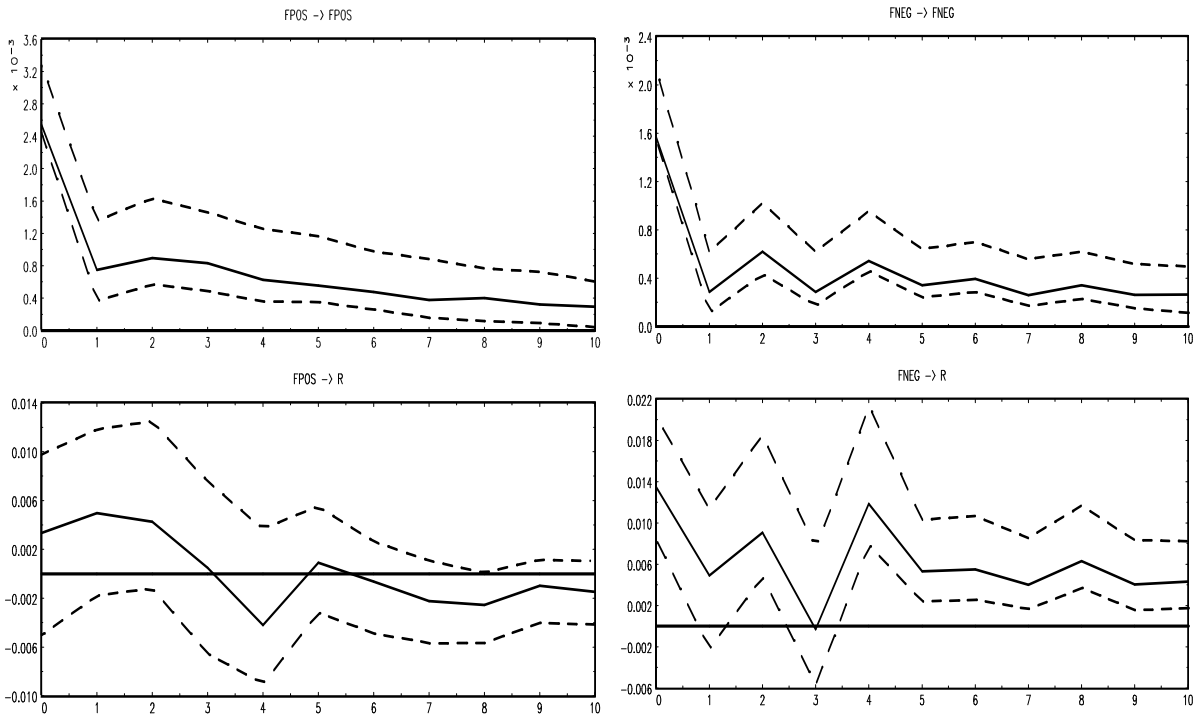
Figure II.GR.2: Asymmetry in Feedback Trading



The left panel shows net foreign flows' (F) response to positive local returns (RPOS), and the right panel shows *F*'s response to negative local returns (RNEG).

The upper panel of Figure II.GR.3 suggests that net flows display persistence following both net inflows and net outflows. The lower panel of Figure II.GR.3 suggests that net outflows are more strongly positively correlated with contemporaneous returns and can forecast future returns.

Figure II.GR.3: Asymmetry with respect to Net Inflows versus Net Outflows

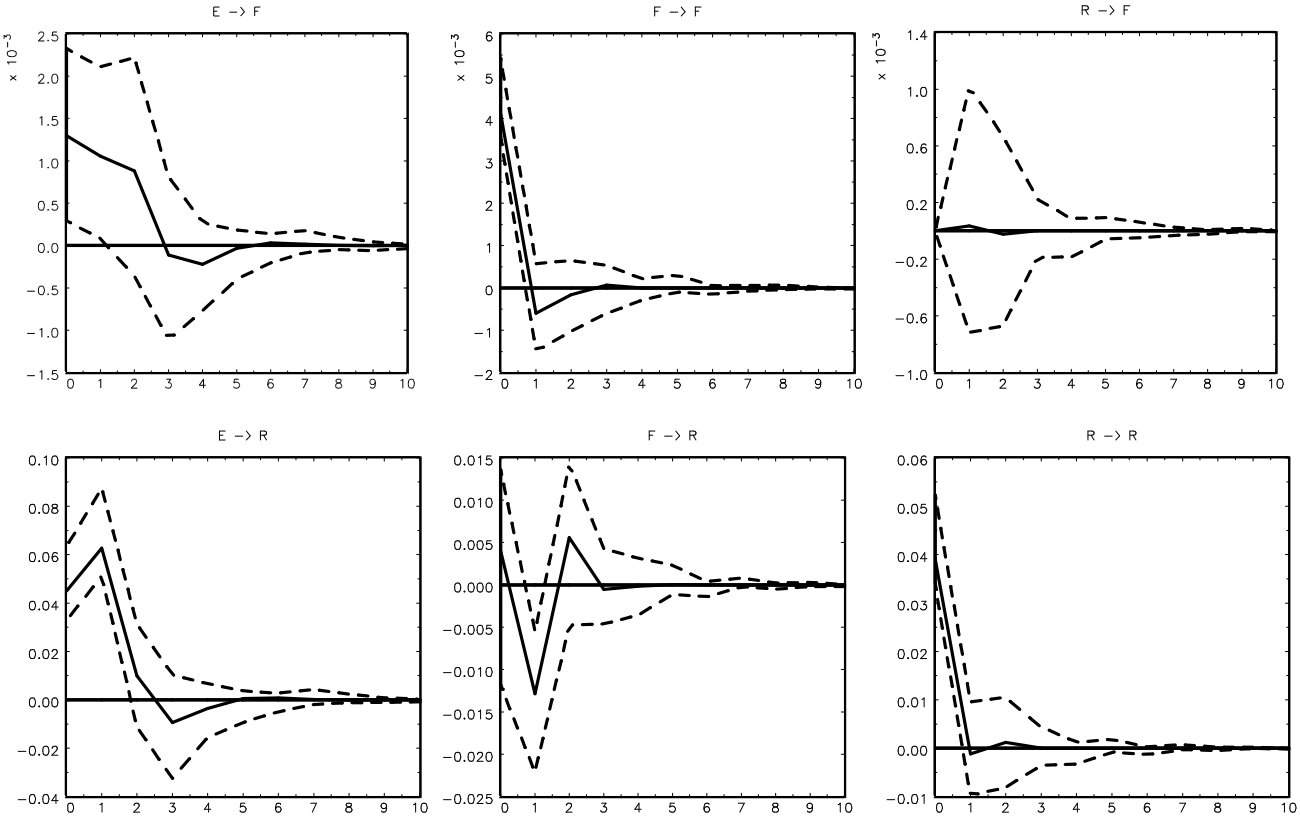


The upper-left panel shows the response of *F* to itself when $F > 0$, and the lower left panel shows the response of *R* to *F* when $F > 0$. The upper-right panel shows the response of *F* to itself when $F<0$, and the lower left panel shows the response of *R* to *F* when $F < 0$.

II.C.10. Austria Results

Austria is clearly categorized as a developed market, thus we analyze Austria only under a trivariate model excluding *EM*. Note that the Austrian sample is the shortest in our study, as available data start from September 2007. To avoid overfitting in a small sample and improve estimation efficiency, for Austria we employ a SVAR of order 2. The first graph in the upper row of Figure II.AU shows that part of *F*'s response to *E* comes at the 1-month lag following a significantly positive contemporaneous response. Interestingly, local returns (R) also display a significantly positive lagged response to E, implying predictability. However, this particular result may have been driven by the short sample dominated by the 2008 crisis effects. The second graph in the upper row suggests no persistence in net foreign flows. The third graph in the upper row suggests absence of any feedback trading by foreigners in Austria at the monthly frequency. Thus, we find the second absence of negative feedback trading in a Euro-area market. This may be important as Hau and Rey's (2004) theory argues that portfolio rebalancing is driven by a need to adjust foreign exchange risk exposure. If negative feedback trading were to be found in most countries having their own currency but not in those using a common currency, this result would be an interesting support of Hau and Rey's theory. The second graph in the lower row is not very clear about *R*'s response to *F*, and the results in Table II.AU suggest *F*'s role in accounting for the forecast error variance of *R* is not economically significant.

Figure II.AU: Impulse Reponses of *F* and *R*



See explanations below Figure II.HU.1 (the responses to *EM*, the second graphs in both rows, are dropped here).

Table II.AU: Variance Decompositions for Austria

Proportions of forecast error in F accounted for by:			
forecast horizon	**E**	**F**	**R**
1	0.09	0.91	0.00
2	0.14	0.86	0.00
3	0.17	0.83	0.00
4	0.17	0.83	0.00
5	0.17	0.83	0.00
6	0.17	0.83	0.00
7	0.17	0.82	0.00
8	0.17	0.82	0.00
9	0.17	0.82	0.00
10	0.17	0.82	0.00

Proportions of forecast error in R accounted for by:			
forecast horizon	**E**	**F**	**R**
1	0.57	0.00	0.43
2	0.78	0.02	0.20
3	0.78	0.03	0.20
4	0.78	0.03	0.19
5	0.78	0.03	0.19
6	0.78	0.03	0.19
7	0.78	0.03	0.19
8	0.78	0.03	0.19
9	0.78	0.03	0.19
10	0.78	0.03	0.19

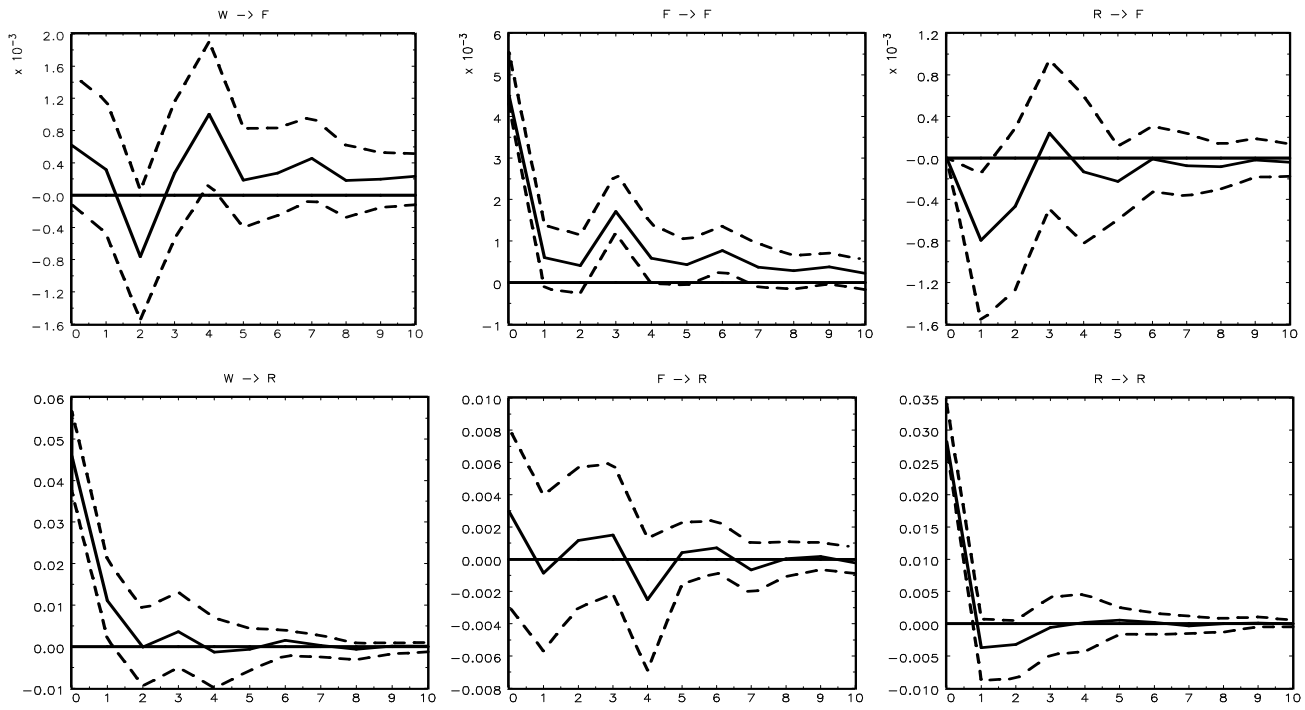
II.C.11. Spain Results

We have been analyzing Spain using data compiled Madrid Stock Exchange before this project was launched. Spain results are strange in that net foreign flows are significantly associated neither with global returns (first graph in the upper row of Figure II.SP) nor with local returns (second graph in the lower row). To enquire whether this finding is driven by measurement errors or by any outlier observations, we have also acquired data on individual stocks, from the Ministry of Commerce, and engaged in discussions with Spanish officials

and experienced market professionals. Some officials told us that this may be a consequence of Spanish companies making acquisitions abroad and paying in their own stocks. Thus, the hypothesis is that a large portion of net foreign trading comes from the liquidity-motivated trades of those who sold their shares to Spanish firms, were paid in Spanish firms' stocks and sell these stocks in Madrid stock exchange when they need cash. This hypothesis is supported by the huge net outflows between 2001 and 2006 equivalent to 25% of market capitalization of Madrid Stock Exchange. We thought that if we could identify and separate these liquidity-motivated trades from typical portfolio flows, we can make a nice contribution to the literature by contrasting the behavior and price impact of liquidity motivated trading and speculative portfolio flows. However, so far we have been unable to obtain a manageable data source to identify Spanish acquisitions of foreign firms paid in Spanish stocks and relate this to our individual stock data. The interaction between foreign flows and returns in individual stocks varies from stock to stock, and we could not identify a pattern. Our effort to illuminate this issue is going on within a separate working paper (Porras and Ülkü, 2010).

The second graph in the upper row suggests persistence in *F*. The second graph in the lower row shows that net foreign flows have no forecasting power on the future local returns. The third graph in the upper row indicates negative feedback trading by foreigners, which can account for 3-4% of the forecast error variance of *F*. Perhaps not very significant economically, the statistically significant negative feedback trading is different from Greece and Austria, the other Euro-zone markets in our sample, hence keeps us from providing evidence to support Hau and Rey's (2004) theory (i.e. negative feedback trading is absent in common currency markets). One reason for the negative feedback trading in Spain, however, may be the liquidity-motivated trades as mentioned above. So, further research is needed to reach a general conclusion on whether negative feedback trading is mainly driven by exchange rate exposure considerations. Obviously, use of net foreign flows data and making a contrast between Euro-area and non-Euro-area markets are likely to provide conclusive tests of Hau and Rey's theory, thus this project work provides us an advantage in performing conclusive empirical tests of Hau and Rey's (2004) theory of rebalancing driven by exchange rate risk exposure.

Figure II.SP.1: Impulse Reponses of *F* and *R*



See explanations below Figure II.HU.1 (the responses to *EM*, the second graphs in both rows, are dropped here). Note that MSCI Europe index is replaced by MSCI World index (W). Results are similar under both *E* and *W*.

Table II.SP: Variance Decompositions for Spain

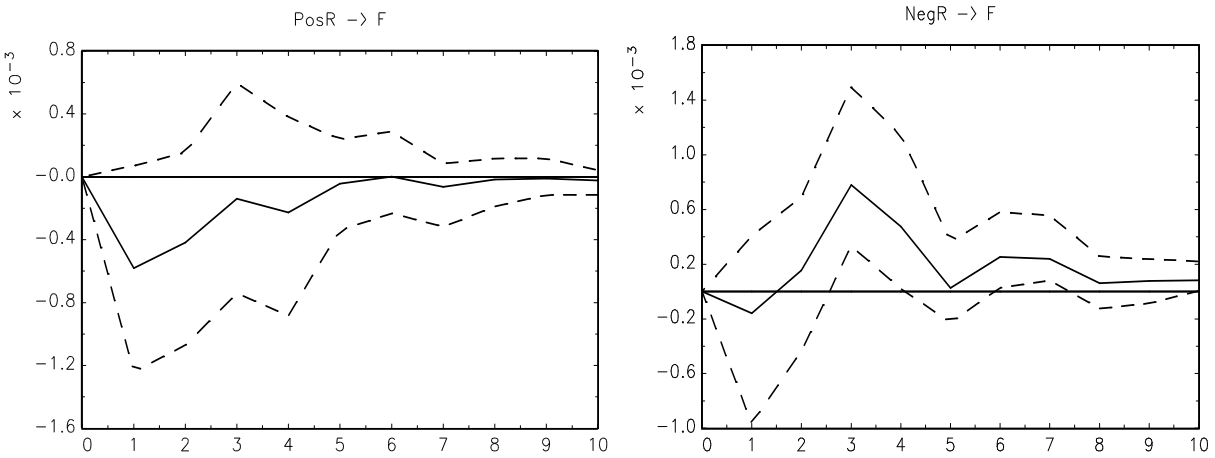
Proportions of forecast error in F accounted for by:			
forecast horizon	**W**	**F**	**R**
1	0.02	0.98	0.00
2	0.02	0.95	0.03
3	0.05	0.92	0.04
4	0.04	0.92	0.04
5	0.08	0.89	0.03
6	0.08	0.89	0.04
7	0.08	0.89	0.03
8	0.09	0.88	0.03
9	0.09	0.88	0.03
10	0.09	0.88	0.03

Proportions of forecast error in R accounted for by:			
forecast horizon	**W**	**F**	**R**
1	0.72	0.00	0.27
2	0.73	0.00	0.27
3	0.73	0.00	0.27
4	0.73	0.00	0.27
5	0.73	0.01	0.27
6	0.73	0.01	0.27
7	0.73	0.01	0.27
8	0.73	0.01	0.27
9	0.73	0.01	0.27
10	0.73	0.01	0.27

Note: W is MSCI World index returns.

Figure II.SP.2 below shows that the negative feedback trading is asymmetry also applies to Spain.

Figure II.SP.2: Asymmetry in Feedback Trading



The left panel shows net foreign flows' (F) response to positive local returns (RPOS), and the right panel shows *F*'s response to negative local returns (RNEG).

III. EMPIRICAL ANALYSIS PART II:
FOREIGN FLOWS – MACROECONOMIC ACTIVITY INTERACTION

This section presents the first ever investigation in the literature of a potential short-term interaction between equity portfolio flows of foreign investors and domestic macroeconomic activity in emerging markets. As suggested in the project proposal, a positive link between equity portfolio flows of foreigners and domestic macroeconomic activity is unlikely to reflect causality from foreign flows to domestic macroeconomic activity, as the size of portfolio flows are relatively small. It may reflect prediction of future macroeconomic activity or responding to information about current macroeconomic activity or factors that may lead to future macroeconomic activity. However, to the extent that there exists a link between equity portfolio flows of foreigners and other larger components of foreign capital (bond and money market portfolio flows and direct investment flows), equity portfolio flows might be a signaler of causal link between larger components of foreign capital and domestic macroeconomic activity.

Hence, the research questions to be investigated in this section are:

i) Do net foreign equity portfolio flows bear a relationship to domestic macroeconomic activity after controlling for the relationship between stock index returns and domestic macroeconomic activity?

ii) Can net foreign equity portfolio flows forecast future domestic macroeconomic activity?

iii) Does the forecast ability, if any, reflect causality or just prediction of information on future macroeconomic activity?

Empirical analyses in Part I and II complement each other and provide a unique contribution to the literature in that they explore whether the association between net foreign flows and returns reflects response

to information or noise. Only a study of the macroeconomic information can distinguish whether the positive association between foreigner's trading and stock market returns (at the expense of a negative association between locals' trading and stock market returns) is due to foreigners' responsiveness to information or just their dominance in emerging equity markets. In this respect, a further focus of analysis is on the portfolio rebalancing hypothesis widely used to explain the strong positive response of emerging market net foreign flows to home market returns. Portfolio rebalancing hypothesis has never been subjected to a test against the alternative that foreign flows may be responding to information conveyed by global developed market returns about global macroeconomic conditions that will affect emerging economies in the future. Such a test would be feasible by measuring the response of domestic macroeconomic variables to global stock index returns. Finally, tracking the effect of foreign portfolio inflows on the short-medium term future macroeconomic activity in emerging economies will explore a potential *reflexive* process (*Reflexivity* defined per Soros, 2008) by which foreign flows cause the future macroeconomic effects they are pricing-in (i.e. they dictate what the reality has to be in the short-medium term in emerging markets).

When launching the project, I was expecting to find some degree of forecast ability and even causality with respect to questions (ii) and (iii). However, the results of Ülkü and Weber (2010), in particular the surprising finding that returns are more likely to affect net foreign flows rather than net flows affecting returns, has dramatically changed my expectations of the results in this section.

III.A. Data

In this Section, in addition to foreign flows and returns data described in Section II, we use data on macroeconomic activity. The most comprehensive indicator of domestic macroeconomic activity is GDP, hence real GDP growth is the first variable we employ. We also use industrial production, exports, consumer confidence, business confidence, and domestic credit volume, which are indicators of specific components of domestic macroeconomic activity.

In this Section, we focus only on markets where we were convinced in Section II of the accuracy of the foreign flows data. Thus, we include only Turkey, Hungary, Poland, Czech Republic and Greece in the analysis in Section III. As the availability of macroeconomic data varies across countries, the macroeconomic variables we are employing do slightly differ from one country to another. The data frequency is dictated by the frequency of macroeconomic data. Hence, we perform a quarterly analysis with GDP and a monthly analysis with all other macroeconomic variables that are available at the monthly frequency. The sample lengths are mostly dictated by the availability of the foreign flows data as in Section II, however there are a few macroeconomic data items which are available only from a later date, in which case we perform the specific analysis on a shorter sample period than dictated by the availability of foreign flows data.

The data are usually obtained from Central Banks and National Statistics offices in respective countries, and in some cases we used databases of www.tradingeconomics.com, IMF and OECD. GDP is

defined to be the real change in GDP adjusted for seasonality. Exports, industrial production and domestic credit figures are in growth rates (i.e. first difference of logarithms). Where the data provider already reports the logarithmic growth rates, we use the data in its original form, otherwise we calculate inflation adjusted logarithmic growth rates before using the data. Whenever the data display significant seasonality, we perform a seasonal adjustment. In some cases, we were able to obtain data adjusted for seasonal and calendar effects (e.g. Hungary industrial production). For Business and Consumer Confidence indices, we use monthly first differences. In some cases, usually with GDP and credit volume data, we could not reject the null hypothesis of a unit root, hence we employed a further differencing. Using credit volume data, we have noticed that credit volume is contemporaneously significantly positively related to the exchange rate (i.e. credit volume expands in months when the domestic currency depreciates). This appears to be a consequence of part of the domestic loans being denominated in foreign currency (this is the case for especially Hungary and Turkey). Hence, in credit volume analyses, we control for the effect of the contemporaneous exchange rate changes by including exchange rate returns in the VAR system as an exogenous variable.

As the definitions of available data vary from one country to another, below we list brief definitions of the variables used in each country analysis. (abbreviations: Q=quarter, M=month, Y=year).

Hungary:

GDP: (1999 Q1 – 2010 Q3) real growth rate with respect to the previous Q of the same Y, seasonally adjusted. Source: Hungarian Statistical Office.

Industrial Production: (1999 January – 2010 November) real growth rate with respect to the previous M of the same Y, adjusted for seasonality and calendar effects. Source: Hungarian Statistical Office.

Consumer, Business, Industrial Confidence indices: (1999 January – 2010 November) index numbers. Source: Economic Research Institute, http://gki.hu/en/konjunkturakutatas/. We used first differences.

Credit Volume: Loans to non-financial corporations, Loans to households. (2000 January – 2010 October). Source: MNB (data at the monthly frequency privately obtained).

Turkey:

GDP: (1998 Q2 – 2010 Q3) real growth rate with respect to previous Q of the same Y. Source: www.tradingeconomics.com. We performed seasonal adjustment.

Industrial Production: (1999 January – 2010 November) Deseasonalized real production index. Source: Statistical Office of Turkey. We computed growth rate with respect to the previous M of the same Y. We removed 2005 January observation due to basis change in the index.

Exports: (1997 January – 2010 August) Quantity index. Source: Statistical Office of Turkey. We used the first difference of growth rates with respect to the same M of the previous Y.

Consumer Confidence Index: (2002 January – 2010 September) Source: CNBC-e. We used first difference of the index.

Total Bank Loans (excluding financial corporations and government): (1997 January – 2010 September) in Turkish Lira. Source: Central Bank of Republic of Turkey. We used inflation adjusted growth rates with respect to previous month.

Consumer Loans: (2000 June – 2010 September) in Turkish Lira. Source: Central Bank of Republic of Turkey. We used inflation adjusted growth rates with respect to previous month.

Poland:

GDP: (2000 Q1 – 2010 Q3) real growth rate with respect to previous Q of the same Y. Source: www.tradingeconomics.com. Seasonality is not significant.

Industrial Production: (2000 January – 2010 November) Production Index adjusted by PPI and deseasonalized. Source: OECD. We computed the first difference of the growth rate with respect to the previous M of the same Y.

Manufacturing Confidence: (2000 January – 2010 November) Source: Central Statistical Office of Poland. We performed seasonal adjustment.

Exports: (2000 January – 2010 October) Growth rate in export volume index in constant prices, with respect to same M of the previous Y. Source: Central Statistical Office of Poland.

Consumer Confidence Index (CCI): (2003 January – 2010 July) Source: www.tradingeconomics.com. We computed the first difference of index numbers.

Czech Republic:

GDP: (2003 Q1 – 2010 Q3) seasonally adjusted real growth rate with respect to previous Q of the same Y. Source: Czech National Bank.

Industrial Production: (2003 January – 2010 October) real change with respect the same M of the previous Y. Source: www.tradingeconomics.com. We use first difference.

Export: (2003 January – 2010 October) in CzKr. We use first difference of the change with respect to the same M of the previous Y. (Note: We have checked whether the export figures in CzKr may have been affected by the exchange rate. We have found a negative contemporaneous month correlation between exchange rate, defined as the price of Euro in CzKr, and export growth of -0.15, whereas a mechanic translation effect would suggest a positive effect. Probably, CzKr exchange rate returns pick some of the effect of *E*, hence we decided not to control by including exchange rate returns exogenously in the system).

Consumer Credit excluding house purchase: (2005 November – 2010 October) in Cz.Kr. Source: Czech National Bank. We use inflation adjusted monthly growth rates. We detected no impact from exchange rates, however we noticed a seasonality whereby December figures are higher than the other months and corrected. June 2010 figure is removed due to a statistical adjustment by CNB.

Greece:

GDP: (2004 Q2 – 2010 Q3) real growth rate with respect to previous Q of the same Y. Source: www.tradingeconomics.com. We perform seasonality adjustment.

Industrial Production: (2004 March – 2010 November) growth rate in the industrial production index. Source: National Statistical Service of Greece. We use the first difference of the log change with respect to same M of the previous Y.

Export: (2004 March – 2010 December) Figure in euro. Source: www.tradingeconomics.com. We use first difference of the log change with respect to same M of the previous Y.

Corporate Credit: Month end credit volume in Euro. (March 2004 – October 2010) Source: Bank of Greece. We use first difference of the log change with respect to the same M of the previous Y.

Household Credit: Month end credit volume in Euro. (March 2004 – October 2010) Source: Bank of Greece. We use first difference of the log change with respect to the same M of the previous Y.

Retail Trade Index: (January 2005 – September 2010). Source: National Statistical Service of Greece.

Obviously, the set of macroeconomic variables is not exhaustive, and open to further explorations based on the interpretations of results obtained in this section and discovery of new data sources.

III.B. Methodology

In this section, we employ a similar VAR model as used in Section 2. We are particularly interested in the short-medium term response of macroeconomic variables to net foreign flows and global and local stock market returns, and the short term response of foreign flows and local stock market returns to shocks in macroeconomic activity. Normally, controlling for cointegration relationships would be important because of the possibility of an error correction (long run) relationship between the levels of the variables. However, short term dynamic responses portrayed via IRF's are more informative than cointegrating equations, and by allowing a generous lag structure (a uniform lag order of 4) we take into account responses which may not be significant at individual lags but are so cumulatively. Moreover, as a robustness check, we have replicated many of the results under the structural VECM (i.e. cointegrating VAR) specification which includes an error correction term, and the results were qualitatively similar to those under SVAR. In cases when one of the variables in the system is I(1), we performed this robustness check and tested for a cointegrating relationship using the Johansen framework:

$$\Delta \boldsymbol{y_t} = \boldsymbol{\delta} + \sum_{p=1}^{p-1} \Gamma \Delta y_{t-1} + \Pi y_{t-p} + \boldsymbol{\varepsilon_t} \qquad (3.1)$$

where y′ = [*E*, *F*, *R*, *Y*] is the variables in levels, *Y* is the particular macroeconomic variable studied, **Γ** is a 4x4 matrix of VAR coefficients, Δ is the first difference operator, and $\boldsymbol{\varepsilon_t}$ is a (4x1) vector of error terms. **Π** can be decomposed as $\boldsymbol{\alpha\beta'}$ where **β** represents the cointegrating equation and **α** represents the error correction coefficients. VECM results following the cointegrating VAR model of Lütkepohl and Krätzig (2004) are available upon request from the author.

Once again, we control the interaction between local returns, foreign flows and domestic macroeconomic activity for world stock market returns, which are a proxy for global effects on all domestic variables. To keep the VAR model parsimonious in the face of small sample sizes, which is particularly problematic with quarterly data, we include only *E* (the global developed market returns proxied by MSCI Europe index), and drop *EM* (global emerging market returns). We believe that global macroeconomic effects are well represented by *E* rather than by *EM* as *EM* is affected by the relative performance of (mostly Asian and BRIC) emerging stock markets which is less relevant for countries studied in our sample when it comes to macroeconomic interaction. As in Empirical Analysis Part I, all local variables, including macroeconomic variables, are restricted from affecting world stock index returns (*E*) both contemporaneously and at lags.

The major difference in the SVAR models employed in this part as compared to that employed in Part I is in contemporaneous identification restrictions. We allow *F* and *R* to affect macroeconomic variables contemporaneously only in the case of Consumer and Business Confidence indices and Credit volume. In all other macroeconomic variables, specifically GDP, Industrial Production and Exports, we only allow one way contemporaneous effect from macroeconomic variables towards *F* and *R* (the structural identifying restrictions matrix is illustrated in Figure 3.1 below using the example of GDP). The justification for this assumption comes from an understanding that market participants, including foreign investors, can observe macroeconomic activity simultaneously and adjust their trading accordingly, while any wealth effect from *R* on macroeconomic activity or any expansionary (contractionary) effect of foreign capital in(out)flows on real activity can come with some lag.

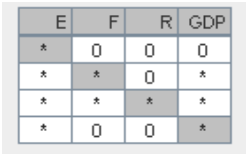


Figure III.1. The structural factorization matrix (see Equation 2.2) used for variables GDP, Industrial Production and Exports.

III.C. Foreign Flows – Domestic Macroeconomic Activity Interaction Results

As the variables, possibly macroeconomic structures, differ across countries in our sample, we report results on an individual country basis rather than pooling together. We start with Turkey, where we have the most reliable data. In each of the figures presented below, we track the response of the macroeconomic variable to a 1–standard deviation shock in *E*, *F*, and *R*, then the responses of local variables *F* and *R* to a 1–standard deviation shock in the macroeconomic variable. As the equity portfolio flows are relatively small compared to bond and money market flows[19], we interpret the lagged response of macroeconomic variables to *F* over the

[19] For example, in Hungary between 1995-2010, the total net portfolio inflow into equities has been 21.9 times smaller than the total net foreign inflow into bonds and money market instruments, 45.4 times smaller than the total net direct

next 1-4 months as forecast ability rather than causality unless intuition suggests a mechanism by which net foreign flows may have a *causing* effect. Where such mechanisms exist (e.g. credit volume), however, we also discuss the possibility that causing and forecasting may both be the case. Note that in this section we report cumulative IRFs (as opposed to reporting individual periods' IR coefficients) which enables us to portray total net effects as responses at individual lags may be too noisy.

III.C.TR. Turkey Results

Panel A of Figure III.TR.1 below shows that a shock in *E* (global market returns) has a permanent positive effect on GDP growth. As *E* (i.e. market participants setting *E*) is not supposed to forecast Turkey's GDP, we interpret this as causality from global stock markets into emerging real economies, possibly implying that *E* contains information on global macroeconomic conditions that have spillover effects on emerging economies. The impact of *E* on Turkey's GDP is economically significant as it accounts for about 38% of forecast error variance in Turkey's GDP growth (see Table III.TR.1). Panel B indicates that net foreign flows into Turkish stock market (*F*) have a temporary positive effect on Turkey's GDP over the subsequent four quarters which is partly reversed thereafter. It must be noted that this result is to some degree sensitive to the specification (in particular to the choice of the lag length), but under most plausible specifications we obtain the same result. The positive impact of F can account for 6% of the forecast error variance of Turkey's GDP by the fifth quarter. We interpret this as forecast ability of net foreign flows of future GDP growth rates. This provides the first externally-verified evidence in the literature that foreign investors' trading is positively correlated with information and that local investors' trading is negatively correlated with information. Panel C indicates that ISE index returns (R) predict GDP growth 1-3 quarters ahead, but the subsequent reversal indicates that local factors exert only a temporary effect which is totally reversed later. *R* can account for about 5% forecast error variance in GDP growth. Recall that our specification shows the responses of GDP to each of *E*, *F* and *R* after controlling for the other two. Hence, we can conclude that local effects to GDP are fragile while global effects are permanent. Further, if *R* had a significant wealth effect, GDP's response to *R* should have been permanent. As it is not, we rule out any causal effect of local stock market returns (i.e. wealth effects) on Turkey's GDP, and attribute the positive response in the first three quarters as forecast ability. This interpretation is consistent with the observation that *R* has no forecast ability on GDP growth after the fourth quarter. Whereas, part of *F*'s effect, which remains permanent, can be attributed to net foreign flows *causing* local GDP growth. Potential mechanisms that may lead to this causation are investigated later below.

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investment inflow (all in Euro). Obviously, comparing total figures might be misleading as equity flows are more volatile. Yet, when compared in quarterly average absolute terms, net flow into equities are still 3.3 and 3.4 times smaller compared to bond and money market flows and direct investment flows.

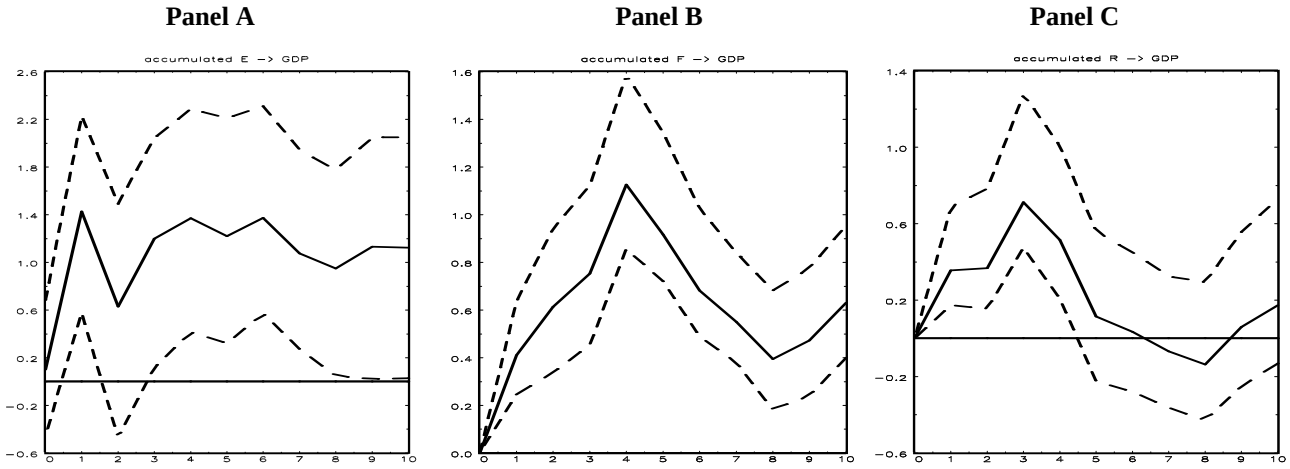


Figure III.TR.1. Cumulative IRFs of Turkey's GDP to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and ISE index returns *R* (Panel C).

Proportions of forecast error in GDP accounted for by:				
forecast horizon	**E**	**F**	**R**	**GDP**
1	0.01	0.00	0.00	0.99
2	0.37	0.00	0.03	0.60
3	0.38	0.01	0.03	0.58
4	0.41	0.01	0.04	0.54
5	0.40	0.06	0.04	0.50
6	0.39	0.06	0.05	0.49
7	0.39	0.06	0.05	0.49
8	0.39	0.06	0.05	0.50
9	0.38	0.07	0.05	0.49
10	0.38	0.07	0.05	0.49

Table III.TR.1. Variance decomposition for Turkey's GDP

Figure III.TR.2 below suggests that GDP growth attracts future net foreign flows while it negatively affects future local returns. The latter probably reflects the typical overreaction pattern of ISE returns: *R* predicts future GDP growth, probably overreacts to it when it is still private information, starts to correct during the period it is realized and continues to correct over the next three quarters. As GDP does not reverse the response to its own shocks (result available from the author), we should interpret this as market's overreaction and then correction, rather than lack of sustainability of growth. Having said that, it should be noted that *R*'s response to GDP is not economically very significant (only 5% explained by GDP, see Table III.TR.2), while *F*'s response is economically quite significant (22% explained by GDP) providing strong evidence that foreign investors' trading is correlated with information.

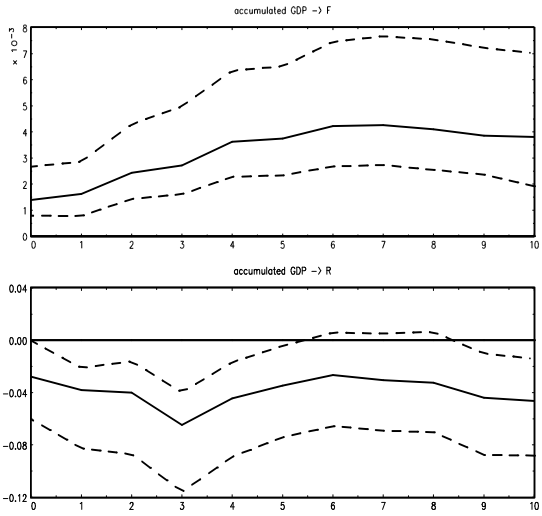


Figure III.TR.2. Cumulative IRF's of net foreign flows *F* (upper panel) and ISE index returns *R* (lower panel) to a 1-standard deviation shock in GDP growth.

Proportions of forecast error in F accounted for by:				
forecast horizon	**E**	**F**	**R**	**GDP**
1	0.39	0.42	0.00	0.19
2	0.38	0.38	0.07	0.17
3	0.39	0.37	0.07	0.18
4	0.38	0.36	0.07	0.19
5	0.36	0.34	0.07	0.22
6	0.36	0.34	0.07	0.22
7	0.36	0.34	0.07	0.22
8	0.37	0.34	0.07	0.22
9	0.37	0.34	0.07	0.22
10	0.37	0.34	0.07	0.22

Proportions of forecast error in R accounted for by:				
forecast horizon	**E**	**F**	**R**	**GDP**
1	0.66	0.03	0.31	0.00
2	0.62	0.06	0.31	0.01
3	0.62	0.08	0.29	0.01
4	0.61	0.09	0.29	0.01
5	0.60	0.09	0.28	0.03
6	0.59	0.09	0.28	0.05
7	0.59	0.09	0.28	0.05
8	0.58	0.09	0.28	0.05
9	0.58	0.09	0.28	0.05
10	0.58	0.09	0.27	0.05

Table III.TR.2. Variance decompositions for *F* and *R* when the model includes Turkey's GDP

All of the following analyses are at the monthly frequency. Figure III.TR.3 shows the response of Turkey's Industrial Production (IP) to *E*, *F*, and *R*, respectively, and enhances the results derived from the GDP analysis with better statistical significance thanks to larger number of observations. Now, it is clear that world stock index returns (E) cause Turkey's industrial production with a 2-3 month lag and their impact remains permanently. As table III.TR.3 suggests, about 10% of the variation in Turkey's industrial production can be attributed to *E* (the lower figure with Industrial Production compared to with GDP may be due to the fact that monthly Industrial Production is a noisier variable compared to quarterly GDP). The impact of *F* is also significantly positive. The faster impact at the 1 month lag may be an indication that foreign flows both forecast and cause Industrial Production. The causal effect, which appears to come at further lags, appears to be permanent. The permanent impact of local returns is insignificant, with an interesting temporary positive impact in the fourth month following the shock.

Panel A **Panel B** **Panel C**

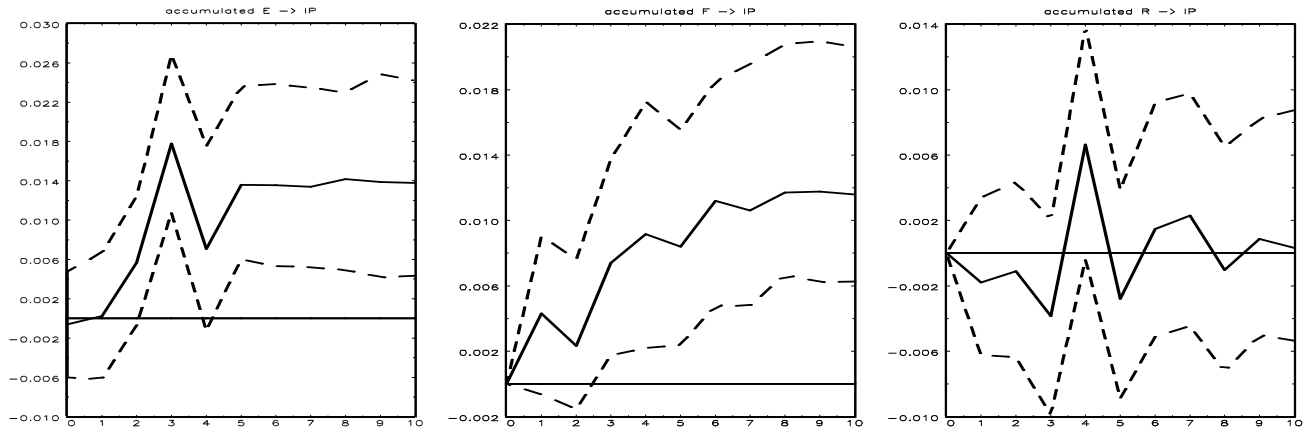


Figure III.TR.3. Cumulative IRFs of Turkey's Industrial Production (IP) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and ISE index returns *R* (Panel C).

Proportions of forecast error in IP accounted for by:				
forecast horizon	**E**	**F**	**R**	**IP**
1	0.00	0.00	0.00	1.00
2	0.00	0.01	0.00	0.99
3	0.01	0.01	0.00	0.98
4	0.06	0.02	0.00	0.92
5	0.10	0.02	0.04	0.85
6	0.10	0.01	0.07	0.81
7	0.10	0.02	0.07	0.81
8	0.10	0.02	0.07	0.81
9	0.10	0.02	0.08	0.80
10	0.10	0.02	0.08	0.80

Table III.TR.3. Variance decomposition for Turkey's Industrial Production (IP)

As seen in Figure III.TR.4 below, the response of *F* to Industrial Production is insignificant. *R* exhibits some initial negative response, which is hard to explain, however it economically insignificant (only 3% of forecast error variance of *R* is accounted for by Industrial Production).

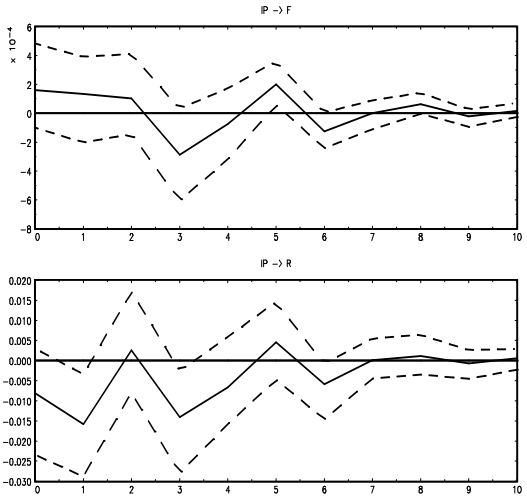


Figure III.TR.4. Cumulative IRF's of net foreign flows *F* (upper panel) and ISE index returns *R* (lower panel) to a 1-standard deviation shock in Industrial Production (IP).

Figure III.TR.5 below shows the response of Consumer Confidence Index (CCI) to *E*, *F*, and *R*, respectively. Recall that the contemporaneous identification assumption changes here: we allow stock market returns and net foreign flows to affect consumer confidence contemporaneously. The results below convincingly validate our choice: The public mood appears to be immediately affected by publicly observable variables such as world and local stock market returns (which are perceived as barometers of current economic situation by the public and media) while net foreign flows as a non-salient piece of statistical information has no incremental effect. It is striking to note that 37% of Turkish consumer's confidence can be accounted for by world stock returns while local stock returns can explain only 10% of it (Table III.TR.4). This plays down the role of wealth effects, which is no surprise given that only 30% of the local stock market capitalization is held by Turkish residents and stock market investment is not a culture in Turkey. Note, however, that the impact of stock market returns on consumer confidence is partly reversed in subsequent months, but the permanent effect remains positive and significant.

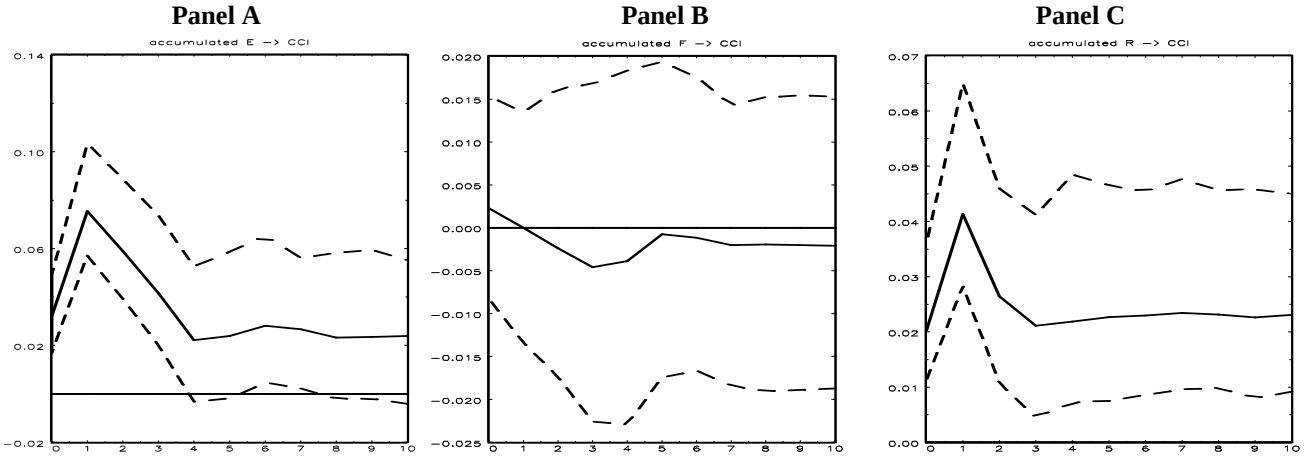


Figure III.TR.5. Cumulative IRFs of Turkey's Consumer Confidence Index (CCI) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and ISE index returns *R* (Panel C).

Proportions of forecast error in CCI accounted for by:				
forecast horizon	**E**	**F**	**R**	**CCI**
1	0.15	0.00	0.05	0.79
2	0.32	0.00	0.09	0.59
3	0.32	0.00	0.10	0.57
4	0.34	0.00	0.10	0.55
5	0.37	0.00	0.10	0.53
6	0.37	0.00	0.10	0.53
7	0.37	0.00	0.10	0.53
8	0.37	0.00	0.10	0.53
9	0.37	0.00	0.10	0.53
10	0.37	0.00	0.10	0.53

Table III.TR.4. Variance decomposition fro Turkey's Consumer Confidence Index (CCI)

Figure III.TR.6. below shows the response of foreign flows and local returns to shocks in CCI. The response of both *R* and *F* to CCI is positive and significant, consistent with the well-known immediate positive response of US and European stock markets to the announcement of such data though the response here is

spread over 2 subsequent months. Both *F*'s and *R*'s response to CCI remain permanent. CCI can explain 7% and 2% of the forecast error variance of *F* and *R*, respectively.

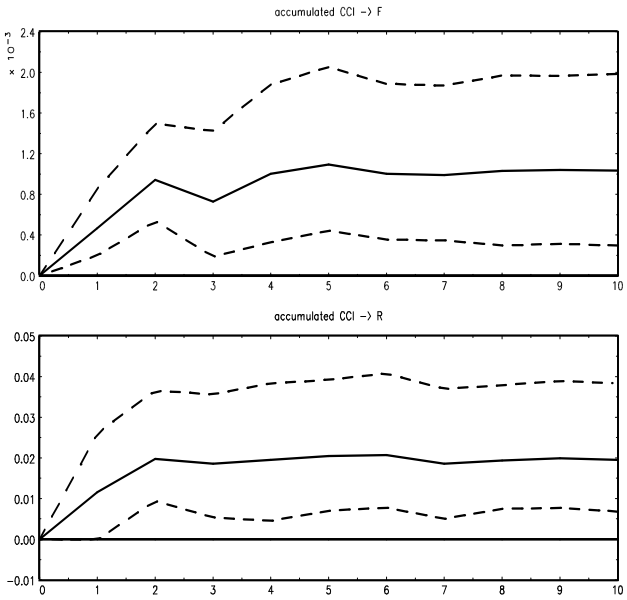


Figure III.TR.6. Cumulative IRF's of net foreign flows *F* (upper panel) and ISE index returns *R* (lower panel) to a 1-standard deviation shock in Consumer Confidence Index (CCI).

Figure III.TR.7. below shows that the response of Turkey's exports to *E*, *F* and *R* is qualitatively similar to Industrial Production's response: Global stock index returns and net foreign flows have a positive impact on Turkey's exports, the quicker response to *F* can be interpreted as foreign investors forecasting the activity level in Turkey's export sector one month ahead. However, the results with exports are less significant both statistically and economically, with *E* accounting for only 1% of the forecast error variance in Turkey's export.

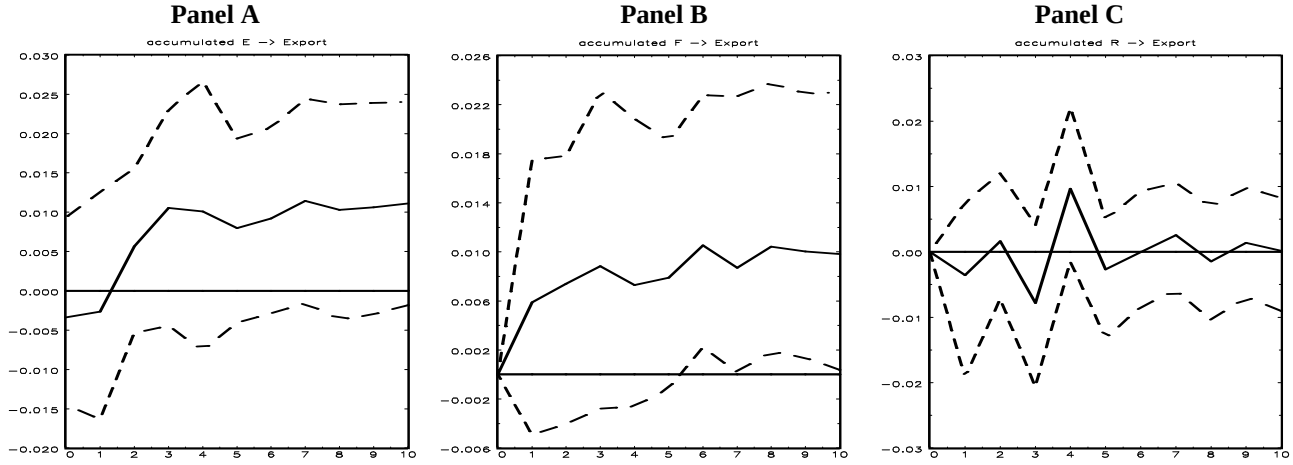


Figure III.1.7. Cumulative IRFs of Turkey's Exports to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and ISE index returns *R* (Panel C).

Figure III.TR.8 below suggests local returns respond positively to export growth while the response of net foreign flows to export is insignificant. The latter, together with the result in Panel B of Figure III.TR.7, implies that foreign investors may have some advantage in forecasting Turkey's export which they can exploit as exports lead local stock returns, however the economic significance of this advantage is quite low. Remember that Turkey's exports are associated with imports hence lead to wider current account deficits.

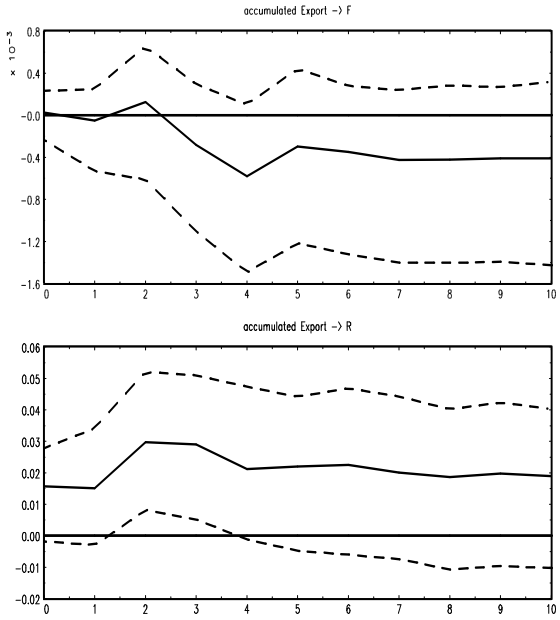


Figure III.TR.8. Cumulative IRF's of net foreign flows *F* (upper panel) and ISE index returns *R* (lower panel) to a 1-standard deviation shock in Exports.

Now, we shift our focus to a variable which can act as a mechanism that may help explain the association between current net foreign flows and future domestic macroeconomic activity: total bank credit excluding financial institutions expressed in monthly real log change (Cr). First of all, it should be noted that ADF test for *Cr* is inconclusive in rejecting the null hypothesis of a unit root: In unit root test equation specification, AIC suggests 6 lags, while HQ and Schwarz criteria suggest 2 lags, and the test rejects the null of a unit root with 2 lags at 1% but not with 6 lags. Thus, we performed robustness checks i) by employing a cointegrating VAR approach ii) by employing the first difference of *Cr* (Dcr). The results with both *Cr* and *Dcr* turned out to be qualitatively similar, so our conclusions derived from Figures III.TR.9.A and III. TR.9.B are robust.[20] Note also that we control for exchange rate changes that enter the system as an exogenous variable (i.e. VARX model), as some of bank loans are denominated in foreign currency such that positive news for Turkey that appreciate the Turkish Lira appear to result in a contemporaneous contraction in the credit volume. Failure to do so results in the contemporaneous response of Dcr to all variables *E*, *F* and *R* to start with a negative value.

[20] VECM specification turned out to be more problematic as it is difficult to ensure that all variables are of the same order of integration.

Figure III.TR.9.A below shows the response of *Cr* to *E*, *F*, and *R*. A first point to note is the high persistence in *Cr*, as seen in Panel D. This causes to responses of *Cr* to stabilize after the 10th period, hence we depict IRFs with 20 periods. Panel A and B show that domestic credit volume in Turkey is strongly positively related to global factors, while local factors appear to be insignificant as seen in Panel C. This confirms the key hypothesis implicitly underlying this project work: The main constraint in the large-external deficit economies in emerging Europe is the availability of capital, and further the main source of capital is the foreign capital. Perhaps, it should be noted that Turkey is more severely exposed to capital constraints, thus to global factors affecting international capital flows, while EU members like Poland, Hungary, Czech Republic and Greece have access to EU funds, thus the impact of global factors can be expected to be alleviated. Note also that *F* has a faster impact on *Cr* than *E* has. For example, by the fourth month following the shock, *F* (*E*) can explain 13% (only 3%) of the forecast error variance in *Cr* (Table III.TR.5). However, by the end of the 10th month forecast error variance accounted for by *E* and *F* becomes equal around 13%. We interpret this as *E* representing factors that eventually increased credit availability in Turkey, while is *F* is directly one of these factors. Figure III.TR.9.B below confirms the robustness of the qualitative results stated above.

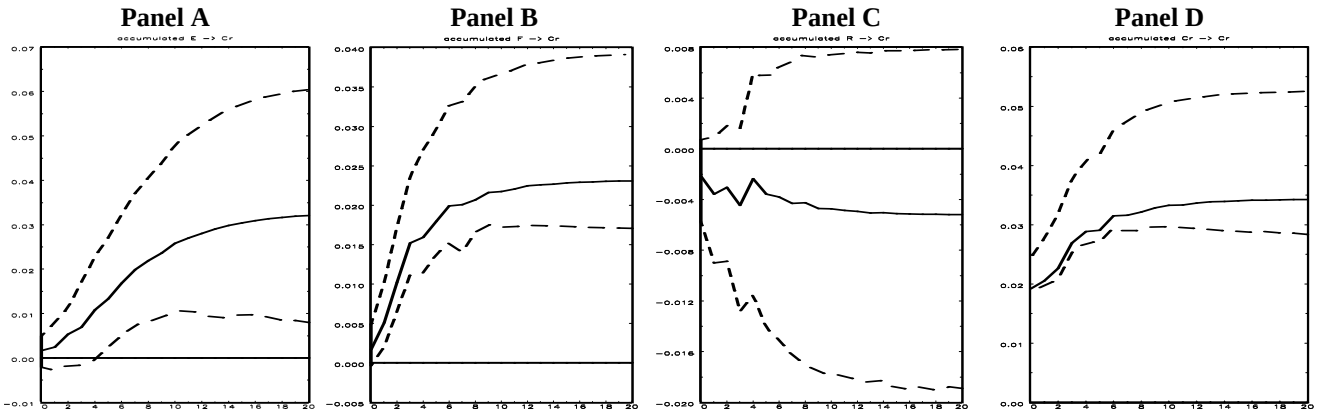


Figure III.TR.9.A Cumulative IRFs of Domestic Credit Volume (Cr) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and ISE index returns *R* (Panel C). Panel D shows the impulse response of *Cr* to a shock in itself.

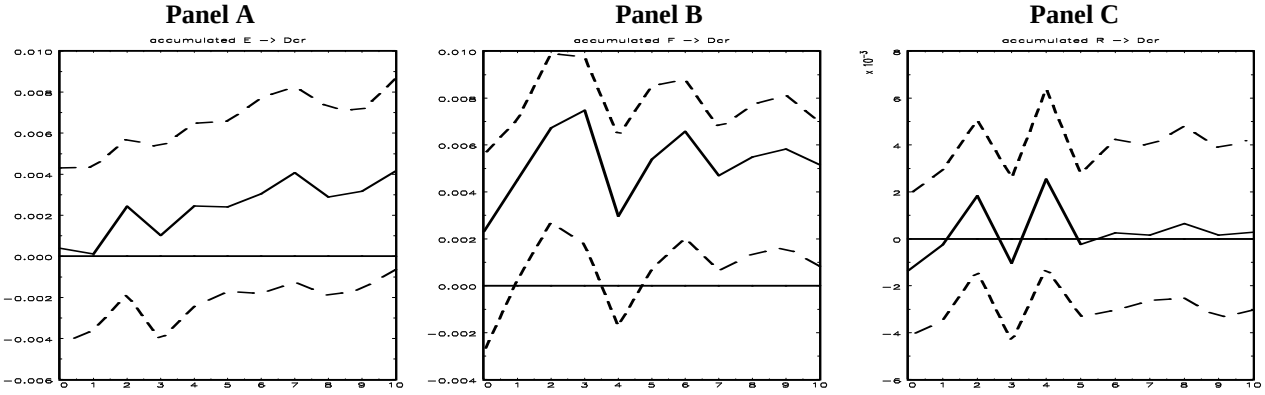


Figure III.TR.9.B Cumulative IRFs of domestic Credit volume in first-difference form (Dcr) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and ISE index returns *R* (Panel C).

Proportions of forecast error in Cr accounted for by:				
forecast horizon	**E**	**F**	**R**	**Cr**
1	0.01	0.01	0.01	0.97
2	0.01	0.04	0.02	0.94
3	0.03	0.09	0.02	0.86
4	0.03	0.14	0.02	0.82
5	0.06	0.13	0.03	0.79
6	0.07	0.14	0.03	0.77
7	0.09	0.14	0.03	0.75
8	0.10	0.13	0.03	0.73
9	0.11	0.13	0.03	0.73
10	0.12	0.13	0.03	0.72

Table III.TR.5. Variance decomposition for total bank credit volume (Cr) in Turkey

These results suggest an important role for foreign equity portfolio flows in forecasting future domestic credit growth. Notice the difference between *Cr*'s contemporaneous response to *E* and *F*: While *E*'s impact becomes significant only at lags, *F*'s positive impact starts from the contemporaneous period. This suggests that *Cr*'s response to *F* may not only reflect *forecasting* but also possibly *causing*, yet we know that equity portfolio flows are too small to cause a significant change in domestic credit volume. This opens up a new research question: Are the equity portfolio flows positively correlated to bond and money market flows? We are currently addressing this question, results will be available in one of the upcoming papers we list under the extensions of the project work.

The impulse responses of *F* and *R* to *Cr* are robust in that we obtain the same conclusion under all specification: *Cr* does not appear to have a significant impact on net foreign flows and local returns (see Figure III.TR.10 below).

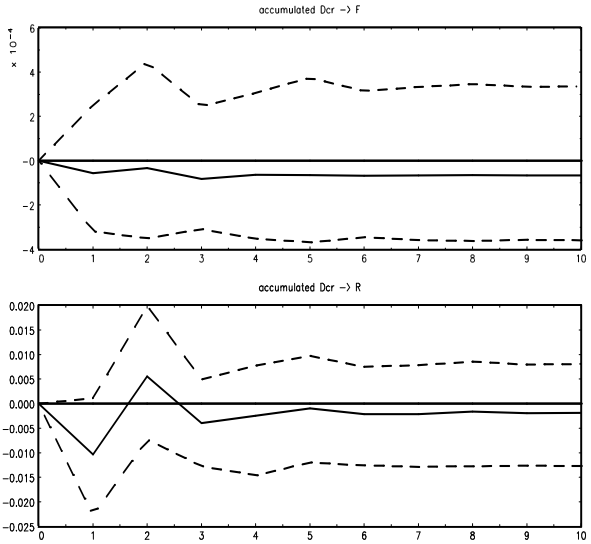


Figure III.TR.10. Cumulative IRF's of net foreign flows *F* (upper panel) and ISE index returns *R* (lower panel) to a 1-standard deviation shock in total domestic credit. The results with *Cr* and *Dcr* are basically the same.

Figure III.TR.11, III.TR.12 and Table III.TR.5 portray similar results with consumer credit volume. (As consumer credit volume shows little sensitivity to exchange rate changes, we drop exchange rate returns as the exogenous control variable here).

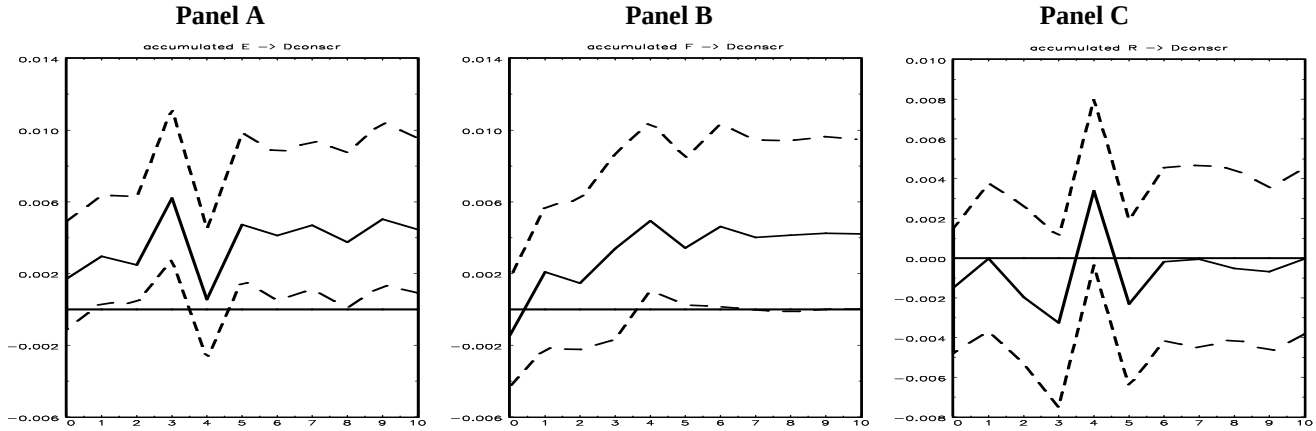


Figure III.TR.11 Cumulative IRFs of Consumer Credit volume in first-difference form (Dcr) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and ISE index returns *R* (Panel C).

Proportions of forecast error in Dconscr accounted for by:				
forecast horizon	**E**	**F**	**R**	**Dconscr**
1	0	0.02	0.00	0.98
2	0.01	0.10	0.00	0.89
3	0.01	0.13	0.00	0.85
4	0.09	0.12	0.00	0.79
5	0.15	0.11	0.02	0.71
6	0.16	0.11	0.05	0.68
7	0.16	0.10	0.06	0.68
8	0.16	0.10	0.06	0.68
9	0.16	0.10	0.06	0.68
10	0.16	0.10	0.06	0.67

Table III.TR.6. Variance decomposition for consumer credit volume (Dconscr) in Turkey

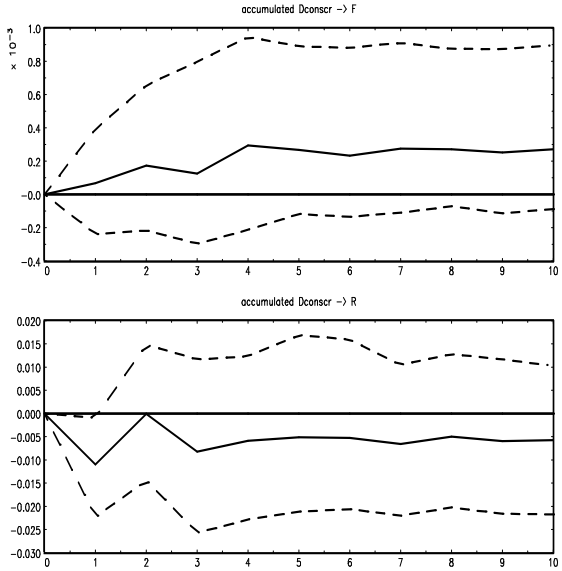


Figure 3.TR.12. Cumulative IRF's of net foreign flows *F* (upper panel) and ISE index returns *R* (lower panel) to a 1-standard deviation shock in consumer credit. The results with *Conscr* and *Dconscr* are basically the same.

III.C.HU. Hungary Results

Hungary's GDP growth, our first variable of interest, turns out to fail to reject the null of a unit root, hence we report results with its first difference (dGDP). Figure III.HU.1 shows that the responses of GDP display some differences from those on Turkey. The impact of *E* on GDP comes faster, but partially reversed later. The economic significance of *E* is similar to that in Turkey (i.e. about 25-35%, depending on the specification chosen, of GDP's forecast error variance can be accounted for by *E*). The temporary negative association between *F* and future GDP (two quarters ahead) is a quite surprising result for which we currently have no explanation. We suspect that net foreign flows might be negatively responding to past returns which predict future GDP growth, and the persistence in GDP growth in Hungary, which also caused the failure to reject the null of a unit root, leads to a negative association between *F* and future GDP growth. As *F* and *E* are highly correlated, the residuals of *F*, which reflect negative feedback trading, do probably negatively predict future GDP growth which is persistent. Small sample size might be magnifying this outcome. Local returns (*R*) have significant ability to forecast GDP growth over the coming 1-3 quarters, which is partially reversed thereafter. Hence, the role of domestic factors appears to be more significant in Hungary than in Turkey. We interpret this as Hungary, unlike Turkey, having access to more stable sources of foreign capital.

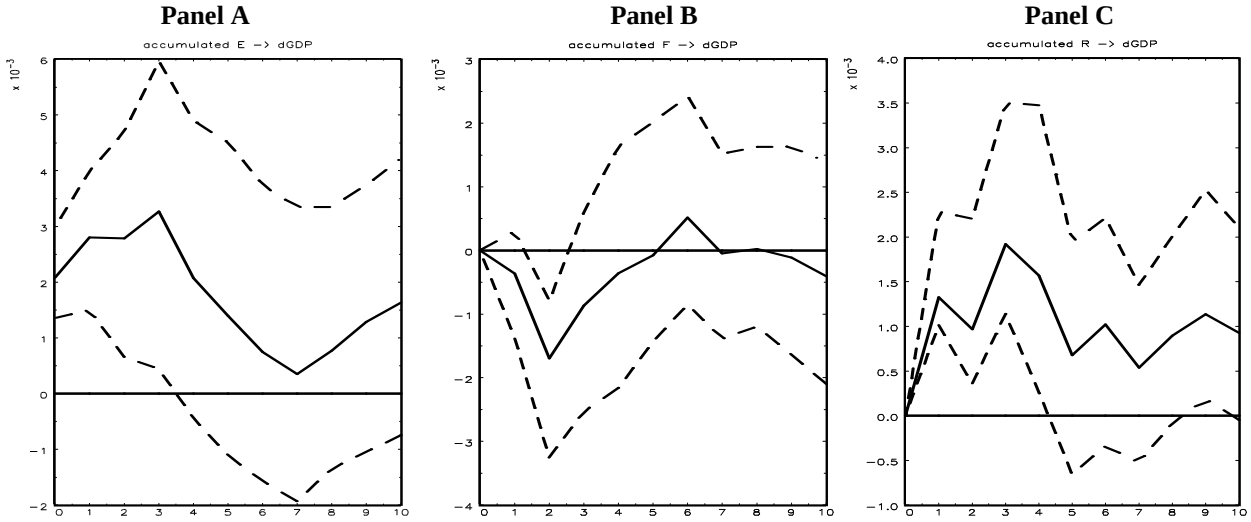


Figure III.HU.1. Cumulative IRFs of Hungary's GDP (*dGDP*) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and BUX index returns *R* (Panel C).

By the third month, *E* is still economically the most significant factor that can account for 26% of the forecast error variance of Hungary's GDP (Table III.HU.1).

Proportions of forecast error in dGDP accounted for by:				
forecast horizon	**E**	**F**	**R**	**dGDP**
1	0.32	0.00	0.00	0.68
2	0.30	0.01	0.11	0.58
3	0.26	0.10	0.10	0.55
4	0.24	0.12	0.13	0.50
5	0.26	0.11	0.12	0.51
6	0.26	0.11	0.14	0.49
7	0.26	0.12	0.14	0.48
8	0.26	0.12	0.14	0.47
9	0.26	0.12	0.14	0.48
10	0.27	0.12	0.14	0.47

Table III.HU.1. Variance decomposition for Hungary's GDP

The lower panel of Figure III.HU.2 below shows that BUX returns positively respond to GDP growth contemporaneously and at the first two lags, and later partially reverse this initial response. The positive response is in contrast to the results on Turkey, and we can attribute it to growth being more fragile in Turkey where market's display a learned pattern of initially overreacting to the expectation of future growth and correcting when it comes true. Hence, the response BUX returns appear to be more "normal". Yet, the explanatory power of GDP growth on local returns in Hungary is quite low. While *E* can account for 68% of quarterly BUX returns, GDP growth can only account for 3% (Table III.HU.2). The initial lack of response and a late response of *F* to GDP growth (the upper panel) is surprising once again. We do not have reliable explanation for this pattern, and the suspected explanation stated above also applies here.

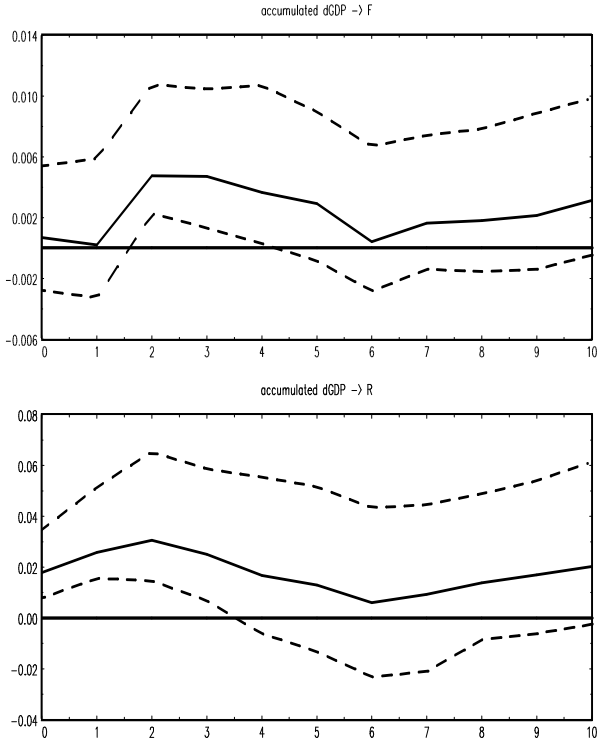


Figure III.HU.2. Cumulative IRF's of net foreign flows *F* (upper panel) and BUX index returns *R* (lower panel) to a 1-standard deviation shock in GDP growth.

Proportions of forecast error in F accounted for by:				
forecast horizon	E	F	R	dGDP
1	0.17	0.83	0.00	0.00
2	0.16	0.77	0.07	0.00
3	0.21	0.68	0.06	0.06
4	0.19	0.64	0.12	0.05
5	0.23	0.61	0.11	0.05
6	0.24	0.60	0.11	0.05
7	0.24	0.59	0.11	0.06
8	0.24	0.59	0.11	0.07
9	0.24	0.58	0.11	0.06
10	0.24	0.58	0.11	0.07

Proportions of forecast error in R accounted for by:				
forecast horizon	E	F	R	dGDP
1	0.69	0.09	0.20	0.02
2	0.67	0.11	0.19	0.03
3	0.67	0.12	0.19	0.03
4	0.67	0.12	0.18	0.03
5	0.68	0.11	0.17	0.03
6	0.68	0.12	0.17	0.03
7	0.68	0.12	0.17	0.03
8	0.68	0.12	0.17	0.03
9	0.68	0.12	0.17	0.03
10	0.68	0.12	0.17	0.03

Table III.HU.2. Variance decompositions of *F* and *R* under the specification which includes GDP.

The results with monthly Industrial Production (IP), seen in Figure III.HU.3 below, perhaps provide a more accurate description. Now, we have all three explanatory variables, *E*, *F* and *R*, positively forecasting future IP growth. The variance decomposition is very similar to that in Turkey: *E* and *F* can explain 10% and 3%, respectively, of the forecast error variance in IP growth (Table III.HU.3). It is clear that *E*'s impact is *causing* as it is protracted whereas *F* and *R*'s association with future IP growth appear to be *forecasting* as the response suddenly stops after the second or third month. It should be emphasized that the unexpected negative association of *F* with GDP is not confirmed with industrial production. To understand what makes this difference, one should remember that a quarterly shock to *F* might be different than a monthly shock. The significant negative feedback trading at the second and third month lags documented in Section II may change the character of shocks to *F* at the quarterly frequency in a way that residuals of *F* equation in our VAR system mainly picks the negative feedback trading component of *F*, and the small sample size of quarterly data might be magnifying this effect. Thus, results with IP at the monthly frequency may be more reliable.[21]

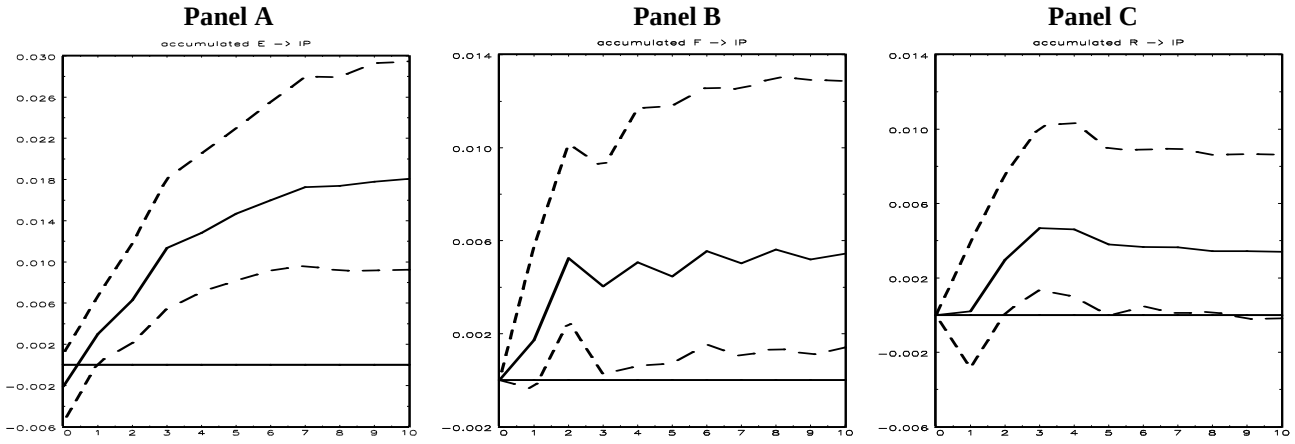


Figure III.HU.3. Cumulative IRFs of Hungary's Industrial Production (IP) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and BUX index returns *R* (Panel C).

[21] The correlation between the quarterly aggregated IP and GDP growth rates is +0.42, hence a different sign of *F*'s response cannot be explained by a negative correlation between IP and GDP, which would anyway be counter-intuitive.

Proportions of forecast error in IP accounted for by:				
forecast horizon	**E**	**F**	**R**	**IP**
1	0.01	0.00	0.00	0.99
2	0.05	0.00	0.00	0.95
3	0.06	0.02	0.01	0.91
4	0.09	0.02	0.01	0.87
5	0.09	0.02	0.01	0.87
6	0.10	0.02	0.01	0.86
7	0.10	0.03	0.01	0.86
8	0.10	0.03	0.01	0.86
9	0.10	0.03	0.01	0.86
10	0.10	0.03	0.01	0.86

Table III.HU.3. Variance decomposition for Hungary's Industrial Production (IP)

Figure III.HU.4 below shows that past IP figures do not have a significant impact on future net foreign flows and local market returns, as expected and as is the case in Turkey. So, one can conclude that local market prices and foreign investors adjust to future IP growth in advance, with little reaction left to announcement effects.

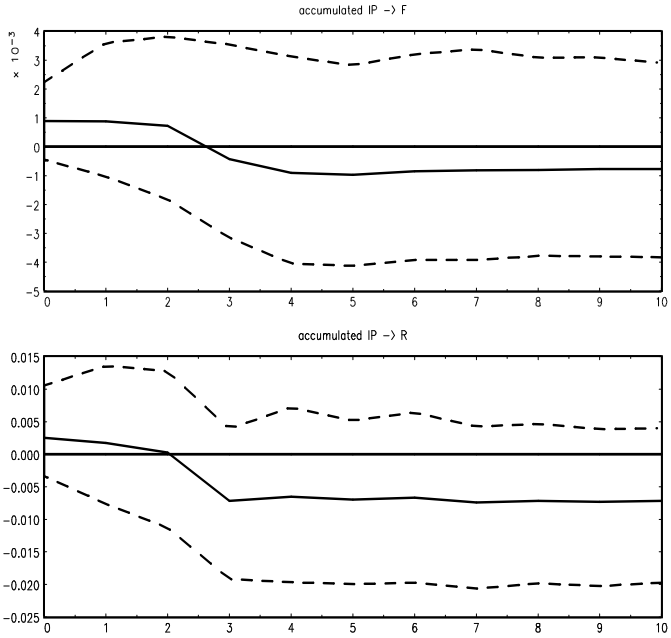


Figure III.HU.4. Cumulative IRF's of net foreign flows *F* (upper panel) and BUX index returns *R* (lower panel) to a 1-standard deviation shock in Industrial Production (IP).

Figure III.HU.5 below suggests that Hungarian consumer confidence strongly responds to world and local stock market returns. These results are similar to those on Turkey, and reliably confirm our interpretation that visible variables such as stock market returns have an immediate effect on consumer sentiment. *F* has a modest lagged effect, suggesting that it may be correlated with a variable than can cause consumer confidence, which is slightly different from Turkey, but this effect is small both statistically and economically. As Table III.HU.4 suggests, the main determinants of Hungarian consumer confidence are visible stock index returns. Note that while *E*'s effect remains permanent (unlike in Turkey) while *R*'s effect partly reverses subsequently.

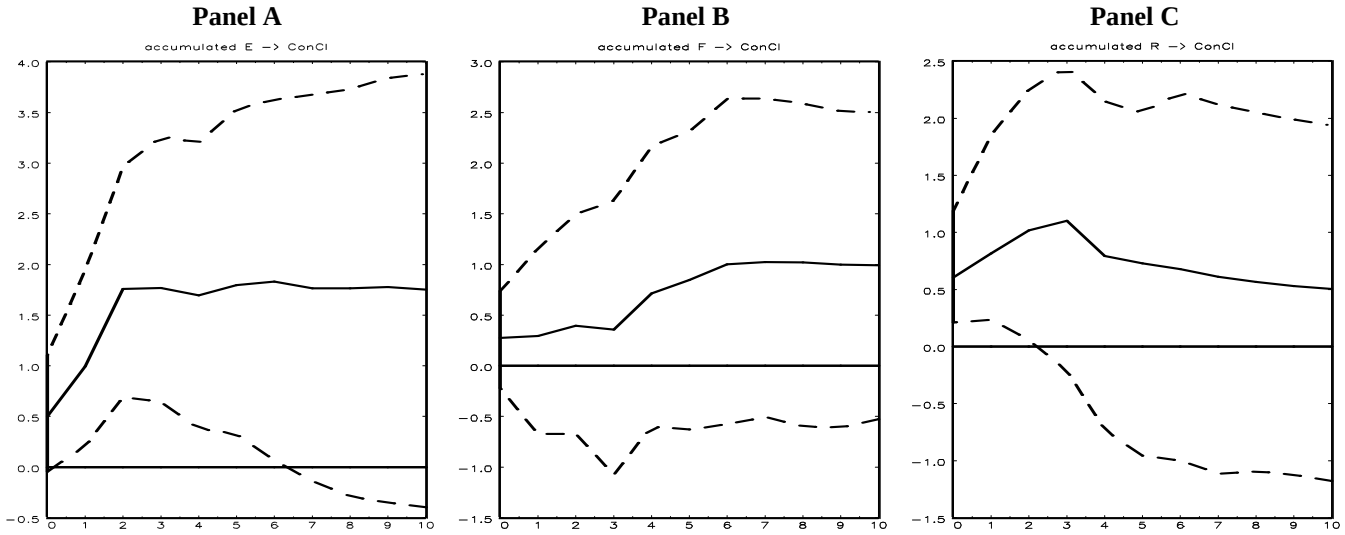


Figure III.HU.5. Cumulative IRFs of Consumer Confidence Index (ConCI) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and BUX index returns *R* (Panel C).

forecast horizon	E	F	R	ConCI
1	0.04	0.01	0.05	0.91
2	0.06	0.01	0.04	0.89
3	0.10	0.01	0.05	0.84
4	0.10	0.01	0.05	0.85
5	0.09	0.02	0.06	0.83
6	0.10	0.02	0.06	0.83
7	0.10	0.02	0.06	0.83
8	0.10	0.02	0.06	0.83
9	0.10	0.02	0.06	0.83
10	0.10	0.02	0.06	0.83

Table III.HU.4. Variance decomposition for Hungary's Consumer Confidence Index (ConCI).

Figure III.HU.6 shows that local returns and net foreign flows display no significant lagged response to Consumer Confidence. The cumulative lag response of foreign flows by the 10th period, however, is interesting, and may imply that at some stage foreign investors may be taking advantage of local sentiment. An interesting note hereby is that the degree of negative feedback trading reported in Section II decreases when ConCI index is controlled for in the VAR system. As such a response is absent in Turkey, where the stock market is more prone to overreaction, one possibility is that this reflects foreign equity portfolio investors' response to excessive consumer borrowing in Hungary. To confirm this hypothesis, a connection between consumer confidence and consumer credit needs to be established and there must be some evidence of consumer over-borrowing in Hungary. We leave this investigation to further extensions of the project work.

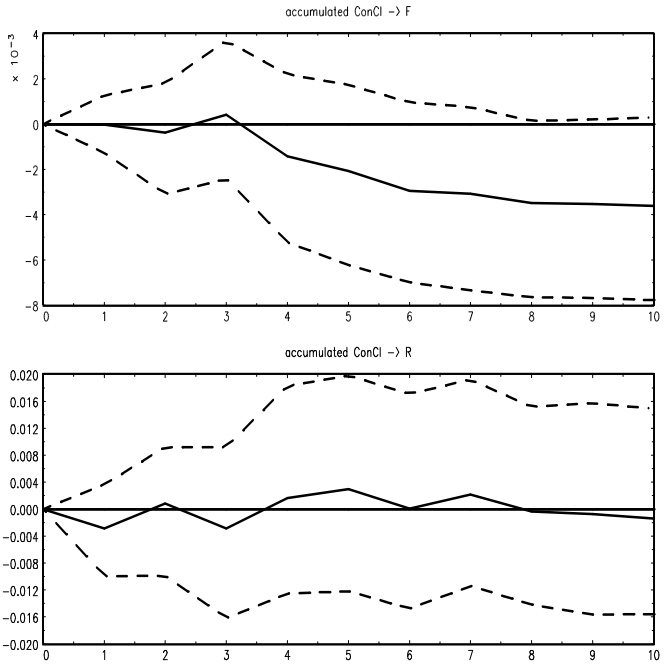


Figure III.HU.6. Cumulative IRF's of net foreign flows *F* (upper panel) and BUX index returns *R* (lower panel) to a 1-standard deviation shock in Consumer Confidence Index (ConCI).

Figure III.HU.7 shows that the Business Confidence Index (BusCI) is affected by, in addition to world and local stock market returns, net foreign flows. This result is quite intuitive and economically significant: *F* can account for 10% of forecast error variance of BusCI, and *E* plays a larger role for BusCI (16%) compared to for ConCI (10%). On the other hand, local returns play a larger role for ConCI (6%) than for BusCI (3%). Hence, we can argue that Business Confidence responds to conditions in world economy (as indicated by the lagged effect of *E*) and to foreign investment flows, whereas Consumer Confidence responds to visible stock price movements as indicated by the immediate response to *E* and *R*. The contrast between ConCI's and BusCI's response to *E* after the second month is striking: while *E*'s impact on ConCI stabilizes after the second month, E's impact on BusCI persists through 7th month. Thus, one can argue that *E* can forecast variables that can affect futures business confidence in Hungary. Local returns' impact on BusCI, on the other hand, stabilizes beyond the third month.

Panel A **Panel B** **Panel C**

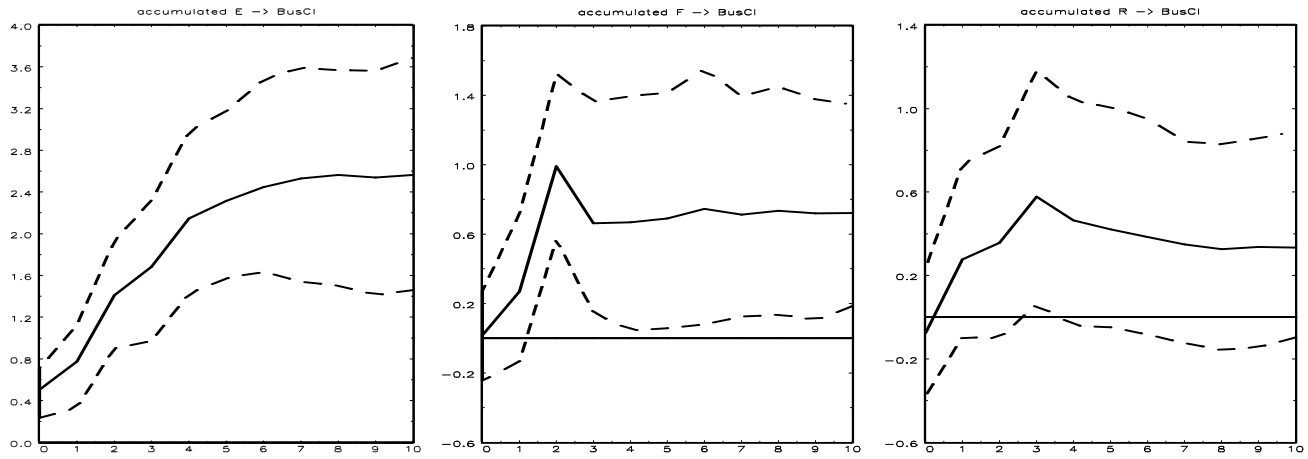


Figure III.HU.7. Cumulative IRFs of Business Confidence Index (BusCI) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and BUX index returns *R* (Panel C).

Proportions of forecast error in BusCI accounted for by:				
forecast horizon	**E**	**F**	**R**	**BusCI**
1	0.05	0.00	0.00	0.95
2	0.06	0.01	0.02	0.90
3	0.12	0.10	0.02	0.76
4	0.13	0.11	0.03	0.74
5	0.16	0.11	0.03	0.71
6	0.16	0.10	0.03	0.71
7	0.16	0.10	0.03	0.71
8	0.16	0.10	0.03	0.71
9	0.16	0.10	0.03	0.71
10	0.16	0.10	0.03	0.71

Table III.HU.5. Variance decomposition for Hungary's Business Confidence Index (BusCI).

Unlike in the case of consumer confidence, stock market variables may have a contemporaneous response to business confidence. Hence, we allow for a contemporaneous response in the opposite direction by alternating the ordering assumption in impulse response analysis. Figure III.HU.8 shows that *F* and *R* display little initial response, perhaps some statistically insignificant positive response at the first month lag (possible some announcement effect), but some subsequent contrarian response to business sentiment.

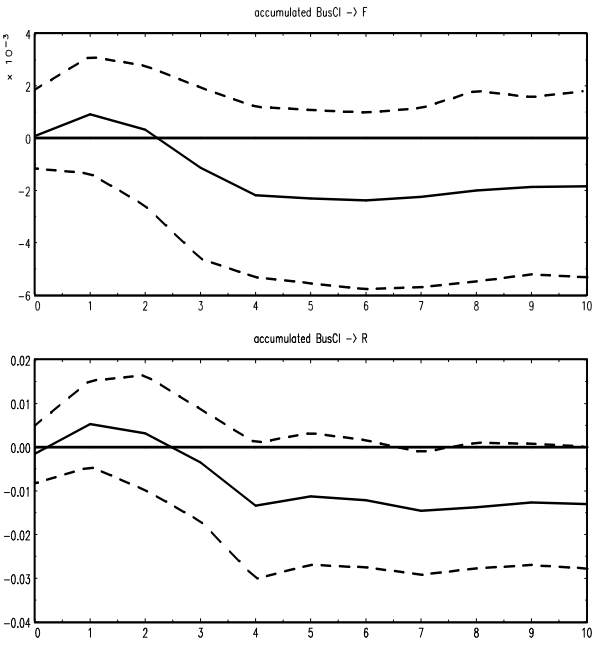


Figure III.HU.8. Cumulative IRF's of net foreign flows *F* (upper panel) and ISE index returns *R* (lower panel) to a 1-standard deviation shock in Business Confidence Index (BusCI).

The results in Figures III.HU.9 and III.HU.10 portray the interaction between *E*, *F*, *R* and Industrial Confidence Index (IndCI), and are very similar to those with Business Confidence index. Perhaps one can add that IndCI's response to local returns even less significant statistically, possibly reflecting the fact that in an export hub economy manufacturers are less affected by variables correlated with local stock market performance.

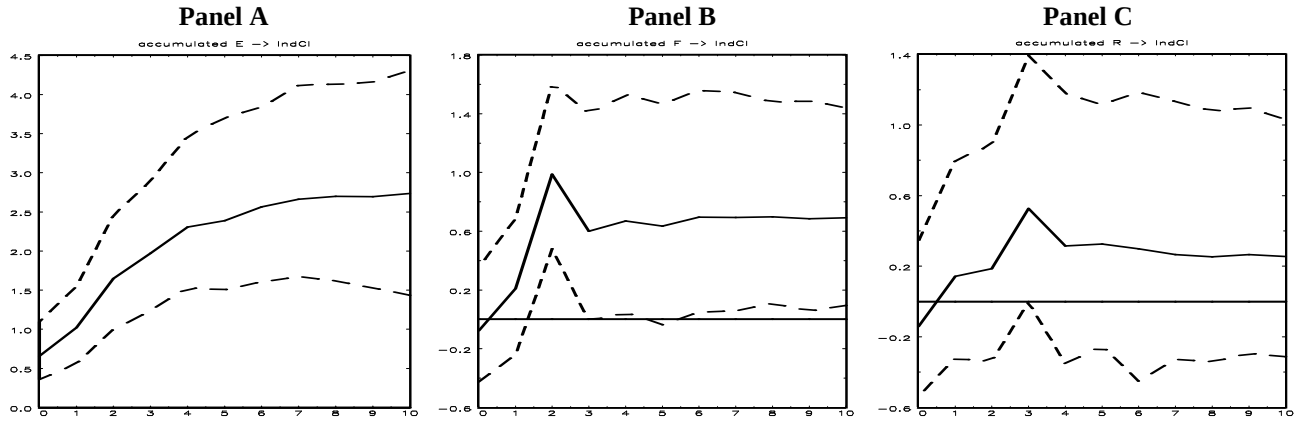


Figure III.HU.9. Cumulative IRFs of Industrial Confidence Index (IndCI) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and BUX index returns *R* (Panel C).

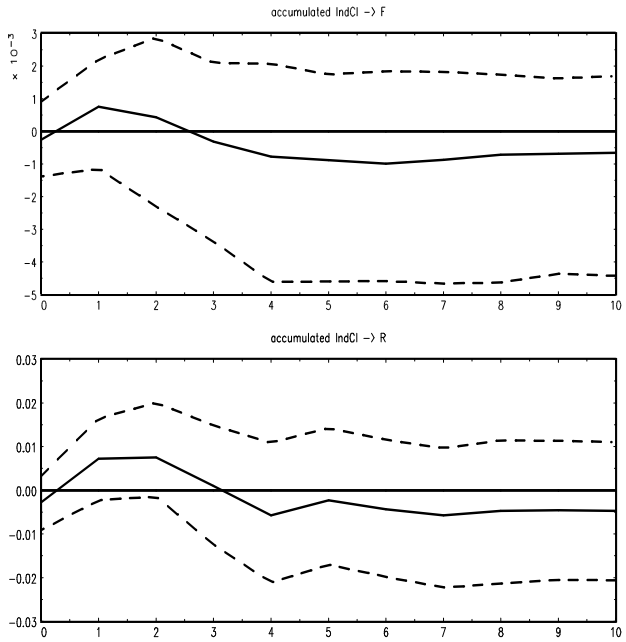
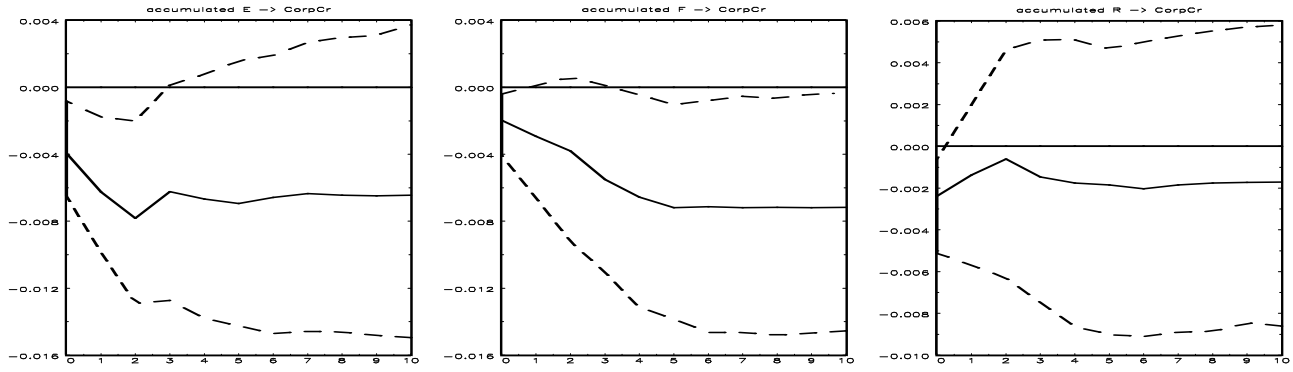


Figure III.HU.10. Cumulative IRF's of net foreign flows *F* (upper panel) and BUX index returns *R* (lower panel) to a 1-standard deviation shock in Industrial Confidence Index (IndCI).

Now, we turn our focus to variables that may potentially intermediate between equity portfolio flows and local macroeconomic activity. In Hungary, we have accessed data on Corporate Credit Volume (CorpCr) and Consumer Credit volume (ConsCr). First, the results in the unnumbered Figure below correspond to the model where exchange rate changes are not included in the VAR system as an exogenous control variable. *E*, *F* and *R* all appear to have a negative effect on CorpCr , which is simply due the fact that a significant portion of loans are denominated in foreign currency, and an appreciation of HUF, which is strongly positively related to *E*, *F* and *R*, results in a decrease in the value of these loans. Hence, we report results based on the specification where EUR/HUF exchange rate returns are included as an exogenous variable in the system. Second, the real changes in Corporate Credit volume (i.e. first difference of the logged corporate credit volume numbers in HUF adjusted for inflation) turns out to be stationary, hence unlike in Turkey, we directly use CorpCr variable without further differencing.



The cumulative IRFs of Corporate Credit Volume (CorpCr) to E, F and R: It turned out that 46.7% and 18.6% of the contemporaneous variation in Corporate Credit and Household Credit, respectively, can be accounted for by the EUR/HUF exchange rate (i.e. Hungarian credit volume appears to expand when Forint depreciates), an indication that a significant portion of loans are in foreign currency, in particular corporate loans.

Figure III.HU.11 below shows that *CorpCr* displays an insignificant positive response to *E* and *F* at lags, and does respond to BUX returns. [22] Thus, unlike Turkey, in Hungary the corporate credit volume does not appear to be highly dependent on foreign capital inflows or world stock market conditions, indicating that credit availability has not been a major bottleneck for Hungarian corporations. Table III.HU.6 suggests that *E* and *F* can account for only 5% and 4%, respectively, of the forecast error variance in CorpCr.

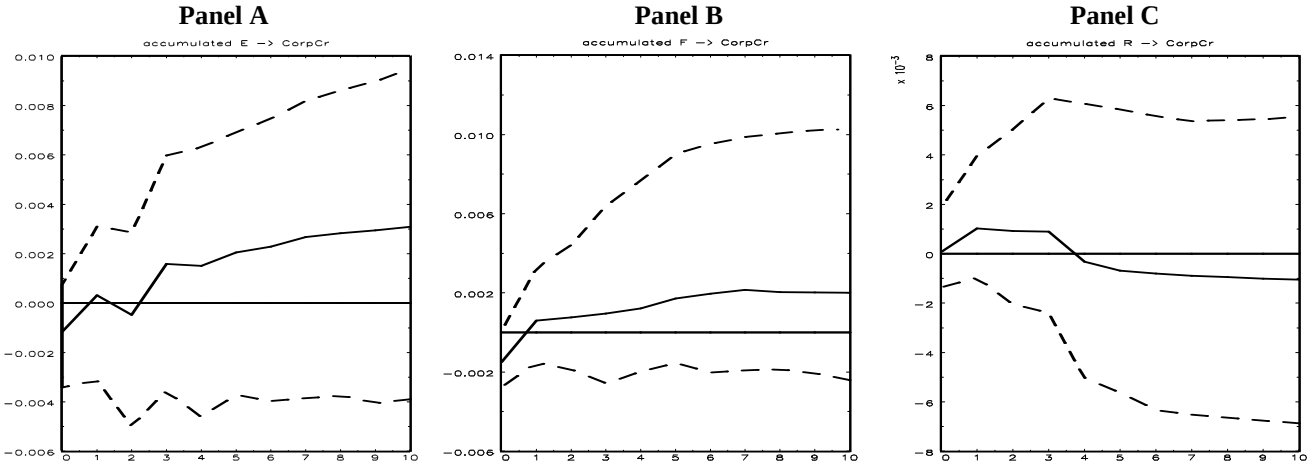


Figure III.HU.11. Cumulative IRFs of Corporate Credit volume (CorpCr) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and BUX index returns *R* (Panel C).

Proportions of forecast error in CorpCr accounted for by:				
forecast horizon	**E**	**F**	**R**	**CorpCr**
1	0.01	0.02	0.00	0.97
2	0.02	0.04	0.01	0.93
3	0.03	0.04	0.01	0.92
4	0.05	0.04	0.01	0.90
5	0.05	0.04	0.01	0.89
6	0.05	0.04	0.02	0.89
7	0.05	0.04	0.02	0.89
8	0.05	0.04	0.02	0.89
9	0.05	0.04	0.02	0.89
10	0.05	0.04	0.02	0.89

Table III.HU.6. Variance Decomposition for Hungary's Corporate Credit Volume (CorpCr).

Figure III.HU.12 portrays the responses of net foreign flows and BUX returns to past corporate credit growth. Both variables, especially *R*, display a negative lagged response to past corporate credit growth. About

[22] These results display some slight variation with the specification employed. In particular, *CorpCr* exhibits some seasonality, and when seasonal adjustment is allowed for, *R* displays a larger negative response, which is still not statistically significant. A negative lagged response of *CorpCr* to *R* could be interpreted as corporations alternating between debt and equity financing as suitability of conditions in the equity market varies. However, the evidence we have is not significant enough to support such a statement.

3% of the forecast error variance in both *F* and *R* can be accounted for by *CorpCr*. It is interesting to note that once *CorpCr* is included in the model, the negative feedback trading loses its significance. Hence, one may argue that negative feedback trading may be also be related to corporate financial leverage. Future returns are more significantly negatively related to corporate financial leverage. Obviously, the results on one country is not sufficient to reach general conclusions , hence this is an issue that needs to be further explored.

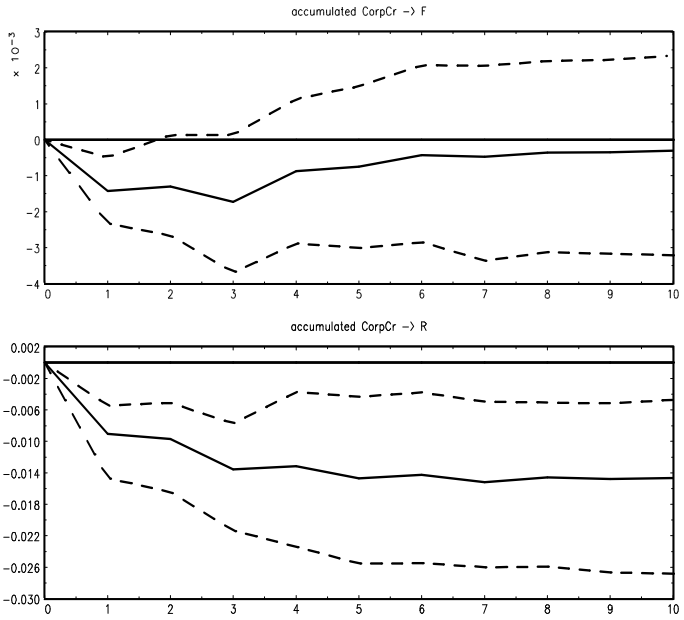


Figure III.HU.12. Cumulative IRF's of net foreign flows *F* (upper panel) and BUX index returns *R* (lower panel) to a 1-standard deviation shock in Corporate Credit volume (CorpCr).

Figure III.HU.13 shows that household credit volume in Hungary (HshldCr) is positively affected by past net foreign flows at long lags, and does not respond to BUX returns. The insignificant negative response to *E* is not easy to explain, but an important part of this response comes from the contemporaneous period, which suggests it is a mechanic effect rather than a response of household to changes resulting from world factors, hence we suspect the negative response may be artifact of *E*'s effect on EUR/HUF exchange rates. (Although we control exchange rate's effect on *HshldCr*, some indirect effect of *E* and *F* on exchange rates may still remain in the system. Note that *HshldCr* 's response to *E* is not significant once the contemporaneous period is disregarded.) These results collectively suggest that net foreign flows may be signaling future consumer credit expansion, possibly by improving the terms of credit to households, while world economy is not relevant for household credit volume. This latter result is in contrast to that on Turkey, once again suggesting that credit availability is a major bottleneck for the Turkish economy, whereas it is not for the Hungarian economy.

Panel A **Panel B** **Panel C**

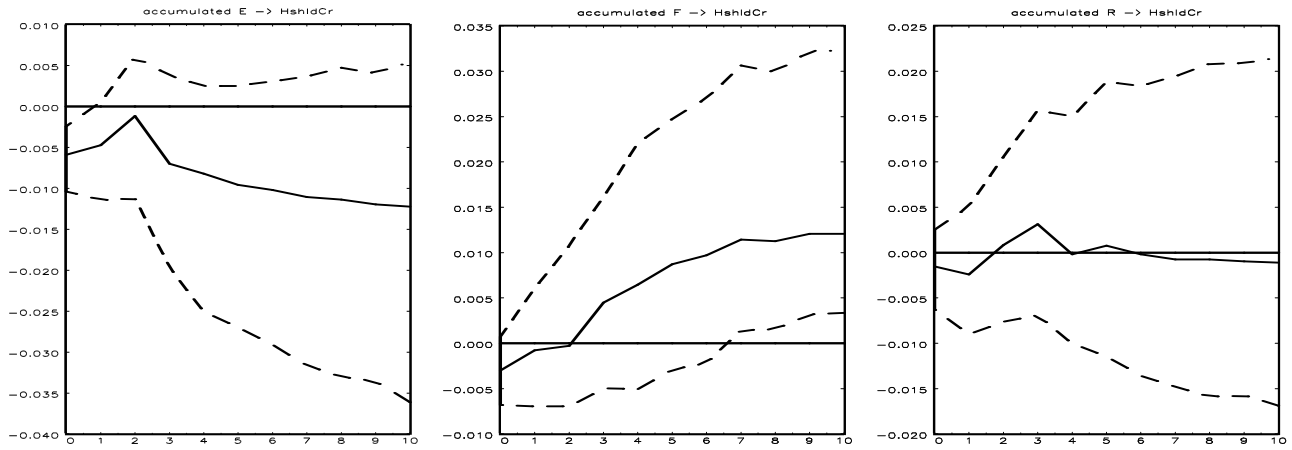


Figure III.HU.13. Cumulative IRFs of Household Credit volume (HshldCr) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and BUX index returns *R* (Panel C).

The impact of Household Credit volume on net foreign flows and BUX returns is negligible. Although Figure III.HU.14 suggests some initial negative response of *R* which is subsequently reversed, *HshldCr* can explain only 1-2% of the forecast error variance in *F* and *R*, hence not economically significant.

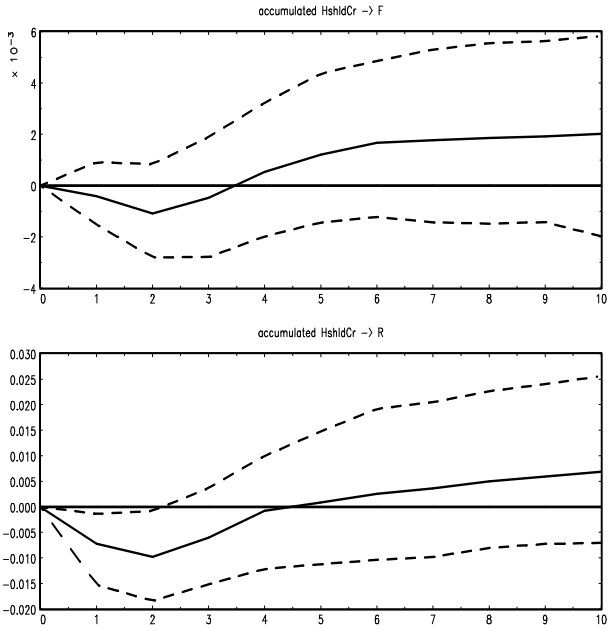


Figure 3.HU.12. Cumulative IRF's of net foreign flows *F* (upper panel) and BUX index returns *R* (lower panel) to a 1-standard deviation shock in Household Credit volume (HshldCr).

III.C.PL.Poland Results:

Since our GDP variable, as defined in Section III.B, failed to reject the null of a unit root, we use its first difference dGDP. The results with GDP, seen in the unnumbered Figure below, are qualitatively similar to those with dGDP except that *E*'s impact on GDP remains persistent with undifferenced GDP.

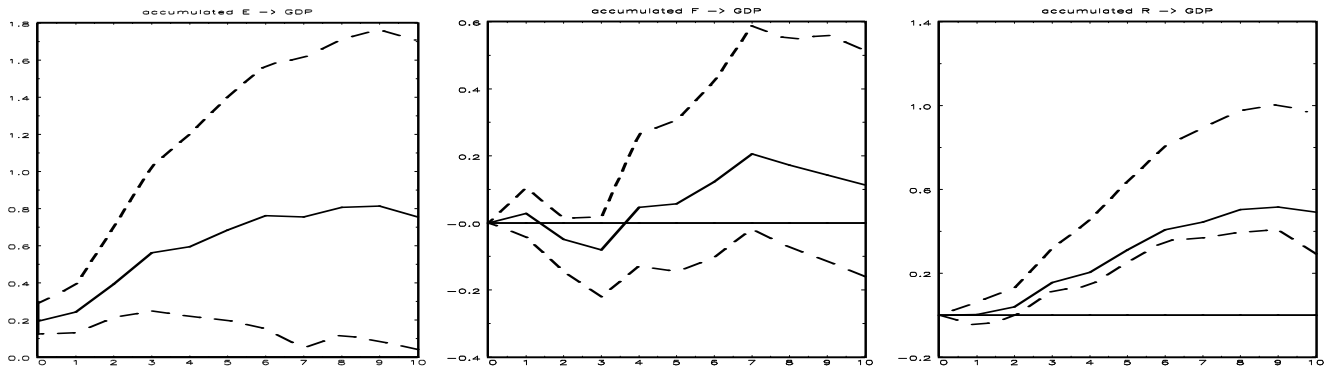


Figure III.PL.1 shows that *E* has only contemporaneous impact on GDP growth, and no significant impact on future GDP growth, while *R* can forecast future GDP growth over the next 3-5 quarters. *F* appears to forecast GDP growth 1 quarter ahead, and also to have some causal effect 4-6 quarters later. In terms of economic significance, *E* still appears to be the most relevant variable explaining *dGDP* with all of its effect coming from the contemporaneous period. The strong contemporaneous effect of *E* on GDP is in common with Hungary, however not persistent in Poland. GDP's response to *F* and *R* are in the expected direction and form (Hungary's GDP's negative response to *F* is not replicated in Poland). Variance decompositions presented in Table III.PL.1 portray a similar picture to that in Turkey and Hungary, except that in Poland all of *E*'s explanatory power stems from the contemporaneous period (i.e. although GDP's response to *R* is statistically significant, it can only account for 5% of the forecast error variance of dGDP)

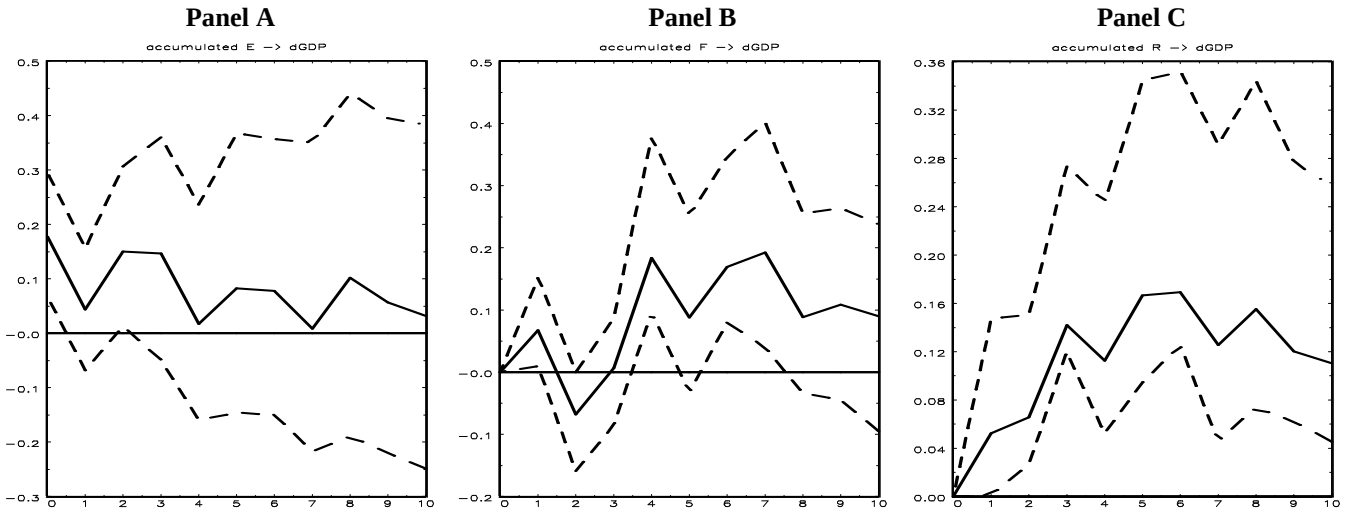


Figure III.PL.1. Cumulative IRFs of Poland's GDP (*dGDP*) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and WIG index returns *R* (Panel C).

Proportions of forecast error in dGDP accounted for by:				
forecast horizon	**E**	**F**	**R**	**dGDP**
1	0.26	0.00	0.00	0.74
2	0.25	0.01	0.03	0.72
3	0.25	0.05	0.03	0.67
4	0.22	0.06	0.05	0.67
5	0.25	0.16	0.04	0.55
6	0.25	0.18	0.05	0.53
7	0.25	0.18	0.05	0.52
8	0.25	0.18	0.05	0.52
9	0.25	0.20	0.05	0.50
10	0.26	0.20	0.05	0.49

Table III.PL.1: Variance decomposition for Poland's GDP.

Figure III.PL.2 below shows that net foreign flows reverse a positive contemporaneous response to GDP growth over the next 5 quarters, while WIG returns show more persistent response to GDP growth. GDP can explain 13% and 6% of the forecast error variance in *F* and *R*, respectively (Table II.PL.2).

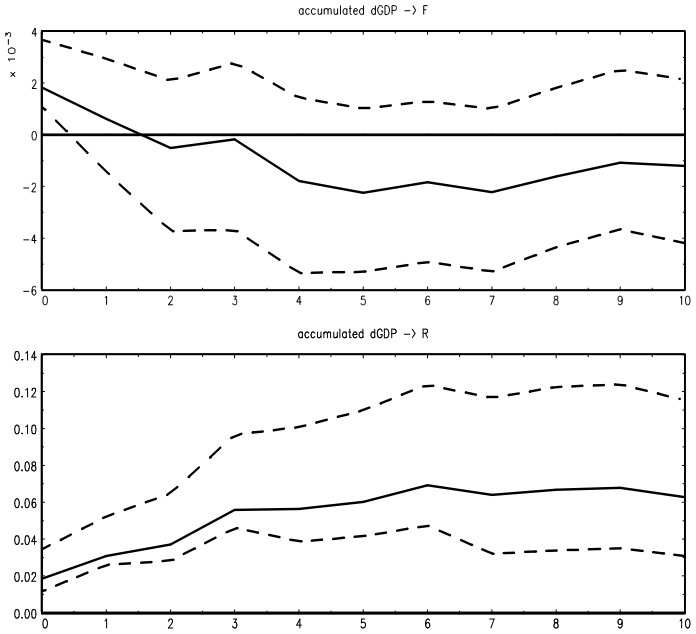


Figure III.PL.2. Cumulative IRF's of net foreign flows *F* (upper panel) and WIG index returns *R* (lower panel) to a 1-standard deviation shock in Poland's GDP (dGDP).

Proportions of forecast error in F accounted for by:				
forecast horizon	**E**	**F**	**R**	**dGDP**
1	0.33	0.59	0.00	0.08
2	0.28	0.62	0.00	0.10
3	0.28	0.60	0.00	0.12
4	0.30	0.58	0.01	0.11
5	0.28	0.55	0.02	0.15
6	0.25	0.59	0.03	0.13
7	0.25	0.60	0.03	0.13
8	0.25	0.59	0.03	0.13
9	0.25	0.58	0.03	0.13
10	0.24	0.59	0.03	0.13

Proportions of forecast error in R accounted for by:				
forecast horizon	**E**	**F**	**R**	**dGDP**
1	0.87	0.00	0.10	0.02
2	0.87	0.00	0.10	0.03
3	0.86	0.00	0.10	0.03
4	0.84	0.00	0.11	0.06
5	0.84	0.00	0.10	0.05
6	0.84	0.00	0.10	0.06
7	0.83	0.00	0.10	0.06
8	0.83	0.01	0.10	0.06
9	0.83	0.01	0.10	0.06
10	0.83	0.01	0.10	0.06

Table III.PL.2. Variance decompositions of F and R under the specification which included Poland's GDP.

Next we focus on variables available at the monthly frequency. Figure III.PL.3 below shows that Poland's Industrial Production (IP) is only weakly linked to *E*, *F* and *R*. Poland's IP is positively affected by *E* and forecast by *R*. However, the impact of *F* and *R* on IP is economically insignificant as the forecast error variance of IP accounted for by *F* and *R* are only 4% and 2%, respectively (Table III.PL.3). *F* does not appear to be much relevant for Poland's IP, either, accounting for only 2% of the forecast error variance in IP. The lagged negative response of IP is basically affected by the relative insulation of Poland's IP during the 2008-09 crisis (in particular, Poland's IP has quickly rebounded within in 4-5 months following October-November 2008 when huge net foreign portfolio outflows took place following Lehman event, which appears as a negative connection between current *F* and IP growth at the 4th month). Leaving aside this outlier effect, the response of Poland's IP to *F* is basically flat. Thus, we can conclude that foreign investors neither play a crucial role in financing Poland's industrial production process nor are able to forecast future path of IP.

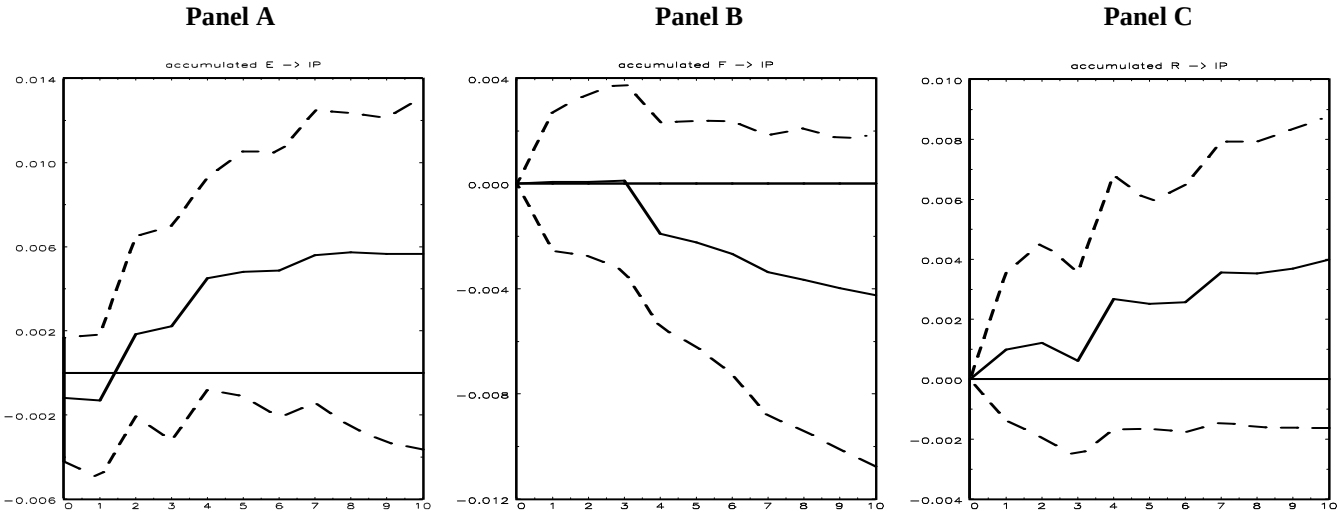


Figure III.PL.3. Cumulative IRFs of Poland's Industrial Production (IP) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and WIG index returns *R* (Panel C).

Proportions of forecast error in IP accounted for by:				
forecast horizon	**E**	**F**	**R**	**IP**
1	0.00	0.00	0.00	1.00
2	0.00	0.00	0.00	0.99
3	0.03	0.00	0.00	0.97
4	0.03	0.00	0.00	0.97
5	0.04	0.01	0.01	0.93
6	0.04	0.01	0.01	0.93
7	0.04	0.01	0.01	0.93
8	0.04	0.01	0.02	0.93
9	0.04	0.01	0.02	0.93
10	0.04	0.01	0.02	0.93

Table III.PL.3. Variance decomposition for Poland's Industrial Production (IP)

Figure III.PL.4 below shows that net foreign flows display a lagged positive response to IP in the second and third months following the shock, with the cumulative effect being flat. WIG returns display a

faster positive response, with the cumulative effect being again flat. The role of IP in explaining *F* and *R* is economically small. One can, nevertheless, conclude that foreign investors do not have an information advantage with respect to IP in Poland.

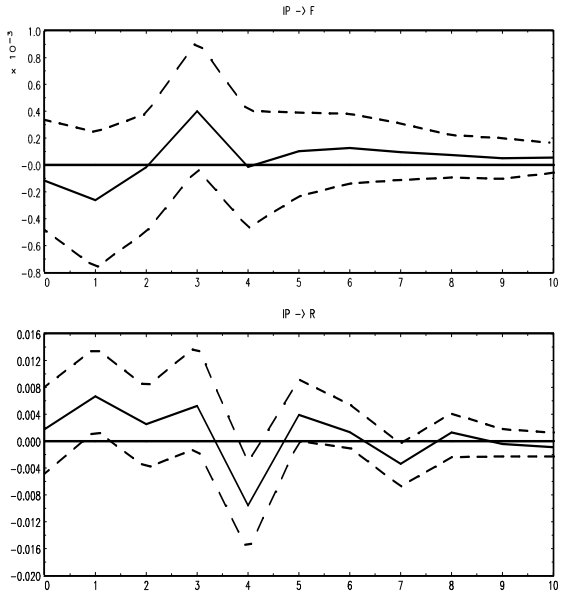


Figure III.PL.4. Cumulative IRF's of net foreign flows *F* (upper panel) and WIG index returns *R* (lower panel) to a 1-standard deviation shock in Poland's Industrial Production (IP).

Figure III.PL.5 below shows that manufacturing confidence in Poland (dManConf) shows a strong positive response to *E*, both contemporaneously and at lags. The contemporaneous response here was absent in actual production activity, hence may be a reflection that either manufacturing orders start to arrive (quit) as European stock markets rise (fall) or Polish manufacturers have learned to revise their expectations by observing global stock markets. However, the lagged impact is much stronger and permanent, implying that the initial signals provided by *E* are followed by actual causal factors. Table III.PL.4 suggests that *E*'s impact is also economically significant (unlike *E*'s impact on IP). Panel C suggests that local returns lead manufacturing confidence at least 2 months ahead. The lack of a contemporaneous[23] and 1-month response of manufacturing confidence to local returns suggests that manufacturers do not appear to adjust their expectations by observing the local stock market. Net foreign flows can positively forecast manufacturing confidence 1-2 months ahead, however the subsequent response in Panel B is counter-intuitive. We suspect that this result may have been affected by net outflows during the recent global crisis which had relatively much less effect on Polish manufacturing. The negative contemporaneous response of *F* to manufacturing confidence in the upper panel of Figure III.PL.6 may be another symptom of the same effect. Local returns appear to be positively associated with manufacturing confidence, though not significantly.

[23] The contemporaneous association between R and manufacturing confidence is positive but insignificant as seen in the lower panel of Figure 3.PL.6, and by assumption we recognize it as market's reaction to manufacturing confidence.

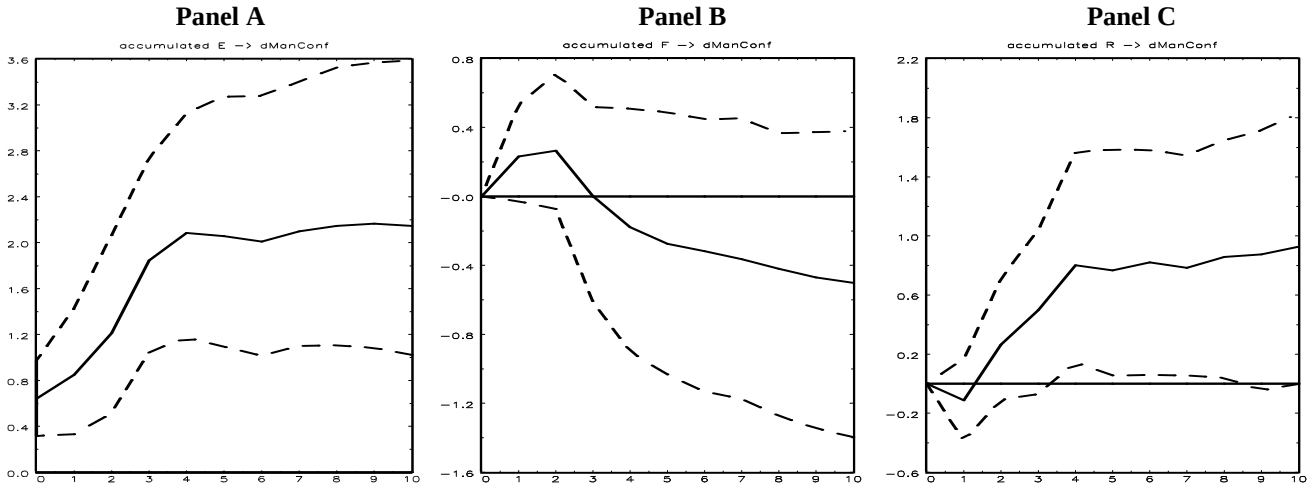


Figure III.PL.5. Cumulative IRFs of Manufacturing Confidence (dManConf) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and WIG index returns *R* (Panel C).

Proportions of forecast error in dManConf accounted for by:				
forecast horizon	**E**	**F**	**R**	**dManConf**
1	0.12	0.00	0.00	0.88
2	0.12	0.01	0.00	0.87
3	0.13	0.01	0.04	0.82
4	0.19	0.02	0.04	0.74
5	0.20	0.03	0.06	0.71
6	0.20	0.03	0.06	0.71
7	0.20	0.03	0.06	0.71
8	0.20	0.03	0.06	0.71
9	0.20	0.03	0.06	0.71
10	0.20	0.03	0.06	0.71

Table III.PL.4. Variance decomposition for Poland's Manufacturing Confidence Index (dManConf)

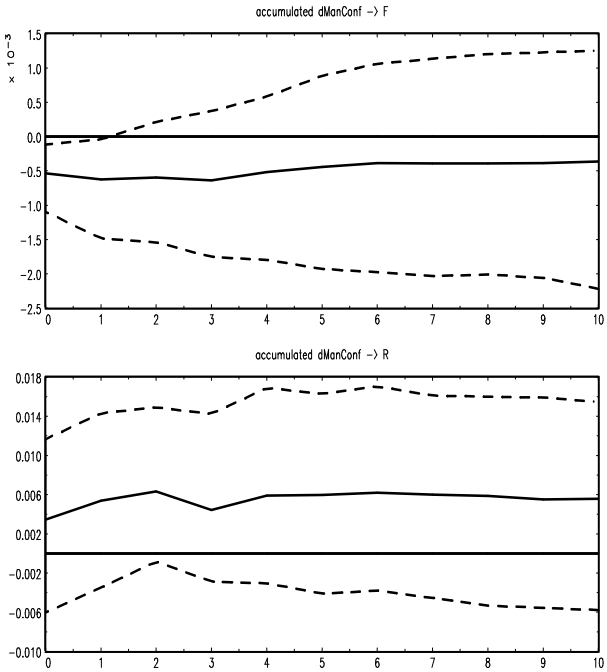


Figure III.PL.6. Cumulative IRF's of net foreign flows *F* (upper panel) and WIG index returns *R* (lower panel) to a 1-standard deviation shock in Manufacturing Confidence (dManConf).

Panel A of Figure III.PL.7 below shows that Poland's exports display a significantly positive lagged response to *E*. The clear interpretation is European macroeconomic activity, as signaled by *E*, causes Poland's exports. Exports are not significantly related to net foreign flows (Panel B). The absence of a response implies that neither Poland's export financing depends on foreign capital availability, nor *F* can forecast Poland's future exports. Panel C shows that local returns have some weak forecast power on future exports.

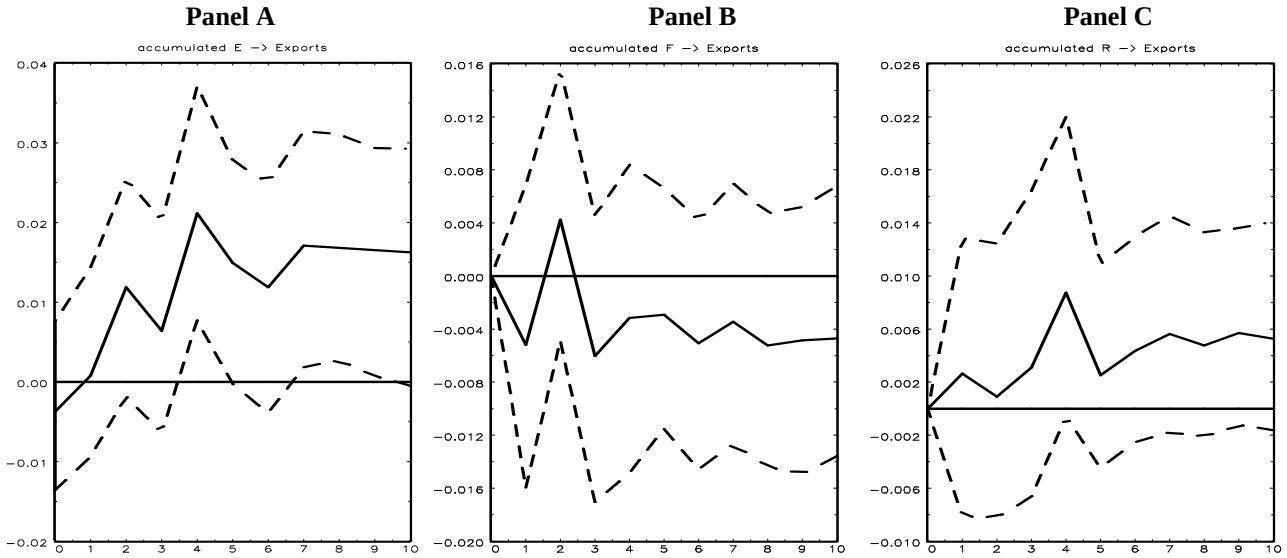


Figure III.PL.7. Cumulative IRFs of Poland's Exports to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and WIG index returns *R* (Panel C).

Figure III.PL.8 below shows that local returns do not respond to exports, while net foreign flows display only weak positive lagged response.

Proportions of forecast error in Export accounted for by:				
forecast horizon	**E**	**F**	**R**	**Exports**
1	0.00	0.00	0.00	1.00
2	0.00	0.00	0.00	0.99
3	0.02	0.01	0.00	0.97
4	0.02	0.03	0.00	0.95
5	0.04	0.03	0.01	0.93
6	0.05	0.02	0.01	0.92
7	0.05	0.03	0.01	0.92
8	0.05	0.03	0.01	0.91
9	0.05	0.03	0.01	0.91
10	0.05	0.03	0.01	0.91

Table III.PL.5. Variance decomposition for Poland's exports

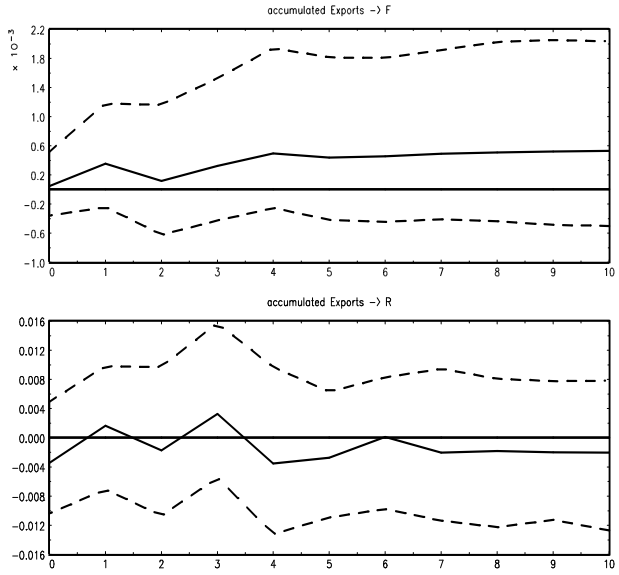


Figure III.PL.8. Cumulative IRF's of net foreign flows *F* (upper panel) and WIG index returns *R* (lower panel) to a 1-standard deviation shock in Poland's Exports.

Figure III.PL.9 below shows that Polish Consumer Confidence (CCI) displays a persistent positive response to *E* and *F*, while showing a temporary response to *R*. Hence, one may argue that local stock market returns have only a transient psychological effect on consumer sentiment, while external factors have some fundamental (economic) effect. Not especially that *F*'s impact starts at lags, which is probably a result of *F* being not visible to public. *E* and *F* can account for 23% and 10%, respectively, of the forecast error variance of *CCI*.

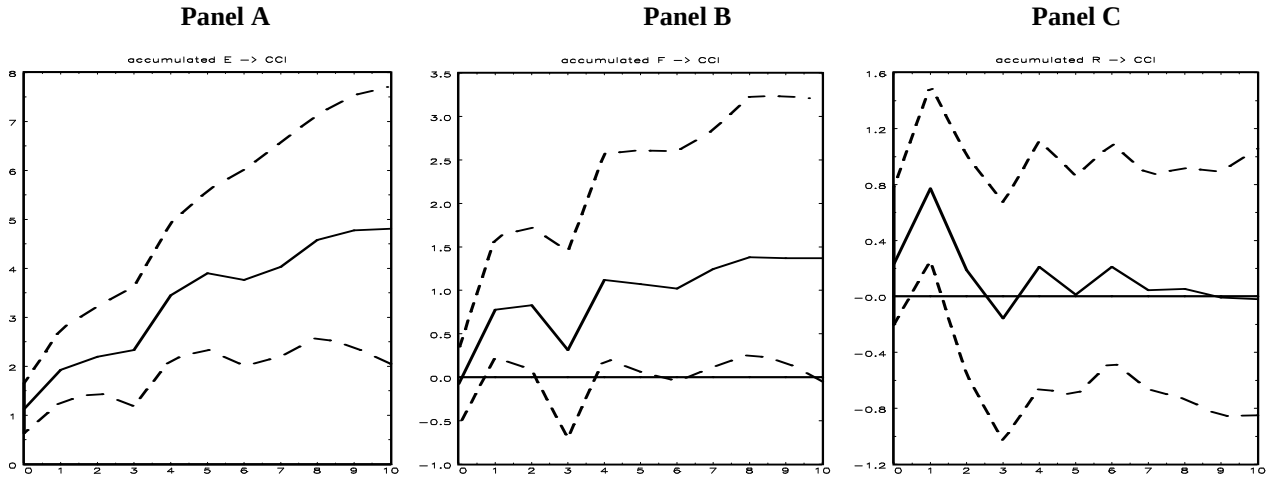


Figure III.PL.9. Cumulative IRFs of Consumer Confidence Index (CCI) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and WIG index returns *R* (Panel C).

Proportions of forecast error in CCI accounted for by:				
forecast horizon	**E**	**F**	**R**	**CCI**
1	0.12	0.00	0.00	0.88
2	0.15	0.06	0.03	0.77
3	0.15	0.05	0.05	0.75
4	0.14	0.07	0.06	0.72
5	0.20	0.10	0.06	0.64
6	0.21	0.10	0.06	0.63
7	0.21	0.10	0.06	0.63
8	0.21	0.10	0.06	0.62
9	0.23	0.10	0.06	0.61
10	0.23	0.10	0.06	0.61

Table III.PL.6. Variance decomposition for Polish Consumer Confidence Index (CCI).

Figure III.PL.10 below shows that net foreign flows positively respond to past consumer confidence changes, while WIG returns are initially unaffected but later display a small negative response, which could be interpreted as domestic sentiment leading to overreaction. Note, however, that these responses are economically small (only 3 and 2% of the forecast error variance of *F* and *R*, respectively).

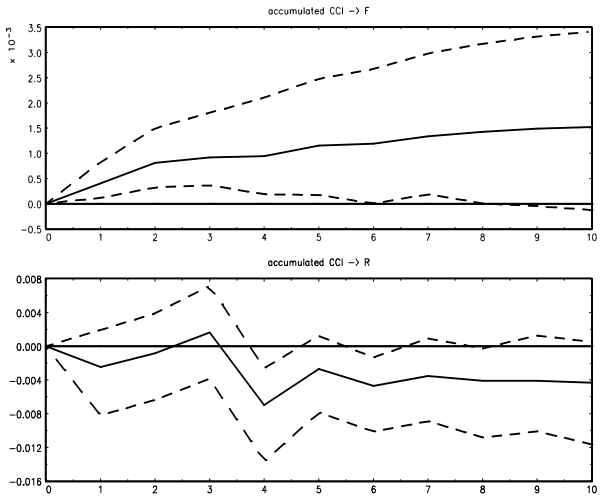


Figure III.PL.10. Cumulative IRF's of net foreign flows *F* (upper panel) and WIG index returns *R* (lower panel) to a 1-standard deviation shock in Polish Consumer Confidence Index (CCI).

III.C.CZ. Czech Republic Results:

Czech GDP series as described in Section III.B rejected the null of a unit root, so we directly use it without first-differencing. Figure III.CZ.1 suggest that Czech GDP responds to *E* strongly positively. *F* has also a statistically significant positive relation with future GDP. However, the role of *E* is striking as it can account for almost 90% of the forecast error variance in Czech GDP (Table III.CZ.1). As this relationship has to be interpreted as causing, it probably reflects the export oriented characteristic of the Czech economy, as represented in the PSE index composition, functioning as a production base for Europe. GDP's response to *F* at the 1-quarter lag (though economically insignificant) should be interpreted as *forecasting*. GDP's response

to *R* is negative at the 1-quarter lag, which should not be surprising given the well-documented failure of Czech stock market to correlate with macroeconomic variables (see Hanousek and Filer, 2000, among others). It is likely that once external effects are controlled for, the residual relationship between local stock market and national macroeconomic activity turns out to be negative reflecting the noise in the stock market. The overall explanatory power of *R* on GDP is negligible (around 1%). It is interesting to note that Czech stock market has been documented to be the least-integrated with world markets among the CEE-3 (Syriopoulos, 2004; Chelley-Steeley, 2005), while its GDP is the most responsive to *E*.

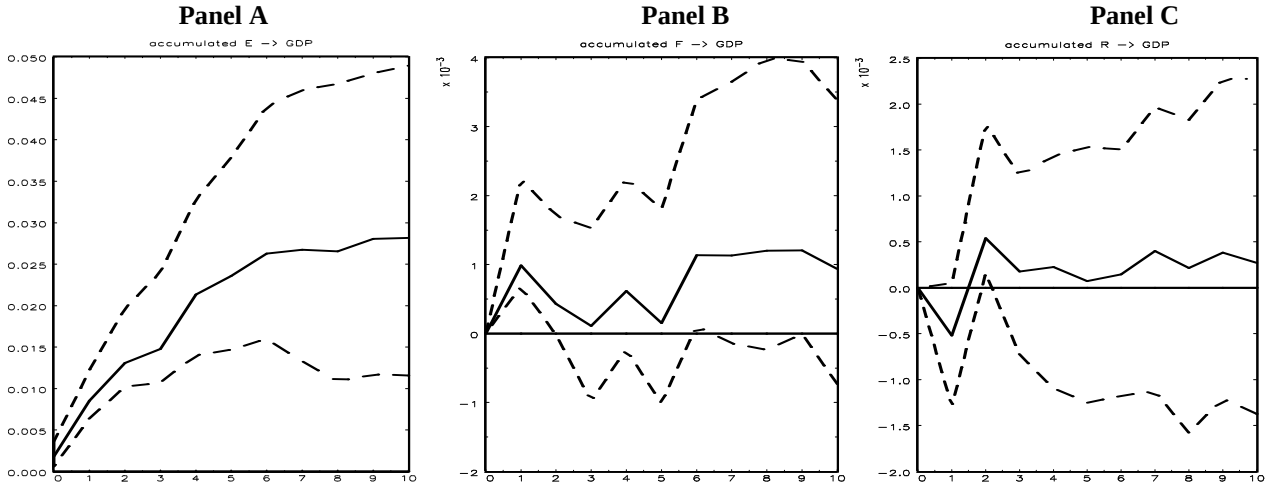


Figure III.CZ.1. Cumulative IRFs of Czech GDP to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and PSE index returns *R* (Panel C).

Proportions of forecast error in GDP accounted for by:				
forecast horizon	**E**	**F**	**R**	**GDP**
1	0.26	0.00	0.00	0.74
2	0.82	0.02	0.00	0.16
3	0.85	0.02	0.02	0.12
4	0.85	0.02	0.02	0.11
5	0.90	0.01	0.01	0.08
6	0.90	0.01	0.01	0.07
7	0.90	0.02	0.01	0.07
8	0.90	0.02	0.01	0.07
9	0.90	0.02	0.01	0.07
10	0.90	0.02	0.01	0.07

Table III.CZ.1. Variance decomposition for Czech GDP

Figure III.CZ.2 below shows that neither net foreign flows nor PSE returns significantly respond to past GDP growth. Although *R* has the usual contrarian response to GDP growth within three quarters following the shock, the response is economically insignificant as it can explain only 1% of the forecast error variance in *R*. Hence, local stock returns appear neither to forecast nor to respond to Czech GDP growth, consistent with well-documented results in the previous literature.

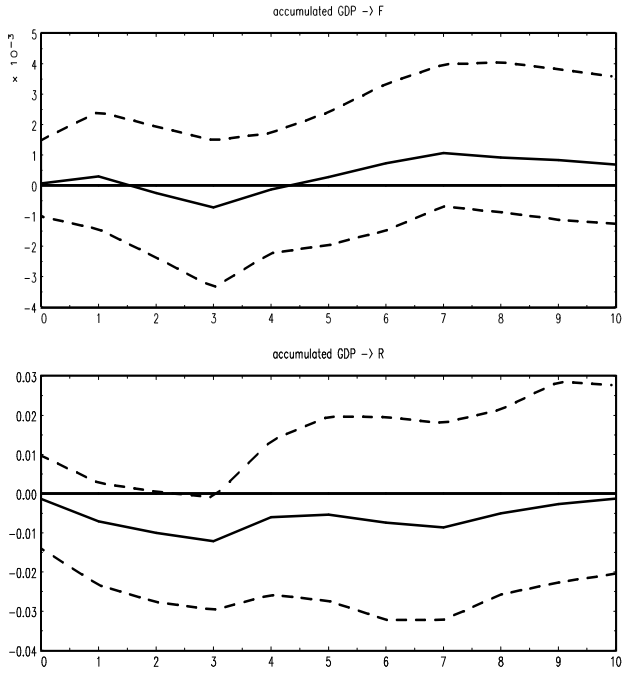


Figure III.CZ.2. Cumulative IRF's of net foreign flows *F* (upper panel) and PSE index returns *R* (lower panel) to a 1-standard deviation shock in Czech GDP.

Figure III.CZ.3 below shows that Industrial Production (IP) similarly respond significantly positively to past European stock market returns, is not significantly related to net foreign flows and local returns. The interpretations is: i) Czech IP is highly responsive to economic conditions in Europe as reflected by MSCI-Europe index returns, ii) Foreign capital flows play little role in causing future IP possibly because capital availability is not a major constraint, and foreign investors' net trading has little forecast power on future IP growth, iii) PSE returns cannot predict future IP growth.

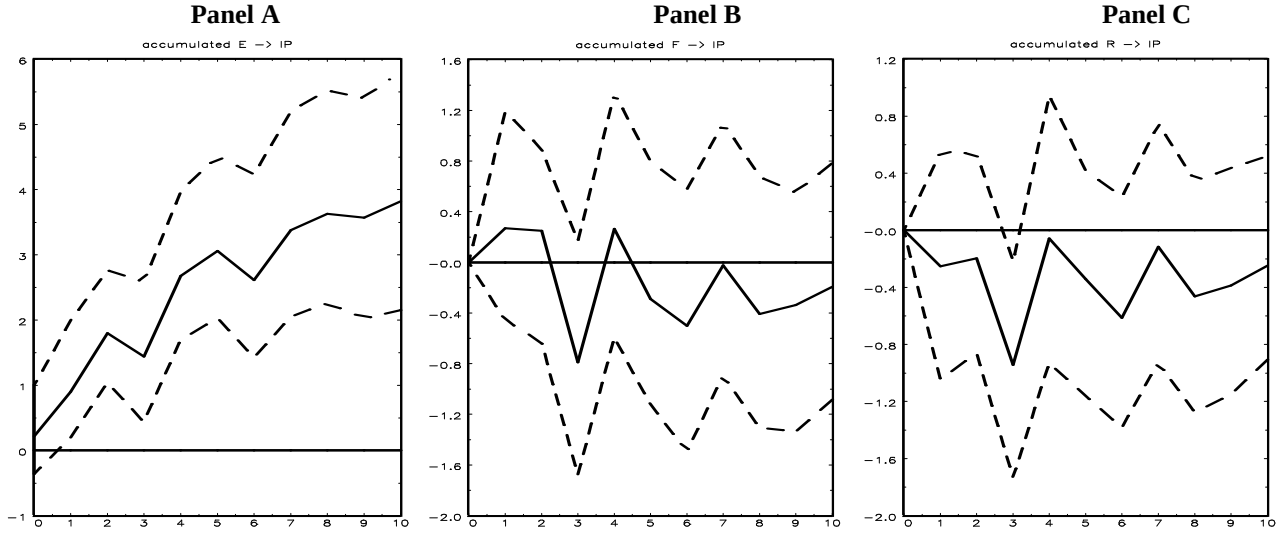


Figure III.CZ.3. Cumulative IRFs of Czech Industrial Production (IP) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and PSE index returns *R* (Panel C).

Figure III.CZ.4 shows that both net foreign flows and PSE returns respond significantly positively to IP shocks as they occur (i.e. contemporaneously). In subsequent months, however, PSE returns partially reverse, while net foreign flows keep remaining positive. Our finding of a contemporaneous positive response of local returns to *IP* is perhaps the first evidence of a positive link in the expected direction between a macroeconomic variable and the Czech stock market. As our sample contains a relatively recent period, this may be a sign of improving informativeness of Prague Stock Exchange. It appears that foreigners' response is helping improve PSE returns' responsiveness to IP.[24] Table III.CZ.2 suggests that shocks to *IP* can account for 15% and 4% of the forecast error variance in net foreign flows and PSE returns, respectively (i.e., a noisier *R* enables foreign investors to have a more precise response to *IP*.

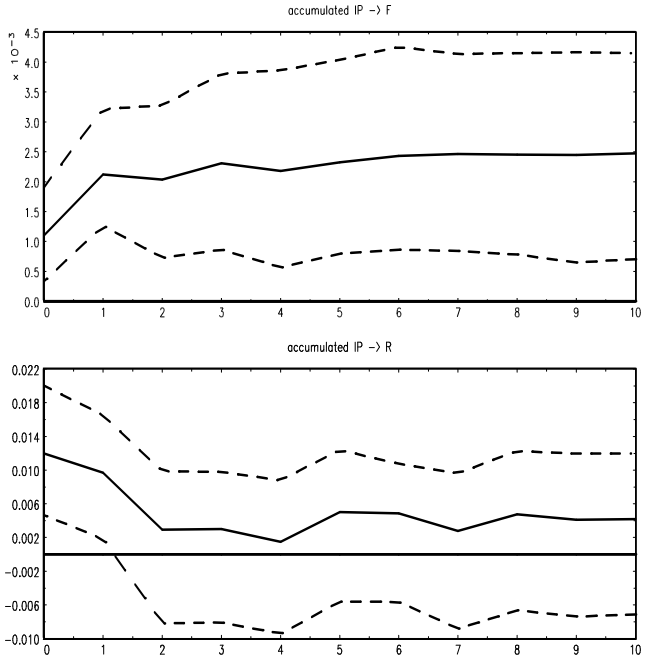


Figure III.CZ.4. Cumulative IRF's of net foreign flows *F* (upper panel) and PSE index returns *R* (lower panel) to a 1-standard deviation shock in Czech Industrial Production (IP).

Proportions of forecast error in F accounted for by:				
forecast horizon	**E**	**F**	**R**	**IP**
1	0.01	0.89	0.00	0.10
2	0.04	0.79	0.00	0.17
3	0.03	0.82	0.00	0.15
4	0.03	0.80	0.02	0.15
5	0.03	0.79	0.02	0.15
6	0.05	0.78	0.02	0.15
7	0.05	0.78	0.02	0.15
8	0.05	0.78	0.02	0.15
9	0.05	0.78	0.02	0.15
10	0.05	0.78	0.02	0.15

Proportions of forecast error in R accounted for by:				
forecast horizon	**E**	**F**	**R**	**IP**
1	0.66	0.00	0.30	0.03
2	0.69	0.00	0.28	0.03
3	0.68	0.01	0.28	0.04
4	0.68	0.02	0.27	0.04
5	0.71	0.02	0.24	0.04
6	0.70	0.02	0.24	0.04
7	0.70	0.02	0.24	0.04
8	0.70	0.02	0.24	0.04
9	0.71	0.02	0.24	0.04
10	0.71	0.02	0.24	0.04

[24] This interpretation is consistent with Wang and Shen (1999) who find that after foreigners are permitted to trade in Taiwan stock market stock returns have started to be affected by fundamental factors.

Table III.CZ.2. Variance decomposition for *F* and *R* under the specification that includes Czech Industrial Production (IP).

Figure III.CZ.5 below shows that once again *E* is a good predictor of the exports of an emerging European economy, and local returns once again have little forecast power on future exports. What is different from IP results is that net foreign flows do also forecast future Czech exports 1-2 months ahead. *E* and *F* can account for 11% and 4%, respectively, of the forecast error variance in Czech exports (Table III.CZ.3). However, *F*'s statistical significance is not robust under some specifications.

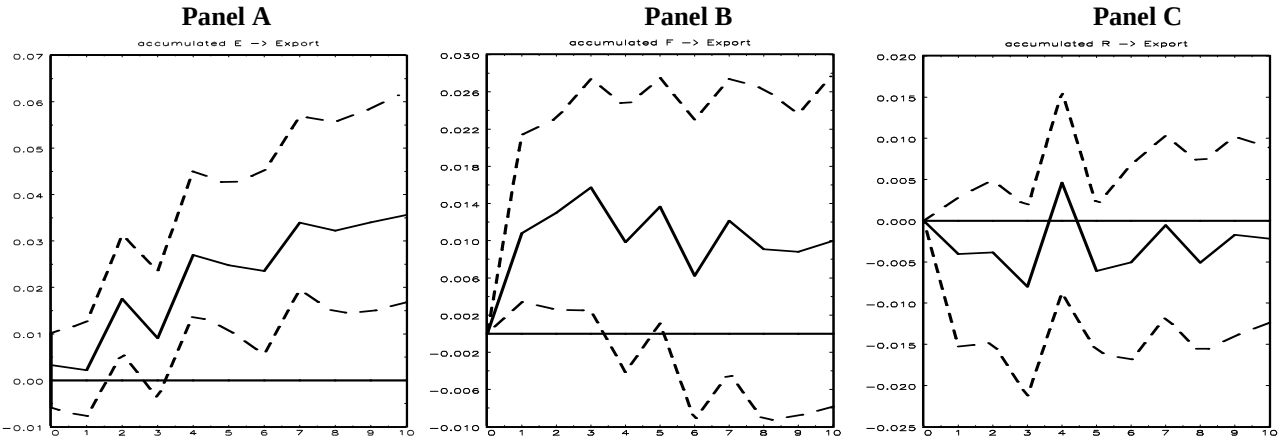


Figure III.CZ.5. Cumulative IRFs of Czech Exports to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and PSE index returns *R* (Panel C).

Proportions of forecast error in Export accounted for by:				
forecast horizon	**E**	**F**	**R**	**Export**
1	0.00	0.00	0.00	1.00
2	0.00	0.02	0.00	0.97
3	0.05	0.02	0.00	0.93
4	0.06	0.02	0.01	0.91
5	0.10	0.03	0.03	0.84
6	0.10	0.03	0.05	0.82
7	0.10	0.04	0.05	0.82
8	0.11	0.04	0.05	0.80
9	0.11	0.04	0.05	0.79
10	0.11	0.04	0.05	0.79

Table III.CZ.3. Variance decompositions for Czech Exports.

Figure III.CZ.6 below shows that both net foreign flows and PSE returns significantly positively respond to exports in the contemporaneous period. However, returns once again reverse this initial positive response subsequently, portraying an overall similar picture as in the response to IP.

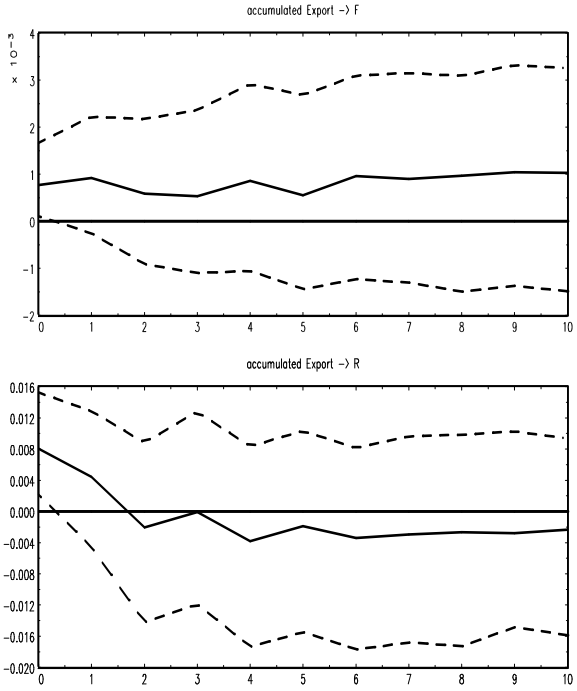


Figure III.CZ.6. Cumulative IRF's of net foreign flows *F* (upper panel) and PSE index returns *R* (lower panel) to a 1-standard deviation shock in Czech Exports.

Our estimations with Consumer Credit turned out to be quite noisy given the small sample size. The consumer credit volume series exhibits significant seasonality, and to alleviate estimation problems, we performed the seasonal adjustment externally, and used the first difference of seasonally adjusted real consumer credit growth (dsaConsCr). To improve estimation efficiency, we searched for lag restrictions. Figure III.CZ.7 shows that consumer credit responds positively to *E* and *F*, and is not significantly related to *R*.

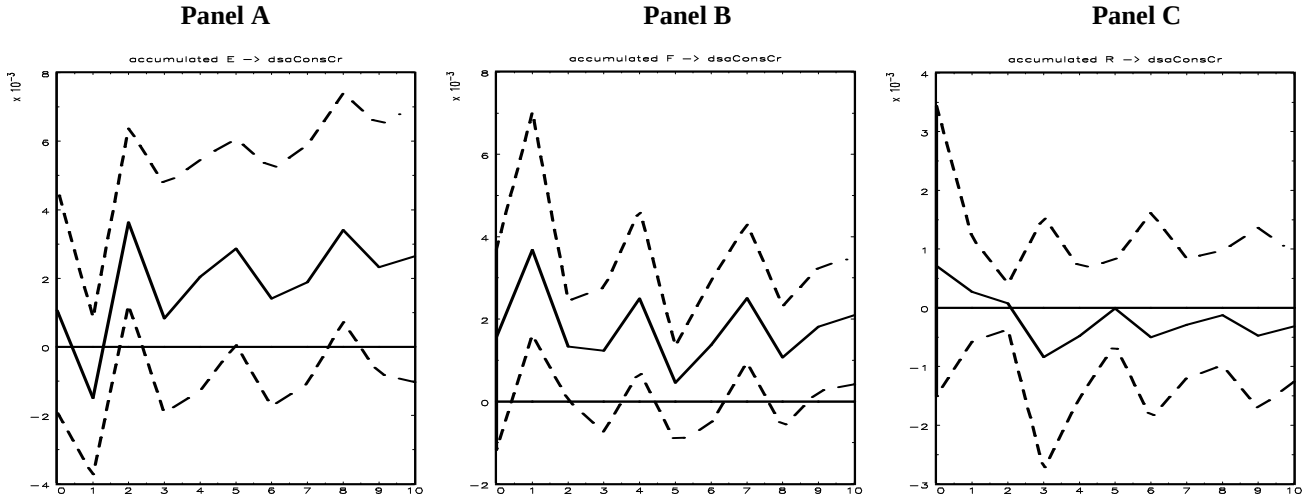


Figure III.CZ.7. Cumulative IRFs of Consumer Credit (dsaConsCr) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and PSE index returns *R* (Panel C).

III.C.GR. Greece Results:

As Greece's GDP, as defined in Section III.B, failed to reject the null of a unit root, we use its first difference dGDP. We encountered estimation problems with quarterly GDP model due to small sample size (n=26), hence we had to estimate a SVAR of order 2. Further, with a small sample size results are quite sensitive to the specification employed, though the results presented in Figure III.GR.1 and III.GR.2 below are consistent under many specifications. Greece's GDP positively responds to *E*, though the explanatory role of *E* is smaller than in other countries analyzed above. *F* also appears to positively forecast future GDP. Neither of these two relationships appear to be statistically significant, however lack of significance should mainly be attributed to small sample size. Panel C suggests that Athens stock exchange index returns significantly positively forecast GDP changes 1 quarter ahead. Yet, as Table III.GR.1 suggests *E* appears to have the most explanatory power.

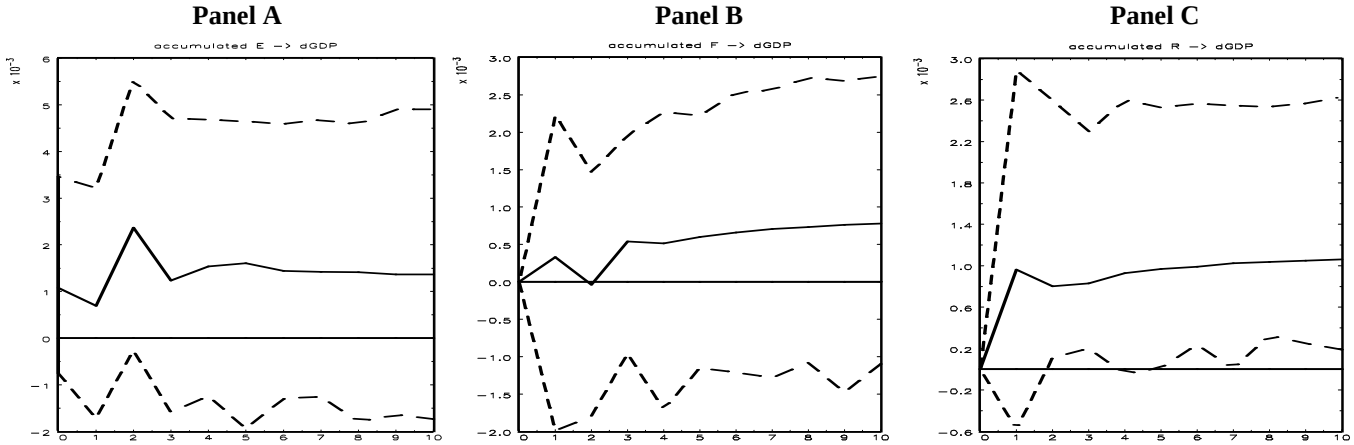


Figure III.GR.1. Cumulative IRFs of Greece's GDP to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and local returns *R* (Panel C).

Proportions of forecast error in GDP accounted for by:				
forecast horizon	**E**	**F**	**R**	**GDP**
1	0.11	0.00	0.00	0.89
2	0.09	0.01	0.01	0.90
3	0.08	0.01	0.01	0.90
4	0.08	0.01	0.01	0.90
5	0.08	0.01	0.01	0.90
6	0.08	0.01	0.01	0.90
7	0.08	0.01	0.01	0.90
8	0.08	0.01	0.01	0.90
9	0.08	0.01	0.01	0.90
10	0.08	0.01	0.01	0.90

Table III.GR.1. Variance decomposition for Greece's GDP.

Figure III.GR.2 below suggests that both net foreign flows and local returns positively respond to GDP growth rate changes. However, net foreign flows' response comes with one quarter lag, while local returns' response is contemporaneous. However, GDP can only explain 1% and 3% of the forecast error variance of *F* and *R*, respectively, implying a low level of economic significance.

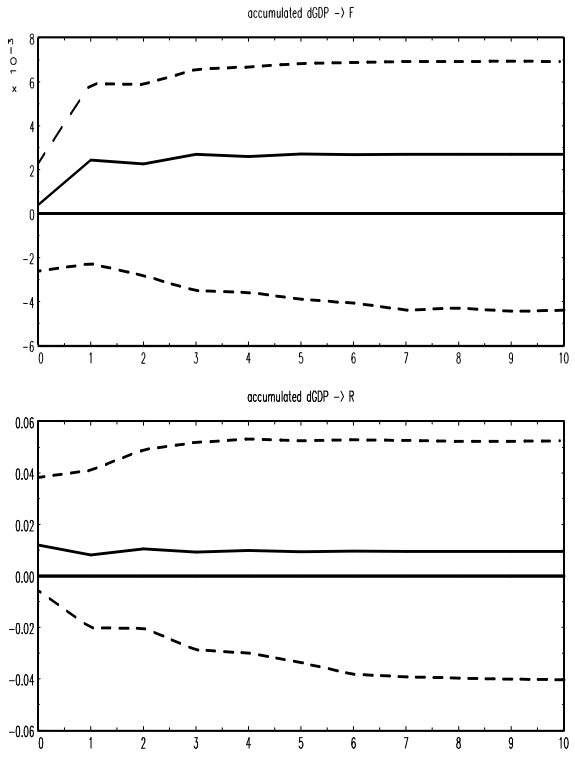


Figure III.GR.2. Cumulative IRF's of net foreign flows *F* (upper panel) and local returns *R* (lower panel) to a 1-standard deviation shock in Greece's GDP.

Figure III.GR.3 below suggests that Greece's industrial production (IP) shows a significant positive response to *E*, is not significantly related to net foreign flows (some insignificant negative relation at long lags), and is predicted by local returns 1 month ahead, but not permanently affected by it. Thus, one may hypothesize that the main bottleneck for Greek industrial production is overall demand conditions in Europe, not capital constraints. As Greece is a service economy, foreigners may not be bothering about forecasting future IP growth.

Panel A **Panel B** **Panel C**

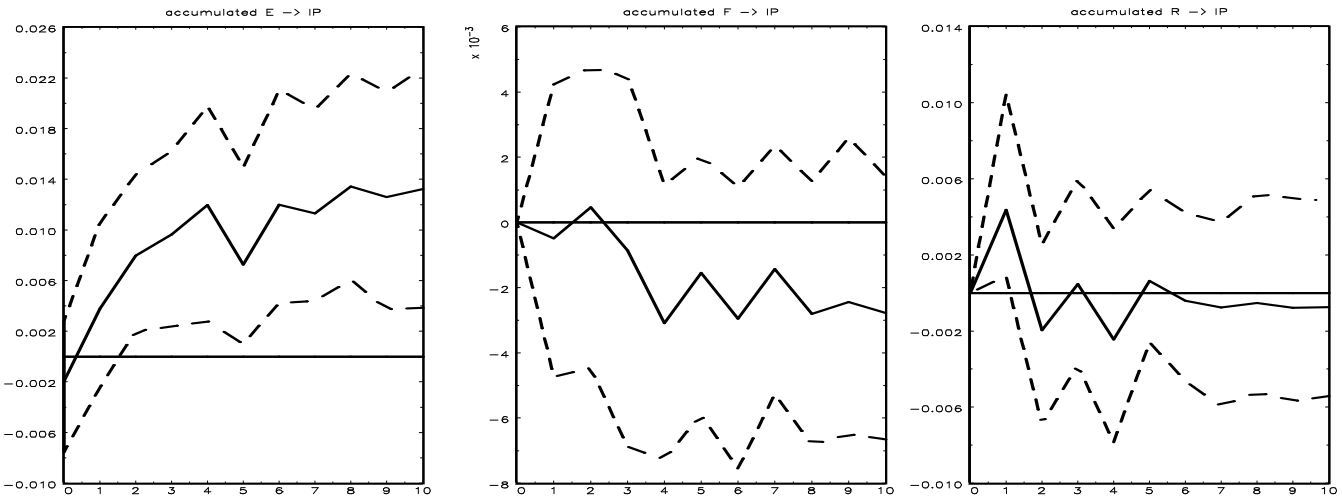


Figure III.GR.3. Cumulative IRFs of Greece's Industrial Production (IP) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and local returns *R* (Panel C).

Proportions of forecast error in IP accounted for by:				
forecast horizon	**E**	**F**	**R**	**IP**
1	0.00	0.00	0.00	1.00
2	0.03	0.00	0.01	0.96
3	0.04	0.00	0.04	0.92
4	0.04	0.00	0.04	0.92
5	0.04	0.01	0.05	0.90
6	0.05	0.01	0.05	0.89
7	0.07	0.01	0.05	0.87
8	0.07	0.01	0.05	0.87
9	0.07	0.01	0.05	0.87
10	0.07	0.01	0.05	0.87

Table III.GR.2. Variance decomposition for Greece's Industrial Production (IP)

Figure III.GR.4 below suggests that net foreign flows negatively respond to past IP growth, while Athens Stock Exchange returns are not significantly related to past IP growth. Foreigners' negative response may again be related to the fact that Greece is a service economy. Recall from Greece results in Section II that net foreign flows bear forecast power on future returns of Athens stock index, and moreover recall from Figure III.GR.2 that *F* positively responds to GDP, which clearly imply that foreigners still trade on information however it is probably not IP what they regard as information.

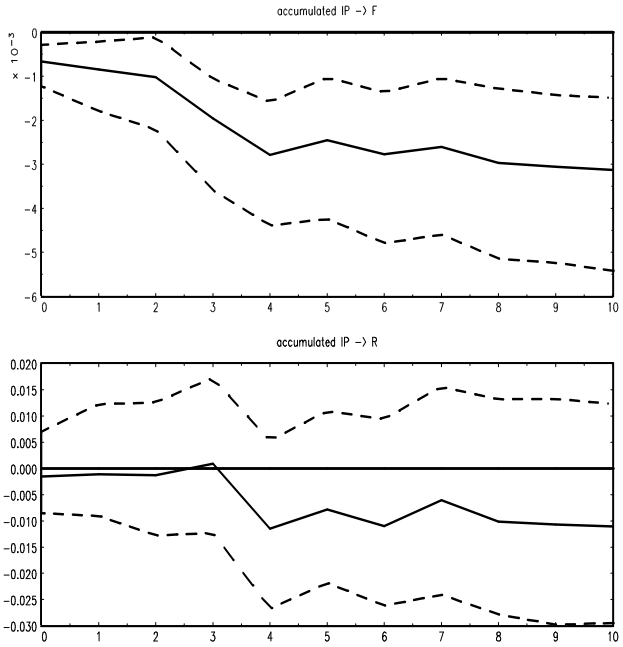


Figure III.GR.4. Cumulative IRF's of net foreign flows *F* (upper panel) and local returns *R* (lower panel) to a 1-standard deviation shock in Greece's Industrial Production (IP).

Greece's exports appear to be insignificantly negatively (positively) related to *F* and *R* (*E*) at lags, while *F* and *R* appear to negatively respond to exports at the 1-month lag (results not reported, as they are

neither statistically nor economically significant). These results can be reconciled taking into account the fact that Greece's exports are mainly agricultural products, possibly of a counter-cyclical nature.

Corporate credit volume (CorpCr) and household credit volume (HshldCr) as defined in Section III.B failed to reject the null of a unit root conclusively (the former rejected the null only under the HQ lag suggestion of 2). Hence, we use first differences of these variables (dCorpCr and dHshldCr). Panel A of Figure III.GR.5 suggests that *E* has a lagged positive impact on CoprCr, while *F* has no impact. Corporate credit volume is contemporaneously negatively associated with local market returns, but displays a positive response at the first and second months which is reversed in the third month. We do not have information to explain these zigzags, which can account for about 18-22% (depending on specification chosen) of the forecast error variance of dCorpCr.

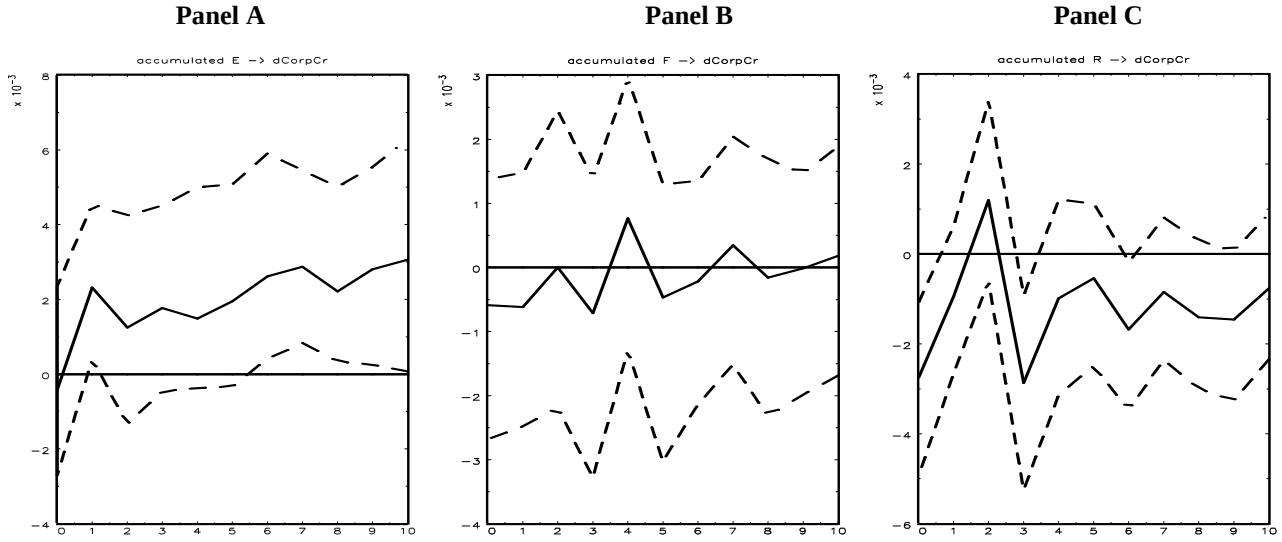


Figure III.GR.5. Cumulative IRFs of Corporate Credit Volume (dCorpCr) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and local returns *R* (Panel C).

Figure 3.GR.6 below shows that net foreign flows and local returns do not exhibit a significant lagged response to corporate credit growth.

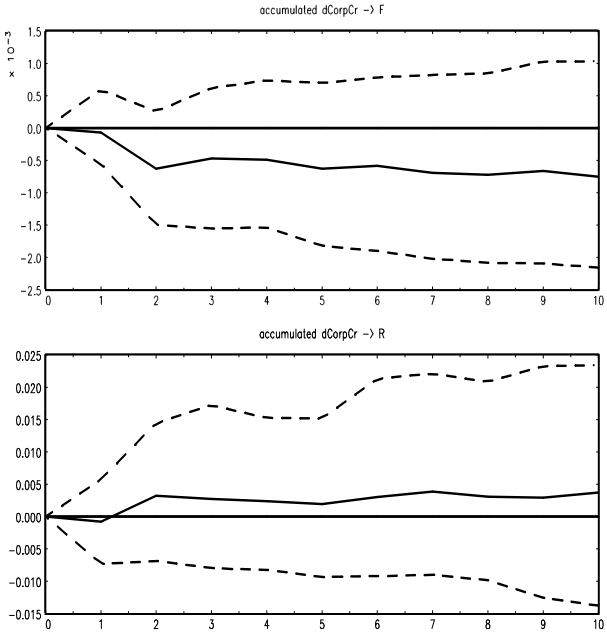


Figure III.GR.6. Cumulative IRF's of net foreign flows *F* (upper panel) and local returns *R* (lower panel) to a 1-standard deviation shock in Corporate Credit growth (dGDP).

Figure III.GR.7 below shows that the response of household credit to *E* and *F* are very similar to that of corporate credit, that is *E* has a lagged positive impact (can explain 14% of dHshldCr) and *F* has no significant impact. Hence, one can argue that Euro-wide macroeconomic activity level signaled by E has a positive impact on credit volume in Greece's banking system, while foreign flows play little role which confirms that credit availability has not been a major concern for Greece economy. The response of household credit to local returns displays a quite similar zigzag as corporate credit at the 1st, 2nd and 3rd months, however the contemporaneous negative association of *dCorpCr* is absent here. Hence, we can regard it as a characteristic associated with corporate financing, possibly a substitution between credit financing and equity financing. A temporary positive response of bank credit to local returns in the first and second months and a reversal of it at the third month appears to be common for both CorpCr and HshldCr, so local stock market returns signal a temporary positive reaction in credit volume. Table III.GR.3 shows that the role cyclical variables *E*, *F* and *R* is minor in explaining Greek household credit volume, and that of net foreign flows is particularly negligible suggesting that credit availability is not a major bottleneck for Greek household (i.e. cyclical foreign capital flows do not determine the credit volume).

Panel A **Panel B** **Panel C**

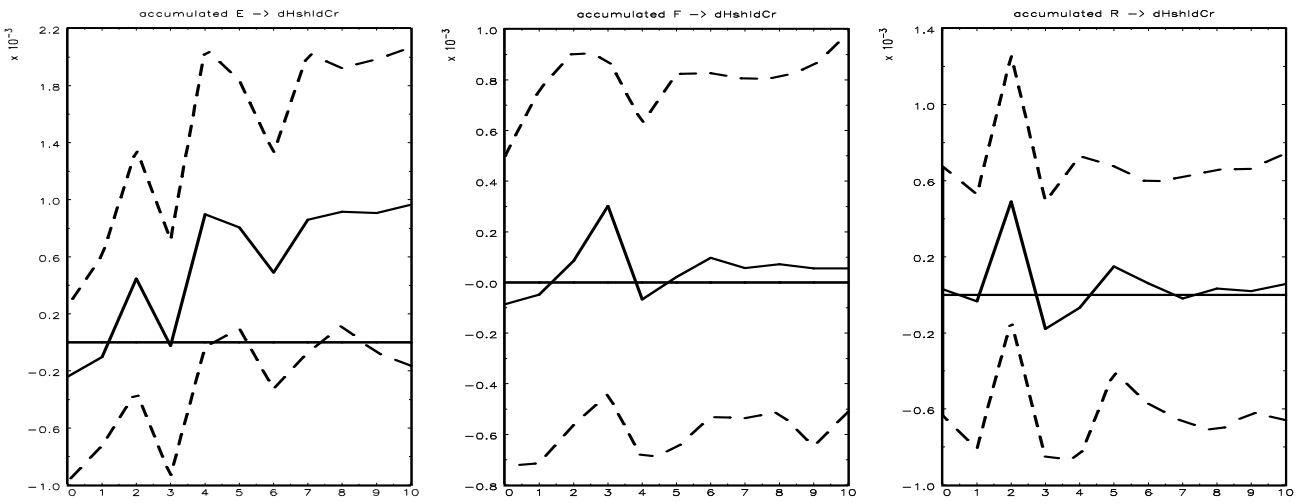


Figure III.GR.7. Cumulative IRFs of Household Credit (dHshldCr) to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and local returns *R* (Panel C).

Proportions of forecast error in dHshldCr accounted for by:				
forecast horizon	**E**	**F**	**R**	**dHshldCr**
1	0.00	0.00	0.00	0.99
2	0.00	0.00	0.00	0.99
3	0.02	0.00	0.01	0.97
4	0.03	0.00	0.04	0.93
5	0.08	0.01	0.03	0.88
6	0.08	0.01	0.03	0.88
7	0.08	0.01	0.03	0.88
8	0.08	0.01	0.03	0.87
9	0.08	0.01	0.03	0.87
10	0.08	0.01	0.03	0.87

Table III.GR.3. Variance decomposition for Greek Household Credit volume (dHdhldCr).

Figure III.GR.8 shows that both net foreign flows and local returns exhibit a significant negative response to consumer credit. Recalling that *F* and *R*'s response to past corporate credit growth was neutral, we interpret this contrarian response as foreign investors taking advantage of local public sentiment. Recall that we had found similar contrarian response to consumer confidence in turkey and Hungary. In Greece, this response contrarian response is particularly pronounced possibly because of excessive borrowing by Greek households. Household credit growth can explain 12% of the forecast error variance in *F*.

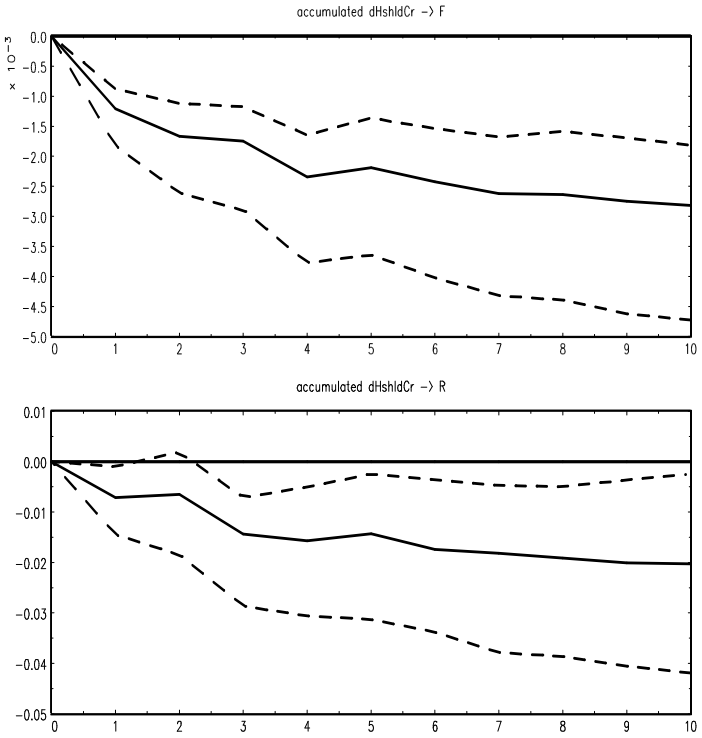


Figure III.GR.8. Cumulative IRF's of net foreign flows *F* (upper panel) and local returns *R* (lower panel) to a 1-standard deviation shock in Household Credit (dHshldCr).

Figure III.GR.9 shows the responses of Retail Trade (a variable that we could access only on Greece) to *E*, *F*, and *R*. As almost all other indicators of macroeconomic activity, Retail Trade responds significantly positively to *E*. We interpret this as the spillover of European-wide macroeconomic activity signaled in advance by European stock market returns. Retail trade is a purely domestic variable, unlike GDP, IP, exports and corporate credit volume, which are associated with external effects at least in one dimension. Hence, this result shows that global macroeconomic conditions do indeed spur purely local spillover effects. Future retail trade activity is also significantly positively associated with current net foreign flows, and to a lesser extent with current local returns. The negative response to *F* and *R* at the first lag is interesting, and we have no information to explain this initial zigzag, however it is economically less significant compared to subsequent positive response (see Table III.GR.4).

Panel A **Panel B** **Panel C**

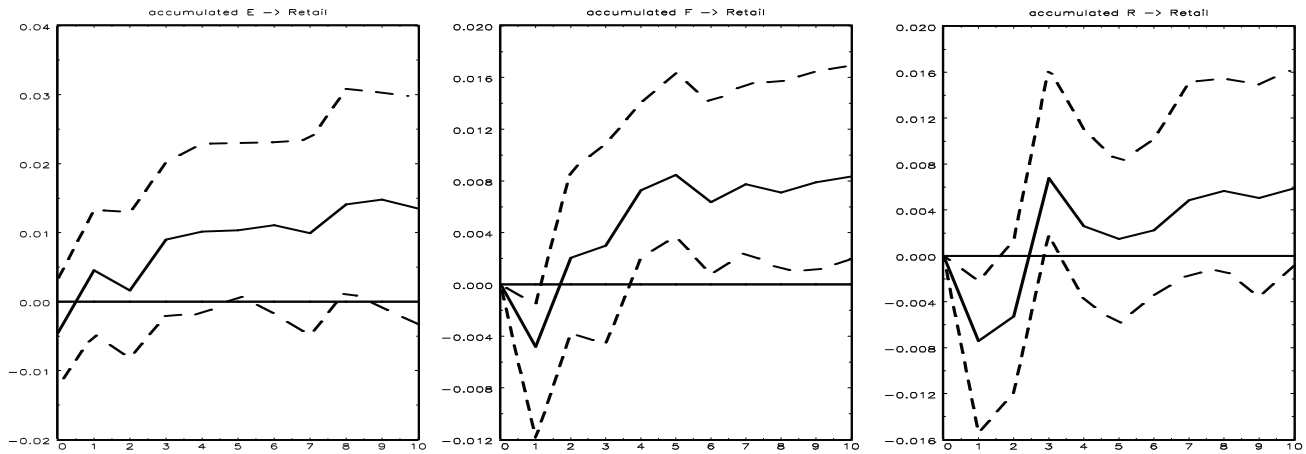


Figure III.GR.9. Cumulative IRFs of retail trade to a 1-standard deviation shock in global stock index returns *E* (Panel A), net foreign flows *F* (Panel B) and local returns *R* (Panel C).

Proportions of forecast error in Retail accounted for by:				
forecast horizon	**E**	**F**	**R**	**Retail**
1	0.03	0.00	0.00	0.97
2	0.11	0.02	0.06	0.81
3	0.11	0.07	0.06	0.76
4	0.14	0.06	0.17	0.64
5	0.13	0.07	0.17	0.63
6	0.13	0.07	0.17	0.63
7	0.13	0.07	0.17	0.63
8	0.13	0.07	0.18	0.62
9	0.14	0.07	0.17	0.61
10	0.14	0.07	0.17	0.61

Table III.GR.4. Variance decomposition for Greece's Retail Trade.

Figure III.GR.10 shows that neither net foreign flows nor local returns display a significant response to retail trade activity level.

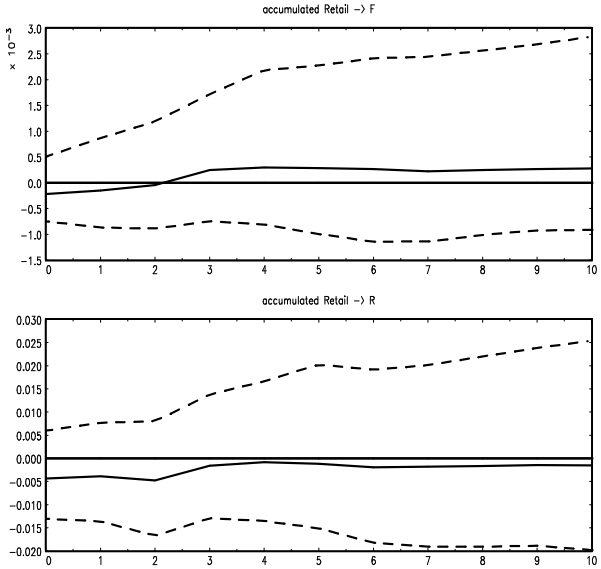


Figure III.GR.10. Cumulative IRF's of net foreign flows *F* (upper panel) and local returns *R* (lower panel) to a 1-standard deviation shock in retail trade.

IV. CONCLUSIONS

This research program has had two major objectives:

1) Although European emerging markets are those economies with the highest external deficits hence most dependent on foreign capital inflows, extant research on the behavior and impact of foreign investors in emerging stock markets excludes European emerging markets, hence there was an important gap in the literature. In order to assess whether conclusions derived from previous studies, which mostly focus on Asian markets due to data availability, can be generalized, one has to analyze European emerging markets where foreign ownership is around 70% of the market capitalization (Hungary and Turkey), unlike Asian markets where the same ratio is around 35%. Hence, the first objective of this research was to find and analyze data to fill this important gap. We accomplished this goal in Part I (Section II of this report) by analyzing data from 11 countries (including Turkey which was analyzed before and served as a benchmark as we were safe of the accuracy of the data).

2) While the macroeconomic effects of total foreign capital flows (including bond, money market and direct investment flows) have been analyzed before, especially in the context of assessing the contribution of capital account liberalization on economic development, we are not aware of any study analyzing the interaction between foreign equity portfolio flows and short-term macroeconomic activity. A particular research question was whether the foreign equity portfolio flows, which is the most volatile and pro-cyclical component of the total foreign capital flows, have forecast power on short-term macroeconomic activity in emerging economies after controlling for global stock market index returns. Obviously, this is a wide area of research, and in Part II (Section III of this report), we established a comprehensive base to address this topic for the first time in world literature, which can be built further upon.

IV.1. Conclusions from Part I

The empirical analysis in Part I enables us to reach generalized conclusions on some previously addressed research questions, and discover some unique characteristics of European emerging markets. These can be summarized as follows:

1) Foreign investors do engage in positive feedback trading at the daily frequency, but in negative feedback trading at the monthly frequency: Theory (Brennan and Cao, 1997, Griffin et al. 2004) describes foreign investors as positive feedback traders (as they are less informed) with respect to host market returns; and almost all available empirical evidence (cited in Ülkü and Weber, 2010) suggest, irrespective of the frequency of data, that foreign investors are indeed positive feedback traders. However, most of this research uses data from earlier sample periods, mostly from Asian markets, and does not combine and contrast data at the monthly and daily frequency. Moreover, most of the earlier research suffers from omission of global market returns. Using longest samples, we consistently document that foreigners do positive-feedback-trade at the

daily frequency (Turkey, Korea, Taiwan), but negative feedback trade at the monthly frequency (9 out 11 European markets in our sample, and Korea and Taiwan). Hence, we obtain a more detailed and precise description of foreigners' behavior, which pretty stable across geographies. They probably respond to information. Their instantaneous response is to join the move within a few days, but then to exploit it by acting in a contrarian way next month. Hence, they appear to be sophisticated traders. The conclusion that foreign investors respond to available information in a more sophisticated manner is shared by some other papers providing more direct evidence (e.g. Chen et al., 2009 on Taiwan).

2) A minor discovery of ours is that global emerging market returns do significantly enter the VAR system equations even after controlling for global developed market returns. Hence omitting them amounts to sort of specification error. While most results are immune to the inclusion of global emerging market returns, some results do change (i.e. persistence of flows in Turkey) when they are included. Hence, future research will have to control for global emerging market returns.

3) Negative feedback trading at the monthly frequency exhibits an asymmetry (foreigners sell following rises, but not buy following falls) in economies with large twin deficits: This is a significant result on Turkey, Hungary, Romania, Czech Republic, Spain in contrast to Korea, Taiwan, Poland. We argue that this may be a distinctive characteristic of European emerging markets, or emerging markets other than those in Asia. In particular, this type of differential behavior may be a reflection of foreign investors long-term perception of the riskiness of a particular market. External deficits may be a main determinant of those perceptions: In economies with large external deficits, foreign investors may be wary of developing Ponzi schemes in national accounts, hence may want to leave when economy is doing well (considering the problems with the sustainability of a foreign-capital dependent recovery) and delay or discard coming back when economy is doing poorly despite low stock prices offering buying opportunities (perhaps knowing that the local economy can recover only when they finance). This type of behavior can be predicted by the reflexivity theory and coordination games used to explain reflexivity (Özdenören and Yuan, 2008). Though, it does not prove the presence of such effects, such behavior may simply result from the information structure relevant to the country in question. Indeed, why we observe this asymmetry in Hungary but not in Poland may have something to do with the information structure.

4) Negative feedback trading is absent in Euro-area markets (Austria, Greece; Spain an exception). Hau and Rey (2004) argue that the main motive for portfolio rebalancing that would lead to negative feedback trading could be re-adjusting the exchange rate exposure (i.e. selling after the market rises to bring the exposure to the currency in question back to the original –diversified- level). Hau and Rey (2006) further argue that the surprising negative correlation between national stock market return differentials and currency returns may be due to this rebalancing. I personally see some flaws in their arguments (discuss them and test Hau and Rey's hypothesis in Ülkü and Demirci, 2011), however our finding that negative feedback trading is absent in 2 (Austria and Greece) out of 3 Euro-area stock markets lends support to their hypothesis. The third Euro-area

market where found negative feedback trading is Spain, where we think negative feedback trading may have been driven by some unique factors. Hau and Rey's (2006) hypothesis has not been tested using equity portfolio flows data, hence we are the first to test it directly. We will present the results in Ülkü and Demirci (2011).

5) Foreign investors' trading appears to be positively correlated with information which implies that domestic investors' trading is negatively correlated with information. Our conclusions (1), (2) and (3) above are jointly consistent with the hypothesis that foreigners respond to information. We further confirm this hypothesis in Part II of this project work by documenting evidence that net foreign flows are positively correlated with contemporaneous and future macroeconomic activity and in Ikizlerli and Ülkü (2010) by showing that foreigners' net trading positively responds to changes political risk ratings of Turkey. As our data partition market participants on the duality of resident versus non-residents, this implies that domestic investors' trading is negatively correlated with information. In other words, they provide liquidity to foreigners who trade on information. This conclusion is intriguing. Brennan and Cao (1997) argue that foreign investors respond to new local information as they were uninformed before (i.e. new local information arrivals results in bigger revisions in foreign investors' valuations than local investors'). We are not aware of any fresh theory on this issue. Our findings are not consistent with Brennan and Cao's argument: First, we have the same result with respect to the response to global information, as well, however one cannot argue that domestic investors are more informed about global market factors so that these global investors have bigger revisions in their expectations. Second, in many markets we find that net foreign flows can also forecast future information on local macroeconomic variables. This rules out the argument that local investors are more informed about the local factors. Hence, our finding opens up the basis for a revised theory of foreign investors' behavior. The revised theory may simply say "foreign investors have a sophisticated response to available information". This is a common characteristic for institutional investors, or for all types of big players (Ülkü, 2010).

6) Foreigners are more likely to follow rather than lead returns. Developing a new methodology, we reached results that pose strong doubt on the standard interpretation of the contemporaneous price impact of foreign investors' trading. It is easy to show using daily data that lagged returns have more explanatory power on future net foreign flows (in the positive direction) than vice versa, which suggests that a significant portion of the contemporaneous positive association between net foreign flows and local returns at the monthly frequency could be due intra-month positive feedback trading. In Ülkü and Weber (2010), we developed a new methodology (i.e. applied the structural conditional correlation methodology from the GARCH literature to microstructure literature for the first time) to identify the daily interaction between flows and returns. Using this approach, we found that the intraday spillover from local returns to net foreign flows is stronger then the reverse spillover. Thus, even what has been described as the contemporaneous price impact of foreign flows at the daily frequency in the literature may in fact be, to a large extent, foreigners responding to the same information which market prices already have adjusted.

This methodology can be applied to any study in the microstructure literature. Hence, in an extension of project work, we adopted a new econometric technique that enables to identify the contemporaneous interaction between trading and returns at the daily frequency. Up to this innovation, all available studies in this line of the literature were circumventing the contemporaneous identification problem in SVAR models by imposing Cholesky ordering assumptions, whose validity are fairly questionable.

IV.2. Conclusions from Part II

The empirical analysis in Part II provided us the first evidence in the literature on the short-term interaction between foreign equity portfolio flows, which are more volatile and responsive to information than total flows, and the domestic macroeconomic activity. This analysis also enables us to enquire about whether net foreign flows can forecast future macroeconomic activity, can even cause it, and further whether there may be a reflexive interaction between foreign flows and domestic macroeconomic activity. The results in the second part, however, are less strong as macroeconomic data are quite noisy and results are not uniform. Yet, we have obtained sufficiently reliable results to have a basic understanding of the answers to our research questions and formed a basis to develop further enquiry. Obviously, Part II has an open-ended coverage, and our current analysis, while answering some of the research questions, has added more new questions, as well. We summarize our current conclusions here.

1) Both global stock market returns and net foreign flows (after controlling for the former) are positively associated with both current and, to a larger extent, future macroeconomic activity. However, this does not necessarily mean net foreign flows have a strong explanatory power on future returns of the local stock market (local returns may respond price-in future macroeconomic activity in advance as *E* and *F* are signaling it, or may not respond to macroeconomic activity at all). Part of the local macroeconomic activity may be *caused* by global macroeconomic activity (signaled by global stock market returns) or by foreign capital flows, especially in economies facing a capital shortage by altering credit availability. Hence, global stock market returns and net foreign flows have significant and positive explanatory power after controlling for local returns.

2) We interpret our evidence as net foreign flows mainly *forecast* rather than *cause* macroeconomic activity in European emerging markets. This mainly applies to EU members who have access to sources of financing from EU institutions. However, in Turkey where credit availability is a major bottleneck, we have found evidence that foreign flows may *cause* macroeconomic activity. In particular, domestic credit volume is significantly positively forecast by net foreign flows.

3) Global stock market returns have a significant positive impact on domestic macroeconomic activity in European emerging markets, which has to be interpreted as *causing*. MSCI-Europe index returns turn out to be the factor with the highest explanatory power in most cases. They have strong explanatory power on external sectors of the economy such as exports and or externally-sensitive sectors such as industrial production, but

also on purely local sectors such as retail trade. Most of these effects come at lags of several months. They have strong effect on domestic consumer sentiment, as well, after controlling for local returns.[25]

The literature investigating the interaction between local macroeconomic activity and total foreign capital flows, as reviewed in Section I.D.iii mainly fails to control for global returns. As net foreign flows are highly correlated with global stock market returns (this statement needs to be empirically verified with other types of foreign capital flows, of course), many of the results in the literature may simply be picking the relation between global macroeconomic activity, signaled by global stock market returns, and foreign capital flows. Hence, they may be overemphasizing the role of foreign capital. The specification employed here ought to be the standard specification to investigate these issues.

4) We have obtained no convincing evidence to support the hypothesis that foreign investors spur a "reflexive" process in emerging economies. They may have such a role only in case of economies with capital shortage (Turkey), however their impact still appears to be more consistent with responding to available information than causing future information. This conclusion implies that the most effective way of avoiding the undesirable effect of sudden outflows while benefiting from inflows is to engineer a positive information set (i.e., a sound and proactive management of the domestic economy) rather than imposing capital flow restrictions.

Foreign investors do not appear to be "creating their own space" in emerging markets, rather they appear to respond to information. If a particular country is facing capital availability constraints, foreign flows may indeed spur macroeconomic activity (kind of providing the missing ingredient), however the behavior of foreign flows is not at their random discretion, they are still responding to information. Thus, in an economy facing capital availability constraint, management of foreign investor expectations assumes a crucial function. As foreign investors are rational, sophisticated, informed investors, the only way to manage expectations is to follow sound policies. In this respect, the emergence of Turkey from 2001 crisis to become one of the world's most robust economies can partly be attributed to recognition and proper management of dynamics of foreign capital flows.

In this respect, we can talk about a continuum: in Turkey, at one extreme, short term macroeconomic activity is highly dependent on external factors both due to trade effects and due to capital availability constraints. In Greece, at the other extreme, capital availability is not a constraint at all and dependence on export markets is minor. Between these two extremes lie Hungary, Poland and Czech Republic, where capital availability is a concern however has much more moderate impact on local macroeconomic activity as many alternative sources of financing are available thanks to access to EU markets and funds. However, the export activity is highly sensitive to macroeconomic activity in Europe which is signaled by MSCI Europe index returns a few months in advance.

[25] Milani (2010) finds that foreign stock price fluctuations play a role by affecting domestic expectations about future output gaps.

IV.3. Further Work

Two major papers will follow from the Part I and Part II of the main project work, respectively. Part I may lead to a paper titled "Foreign Investors in European Emerging Stock Markets". I plan to submit this paper in March 2011. Part II may lead to a paper titled "The Interaction between Net Foreign Equity Portfolio Flows and Local Macroeconomic Activity in Emerging Economies". I also plan to replicate the analysis in Part II on a number of Asian markets where we have reliable data, and include in this paper. The paper requires more work before it can be published; for example, numerous robustness checks, perhaps a standardization of macroeconomic data across countries and use of panel data methodology. At this stage I cannot specify a precise time horizon, but if everything goes as planned, I intend to submit this paper by May or June 2011. These two papers, the main output of the project work, will target top international journals.

We plan to extend the sample coverage to include Bulgaria, Baltic countries and Scandinavian countries, where we expect to find some data. In addition, we will extend our scanning across Ukraine, Balkan Republics, Italy, Portugal and MENA (Middle East North Africa) region over time. We also plan to check for robustness of our results by controlling for US interest rates, terms spreads, bond-risk premium spreads as they may also be significant determinants of capital flows. Note that these robustness checks have been performed in the literature relating to Part I of our empirical study, however involvement of macroeconomic data may require a replication of these controls with macroeconomic data as well.

In a possible extension of this project work, we plan to analyze the commonalities among net foreign flows to different emerging stock markets. Thanks to this project work, we have now formed one of the most comprehensive but unutilized data sets of net foreign flows to emerging stock markets. This data set may enable us to measure the extent net foreign flows co-vary across different countries. Further, it may enable us to enquire whether the increasing correlation among emerging national stock market indices can be attributed to foreign investors' increasing participation. For example, Ülkü (2010a) documents evidence that Hungary and Turkey's stock market returns' correlation has increased by the most in recent years, especially during the recent global crisis period (during the 2003-2006 subperiod, Hungary's BUX index' monthly real returns had a correlation of +0.69 with Poland's WIG index and +0.45 with Turkey's ISE-100 index; whereas during the 2007-2010 period Turkey has become to be the most correlated market with Hungary with +0.83, overtaking Poland at +0.82). Moreover, BUX and ISE-100 returns bear incremental forecast ability for each other after controlling for global stock index returns. As discussed in detail in Ülkü (2010a), this cannot be explained by trade links, policy coordination or any other fundamental factors hypothesized in the literature to be drivers of national stock market comovements. Hungary and Turkey stand out with the highest foreign ownership ratios (72% and 69% of market capitalization, respectively, as of October 2010). Hence, the correlation of national stock market index returns may be driven by foreign investors' response to common global factors, especially at times of global turbulence. This idea has been first investigated by Poshakwale and Thapa (2009) using

cointegration methodology and data from Asian markets. I believe cointegration tests have some deficiencies in investigating this issue. Hence, I plan to analyze this issue using data complete data from both European and Asian markets and employing SVAR methodology. This will probably be the third paper out of the project work.

I expect to add a fourth paper by investigating the interaction between equity portfolio flows and other types of foreign capital flows. In particular, we will test the hypothesis that equity portfolio flows may be co-moving with money market and bond flows, which may explain the link between net equity portfolio flows and domestic credit volume, and the hypothesis that that equity portfolio flows may be leading or responding to direct investment flows. Within the first half of 2011, we will conduct pilot studies on Hungary and Turkey which will shape how we will proceed.

Further work may include an investigation of the negative correlation between corporate credit volume and local stock returns (i.e., testing a substitution hypothesis between equity capital and debt in European emerging markets). Also, the negative response of net foreign flows to domestic credit volume in some countries requires further investigation. Finally, we plan to illuminate the interesting case of Spain by finalizing our working paper (Porras and Ülkü, 2010).

We thank OTKA for providing us with the motivation, energy and resources to finalize actualize this comprehensive work.

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APPENDIX I

Bigger Fish in Small Pond: The Interaction between Foreigners' Trading and Emerging Stock Market Returns under the Microscope

Numan Ülkü[a] *and Enzo Weber*[b]

[a] *Central European University Business School, Budapest (E-mail:UlkuN@ceubusiness,org)*

[b] *Universität Regensburg (E-mail: Enzo.Weber@wiwi.uni-regensburg.de)*

Abstract

This paper provides the first study of foreign investors' trading in a sizeable European emerging stock market, using a combination of daily and monthly complete data collected at the destination. It also introduces the structural conditional correlation (SCC) methodology to identify the contemporaneous interaction between foreign flows and returns. We show that global emerging market returns are an additional driver of foreign flows after controlling for global developed market returns. Foreigners do negative (positive)-feedback-trade with respect to local returns at the monthly (daily) frequency. SCC methodology shows that the standard assumption in the literature, that flows cause returns contemporaneously but not vice versa, is not justified, even at the daily frequency, making price impact estimates reported in previous literature questionable.

I. Introduction

Foreign investors' trading has been associated with a dominant influence in emerging stock markets. Moreover, it is perceived to have acted during the recent global crisis as a channel of transmitting the turbulence from developed economies into emerging economies, which were relatively more stable. These observations are particularly relevant for European emerging economies with large external deficits, which depend on foreign capital inflows to sustain their finances. However, most of the available research on foreign investors' trading in stock markets is confined to Asian markets, mainly due to availability of exact data on foreigners' trading. As data collected from one source country or from one custodian might be biased or at least unsafe to generalize,[26] conclusive research should be based on complete data compiled at the destination

[26] Studies that use such data include Froot et al. (2001) who employ data from only one particular custodian (State Street), and Bekaert et al. (2002) who employ data from only one source country (TIC data from US). However, such data may contain measurement errors and even biases, as they do not include all foreign flows. Foreign flows data should be collected from destination (see Pavabutr and Yan, 2007, who show that the correlation between actual foreign flows data in Thailand and that derived from US Treasury's bulletin is merely +0.43).

market. We are not aware of any published research in the literature on foreigners' trading in European emerging markets, which employs complete data from the destination.[27] Istanbul Stock Exchange (ISE), the largest and deepest stock market in the CEEMENA (Central and Eastern Europe, Middle East, North Africa) region, ranked 7th among all world emerging markets in terms of total value of shares traded, presents an ideal case study as precise data on foreigners' trading are compiled in a centralized manner. Moreover, as Turkey removed all restrictions on foreign portfolio investments in August 1989, an analysis on ISE is not blurred by the initial impact of liberalization (i.e.; one-time portfolio rebalancing by international investors) as documented in Bekaert et al. (2002).[28] Further, Turkey, unlike many Asian markets, has never implemented any (partial) restrictions on foreigners' trading in the stock market, so a clean picture of the foreign trader behavior and market return interaction can be obtained. Finally, and perhaps most importantly, results on Turkey with a very large external deficit enables to assess the generalizability of previous results obtained on external surplus economies of Asia, where stock markets are dominated by domestic individual investors. To highlight the point, the fraction of market capitalization held by foreigners has been fluctuating around 70% in recent years in ISE, which is representative of external deficit economies in emerging Europe (for example, roughly 72% in Hungary), while the same ratio is much smaller in Asian stock markets: 31.60% in Taiwan in October 2010; 32.65% in Korea and 36% in Indonesia as of end of 2009, 28% in Japan as of end of 2008).[29] That is, in Richards' (2005) words, the "big fish" is actually in emerging Europe. Given the fact that most stock exchange administrations in emerging Europe do not keep track of foreigners' trading,[30] this study on ISE provides the sole opportunity to investigate if previous results obtained on mostly Asian markets (Choe et al., 1999; Griffin et al., 2004; Richards, 2005 among many others) hold for European emerging markets characterized by external deficits.

By using new data, combining and contrasting the analysis at the daily and monthly frequencies, and most importantly, introducing a promising new methodology to address some previously unanswered questions, this paper takes the literature on the interaction between foreigners' trading and emerging stock market returns several steps further. A first contribution stems from the data used. The monthly data on foreigners' trading in ISE, which have been employed before, are compiled by ISE by requiring member brokers to report transactions executed on behalf of nonresident clients on a monthly basis. A daily counterpart

[27] One exception is Slovenia in Griffin et al. (2004). However, this market is of negligible size, and even the authors questioned the legitimacy of reporting results on this market.

[28] In particular, as liberalization itself leads to stock market appreciation, an appearance of positive feedback trading may emerge in addition to a possible overstatement of the persistence in flows.

[29] These ratios were even much smaller during the periods covered by major papers in this literature. For example, Choe et al. (1999) report the average foreign ownership in their sample as merely 12%).

[30] We contacted all European emerging stock exchange administrations individually within a research project supported by OTKA (The Hungarian Scientific Research Fund), and found out that major stock exchanges (e.g. Budapest, Warsaw, Prague) do not even collect any data on foreigners' trading except for asking member brokers once a year about an estimate of the percentage of trading volume executed on behalf of nonresidents during the year. Daily data are reported to be available only in Ljubljana (Griffin et al., 2004), a market of negligible size, though we were unable to verify availability of such data.

does not exist. However, the Central Registry Agency of Turkey (CRAT) has been reporting the percentage of listed shares held by nonresident investors on a daily basis. To our knowledge, this paper is the first to utilize this data set, and more generally the first and only daily data on foreigners' trading in a sizeable European emerging market.

A main contribution of the paper is to explore feedback trading behavior of foreign investors. Academic literature predominantly characterizes foreign investors in equity markets as uninformed, positive feedback traders (Brennan and Cao, 1997), or portfolio rebalancers (Griffin et al, 2004; Hau and Rey, 2004). However, İkizlerli and Ülkü (2010) have shown that foreigners in ISE tend to negative feedback trade with respect to local returns at the monthly frequency. This finding contrasts earlier empirical literature that predominantly reports positive feedback trading by foreigners in mostly Asian markets (Stulz, 1999; Bekaert et al., 2002; Kim and Wei, 2002; Griffin et al., 2004; Richards, 2005) and in developed markets (Dahlquist and Robertsson, 2004). In this paper, we explore foreigners' feedback trading behavior by combining monthly and daily data and further by putting the daily interaction under the microscope introducing a new methodology, based on GARCH modeling, for contemporaneous identification of returns and flows. A key finding is that the lagged response of net foreign flows to local returns, which is significantly negative at the monthly frequency particularly following positive returns, is positive at the daily frequency particularly following negative returns. This discards an automatic portfolio rebalancing mechanism, and suggests that different mechanisms may be operating at different time horizons. For example, foreigners might be responding to new information over a horizon of a few days and rebalancing their portfolios via contrarian trades in the following month. At the same time, the lagged response of net foreign flows to global returns is positive and strong at both the monthly and the daily frequency; yet negative feedback trading with respect to local returns, in particular following rising markets, at the monthly frequency rules out a naïve positive feedback trading strategy or especially sentiment trading. Our results rather lead to a conclusion that foreign investors' trading reflects a sophisticated response to information. Finally, our new approach suggests that intraday positive feedback trading, which has been imposed not to exist in vector autoregressions (VAR) in the extant literature, may be a pervasive feature, as further discussed below.

The results of Griffin et al. (2004) and Richards (2005) strongly called for inclusion of global market returns as an exogenous variable in the VAR model describing the interaction between foreign flows and local stock market returns. Such results are predicted by theories of portfolio rebalancing (Griffin et al, 2004), that is, international investors in source markets should buy in foreign markets following increases in their home markets to bring portfolio weights back to previous levels. Hence, host market local return – net foreign flow interaction has been conditioned on returns in developed (source) markets.[31] In this paper, we show that global

[31] The fact that in today's globalized economy, world market returns may provide significant information on future global economic climate, hence the possibility that foreign investors might be responding to information rather than merely

emerging market returns are a significant and strong driver of both foreign flows and local emerging stock market returns after controlling for global developed market returns, in particular at the monthly frequency[32] where we document a prolonged response. Persistence in foreign flows in Turkey is accounted for, to a large extent, by lagged positive responses to global emerging market index returns. The lower significance of global emerging market returns at the daily frequency may be a reflection of the fact that emerging market information is less salient and more scattered.

In trading – return interaction, the interpretation of positive contemporaneous correlation at low frequencies has been a notorious problem: it may reflect three possibilities, namely, contemporaneous and lagged intraperiod price impact, intraperiod positive feedback trading, or latent common factor influence driving both flows and returns simultaneously. The standard treatment in this line of literature has evolved based on a questionable assumption suggesting flows be ordered before returns to enable contemporaneous identification in a recursive VAR system, and major papers followed this assumption, that would be safe only under tick data; see Danielsson and Love (2006) and Sias et al. (2006) for a detailed discussion of this issue. The third possibility, latent common factor influence, has been totally ignored. A clarification is handicapped by the lack of trading data at sufficiently high frequency. In this paper, we propose a frontier methodology that exploits time variation in the volatility of shocks to achieve identification (see e.g. Sentana and Fiorentini, 2001 or Rigobon, 2003). In particular, we employ the structural conditional correlation (SCC) model of Weber (2010) to identify the contemporaneous return-flow interaction at the daily frequency. Importantly, the contributions of all three possible sources of the correlation can be estimated without zero-restrictions. Our results show that the standard assumption in this line of literature, that flows cause returns but not vice versa, is not justified. This implies that caution is needed in interpreting price impact estimates reported in earlier studies.

The paper is organized as follows. Section II first provides a review of the literature on foreign investors' interaction with emerging stock market returns, and then discusses the contemporaneous identification problem. Section III explains the data and methodology employed in the paper, with a subsection on adopting the SCC concept into the return-flow literature. Section IV first reviews the monthly results, then presents the daily results. Section V presents SCC results and discusses their implications. For the purpose of comparing to results in previous literature, the analysis is also replicated on Korea and Taiwan. Section VI concludes by summarizing the main lessons from the study.

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rebalancing their portfolios is another possibility which could not be examined in extant literature as developed (source) market returns are a driver of both rebalancing and global economic information channels.

[32] It is interesting to note that Richards (2005) and Griffin et al. (2004) included MSCI Emerging Markets index in their preliminary analysis, however, continued the main analysis employing only US returns, possibly to avoid the problem of time-zone differences inherent in using MSCI Emerging Markets index at the daily frequency that may confuse the analysis.

II. Related Literature

A. Literature on Foreigner's Trading and Emerging Stock Market Returns

Research on foreigners' trading has dealt with three questions: i) Do foreign investors pursue positive feedback trading strategies? ii) What is the impact of foreign flows on domestic stock returns? Is the contemporaneous price impact to be explained by price pressure, by base-broadening or by information? iii) Does foreigners' trading contain superior information (i.e., forecast value)?

On the first question, Brennan and Cao (1997) using quarterly data; Stulz (1999), Bekaert et al. (2002), Kim and Wei (2002), and Dahlquist and Robertsson (2004) using monthly data; Karolyi (2002) using weekly data; Choe et al. (1999),[33] Froot et al. (2001), Griffin et al. (2004), and Richards (2005) using daily data find evidence of positive correlation between current foreign flows and lagged local equity returns which suggests that international investors are positive feedback traders. Grinblatt and Keloharju (2000) report strong evidence of momentum trading by foreigners in individual stocks (i.e. buying past winners and selling past losers). The finding of positive feedback trading by foreigners seems to be a uniform result, with few exceptions, irrespective of the frequency of data used. The main exception has been documented on ISE, where foreigners pursue negative feedback trading with respect to local returns at the monthly frequency (İkizlerli and Ülkü, 2010).[34]

The above results raise the question of why international investors are positive feedback traders. In this respect, Brennan and Cao (1997) and Griffin et al. (2004) assert that the expectations of foreign investors regarding the local market returns are more extrapolative than local investors, because they are less informed. In support of this argument, Kim and Wei (2002) find that foreign investors outside Korea are more likely to engage in positive feedback trading than foreign investors residing in Korea. The model of Brennan and Cao (1997) predicts foreign investors to use recent returns as information signals, as they have an informational disadvantage in emerging markets. An alternative explanation examined by Bohn and Tesar (1996) and Bekaert et al. (2002) is that international investors are "expected return chasers" entering the markets that have high expected returns and fleeing from markets that have low expected returns. While Bohn and Tesar (1996) do, Bekaert et al. (2002) do not find evidence of expected return chasing. Richards (2005) concludes that positive feedback trading observed in his sample is likely to be due to behavioral factors or foreigners extracting information from recent returns rather than portfolio rebalancing.

The second question addressed in this line of literature focuses on the impact of flows on returns. All studies [for example, Clark and Berko (1997), Froot et al. (2001), Dahlquist and Robertsson (2004), and

[33] Choe et al. (1999) also report, however, that foreigners did negative feedback trade at the daily frequency during the Asian crisis, selling to local individual investors who were buying following positive returns.

[34] The case of negative feedback trading in ISE has also been noted in some earlier papers (either unpublished or published in local journals): Karataş et al. (2004), Adabağ and Ornelas (2004) and Akar (2008).

Richards (2005)] uniformly report that foreigners' net buying raises stock prices, which ironically means that net selling of an equal amount by domestic investors raises stock prices. Reported estimates of the price impact of net foreign flows equivalent to one per cent of market capitalization are: +13% in Mexico (Clark and Berko, 1997; monthly data 1989-96), +10% in Sweden (Dahlquist and Robertsson, 2004; monthly data, subsequent to liberalization), +14.9% in Turkey (İkizlerli and Ülkü, 2010; monthly data, 1997-2008) and +38% median for six Asia-Pacific emerging markets (Richards, 2005; daily data, 1999-2002).[35] Then, an issue of particular interest is whether the effect is temporary or permanent. If the price increase is temporary, it may reflect pure price pressure. If it is permanent, it may be a reflection of risk sharing benefits of a stock market liberalization, i.e. base-broadening [Bekaert and Harvey (2000), Henry (2000), Kim and Singal (1997) and Dahlquist and Robertsson (2004)] or information revelation (Froot and Ramodorai, 2001). The latter encompasses a proposition that foreign net purchases incorporate fundamental prospects, making the effect of flows on returns permanent. Focusing on 28 emerging markets and employing daily data, Froot et al. (2001) find some evidence of price pressure. As to studies employing monthly data, Clark and Berko (1997) and Dahlquist and Robertsson (2004) find no evidence of price pressure in their study, while Bekaert et al. (2002) report that only a very small portion of returns due to flow shocks are reversed subsequently.

In analyzing these two questions, it is necessary to consider to what extent the capital flows are determined by global factors in order to adequately describe the relationship between foreign flows and local returns. Models that fail to control for global returns are likely to overstate the price impact. Chuhan et al. (1998) document that US equity portfolio flows into emerging markets are more sensitive to *push* (US or global) than *pull* (host country-specific) factors. Foreign investors might affect emerging markets responding to a shock in broad markets by rebalancing their equity portfolios across markets (Kodres and Pritsker, 2002). The model of Griffin et al. (2004) also incorporates portfolio rebalancing effects which suggest that global investors might increase their allocations to emerging markets following price increases in their home markets. Thus, net inflows may be partly explained by global market returns. Richards (2005), focusing on six Pacific emerging markets using daily data, finds that lagged returns in mature markets, in particular S&P500, are useful in explaining equity flows into emerging markets. He further suggests that those *push* factors have a larger role than implied by previous work. Griffin et al. (2004) also document similar evidence for nine emerging markets, that is, lagged North American returns are useful in explaining the net inflows towards emerging markets.

The third question analyzed is whether foreigners' net trading contains private or superior information, i.e. ability to forecast future returns. Foreign flows generally come from professionally managed, institutional investors, who are likely to be informed traders. On the other hand, based on previous evidence that relates

[35] In reporting price impact, several studies make a useful distinction between the expected and surprise components of foreign flows. Most of the price impact comes from the surprise component (Richards, 2005). On daily data from Thailand, Pavabutr and Yan (2007) show that the expected component, which is associated with positive feedback trading, has insignificant price impact.

location to informedness, models such as Brennan and Cao (1997) and Griffin et al. (2004) assume that foreigners have informational disadvantages compared to domestic investors. Yet, it is also plausible to think that global institutional investors invest in information sources, thanks to their size, global experience, talent and resources [e.g. Barron and Ni (2008) find that "portfolio managers with larger portfolio size acquire information about the foreign asset"]. They may have advantages in analyzing push factors, which may be especially important at times when domestic markets are highly influenced by global factors. Seasholes (2002) suggests that some foreigners have an information advantage. Bailey et al. (2007) provide evidence from Thailand and Singapore that foreign investors have superior information processing ability. Grinblatt and Keloharju (2000) find that foreign investors in Finland achieve superior performance, even after adjusting for momentum. Griffin et al. (2004) find that the one-day-ahead predictive ability of foreigners' net purchases is mainly due to past flows signaling further future flows, and remain committed to their view that foreign investors do not posses an information advantage. Using monthly data from Sweden, Dahlquist and Robertsson (2004) similarly conclude that "foreigners are uninformed feedback traders" even though net foreign flows are positively associated with future returns. Richards (2005) finds that a substantial part of the price impact of inflows is completed the day after the inflow, and suggests that it would be difficult to economically exploit the apparent predictability using the information contained in foreigners' trading. The only paper to suggest significant forecast power of foreign flows is Froot et al. (2001). However, their findings are disputed by Richards (2005) due to problems in the inferred dates of trades. Perhaps, Dvorak's (2005) conclusion that global investors posses expertise but lack local information can be considered as a synthesis of extant literature on this question.

A prominent feature of foreign flows is persistence. As implied above, most of the forecast ability of foreign flows is accounted for by flow persistence. Most of the studies mentioned above report that current net flows are a strong predictor of future net flows (see also Froot and Donohue, 2002, who show that the persistence of foreign equity flows into emerging markets is much more pronounced compared to those into developed markets, and document cross-country effects). However, these results are based on earlier sample periods dominated by post-liberalization effects, and it needs to be seen whether the persistence remains robust over time or after controlling for global emerging market returns.

B. The Problem of Endogeneity between Contemporaneous Flows and Returns

The typical solution to deal with the endogeneity between net foreign flows and local returns in VAR models (i.e. contemporaneous period identification of impulse response functions) has been to impose a Cholesky ordering assumption whereby flows are ordered before returns, that is flows are assumed to contemporaneously affect returns but not vice versa. Most papers, especially those using daily data, followed this assumption without questioning its validity (Froot et al., 2001; Bekaert et al., 2002; Richards, 2005) while

some papers included a robustness check by the reverse ordering assumption (e.g. Dahlquist and Robertsson, 2004). The assumption that flows affect returns contemporaneously but returns can only affect future flows is questionable with daily data, and clearly unrealistic with monthly data.

It is important to see that the contemporaneous identification assumption is in close relation to the assumptions in microstructure theory (see Hasbrouck, 1991, for a detailed discussion). Specifically, classical models of price formation assume that public information arrivals are fully and instantaneously incorporated by only return innovations, excluding the possibility of accompanying flow (or trade) innovations. Thus, focusing on tick data, the contemporaneous relation between flows and returns is named *price impact*, and returns' lagged response to flows is associated with private (asymmetric) information, notwithstanding market frictions. An important issue, a frequent and systematic violation of the assumptions behind classical models in especially electronic order book systems without dealers, is the possibility that flows (trades) may actually be correlated with public information arrivals.[36] That is, both flows and returns may contemporaneously be driven by common factors such as public information arrivals in general, and by global returns in our particular case of foreign flows. Thus, standard microstructure models that name the contemporaneous association between returns and flows as price impact (e.g. include current flows in the return equation in a VAR system of returns and flows) may be inaccurate, even under tick data. At least, the standard treatment incurs the risk of incorrectly attributing part of the contemporaneous relation between flows and returns as price impact whereas in reality it reflects common factor influence. Thus, an apparent time-variation in price impact may actually be caused by the time-varying intensity of public information.

Danielsson and Love (2006) present a detailed discussion of the problems associated with the ordering assumption that places flows before returns and offer a solution based on instrumental variables to enable contemporaneous identification. Obviously, the problem connected to this approach is to find strong and valid instruments, i.e. observed variables sufficiently correlated with the endogenous variables but uncorrelated with the residuals. In their foreign exchange example, Danielsson and Love (2006) find that the lagged instruments are insignificant at frequencies lower than five minutes while in our case foreign investor flows data at frequencies higher than days are a rarity. Dependency of stock returns over days is known to be weak at best, and besides, any instrument would have to yield a correlation *over and above* what can be explained by autoregressive lags. Concerning validity, an instrument say for the first variable must be excluded from the equation for the second variable. Taken at face value, the exclusion restrictions from the Cholesky approach are replaced by exclusion restrictions on the instruments. However, this makes it necessary to argue that for instance a variable influencing returns in the Turkish stock market does not directly affect flows in the very same market. This seems questionable at best.

[36] While perfect information models exclude trading in response to public information, there might be many types of market frictions that prevent full instantaneous adjustment (see the discussion in Hasbrouck, 1991 referring to a dealer system). In ISE, which operates under a continuous auction electronic order book system with irreversible limit orders, it is clear that such imperfections will be rule rather than exception.

The allocation of the contemporaneous positive relationship at low frequency between positive feedback trading, contemporaneous and delayed price impact and latent common factors has important implications for our understanding of the flow-return interaction, as the bulk of the relationship is observed at the contemporaneous period. This issue has become a particular challenge as flows data are typically unavailable at higher frequency. Besides Warther's (1995) classical simple suggestion, Sias et al. (2006) within the US institutional investor literature deal with this issue by introducing a term structure of correlations between quarterly flow data and monthly return data. However, this approach still cannot resolve the decisive contemporaneous correlation at the higher of the two frequencies (i.e. in their paper the largest correlation appears for contemporaneous months, but this is exactly the correlation which is to be explained!). The approach cannot distinguish price impact from latent common factors, and by the same token, does not consider any observed external factors; it just measures covariances. Furthermore, it requires the choice of a number of differences (see Sias et al., 2006, section IV.D) to approximate an infinite recursion (normally, the high-frequency period length should be chosen such that no lagged interaction takes place within the span of one period.). This would inevitably introduce considerable noise into the estimates, especially when the higher frequency covers intraday data. Besides, concerning such data it is obvious that, say, hours of different trading days cannot be handled just as adjacent months of different quarters.

Here, we propose a frontier methodology that is suitable for daily data and does not rely on exclusion restrictions. Thereby, we follow Weber (2010), who developed the class of so-called *structural conditional correlation* (SCC) models. To recapitulate, the fundamental problem in estimating flow-return interaction concerns simultaneity. While we can observe a certain correlation of flow and return data, this can be due to three sources: flow-return spillover (price impact), return-flow spillover (intraperiod feedback trading) or latent common factors; the latter would be reflected in correlation of the structural innovations. Evidently, by conventional methods these three sources cannot be uniquely recovered from the single correlation without assumptions. The usual solution applied in extant literature is to exclude the second spillover and any correlation produced by latent factor exposure. The latter also holds for the methodologies of Sias et al. (2006) and Danielsson and Love (2006).

However, it can be shown that structural VARs (SVAR) become uniquely identifiable in the presence of time-varying second moments, i.e. heteroscedasticity; see Sentana and Fiorentini (2001) in this context. Further discussion is provided by Rigobon (2003) and Weber (2010). The idea is that variation in the structural variances provides additional identifying information through rotation of the whole reduced-form covariance matrix. Concretely, assume a change in the variance of a shock in a SVAR like (2) below. Through the contemporaneous impacts (matrix A_0 below), the considered shock enters all model equations. Therefore, the variance change is passed to the second moments (variances and covariances) of all residuals in the reduced form. Thus, it leads to a shift of the whole reduced-form covariance matrix. Since such a shift in reduced form

is measurable, it provides additional information for the identification of the contemporaneous structure (A_0). Importantly, no instruments and no identifying parameter restrictions are required.

The fundamental shocks in classical SVARs are uncorrelated. Furthermore, this assumption is made for example by Sentana and Fiorentini (2001) in order to achieve identification. As a matter of fact, unrestricted covariances of the structural innovations would exhaust the additional information obtained from time-varying volatility. However, uncorrelatedness of these innovations would *a priori* exclude the third potential source of flows-returns correlation, common driving forces of the variables. Accordingly, one could never be sure that potential exogenous variables in the model equations completely cover the factor influence. Weber (2010) allows for latent common driving forces by introducing a constant conditional correlation (CCC) specification for the structural disturbances. Here, time-varying covariances become assessable by restricting them to be governed by the conditional variance dynamics. The idea is that once the constant correlation coefficient is taken into account, shifts in volatility introduce no additional unknown covariance parameters. The method enables us to estimate a fully simultaneous model for flow and return data. Particularly, we can identify all relevant impacts, letting the data decide about the respective contributions to the flow-return interaction. We discuss the methodological details below.

III. Data and Methodology

To provide a comprehensive account of the interaction between foreigners' trading and stock market returns, we combine analyses using monthly and daily data. The key data set consists of monthly and daily foreign flows. The monthly purchases and sales of foreign investors are reported by ISE who requires member brokers to file monthly reports of trades executed on behalf of nonresident clients. These data start from January 1997 and our sample period ends in September 2010. We normalize monthly net foreign flows by dividing by contemporaneous market capitalization, which ensures stationarity and comparability across time periods and to the results of other studies. Such normalization is also useful to figure out how important the net foreign demand is compared to the total supply of shares. The daily data are derived from the ownership data supplied by the CRAT on a daily basis.[37] These data start from May 4, 2004 and our sample period ends on October 7, 2010, providing a total of 1620 observations. Both monthly and daily samples used in this study are the longest employed in this line of literature.

The local market is represented by the ISE-100 index. The monthly local returns are inflation-adjusted, as annual inflation during our sample period ranged between 101.62% in January 1998 and 5.27% in September 2009. We represent global developed markets by the MSCI Europe index, and global emerging

[37] These data have been published between May 4, 2004 and .November 25, 2005 by the Clearing and Custody Bank (www.takasbank.com.tr).

markets by the MSCI Emerging Market index; both in local currency terms, avoiding currency fluctuations clouding stock market returns. The reason for choosing MSCI Europe index instead of MSCI-World index or US indices is that using daily data, trading hour differences might blur the analysis, especially the contemporaneous and first lag interaction. As the monthly return correlation between MSCI World and MSCI Europe indices is 0.944, this choice does not distract us from picking worldwide market information. Moreover, ISE-100's correlation is stronger with MSCI-Europe index than with other global developed market proxies.[38] All stock index returns are the first differences of natural logs of index values. All variables entering the VAR system, including normalized net flows, are I(0), and unit root test results are available from authors.

Use of MSCI Emerging Markets index requires special care at the daily frequency given that it covers a range of time zones across the world. In particular, Latin American components, which have high correlations with ISE, contain global (developed) market information that is not available at Istanbul closing time. Using the same-dated index values would thus cause US market information from later Latin American trading hours to appear like current emerging market information, thus lead to overstating the impact of emerging markets on ISE at the expense of next day MSCI Europe index's impact, and may even distort contemporaneous flow-return estimations. Indeed, results turned out to be sensitive to the inclusion or exclusion of Latin American components of MSCI Emerging Markets index. To avoid this problem, we created a time-zone-adjusted Emerging Markets index by using values from *t*-1 of Latin American components and same-dated values of all other (Asia, Europe, Middle East, Africa) components of the MSCI Emerging Markets index, such that its value only reflects globally available information as of Istanbul closing time. This critical issue has not been mentioned in earlier papers that experimented with the MSCI Emerging Markets index.

Finally, for the sake of comparing our results to earlier literature that predominantly focuses on Asian markets, and for reaching generalized conclusions, we replicate our key analyses on Korea (KSE) and Taiwan using precise data supplied by the respective stock exchanges. The daily and monthly data for Korea extend from January 1999 to September 2010, and those for Taiwan from January 2001 to July 2008. Note that in the daily analysis, due to time zone differences, we use S&P500 index (*t*-1) values to represent the world index as in Richards (2005) and omit the emerging markets index to ensure comparability to his results. Table 1 displays summary statistics for data employed in this study, including those on Korea and Taiwan.

TABLE 1

Summary Statistics

Panel A: Monthly Data **Panel B: Daily Data**

[38] Over the 1997-2010 sample period, the monthly return correlation of ISE-100 with the MSCI Europe index was 0.572, while it was 0.569 with the MSCI World index, 0.530 with the S&P500 index and 0.550 with the FTSE-100 index.

		Net Foreign Flow		Local Return			Net Foreign Flow		Local Return	
	n	Mean	St.Dev.	Mean	St.Dev.	n	Mean	St.Dev.	Mean	St.Dev.
Turkey	165	0.000526	0.002794	-0.01325	0.14542	1620	0.000065	0.001366	0.00081	0.01895
Korea	141	0.000751	0.004299	0.00853	0.08154	2925	3.71E-05	0.000414	0.00040	0.01883
Taiwan	91	0.001957	0.004319	0.00655	0.07194	1872	9.46E-05	0.000465	0.00028	0.01464

A. Daily Foreign Ownership Data

While quarterly and annual institutional ownership data have been extensively used in studies on US institutional investors, use of this kind of data in foreign investors' trading literature, especially at the daily frequency, is not common. Research on foreigners' trading in European emerging markets is blocked due to the absence of high-frequency data on foreign flows. Our derivation of a daily net foreign flow proxy from the ownership data enables the first study of foreigners' trading in a sizeable European emerging market, where foreign investors have a much more significant role. As the current paper is, to our knowledge, the first to employ this data set from Turkey, we discuss here some points that deserve attention in using these data.

The variable we use as *normalized marketwide net foreign flows* is the first difference of the percentage held by foreigners. We do not use a log transformation here, as the change in the percentage held by foreigners multiplied by the total market cap is directly a proxy for net foreign trading in dollars normalized by market cap. Or reversely, as shown by Bekaert et al. (2002, p.300-301), the percentage held by foreigners is the cumulative normalized net foreign flow.

CRAT reports both the total number of shares held by domestic and foreign residents and the total market value of these shares, along with percentages calculated thereof. We analyzed both versions: the correlation between the two net foreign flow proxies based on number of shares and market value is +0.93. The former avoids potential biases to which the latter is vulnerable as the ownership ratio based on market value of holdings may change not only by trading but also by the relative price changes of stocks. This bias may potentially be systematic as foreigners are known to typically hold large-cap stocks, and our data indicate that they hold higher-priced stocks on average. On the other hand, in this marketwide aggregated study, it is obviously the dollar value of trading that matters in terms of the impact on the market index. To guide our choice, and also to perform an external check of the accuracy of the proxy we are using, we computed the correlations between the monthly counterpart of the proxy we derive from daily ownership data and the actual monthly net foreign trading data supplied by ISE. The correlation is +0.845 when number of shares is used versus +0.830 when market value is used. Hence, throughout the paper we report results based on number of shares, though results are almost identical in both versions. It is worth mentioning that the correlation between our proxy and the actual trading data is satisfactorily high, compared to poorer proxies used in US institutional investors literature that had much lower correlations with the actual trades.

One of the sources of deviations from actual trading data is the fact that ownership may change for reasons other than trading. To inquire about this, we had detailed conversations with the officials of the CRAT

and were told that non-trading transfers do not typically take place between foreigners' and domestic residents' accounts. The high correlation between our proxy and the actual monthly net flows data is thus owing to the fact that most non-trading transfers take place among same-residence-status clients. Yet, the quality of the data could be further improved if all changes due to anything other than trading could be identified and adjusted for, which, however, is not possible. In this direction, however, we took the following steps: first, there are two dates when these data were revised by CRAT (with statistical justifications explicitly explained) resulting in jumps in the percentage held by foreigners. We removed the related observations. Then, we identified outliers,[39] and analyzed them individually. For three observations the change in percentage ownership was accompanied by an offsetting change on a near date, giving a clear impression of a large-size swap or security borrowing, so we removed them. There is also one day when the Clearing and Custody Bank did not report the data and started the next day with a jump: we removed this observation although we could not find an explanation.[40] Finally, for the remaining outliers we checked the effect of removing them on the correlation with the monthly actual trading data, and decided to remove the outlier observations whenever an improvement in the correlation is observed. This procedure led us to remove six more outliers. As our data consists of 1620 observations, this concerns only a negligible portion of it.

B. Methodology

Our analysis is based on VAR methodology, which portrays the dynamic relationship between flows and returns.[41] We augment the bivariate-VAR model with the developed and emerging global market returns that are affected only by their own lags. The advantage of utilizing this specification instead of a conventional VAR is that none of the lags of foreign flows in ISE and local returns affect the world returns, but contemporaneous values of them are affected by the instantaneous and lag values of world returns.

Specifically, the following SVAR specification is estimated:

$$A(L)\,y_t = \varepsilon_t \qquad (1)$$

where *A(L)* is an *n* x *n* matrix polynomial in the lag operator, $\boldsymbol{y}' = [E, EM, F, R]$, $\varepsilon(t)$ is the 4x1 vector of structural disturbances. *E, EM, R* are the log returns of the MSCI Europe index, MSCI Emerging Markets index (adjusted for time-zone differences at the daily frequency) and ISE-100 index, respectively, and *F* is normalized net foreign purchases. The analysis is performed first at the monthly and then at the daily frequency. The matrices in (1) are specified as follows:

[39] An outlier is defined to be a change in "market cap held by foreigners" which is greater than 0.7% in absolute value.
[40] The correlations with the actual monthly data reported above are calculated after these adjustments that are justifiable externally.
[41] Hasbrouck (1991) was the first to suggest the interaction between returns and flows be modeled as a VAR system.

$$y(t)=\begin{bmatrix} E_t \\ EM_t \\ F_t \\ R_t \end{bmatrix} \quad A(L)=\begin{bmatrix} \mathrm{A}_{11}(\mathrm{L}) & 0 & 0 & 0 \\ \mathrm{A}_{21}(\mathrm{L}) & \mathrm{A}_{22}(\mathrm{L}) & 0 & 0 \\ \mathrm{A}_{31}(\mathrm{L}) & \mathrm{A}_{32}(\mathrm{L}) & \mathrm{A}_{33}(\mathrm{L}) & \mathrm{A}_{34}(\mathrm{L}) \\ \mathrm{A}_{41}(\mathrm{L}) & \mathrm{A}_{42}(\mathrm{L}) & \mathrm{A}_{43}(\mathrm{L}) & \mathrm{A}_{44}(\mathrm{L}) \end{bmatrix} \quad \varepsilon(t)=\begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{bmatrix} \qquad (2)$$

where the assumptions are that $\varepsilon(t)$ is uncorrelated with past $y(t-p)$ for $p>0$, and the coefficient matrix of L^0, A_0, is non-singular. The block exogeneity is represented by zero entries in *A(L)*, and implies that *E* and *EM* are exogenous to local variables *F* and *R* both contemporaneously and at lags.[42] This set of restrictions reflect a plausible hypothesis that conditions in developed markets as well as the general appetite towards emerging markets as a whole affect the domestic emerging stock markets, however domestic market variables are unlikely to affect world indices.[43] Omission of this plausible restriction might result in inaccurate impulse response coefficients and variance decompositions. Major papers employing VAR methodology in this line of literature (Griffin et al., 2004; Richards, 2005) employ similar restrictions only contemporaneously to enable identification of contemporaneous impulse response coefficients. We performed a sensitivity analysis by comparing the results with and without restrictions on lagged VAR coefficients. Main conclusions of our analysis are robust under both specifications. However, we have noted some small differences whereby the impact of flows on local returns at some lags operates via their relation to global market indices. While the discovery of lagged responses of global indices to local variables in ISE is interesting itself, we leave it elsewhere. The key insight is that, without the restrictions on lag coefficients described above, impulse responses may incorporate a spurious transmission effect whereby a lead by local variables over global indices may appear like a direct causal relationship between two local variables, which might entail misleading inferences, in particular an overstatement of lagged price impact and the extent of positive feedback trading with respect to local returns.

We chose the lag order based on eliminating residual autocorrelation, thus we preferred a rich lag structure.[44] This led us to a lag order of 5 in daily analysis, which is also the suggestion of AIC, and 4 in monthly analysis. Impulse response functions (IRF) are derived based on the structural factorization as defined in Equation (2), which implies *E* to be ordered first, followed by *EM*, and then the block of local variables. Note that by ordering *EM* after *E*, we are measuring the incremental contribution of global emerging markets index over and above the global developed market index. The system is estimated via Maximum Likelihood. For inference, we compute bootstrapped error bands for impulse responses using the percentile method (Hall, 1992).

[42] Note that the above specification allows *E* to affect *EM*, but not vice versa.

[43] This hypothesis would hold true except for contagious emerging market crises like Mexico-94, Thailand-97 or Russia-98; and no such crises have taken place in Turkey during our sample period.

[44] By doing so, we avoid imposing doubtful restrictions at the expense of losing some degrees of freedom. Especially at the daily frequency where our sample size is very large, this is not an issue at all. This helps us uncover borderline significant individual responses at some lags.

A central issue in the literature has been the ordering between flows and returns in Cholesky factorization to enable contemporaneous identification. While the common treatment in the literature has been to place flows first, as discussed in Section 2.B above, the assumption underlying this choice may not necessarily be justified for data at frequencies lower than tick data. Here, we first follow the classical treatment in the literature by restricting the contemporaneous response of *F* to *R* to zero. Then, we introduce the SCC methodology as a new solution for this problem, and contrast the implications of both approaches.

C. Structural Conditional Correlation

Herein we discuss methodological details of the structural CCC (SCCC) model. As explained in section 2.B, time-variation in volatility is exploited for identification. Since *E* and *EM* are factors exogenous to the domestic variables, it is sufficient to consider the *F* and *R* equations in this respect, i.e., we deal with a two-equations system ($n = 2$) that includes contemporaneous and lagged *E* and *EM* as regressors. The task is to disentangle the sources of the (sizeable) part of the contemporaneous correlation between *F* and *R*, which is left unexplained by the observed factors.

Introducing the heteroscedastic specification, denote the conditional variances of the elements in an innovation vector ε_t by

$$\mathrm{Var}(\varepsilon_{jt} \mid I_{t-1}) = h_{jt}^2 \qquad j = 1,\ldots,n, \tag{3}$$

where I_{t-1} stands for the whole set of available information at time $t-1$. The vector $H_t = \begin{pmatrix} h_{1t}^2 & \ldots & h_{nt}^2 \end{pmatrix}$ stacks the variances. The volatility dynamics are modelled by a set of univariate GARCH(1,1) processes. For $j = 1,\ldots,n$ we write

$$h_{jt}^2 = (1 - g_j - d_j)c_j + g_j h_{jt-1}^2 + d_j \varepsilon_{jt-1}^2, \tag{4}$$

where c_j denotes the unconditional variance and g_j and d_j are the GARCH and ARCH coefficients, respectively. The structural covariances can be recovered by the constant conditional correlation assumption as

$$\mathrm{Cov}(\varepsilon_{it}, \varepsilon_{jt} \mid I_{t-1}) = h_{ijt} = \rho_{ij} h_{it} h_{jt} \qquad i \neq j, \tag{5}$$

where ρ_{ij} denotes the correlation between the ith and jth innovation. This correlation can be thought of as arising from exposure of variables i and j to unobserved common factors.

Let *P* designate the correlation matrix of ε_t, holding ones on the main diagonal and the ρ_{ij} as its off-diagonal elements. Then, the conditional covariance matrix Ω_t of the structural innovations results as

$$\Omega_t = diag\{H_t\}^{1/2} P diag\{H_t\}^{1/2}. \tag{6}$$

Accounting for the discussion in Bollerslev (1990) and given positive variances from the GARCH processes, Ω_t is assured to be positive definite. This property carries over to the conditional covariance matrix of the reduced-form residuals $A_0^{-1}\varepsilon_t$

$$\Sigma_t = A_0^{-1}\Omega_t(A_0^{-1})' \tag{7}$$

due to its quadratic form. Cross-correlations, as represented by non-zero off-diagonal elements, can arise both from spillovers according to the coefficients in A_0^{-1} or from structural covariances h_{ijt} (the off-diagonal entries in Ω_t). In this context, note as well that the constant correlation restriction only applies to the *structural* innovations; the realised variables y_{it} may well feature time-varying correlation depending on the variance developments and the spillovers in A_0. Furthermore, Weber (2010) created a model version featuring dynamic structural correlation. We tested for time variation in P using the procedure proposed in Engle and Sheppard (2001). However, we found no evidence against constancy of structural conditional correlations, what supports the SCCC framework employed in the following.

The SCCC model is estimated by Quasi Maximum Likelihood (QML) applying conditional normal densities for the ε_{jt}. Numerical likelihood optimisation is performed using the BHHH algorithm (Berndt et al., 1974). In order to avoid relying on numerical standard errors we conduct relevant parameter tests by likelihood ratio (LR). All model equations (2), (4), (5) are estimated simultaneously in one step, i.e. including the VAR. Weber (2010) discusses identifiability of the SCCC model. In particular, linear independence of the conditional variances is required. Logically, identification through SCCC relies on sufficient time variation in the variance of at least one of the innovations. In particular, ARCH effects must be present. While this is trivially fulfilled in daily financial data, it is well known that ARCH weakens when the data frequency is lowered. Indeed, in our monthly time series no ARCH can be detected. Therefore, using SCCC we focus on the daily data.

IV. VAR Results

We present results by studying IRFs. IRFs track the dynamic response of a variable to a shock in another variable until the effect of the shock dies down. Hence, they provide a tool to distinguish temporary and permanent effects, to simultaneously analyze contemporaneous[45] and lagged responses, and to quantify the

[45] Concerning contemporaneous effects, they reflect the factorization imposed. However, SCC, which we will resort to in the next section, can avoid the ordering assumptions as discussed above.

cumulative effect. By portraying the trajectory of the lagged responses, they also enable measurement of economic significance of forecast ability.

In IRF graphs to follow, we track the response to a one-standard deviation shock (the solid line in the middle). Thus, we focus on the effect of the surprise (unexpected) component of the variables in the system. Bootstrapped 90% confidence bands are also provided to help a visual inspection of the significance of the results (dashed red lines around the solid line). Throughout the text below, we will use the variable names in abbreviated form as defined above. We first present monthly and then daily results. When we are comparing two IRFs in the same graph or focusing on measuring price impact, we depict cumulative IRFs.

A. Results at the Monthly Frequency

The first (upper-left) IRF in Figure 1 suggests a strongly positive contemporaneous response of *F* (net foreign flows in ISE) to *E* (global developed market returns). The lagged responses are positive and borderline significant in some of the subsequent months. The response to *EM* (global emerging market returns) is similarly significantly positive, though with a smaller magnitude contemporaneously, but stronger at lags, even significant up to 4th month. Thus, global emerging market returns are an important determinant of foreign flows into ISE, significant even after controlling for global developed market returns. This is a new finding, suggesting that portfolio rebalancing following price changes in source markets may not be the only global driver of foreign flows into emerging markets. An additional factor, either portfolio rebalancing among emerging markets or an information factor correlated with emerging market returns, must exist.

In unreported results without controlling for *EM*, we find that the lagged responses of *F* to itself are significantly positive, implying strong persistence, which might be considered as an indication of herding as the alternative explanation, marketwide order splitting across months, is to be ruled out here. However, once sufficient lags of global emerging market returns are controlled for, its magnitude and significance visibly diminish, as seen in Figure 1 below (third graph in the upper row). Thus, lagged global emerging market returns account for a large portion of persistence in net foreign flows.

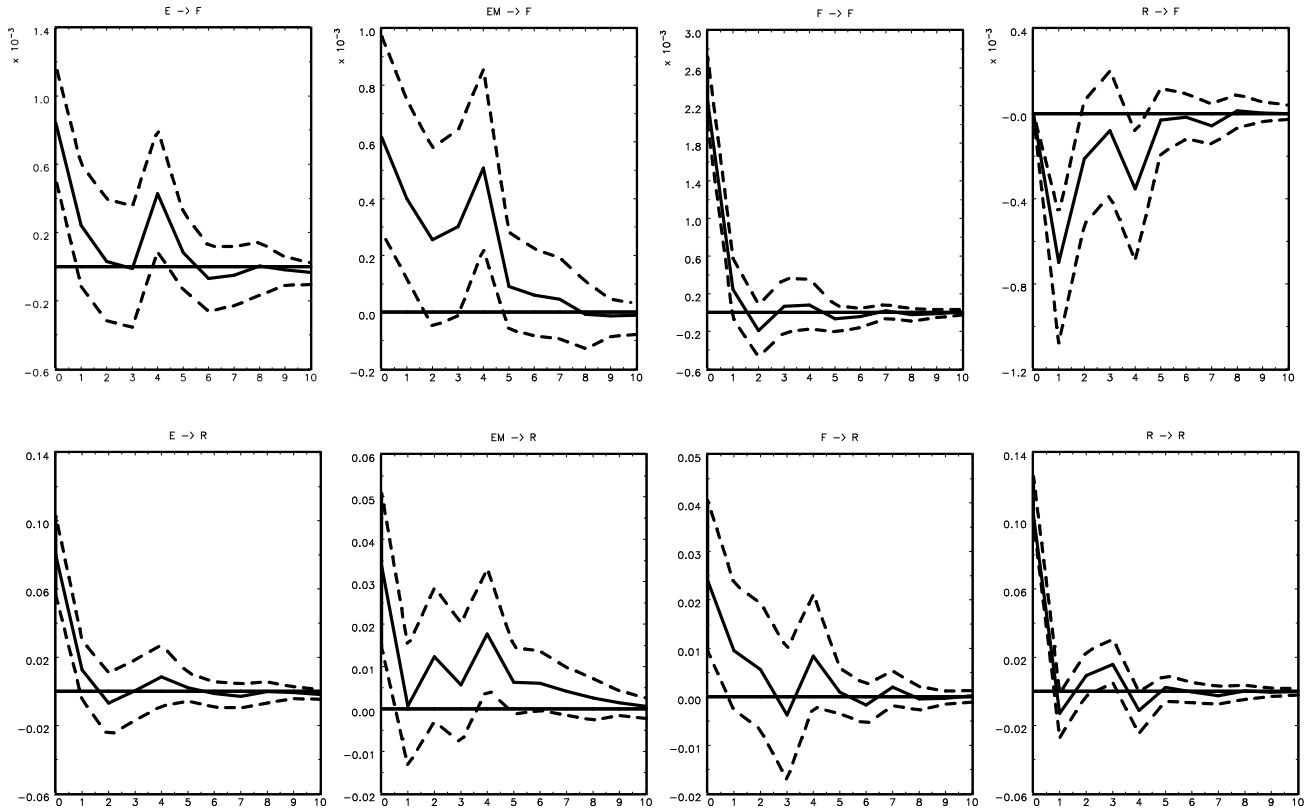
A key finding, already documented by İkizlerli and Ülkü (2010) is the negative feedback trading with respect to local market returns at the monthly frequency. Here, we show that this finding is robust to controlling for global emerging market returns (the fourth graph in the upper row). The negative lagged response of net foreign flows to local returns at the monthly frequency would be consistent with portfolio rebalancing whereby international investors reduce their holdings gradually over time after a particular emerging market has overperformed to bring their portfolio weights back to previous levels. Note that although the lagged response of net foreign flows to global returns is significantly positive, the negative response to local returns rules out two alternatives: a naïve, mechanic positive feedback trading strategy and sentiment trading.

IRFs in the lower row suggest that ISE returns show some borderline-significant lagged response to global emerging market returns and net foreign flows, implying some forecastability. In particular, the cumulative lagged response of *R* to *EM* is noteworthy.

FIGURE 1

Monthly Impulse Reponses of *F* and *R*

The upper row shows impulse responses (IR) of net foreign flows (*F*) to a 1-standard deviation shock in MSCI-Europe index returns (*E*), MSCI Emerging Markets index returns (*EM*), itself, and ISE-100 index returns (*R*), respectively. The lower row shows impulse responses of ISE-100 returns (*R*) to a 1-standard deviation shock in MSCI-Europe index returns (*E*), MSCI Emerging Markets index returns (*EM*), net foreign flows (*F*) and itself, respectively. Each graph is described by a notation on its top where the letter before the arrow stands for the impulse (shock) variable and the letter after the arrow represents the response variable. The solid line in the middle represents IR coefficients and the dashed lines around it represent bootstrapped 90% confidence band. X-axis shows the months. 0 is the contemporaneous month.



Forecast error variance decompositions based on the same specification are presented in Table 2 below to assess the relative role played by variables in our VAR system in explaining foreign flows and local returns. Global emerging market returns have a significant explanatory power in determining net foreign flows that operates with lags of several months. It is also noteworthy that a significant portion of the variance in *F* (unlike that in *R*) is accounted for by lagged variables in the system.

TABLE 2

Variance Decompositions for the Monthly Frequency

Proportions of forecast error in **F** accounted for by:					Proportions of forecast error in **R** accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**	forecast horizon	**E**	**EM**	**F**	**R**
1	0.12	0.06	0.82	0.00	1	0.35	0.07	0.03	0.55
2	0.11	0.08	0.74	0.07	2	0.34	0.07	0.04	0.55
3	0.11	0.08	0.74	0.07	3	0.34	0.07	0.04	0.55
4	0.11	0.09	0.73	0.07	4	0.34	0.08	0.04	0.55
5	0.13	0.12	0.68	0.08	5	0.33	0.09	0.04	0.54
6	0.13	0.12	0.68	0.08	6	0.33	0.09	0.04	0.53
7	0.13	0.12	0.68	0.08	7	0.33	0.10	0.04	0.53
8	0.13	0.12	0.68	0.08	8	0.33	0.10	0.04	0.53
9	0.13	0.12	0.68	0.08	9	0.33	0.10	0.04	0.53
10	0.13	0.12	0.68	0.08	10	0.33	0.10	0.04	0.53

Next, we provide additional break-downs using dummy variables to partition the data. Specifically, by employing dummy variables, we estimate different coefficients for a particular right-hand-side variable (including all lags) depending on its current sign. In Figure 2, we compare the cumulative impulse responses of net foreign flows to local return shocks when returns are negative or positive.[46] There is a pronounced asymmetry: negative feedback trading appears only following positive local returns. This rules out a mechanic portfolio rebalancing strategy and especially sentiment trading. In Figure 3, we compare the cumulative impulse responses to positive and negative net foreign flows. Panel A shows that net flows are more persistent at long lags following net inflows, whereas they are more volatile (persistent at lag 1, but reverse later) following net outflows. In unreported results, we also find that both net inflows, but in particular net outflows, exhibit contrarian market timing with respect to local returns. Panel B shows that ISE returns exhibit more lagged response to *F* when foreign capital flows out whereas the price impact in case of net inflows is mainly contemporaneous and partly reversed later. These results together may be indicative of an ingenious timing strategy whereby foreigners build up long positions smoothly over time, and take advantage of bullish sentiment among domestic investors, after initially riding it, to exit the market well ahead of bad times, successfully avoiding a contemporaneous price impact.[47] As we shall see below, daily results also support this interpretation.

FIGURE 2

Asymmetry in Feedback Trading

The solid-blue (dashed-red) line shows cumulative impulse responses of net flows to a 1% return shock when returns are positive (negative). 0 is the contemporaneous period.

[46] As the standard deviation in cases of positive and negative values of the variables might differ, in asymmetry checks we track impulse responses to a 1-unit rather than 1-standard deviation shock for better comparability.

[47] An alternative interpretation based on the relative easiness of implementing portfolio rebalancing following a rise in the local market (in the form of profit taking) would not be consistent with the lagged price impact of net outflows.

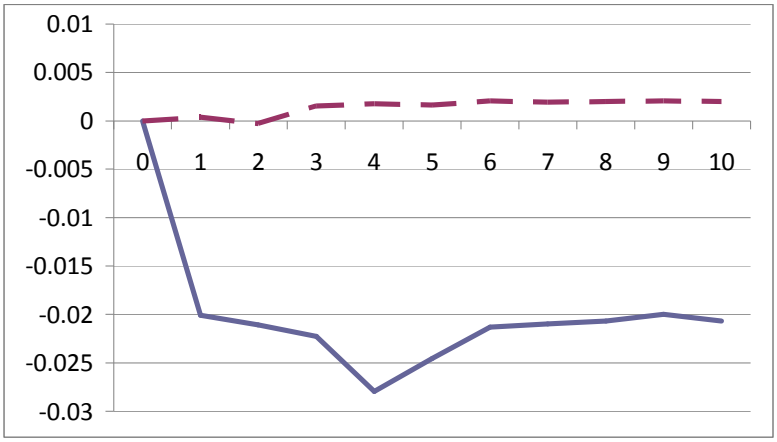
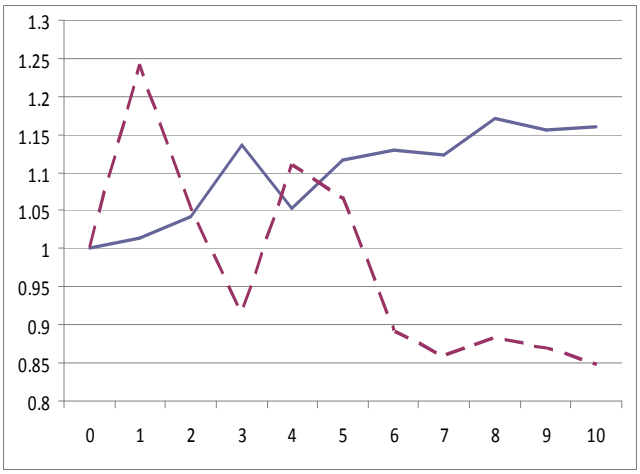


FIGURE 3

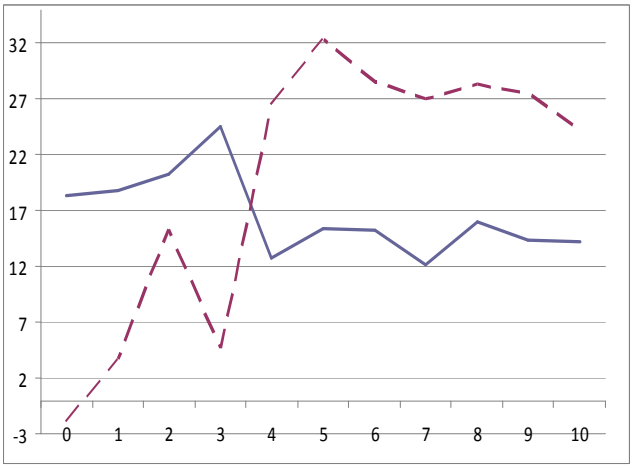
Asymmetry with respect to Net Inflows versus Net Outflows

In Panel A, the solid-blue (dashed-red) line shows cumulative impulse responses of net flows to a unit net flow shock when it is inflow (outflow). In Panel B, the solid-blue (dashed-red) line shows cumulative impulse responses of local returns (in per cent) to a unit net flow shock when it is inflow (outflow). 1-unit net flow is 1 % of market capitalization. 0 is the contemporaneous period.

Panel A: Response of *F* to positive versus negative *F*



Panel B: Response of *R* to positive versus negative *F*



To assess whether the above results are specific to a European emerging market with a large external deficit or can be generalized, we compare our results by replicating the same specification on Korea and Taiwan. Results available from the authors suggest that in both Korea and Taiwan *E* is a significant determinant of *F* both contemporaneously and at the first lag, while *EM* is significant only contemporaneously.[48] The persistence in net foreign flows is much stronger in Korea, while it is similar to Turkey in Taiwan. Net flows respond to local returns significantly negatively at the first and second month lags in both Korea and Taiwan, as in Turkey. This suggests quite uniform behavior of foreign investors across

[48] Results are robust when we replace *E* with S&P500 index or MSCI World index.

geographies and qualifies results of some previous studies that report positive feedback trading at the monthly frequency.[49] However, the asymmetry (i.e., negative feedback trading following bullish but not bearish months) is most visible in Turkey, quite moderate in Taiwan and absent in Korea. This may be consistent with an argument that large external deficits might make foreign investors more alert at good times and hesitant to finance at bad times.

B. Results at the Daily Frequency

In this section, we present the first daily results on foreigners' trading in a sizeable European emerging market in the literature. The first (upper-left) graph in Figure 4 shows that net foreign flows in ISE exhibit significantly positive contemporaneous and lagged responses to *E* (global developed market returns). Net foreign flows have a significantly positive contemporaneous association with *EM* (global emerging market returns), however the lagged responses to *EM* are insignificant (the second graph).[50] Thus, we obtain a different picture at the daily frequency where the effect of *E* is much stronger as opposed to the monthly frequency where *EM* took a stronger and prolonged role. A viable interpretation is that developed market returns induce immediate rebalancing whereas the prolonged lagged responses to global emerging markets index operates via a different channel such as longer term trends. Foreign flows may be instantaneously responding to globally relevant information such as US data or US-European market events, which are more visible, and reacting to emerging markets related information, which is less visible and more scattered, only when they lead to medium-term trends.

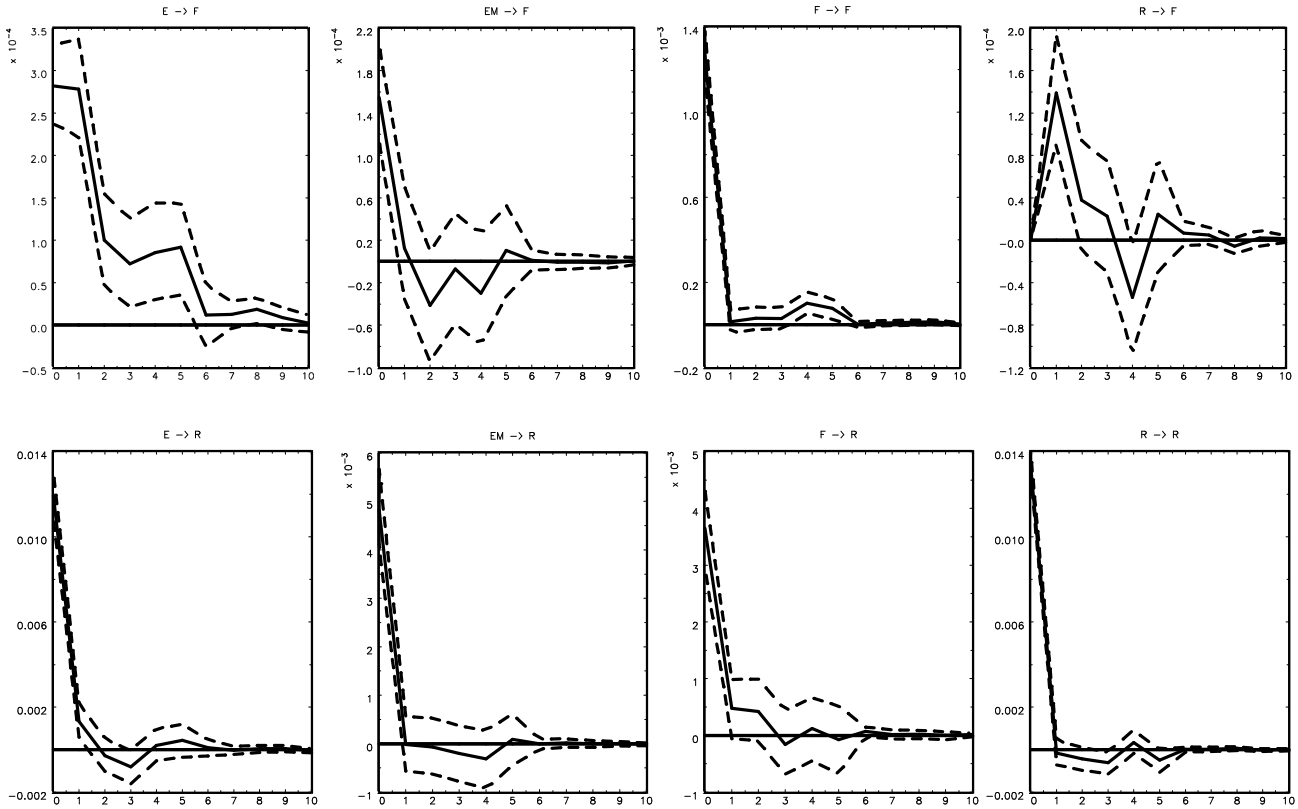
FIGURE 4

Daily Impulse Responses of Net Foreign Flows and Local Returns

The upper row shows impulse responses (IR) of net foreign flows (*F*) to a 1-standard deviation shock in MSCI-Europe index returns (*E*), MSCI Emerging Markets index returns (*EM*), itself, and ISE-100 index returns (*R*), respectively. The lower row shows impulse responses of ISE-100 returns (*R*) to a 1-standard deviation shock in MSCI-Europe index returns (*E*), MSCI Emerging Markets index returns (*EM*), net foreign flows (*F*) and itself, respectively. Each graph is described by a notation on its top where the letter before the arrow stands for the impulse (shock) variable and the letter after the arrow represents the response variable. The solid line in the middle represents IR coefficients and the dashed lines around it represent bootstrapped 90% confidence band. X-axis shows the days. 0 is the contemporaneous day.

[49] Those earlier results may be due to failure to properly control for global developed and emerging market returns, and short samples covering post-liberalization periods with partial restrictions on foreigners' trading.

[50] When interpreting the daily results, one should recall that we are employing here a time-zone-adjusted version of the MSCI Emerging Markets index. The results with the original MSCI Emerging Markets index were misleading in that the responses of both *F* and *R* to *EM* were significant at the first lag, which justifies the efficacy of our time-zone-adjusted version.



One of the key contributions of this paper is to combine monthly and daily analysis to illuminate the issue of feedback trading by foreigners. The finding of negative feedback trading at the monthly frequency is neither consistent with previous results reported in the literature nor easy to explain in the light of available theories other than the rebalancing theory of Hau and Rey (2004). The last graph in the upper row of Figure 4 shows that net foreign flows exhibit a significantly positive lagged response to local returns at the daily frequency, in sharp contrast to monthly frequency. Hence, foreigners' feedback trading does not follow a mechanic trading rule. Our daily results are not consistent with an automatic rebalancing mechanism whereby international investors respond by immediately reducing their holdings when a particular emerging market overperforms, either. Rather, they may be responding to local information instantaneously within days when it arrives, then shifting to contrarian strategy after the pricing-in of new information is completed or local traders overreact to it.

A comparison of lagged responses of *F* and *R* to each other raises strong doubt on the validity of the standard ordering assumption in the literature at the monthly frequency, as net foreign flows' lagged response to local returns is much more pronounced compared to local returns' lagged response to net foreign flows. The variance decompositions presented later show that *R*'s lagged effect in the forecast error variance of *F* is about seven times bigger than *F*'s lagged effect in the forecast error variance of *R*. In the next section, we will further question the validity of the same assumption in identifying the contemporaneous day association between flows and returns, employing novel methodology.

The first two graphs in the second row of Figure 4 show that ISE-100 index returns (*R*) exhibit a significant contemporaneous response to both *E* and *EM*. The response to *E* at the first lag is also significantly positive, though of a much smaller magnitude compared to the contemporaneous response, and is reversed at the third lag. All other lagged responses are insignificant. This indicates that global market information is quite quickly incorporated in stock prices in ISE. The contemporaneous price impact of net foreign flows (as interpreted under the standard assumption that flows cause returns) is significantly positive, and first and second lags are also positive at borderline levels of significance, which implies a modest degree of forecast ability contained in surprise foreign flows. As there are no negative lagged responses, our results reject the price pressure hypothesis, but are consistent with information and/or base-broadening. This insight is enhanced in the light of monthly results where we had reported no reversal, either. The response of *R* to a shock in itself shows that domestic information is priced-in instantaneously and precisely within one day.

We can compare these results to those on Korea and Taiwan (available from authors). A first note is about common factor influence: Richards' (2005) results are based on overnight US returns being the sole control variable. However, it is well known that global information is incorporated via US index futures that are traded on an almost-24-hour basis, hence a simultaneous global return variable is missing in Richards' specification. For this reason, we include same-day returns of Nikkei-225 index of Japan into the specification which are highly correlated with US index futures during Asian trading hours. Japanese returns enter the system significantly, alter other coefficients and, in particular, reduce the price impact estimates of foreign flows, making a typical example of omitted common factor influence. In both Korea and Taiwan, we observe a higher degree of persistence in net foreign flows, as compared to Turkey. In Korea, there is significantly positive feedback trading at the first lag, which suggests that Richards's (2005) finding of insignificant negative feedback might be due to the short sample. However, positive feedback trading is relatively short-lived. In Taiwan, positive feedback trading is significant and persists through the third day. Thus, notwithstanding small differences, positive feedback trading at the daily frequency appears to be a uniform result. One can also note that the borderline significant forecast power contained in *F* at the first and third lags in Turkey is absent in Korea and confined to the first lag in Taiwan. All other results are qualitatively similar to those on Turkey.

Next, we enquire potential asymmetries at the daily frequency by comparing cumulative impulse responses to a 1-unit shock. Figure 5 shows that positive feedback trading is particularly significant following negative local returns, which is consistent with a quick defensive reaction to bad news, and a lax slow reaction to good news.[51] It is also consistent with the well-known contrast between institutional and individual investor behavior: institutionals are more likely to cut losses following bad news while individuals suffer from disposition effect (O'Connel and Teo, 2009). Panel A of Figure 6 shows that flows exhibit strong persistence

[51] This finding is in line with İkizlerli and Ülkü (2011) who document, using monthly data, that foreign investors in Turkey exhibit an immediate response to political risk downgrades but a slow modest response to political risk upgrades.

following only net buys. Thus, the asymmetry of net flows to positive and negative local returns cannot be explained by an asymmetry between buying and selling persistence (i.e., different strategies employed in executing large buy and sell orders, or different intensity of herding when buying versus selling). Rather in presence of persistence asymmetry, the feedback trading asymmetry becomes more pronounced.

FIGURE 5

Asymmetry in Feedback Trading

The solid-blue (dashed-red) line shows cumulative impulse responses of net flows to a 1% return shock when returns are positive (negative). 0 is the contemporaneous day.

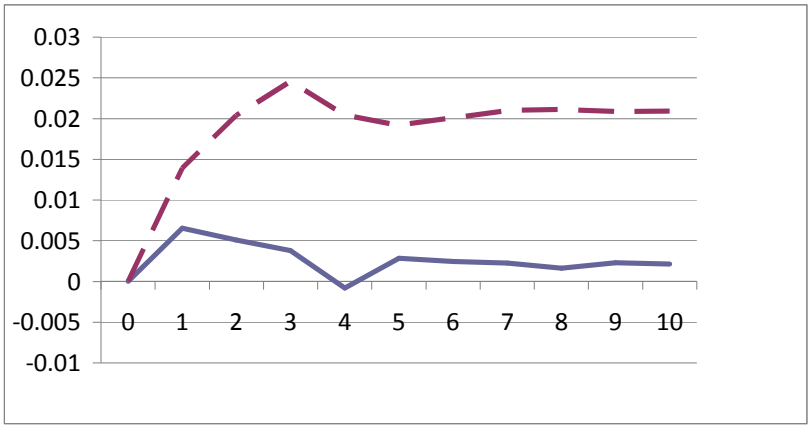
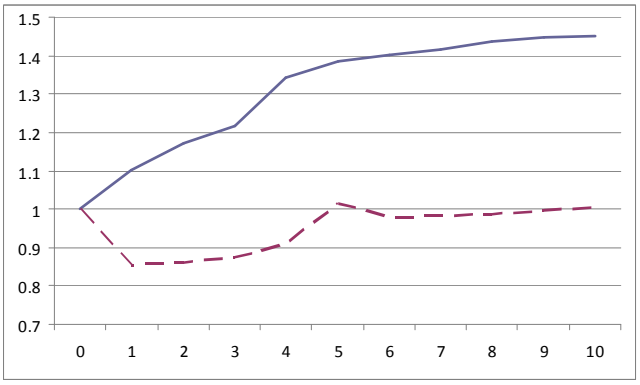


FIGURE 6

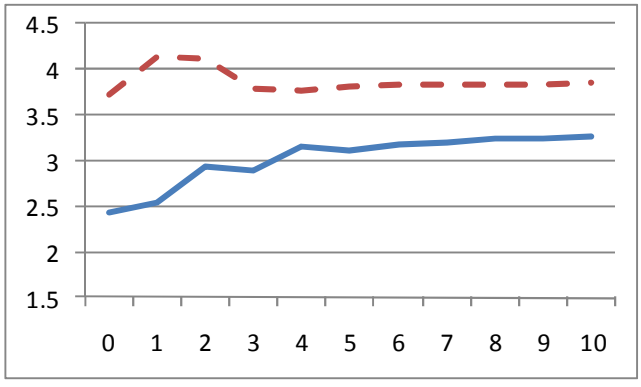
Asymmetry in Responses to Net Inflows versus Net Outflows

In Panel A, the solid-blue (dashed-red) line shows cumulative impulse responses of net flows to a unit flow in case of net inflows (net outflows). In Panel B, the solid-blue (dashed-red) line shows cumulative impulse responses of local returns (in per cent) to a unit flow shock in case of net inflows (net outflows). 1-unit net flow is 1 % of market capitalization. 0 is the contemporaneous period.

Panel A: Response of *F* to Positive versus Negative *F*



Panel B: Response of *R* to Positive versus Negative *F*



Panel B of Figure 6 shows that the contemporaneous price impact (again as interpreted under the standard assumption) is stronger in case of net foreign selling, although it should be easier to supply liquidity to a seller than to a buyer in a non-dealer market where short selling is practically absent. This is also true at the first lag. From the second lag, lagged price impact of buys continues and that of sells partly (in particular, the follow-through at the first lag) reverses. These observations, in relation to net flow persistence following only net buys, are consistent with immediate reaction to bad news but slow build-up of confidence upon good news. Recall that at the monthly frequency, we found negligible contemporaneous price impact of net foreign selling whereas at the daily frequency we see net selling has even stronger contemporaneous price impact. These break-downs are quite illuminating in that they lead us to a comprehensive description of foreign investors' trading behavior: Foreigners are probably a heterogeneous group, who employ sophisticated medium-term timing strategies to minimize price impact by picking extreme bullish sentiment among domestic investors to exit, while also reacting to bad news immediately. Thus, it would be fair to argue that their trading reflects (a sophisticated use of available) information.

Variance decomposition results at the daily frequency show some contrast to those at the monthly frequency in that *EM* has a very small incremental role in explaining net foreign flows at the daily frequency. As all of this role come at the contemporaneous period, we interpret this as absence of rebalancing with respect to global emerging markets, consistent with our aforementioned interpretation that foreign flows' response to *EM* operates via a different channel. Half of the response to *E* comes at lags. Note that the forecast error variance of *F* and *R* accounted for by each other reported here rely on the standard ordering assumption that only flows can cause returns contemporaneously, and will be compared to those results when this assumption is relaxed in the next section.

TABLE 3

Variance Decompositions for the Daily Frequency

Proportions of forecast error in **F** accounted for by:					Proportions of forecast error in **R** accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**	forecast horizon	**E**	**EM**	**F**	**R**
1	0.05	0.01	0.94	0.00	1	0.40	0.07	0.04	0.50
2	0.09	0.01	0.89	0.01	2	0.40	0.06	0.04	0.50
3	0.09	0.01	0.88	0.01	3	0.40	0.06	0.04	0.50
4	0.09	0.01	0.88	0.01	4	0.40	0.06	0.04	0.50
5	0.10	0.01	0.88	0.01	5	0.40	0.06	0.04	0.50
6	0.10	0.01	0.87	0.01	6	0.40	0.06	0.04	0.50
7	0.10	0.01	0.87	0.01	7	0.40	0.06	0.04	0.50
8	0.10	0.01	0.87	0.01	8	0.40	0.06	0.04	0.50
9	0.10	0.01	0.87	0.01	9	0.40	0.06	0.04	0.50
10	0.10	0.01	0.87	0.01	10	0.40	0.06	0.04	0.50

V. Daily Results Identified by SCC

A. Estimation Results

As noted above, we estimate the structural VAR under the SCCC specification by QML. The focus is on the simultaneous part, i.e. the spillovers between flow and return in A_0 and the correlation ρ of the according shocks, ε_{3t} and ε_{4t}. We explore by LR tests which coefficients matter for the simultaneous structure. The null hypothesis $H_0 : \rho = 0$ leads to a LR statistic of 0.03. This is clearly insignificant, the 10% critical value being 2.71. Evidently, the considered exogenous variables are sufficient to cover the common factor influence. The contemporaneous spillover from flows to returns $A_{0,43} = 0.7162$ is only borderline-significant with a LR value of 2.735.[52] Notably, this value is far smaller than that in the standard Cholesky model.[53] The second spillover from returns to flows $A_{0,34} = 0.0188$ is highly significant (LR=9.202). This suggests that a larger portion of the contemporaneous association between foreign flows and local returns is due to returns affecting flows rather than vice versa.

As the application of the SCC methodology to this line of literature is new, it may be useful to provide a mapping between the concepts of standard models and our results using the SCC approach. As noted previously, under the infeasibility of contemporaneous identification and negligence of common factors, the standard models decompose flow-return interaction into three effects: (i) price impact (the in-tick-data-sense contemporaneous association between flows and returns which is assumed to be caused by flows thus attributed to either private information if it is permanent, or to price pressure if it is reversed subsequently), (ii) intraday lagged price impact (which would be attributed to asymmetric information), and (iii) intraday positive feedback trading. The output of our approach does not map one-to-one. For example, (i) may in reality be due to (i.a) latent common factor influence (i.e. public information arrivals) to the extent that price reaction to public information arrivals is accompanied by trading,[54] and (i.b) price impact. It should also be noted that SCC methodology does not impose a time order within the contemporaneous period, rather it operates based on identifying contemporaneous regression coefficients. Our approach decomposes the contemporaneous interaction between flows and returns into four components: 1) common observed factor influence (the impact of global indices), 2) common latent factor influence (domestic public information), 3) flow's impact on return

[52] Recall that A_0 stand left hand side, so that positive spillovers have a negative sign in the estimated equation, however we report them the way they should be interpreted for reader's convenience.

[53] Danielsson and Love (2006) argue that in their case price impact *increases* when *positive* feedback trading is allowed for. However, note that both spillovers $A_{0,43}$ and $A_{0,34}$ simultaneously explain the given flow-return correlation. When the feedback trading rises from zero (i.e., no feedback trading) to some positive value, there remains a lower share of the correlation to be explained by the price impact. Therefore, the price impact should *decrease*, as it does in our estimations.

[54] In ISE, electronic order book system with irreversible limit orders and absence of specialists makes public information arrivals for sure accompanied by trading.

(as all common drivers are controlled for in (1) and (2), this can be regarded either private information or price pressure if it is reversed on subsequent days), 4) return's impact on flow (after controlling for all common drivers and logically excluding the possibility of returns affecting same-moment flows, this can be regarded feedback trading, although SCC results are not based on a time order within the day). The SCCC specification captures (1) by explicitly controlling for known common drivers *E* and *EM*, (2) via the correlation ρ of the according shocks, ε_{3t} and ε_{4t}, (3) and (4) via the identified contemporaneous coefficients of *F* and *R* in *R* and *F* equations, respectively.

Thus, our SCCC results lead to the following interpretation: The correlation between ε_{3t} and ε_{4t} in a standard bivariate VAR, which does neither contain the global indices *E* and *EM* nor any contemporaneous effects, is 0.35, and falls to 0.26 once global public information (*E* and *EM*) are controlled for. Hence, a significant portion of the contemporaneous association between domestic returns and net foreign flows is due to global indices. While one may expect it to be even higher as ISE returns are very strongly contemporaneously related to global indices and a main determinant of foreign flows is known to be global markets, it should be recalled from Figure 4 that more of the response of net flows to *E* comes at lags, while *R*'s response to *E* is almost completed at the contemporaneous period. This is consistent with a heterogeneous speed of adjustment by foreign investors to global market information or gradual rebalancing over a time span of several days. The remaining 26% are to be further decomposed by SCC. As ρ turned out to be insignificant, we conclude that domestic public information has little role in leading to simultaneous flows and local returns. This can be interpreted as either domestic (country-specific) public information being not so important as a common driver of ISE returns and foreign flows, or foreign investors responding to it either ahead or with some lag.[55] In particular, if foreigners are heterogeneous in terms of access to private information, among short-term traders contemporaneous positive response to public news may be offset by contrarian trading (profit taking) by privately informed foreigners, while long-term foreign investors' response comes with lags. Sophisticated institutional traders might be hesitant to trade right upon public information arrivals either to avoid unfavorable price impact or because they need time to assess the implications of news within institutional decision making bodies.

Results on coefficients $A_{0,43}$ and $A_{0,34}$ suggest that the interaction between domestic returns and foreign flows is bilateral, even the effect of local returns on foreign flows is stronger rather than vice versa.

[55] Our direct observations in the market are partly consistent with both arguments. For example, intraday behavior of ISE indices and market participants show much more modest response to domestic macroeconomic data compared to US macroeconomic data. Moreover, variance decompositions at the daily frequency show that the lagged role of *E* in explaining *F* is about four times larger than the lagged role of *R*, so a smaller contemporaneous role of domestic information is no surprise taking into consideration potential delays in foreigners' response to domestic information. Our observations also suggest that lagged reactions to domestic public information are common.

Three factors may contribute towards a significant effect of local returns on foreign flows:[56] (i) intraday positive feedback trading whereby foreigners infer information from intraday price changes or technical-trading funds condition their trades on intraday price signals; (ii) local returns adjusting to new information quickly and precisely whereby foreigners as a group display partial and gradual adjustment to new information; (iii) a front running story whereby local returns adjust faster and more precisely to the information contained in foreign order flows forcing foreigners to split orders.[57] For a better understanding of (ii) and (iii) it is important to note that these mechanisms would create noise in *F*. Specifically, trades adjusting with a lag, or limit orders filled on a later delay upon a reverse price move would create noise in *F* amid the contemporaneously reacting flows. Thereby, "noise" is used in the sense of effects orthogonal to the actual *F-R* connection. Other sources of such effects include liquidity-motivated trading or deviations of the measured from the true *F* series (see Section III.A). It is well known that such noise is rather neutral when it concerns a dependent variable, since it can simply enter the residual. However, when an explaining variable contains noise, its explanatory power is adversely affected by the presence of components unconnected to the dependent variable. In our simultaneous equation system this implies that the causality might tend to be allocated away from the effect of *F* on *R* towards the reverse effect. This would be the case when *R* responds precisely the information contained in a noisier *F* distracted by other influences unrelated to the *F-R* connection.

As SCC results alter impulse response functions, which were previously based on an inaccurate Cholesky ordering assumption, we repeat the impulse response analysis in the correctly identified model (ρ is restricted to zero to improve estimation efficiency). Figure 7 compares *F* and *R*'s cumulative impulse responses to each other under the SCCC model (on the left) and under the standard Cholesky assumption (on the right). Most obvious is the shift from *imposed* price impact to feedback trading.

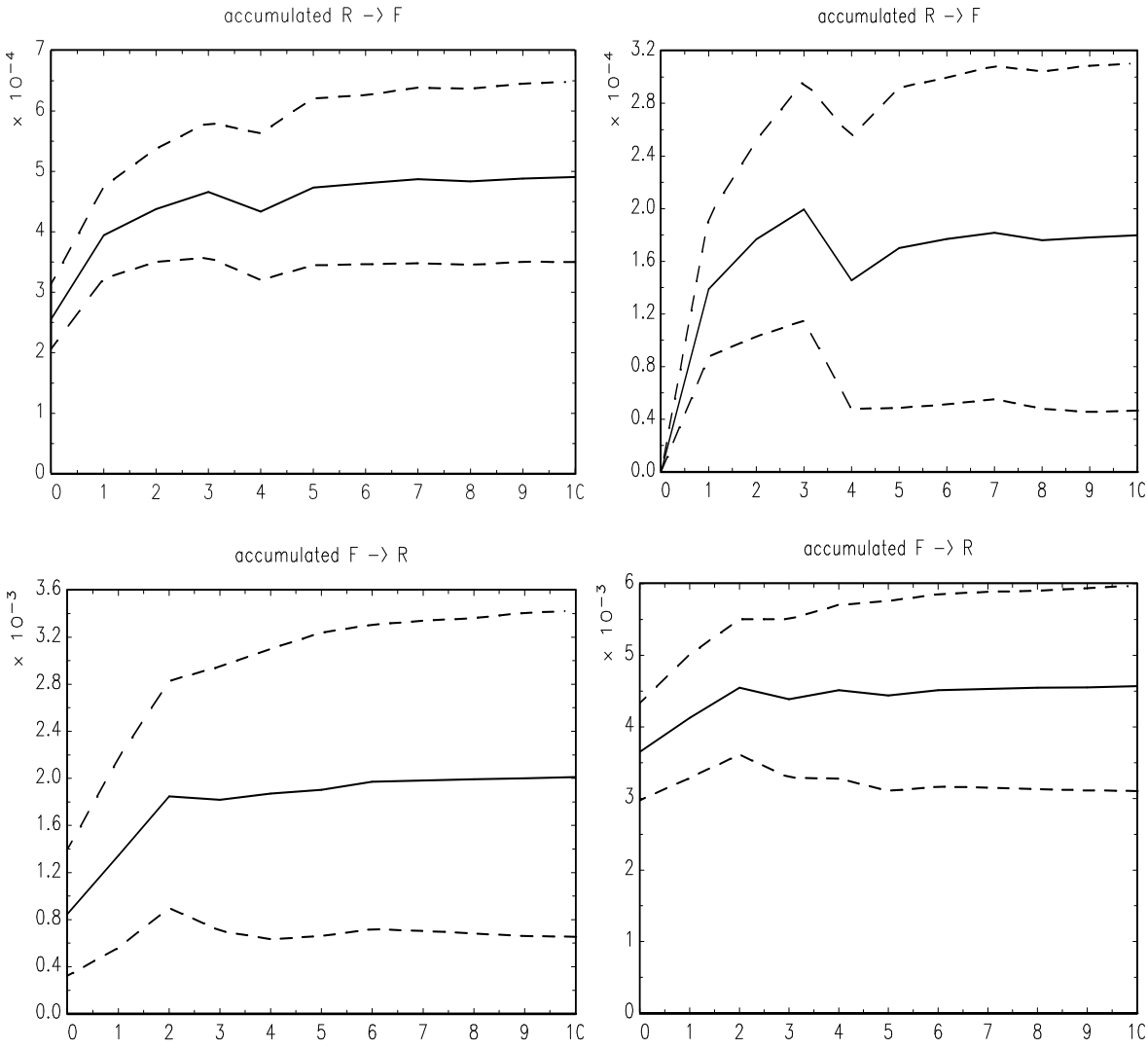
FIGURE 7

Comparison of Flow-Return Interaction under the Standard Assumption versus under SCCC

IR's on the left are based on SCCC results and those on the right are based on the standard assumption that only flows can cause returns contemporaneously. The upper row shows ISE-100 index returns' cumulative IR to a 1-standard deviation shock in net foreign flows. The lower row shows net foreign flows' cumulative IR to a 1-standard deviation shock in ISE-100 index returns.

[56] Danielsson and Love (2006) mention a fourth possibility, which is more relevant for the foreign exchange markets they study: stop-loss orders. With stop-loss orders, it is clear that causality runs from returns to flows. However, stop-loss orders are not very common in ISE, and foreign investors are generally long-term investors who make less use of stop-loss orders.

[57] Several mechanisms may lead to this: leakage of information on large foreign orders, leakage of information during foreign investors institutional decision process, the high level of transparency in ISE enabling intraday traders infer information from trades of brokers associated with large foreign clientele so that when foreign traders start executing a large order they could buy or sell the largest portion of the order only after driving the price by a significant magnitude and quite frequently have to postpone execution of part of the order.



Finally, the variance decompositions based on the SCCC model are reported in Table 4 below. It is striking that the proportion of local returns accounted for by net foreign flows is negligible once the Cholesky assumption is relaxed.

TABLE 4

Daily Variance Decompositions under the SCCC Assumption

Proportions of forecast error in **F** accounted for by:					Proportions of forecast error in **R** accounted for by:				
forecast horizon	**E**	**EM**	**F**	**R**	forecast horizon	**E**	**EM**	**F**	**R**
1	0.05	0.01	0.90	0.04	1	0.40	0.07	0.00	0.53
2	0.09	0.01	0.85	0.05	2	0.40	0.06	0.00	0.53
3	0.09	0.01	0.85	0.05	3	0.40	0.06	0.00	0.53
4	0.09	0.01	0.84	0.05	4	0.40	0.06	0.00	0.53
5	0.10	0.01	0.84	0.05	5	0.40	0.06	0.00	0.53
6	0.10	0.01	0.84	0.05	6	0.40	0.06	0.00	0.53
7	0.10	0.01	0.84	0.05	7	0.40	0.06	0.00	0.53
8	0.10	0.01	0.84	0.05	8	0.40	0.06	0.00	0.53
9	0.10	0.01	0.84	0.05	9	0.40	0.06	0.00	0.53
10	0.10	0.01	0.84	0.05	10	0.40	0.06	0.00	0.53

For a re-assessment of previous studies' results, in particular the reported price impacts, in the light of SCCC methodology, we find it useful to replicate the same analysis on daily Korea and Taiwan data to see whether our finding is a general phenomenon. We follow the same specification introduced above which includes Japanese returns as an additional control variable to proxy for same-day global market information. In Korea, the contemporaneous spillover from flows to returns is 2.856, significant with a LR value of 4.27, and the spillover from returns to flows is 0.0033, significant with a LR value of 22.70. In Taiwan, the spillover from flows to returns is 5.977, significant with a LR value of 22.69 and the spillover from returns to flows is 0.0022, also significant with a LR value of 9.10. These results confirm that intraday spillover from returns to flows is a common phenomenon, omission of which seems to have biased upwards the price impact estimates reported in previous studies. Yet, contemporaneous spillovers from returns to foreign flows are relatively stronger in Turkey compared to in Korea and Taiwan.

B. Implications of SCC Results

Our results based on the SCCC approach presented above have shown that the contemporaneous effect is running to a considerable extent in the opposite direction to what the standard assumption in the literature imposes. This new finding has important implications. At the first glance, it may suggest that intraday positive feedback trading might be a more pervasive behavior of foreigners than previously thought. However, this is not the only possible explanation of this finding: as mentioned above, returns may be adjusting more precisely to new information, even to the information contained in foreign order flows, while foreign flows display a noisier adjustment with lags and order execution delays. In that case, and particularly in combination with our results pointing to the absence of latent common drivers, our finding may imply that foreign investors are disadvantaged in executing orders and in exploiting the information they have. This may be consistent with Choe et al.'s (2005) result that foreign traders are disadvantaged in daily prices at which they trade and that prices move more against foreign investors than domestic investors before they trade. This may lead them to adopt order splitting strategies, especially in buy orders which typically require less urgency so that their

trading appears to be affected by recent returns. Further research is needed to distinguish between these possibilities.

To the extent that returns independently respond to information and foreign flows just adjust to the information that would anyway be incorporated, an important implication of our SCCC results comes on the price impact estimates reported in this line of the literature. Specifically, the implication of the price impact estimates under the standard interpretation that flows cause returns gets blurred, and can even be misleading. Consider an extreme case where foreigners only respond to information contained in returns in the manner predicted by Brennan and Cao (1997) and markets are efficient such that all information is incorporated instantaneously and fully (that is, the contemporaneous association between flows and returns is due only to spillover from returns to flows). Suppose, in country X foreign investors have a large participation, and in country Y they have a rather minor participation. Then, the price impact estimate, interpreted in the standard sense and measured as the return associated with a net foreign purchase equivalent to 1% of market capitalization, will be the higher, the smaller the net foreign flow is. Thus, *ceteris paribus*, one will obtain a higher price impact estimate in country Y than in X. In this respect, it is interesting to note that Richards' (2005) price impact estimates (38% median value to a net flow equivalent to 1% of market cap) are highest for Indonesia and Philippines (lowest for KSE) where the standard deviation of daily net foreign flows is lowest (highest). As the standard deviation of daily net foreign flows is much higher, we naturally obtain a much lower price impact estimate in Turkey under the standard Cholesky assumption (merely around 3.3%). Thus, to the extent that returns independently respond to information and flows just adjust to the information that would anyway be incorporated, conventional price impact estimates lose their meaning. In a similar manner, the contemporaneous price impact estimate of net foreign flows (or in general net flows of any investor group whose trades are correlated with information) will be higher, the higher the volatility of returns, that is the intensity of new information.

Overall, our findings are consistent with the well-supported view that foreign investors do not transmit instability or misinformation, rather they only respond to information. In markets where local individual investor participation is larger, they may have a role in accelerating the process of incorporating information into prices. The relatively higher local individual investor participation rates in Asian markets may be leaving an informative role to foreign investors, consistent with our results suggesting stronger spillover from foreign flows to local returns in Korea and Taiwan compared to in Turkey.

VI. Conclusion

In the first comprehensive study of foreign investors' trading in a sizeable European emerging market combining complete data at the daily and monthly frequencies, and comparing our results to those on Taiwan

and Korea, we reach several conclusions that can be fairly generalized. First, we show that global emerging market returns bear strong incremental explanatory power on foreign investor flows especially at the monthly frequency. For Turkey, inter-month persistence in flows is accounted for, to a large extent, by global emerging market returns.

We document an interesting term structure of feedback trading by foreigners, which is fairly robust across regions of the world: while the lagged response of net foreign flows to global returns is always positive, the lagged response to local returns is negative at the monthly frequency, but positive at the daily frequency. The positive feedback trading at the daily frequency is more significant following negative returns although the persistence of daily flows is stronger in case of net inflows. For Turkey, the negative feedback trading at the monthly frequency is significant only following positive returns. These results at least point to the fact that there is no automatic type of rebalancing by foreigners, while monthly feedback trading asymmetry seen in Turkey may be a symptom of foreigners' attitude to large external deficits. Taken together, these results are not fully accounted for by existing theories of uninformed positive feedback trading or portfolio rebalancing, rather they are consistent with the view that foreigners' net trading is correlated with information and reflects their sophistication in utilizing information. Yet, foreigners do not seem to possess significant asymmetric information as a group. It is more likely that net foreign trading follows returns or responds to the same information to which returns already adjust faster and more precisely, rather than returns are caused by net foreign trading, in a European emerging stock market where foreign ownership fluctuates around 70% of market capitalization.

Our results cast doubt on the standard ordering assumption in the microstructure literature that "flows cause contemporaneous returns but not vice versa", and the consequent interpretation of price impact. While it is easy to show the invalidity of the assumption, that excludes returns affecting foreign flows, at the monthly frequency by measuring and comparing the lagged responses of net flows and local returns to each other as long as daily trading data are available, putting a microscope into the day is made possible only by the approach proposed here utilizing the SCCC concept. An additional advantage of this contemporaneous identification technique is enabling to check for latent common drivers of flows and returns. Our results using this approach imply that the aforementioned standard assumption is fairly questionable even at the daily frequency: it is even more likely that local returns lead foreign flows than vice versa. This should be no surprise given that under the standard specification the daily lagged response of net foreign flows to local returns is several times larger than local returns' lagged response to net foreign flows, not only in Turkey but also in Korea and Taiwan. Foreign investors may simply be more likely to trade on information that would anyway be incorporated into prices rather than causing prices to move. This finding points to a need to revise the conventional interpretation of the price impact. We caution that our finding of contemporaneous spillover from local returns to net foreign flows may not necessarily imply that foreigners infer information from intraday returns and trade accordingly. Rather, it may also imply that, in line with market efficiency, stock

prices do adjust to information more precisely and timely than net foreign flows responding to the same information. Under both cases, however, the interpretation of the price impact in the conventional sense can be misleading. Though, in Asian markets where local individual investor participation is high, foreign investors may have a role in speeding up the process of incorporating new information into prices.

Net foreign flows appear to respond to information in a sophisticated manner. This conclusion is enhanced under the finding that net foreign flows respond negatively to previous month's positive but not negative local returns, possibly exploiting sentiment among local investors in a large-external-deficit economy. Remember that our data partition market participants on the duality of resident versus nonresident. Hence, our results imply that local market participants on average trade in the opposite direction of information. In other words, they supply liquidity to foreign investors who trade on information. As in the absence of significant price impact foreigners responding to information have to trade after the major part of the information is priced, the price of supplied liquidity appears to be higher in Turkey than in Korea and Taiwan, possibly due to higher local individual trader participation in the latter.

The adoption of the SCC approach from the GARCH literature into the microstructure literature opens up a new set of possibilities for expanding research in the microstructure literature. Research has so far been confined to limited, in most cases privately acquired, short samples of trading data obtained from stock exchanges that risk being not representative of all population characteristics. It is from now possible to expand research using long samples of publicly available data sets at the daily frequency by putting a microscope into the day employing the approach introduced here.

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APPENDIX II

Big players' aggregated trading and market returns in Istanbul stock exchange

Numan Ülkü

Central European University Business School

Frankel Leo ut. 30-34, 1023 Budapest, Hungary

E-mail: UlkuN@ceubusiness.org

ABSTRACT

This study uses a special data set, derived from member brokers' transactions, as a proxy for big players' trading. Big players as represented by this variable include institutional, big individual and foreign traders, and these groups are not mutually exclusive. The interaction between big players' trading and markets returns is analyzed using a structural VAR model. Big trader flows are strongly associated with contemporaneous returns, exhibit persistence, possibly indicative of herding, some positive feedback trading and little forecast power. The tendency to herd is stronger than to positive feedback trade. Big players' trading is correlated with information, and our analysis shows that the apparent positive feedback trading is more likely to result from delayed response to information rather than naively following past returns. Asymmetric price impact of buys versus sells is driven by the underlying market conditions.

I. Introduction

Literature related to big players' trading consists of several different paths: block trades (Kraus and Stoll, 1972; Holthausen et al. 1987, 1989; Ball and Finn, 1989; Seppi, 1992; Keim and Madhavan, 1996; Bozcuk and Lasfer, 2005), trades sorted by size (Easley and O'Hara, 1987; Barclay and Warner, 1993; Easley et al., 1997; Chan and Fong, 2000; Chakravarty, 2001), institutional trading (Klemkosky, 1977; Lakonishok et al., 1992; Chan and Lakonishok, 1993, 1995; Grinblatt et al., 1995; Keim and Madhavan, 1995; Wermers, 1999; Chiyachantana et al., 2004; Ng and Wu, 2007; Campbell et al., 2009) and foreigners' trading (Griffin et al, 2004; Dahlquist and Robertsson, 2004;

Richards, 2005).[58] These paths are not mutually exclusive: for example, Bozcuk and Lasfer (2005) start with a size criterion and end up picking institutional block trades; Griffin et al. (2003) document an overlap between being institutional and having large trade size; several articles such as Campbell et al. (2009) use "large size" as a proxy for "institutional" (see Lee and Radhakrishna, 2000); foreign investors are mostly institutionals; and big individual players behave like institutions (Ng and Wu, 2007). The current article relates to an intersection of these paths of literature. The common conclusion of these strands of literature is that big players, whether they are wealthy individuals, institutions or foreign investors, do have a strong impact on stock prices. They are more likely to herd together and to pursue positive feedback trading, which do not appear to be irrational. Some studies find forecast ability in big players' trading, however this does not necessarily translate into entry-to-exit profitability.

The significant price impact along with tendencies of positive feedback trading and herding makes big players price setters, hence raises important issues to be investigated: whether their price impact is temporary or permanent (i.e. reflects price pressure or information), whether they destabilize stock markets by herding together and pursuing positive feedback trading strategies, whether their trading contains forecast value, whether their price impact differs in buys and sells, etc. However, the literature that investigates the interaction between big investors' trading and stock market returns is handicapped by the limited availability of trading data with trader identity. Research is confined to some specific samples exclusively obtained from stock exchanges (e.g. certain short sample periods, reported block trades), quarterly or annual institutional holdings or quite imperfect proxies.

This study uses a specific type of data on Istanbul Stock Exchange (ISE) that permits to identify big investors' aggregated net trading endogenously. Unlike the specific small samples and delayed availability in extant literature, the data used in this study are publicly available continuously, even on an intraday real-time basis for a small fee. These data are used by market participants, including big individual speculators as well as professional fund managers, to infer big players' trading in ISE. Specifically, the data set contains buying and selling value of member brokers. In this study, marketwide-aggregated figures at the daily frequency are used.[59] While the link

[58] Obviously, the list provided here is not exhaustive. A much larger coverage is provided in the next section.

[59] See Chordia et al. (2002) for a marketwide-aggregated study of order imbalance at the daily frequency on NYSE. However, that article differs from the current one in that the order imbalance variable is actually a proxy for market orders (active orders executed against the limit order book), while the variable derived here is a proxy for big players' trading. In other words, they focus on trading *aggressiveness*, while this study focuses on size. Interestingly, both variables exhibit

from brokers' cumulative trading volume to identification of big players may seem indirect at first sight, the derivation explained in the next section ensures that these data pick net trading by big players. The category of big player as picked by these data naturally includes institutional traders, big individual traders and foreigners. As a matter of fact, as extant literature documents, these categories are not mutually exclusive, especially as far as their behavior is concerned.

Given the repeated failure of economic models to explain, let aside to forecast, exchange rate changes, Lyons (2001) proposes order flow analysis as an effective tool to explain and, to some degree, forecast exchange rate changes. This tool, however, is only available to major dealers. The data employed in our study can be considered as the stock market counterpart of the order flow approach to FX markets, with the additional advantage of being available to the public on a real-time basis.

The unique features of this data set help contribute to the literature in several ways: First, in earlier studies of trades sorted by trade size, potential links between orders (i.e. serial orders) are omitted, and fixed arbitrary trade size categories ignored variation in the trade size resulting from dynamic stealth trading tactics of big traders. Menkhoff and Schmeling (2010) provide evidence that medium size trades of large traders convey most information, and the relation between trade size and permanent price impact is nonlinearly intermediated by trader size. Moreover, the relation between trade size and trader size has been noted to be broken in recent years as a result of increased splitting of orders thanks to computerized trading (Hvidkjaer, 2008; and Campbell et al., 2009). The data used in this study identify big net traders without referring to the size of individual trades, and critically capture the interaction between trade size and trader size. Second, most empirical studies in the literature are confined to specialist dealer systems.[60] With the advance of computerized trading, all major stock markets are now migrating towards electronic continuous auction systems with no specialist dealers, where not only order execution strategies but also, and perhaps more importantly, the mechanism by which the information content of trades is incorporated into price might differ. However, there is no study of big players' trading and its price impact under the continuous limit order book blind matching system except for Ball and Finn (1989) on Australia, several studies on South East Asian markets, and Menkhoff and Schmeling (2010) using a 6-day sample on the ruble currency market at MICEX. As under the specialist system the price impact of an order depends on specialist's assessment of its information content and inventory effect, it needs to be seen whether the

similarities such as positive relation to current returns and persistence, which may be an indication of big players being more likely to use market orders. See Visaltanachoti and Luo (2009) for a study of order imbalance on Thailand.

[60] Lee et al. (1999) and Lee et al. (2004) on Taiwan Stock Exchange pertain to a batch processing system.

results would differ under blind electronic continuous auction systems without a specialist where crowd is supposed to fulfill the same function (see Bloomfield et al., 2005). The current article fills this gap. Third, the sample period corresponds to a symmetric and significant V-shape in price action around the recent global crisis, enabling clean empirical tests of long-debated hypotheses about price impact asymmetry such as Chiyacanthana et al. (2004) and Saar (2001). Fourth, this article fills a gap as there is a scarcity of studies on big players' trading in European, especially emerging European, stock markets.[61] Finally, the way our key variable is derived from broker level data, though simple, is new to the literature, and can inspire similar studies in other markets.

In this study, a structural VAR model is employed to portray the dynamic interaction between big players' trading and market returns, augmented with world market returns which enter the system exogenously. As global market returns are a relevant information variable with high explanatory power on ISE returns, especially during the sample period which corresponds to the recent global crisis, our specification enables to condition the return-flow interaction with an information variable. This provides a unique contribution to the literature by distinguishing between positive feedback trading and delayed reaction to information.

Results suggest a strong positive contemporaneous price impact, which confirms, under a different trading system, previous conjectures that link information content to trade or trader size. By the end of the trading day, the information contained in big players' buying is almost fully reflected in market prices although there is no specialist dealer who derives information from order size, sequence and identity of traders. It takes longer, however, for big players' selling to be fully priced in probably because of the practical absence of short selling in ISE. This indirectly suggests that some market participants infer information from observing trades (possibly using this data set) to accelerate the incorporation of information contained in trades into prices, thus fulfilling the informational role of a specialist.

Big player flows exhibit persistence, which may be indicative of herding. The relation of current big player flows to past big trader flows is stronger than to past returns. Moreover, big player flows are much more strongly affected by past world returns than by past local returns. Failure to augment the return-flow interaction with an information variable in the extant literature has resulted in inability to distinguish positive feedback trading from differential response time to information. As

[61] One exception is Voronkova and Bohl (2005), who use data on semi-annual and annual holdings of pension funds in Poland.

world returns were a highly relevant information variable during our sample period, these results can be interpreted as big players' responding to information rather than naively to past returns.

Thanks to the V-shaped price action during our sample period, our results provide a clean confirmation of Chiyachantana et al.'s (2004) suggestion that the asymmetry in price impact documented in earlier studies may have simply been driven by the underlying market conditions.

The article is organized as follows: Section 2 relates this article to extant literature. Section 3 describes the unique data set employed in this study and the methodology. Results are presented in Section 4, and main conclusions are discussed in Section 5.

II. Related Literature

In the microstructure literature, large-size trades have been associated with significant price impact and informed trading both theoretically and empirically (Easley and O'Hara, 1987; Easley et al. 1997). Barclay and Warner (1993) modify this association with the *stealth trading hypothesis* (i.e., under a specialist dealer system, privately informed traders will mostly concentrate in medium size trades for strategic reasons). On a sample of tender offer targets, they document that medium-size trades account for a disproportionately larger portion of the cumulative price change. Chakravarty (2001) confirms the stealth trading hypothesis on a 63-day sample from the audit trail file of the TORQ data, and further documents that most of the cumulative price impact is due to medium size trades of institutions. Using TAQ data on NYSE and Nasdaq stocks for July-December 1993, Chan and Fong (2000) find that the order imbalance in large trade size categories affects returns more than that in smaller trade size categories. Using a 6-day sample of all trades with trader identity from the MICEX currency exchange, Menkhoff and Schmeling (2010) show that most of the price impact is due to medium–size trades of large traders. The literature on regular trades sorted by size employs special short samples of trading data provided by stock exchanges.

Major international replications of the analysis of trades sorted by size are on China and Taiwan, where individual investors dominate. Using a VAR model, Lee et al. (1999) find that big individual trades in Taiwan Stock Exchange are strongly positively correlated with contemporaneous returns, lead returns over the next 15-minutes interval, and are themselves independent of past returns or any other category of trades. Small individual trades exhibit contrarian behavior. Using detailed audit trail data from Shanghai Stock Exchange for April 2001 - August 2002, Ng and Wu (2007)

analyze trading behavior and price impact of institutions and three categories of individuals sorted based on trade size. Institutions and large-size individuals exhibit momentum trading, while small size individuals exhibit contrarian trading. Only trading by institutions and largest size individuals affect future volatility, while none of the investor groups' trading has forecast power. Using the same data set, Wongchoti et al. (2009) confirm that when past market returns are high, investors with larger trade size tend to buy while investors with smaller trade size tend to sell. These results are relevant for the setup of this article as they document that large individual traders behave like institutions.

In the earliest study of the price impact of block trades, Kraus and Stoll (1972) document a strong price impact associated with block trades ($ 1 million or higher in value) on a 1968-69 sample from NYSE. They also find that the price impact of block purchases is larger in magnitude and more permanent than block sales (suggesting that the price impact of block purchases might be associated with information whereas that of block sales might be reflecting price pressure), and that the price impact is proportional to trade size. Holthausen et al. (1987) find that temporary price impacts are larger for seller-initiated blocks, while permanent price impacts are larger for buyer-initiated blocks. Holthausen et al. (1990) add that most of the price impact is permanent and related to block size. Seppi (1992) documents private information content of block trades. He finds that a portion of the price impact of block trades prior to earnings announcements can be explained by earnings surprises, and information content is increasing in block size. Bozcuk and Lasfer (2005), on a 1993-99 sample from London Stock Exchange, find that a combination of trade size and trader's resulting level of ownership, as well as the type of investor behind the trade, are major determinants of the permanent price impact. Keim and Madhavan (1996) analyze upstairs blocks of a single institutional trader between 1985 and 1992. Upstairs transactions, accomplished through a search brokerage mechanism, differ from regular block trades in that they involve a higher probability of information leakage at the preparation stage, hence omission of price changes prior to the trade would seriously understate price impact. They document significant price movements up to 4 weeks prior to block trade date, positively related to trade size. They find larger temporary price impact for block sales. The only analysis of block trades under a non-dealer auction system is Ball and Finn (1989) on Sydney. They find no post-block reversals (there is even some evidence of continuation), which supports the information hypothesis (and contradicts results of Kraus and Stoll, 1972). Moreover, there is no significant relationship between block size and post-block reversal which rules out price pressure hypothesis. While they do not specifically mention in their article, their reported results suggest a

run-up just prior to block purchases and some earlier price increase before block sales. The continuation following sales is stronger, which is similar to our finding in this article.

Clearly, institutional traders and trades are of large size, and they constitute a major component of big players' trading. The literature on the interaction between institutional trading and stock returns is mainly confined to US and South East Asian markets. In the earliest study of institutional trading, Klemkosky (1977) documents the price impact of large institutional trading imbalances, using data on quarterly holdings. Chan and Lakonishok (1995) analyze trades of 37 large investment management firms focusing on price impact and execution costs. Warning that individual trades may be misleading as institutional orders are broken up into several trades, they use trade packages (sequence of trades identified via simple rules) as the unit of analysis. They document a price impact asymmetry: average price impact is about 1% for buys and -0.35% for sells, and the subsequent reversal for buys is much smaller. The price impact is proportional to relative trade size. Keim and Madhavan (1995) use orders of 21 institutions of differing investment styles to analyze feedback trading motives and order execution strategies. They find heterogeneity with respect to feedback trading strategies varying with investment style, with the overall effect likely to be offsetting. Feedback trading tendency is often not symmetric for buys versus sells. They also find that buys take longer to execute. Nofsinger and Sias (1999) find strong positive contemporaneous relationship between stock returns and annual changes in institutional ownership, which is not reversed in the following two years. They also find evidence of institutional positive feedback trading, mostly on smaller firms. Their additional analysis on a short sample of daily data suggests that the contemporaneous relation reflects the impact of institutional trading on returns rather than institutions engaging more intraperiod positive feedback trading. Using quarterly changes in institutional ownership, Lakonishok et al. (1992) find weak evidence of momentum trading by pension funds, while Grinblatt et al. (1995) find stronger evidence of momentum trading by mutual funds: 77% of the 155 mutual funds in their sample were momentum investors, but they also note an asymmetry (the tendency to buy winners is much stronger than to sell losers). Employing quarterly portfolio holdings data of all types of institutions, Badrinath and Wahal (2002) confirm that investment advisors and mutual funds, particularly growth funds, exhibit stronger tendency of positive feedback trading, while overall positive feedback trading is modest. Institutions exhibit momentum trading in entering a position and contrarian trading in exiting. They also report that average abnormal entry-to-exit returns are close to zero. Using quarterly institutional holdings data from 1981 to 1996, Cai and Zheng (2004) find that returns Granger-cause institutional trading rather

than vice versa (institutions buy popular stocks after market rise) and returns are negatively related to lagged institutional buying, suggesting that institutions are uninformed positive feedback traders. Based on data sorted by brokers specializing with institutions and individuals, Griffin et al. (2003) analyze institutional and individual trading at daily and intradaily frequency. Institutions exhibit positive feedback trading (based on previous day's returns, the top decile of stocks is 23.9% more likely to be bought by institutions -and sold by individuals- than those in the bottom decile). They also find that most of the positive contemporaneous association between stock returns and institutional net buys is due to net institutional trading following past intradaily excess returns (or the news associated therein). Campbell et al. (2009) find that institutional trades are highly persistent, respond positively to recent daily returns but negatively to longer-term past daily returns. Institutional trades, particularly sells, consume liquidity. Their trading anticipates both earnings surprises and post-earning announcement drift.

An important aspect of institutional trading is herding given the potentially destabilizing effects. Using 20 years of quarterly data on mutual fund holdings from 1975 to 1994, Wermers (1999) finds significantly higher levels of herding by mutual funds in small stocks, and among growth-oriented funds, especially on the sell side. The next quarter return difference between stocks bought and sold by mutual fund herds is significantly positive, especially for small stocks (chiefly due to underperformance of stocks sold), which implies that mutual fund herding speeds the price-adjustment process. While the overall degree of institutional herding reported by Lakonishok et al. (1992), Grinblatt et al. (1995) and Wermers (1999) is not very strong, Sias (2004) provides compelling evidence of institutional herding. He further demonstrates that net institutional demand is more strongly related to lag institutional demand than lag returns. Lee et al. (2004) use marketable order imbalances by trader type and trader size from Taiwan Stock Exchange. They find that domestic and foreign institutions have more persistent order imbalances, inducing continuation in price pressure. Their detailed data permit to distinguish between herding and order splitting and they conclude that both herding and order splitting appear to cause persistence. Sias and Starks (1997) document that return autocorrelations of individual stocks are an increasing function of institutional ownership, even after controlling for size. As high institutional ownership stocks tend to lead, institutional trading seems to reflect information. Employing a similar methodology, Dennis and Strickland (2002) provide evidence supporting the argument that institutions (except banks) are more likely to herd and add to volatility by joining the momentum. Dasgupta et al. (2010) find that multi-quarter herding by institutions negatively predicts long-term stock returns. Li and Wang (2010),

however, show that institutional informed trading is negatively related to volatility in the retail investor-dominated Chinese stock market. They argue that when the percentage of institutional investors in a market reaches a certain level, the effect of noninformational institutional trading may prevail and increase volatility.

One of the unresolved issues in the literature is the price impact asymmetry, that is, the stronger permanent price impact of institutional/block buys versus sells. Saar (2001) proposes an explanation based on information search and trading constraints to explain the asymmetry of price impact of institutions' block purchases and sales. Chiyachantana et al. (2004), using data from 37 countries and two different sample periods with bull vs. bear market characteristics, document that underlying market conditions (whether the market is in a bull- or bear trend) is a major determinant of the price impact of institutional trading, and can explain the asymmetry in price impact of institutional buy and sell orders. Their findings imply that previous results on this asymmetry might have been driven by sample specific market conditions.

Another member of the group of big players is foreign investors, especially in emerging markets. The literature on foreign investors' trading documents a strong positive price impact, associated with mostly global (push) factors, and positive feedback trading (Griffin et al, 2004; Dahlquist and Robertsson, 2004; Richards, 2005).

On the other hand, several studies document a contrast between large and small traders and between institutional and individual traders: Henker and Henker (2010) provide convincing evidence that retail investors have no impact on stock prices. Small players' trades usually are negatively related to contemporaneous and past returns (Lin et al., 1999; Hvidkjaer, 2008). Unlike institutions, individual traders are more prone to disposition effect and contrarian trading (Odean, 1998; Kaniel et al., 2008). Small trades negatively predict med- and long term stock returns (Hvidkjaer, 2008; Barber et al., 2009), while positively predict short term returns (Barber et al., 2009). Kaniel et al. (2008) find that individual trader imbalances earn positive excess returns in the next month, and attribute this to compensation for liquidity provision to meet the institutional demand for immediacy. Indeed, Lee et al. (2004) using a detailed data set on Taiwan Stock Exchange show that liquidity appears to be provided predominantly by small individuals who "often lean against the wind". Several studies note an overlap between "small trade size" and "individual investor" and use the former as a proxy for the latter (Lee and Radhakrishna, 2000; Barber et al., 2009). Hvidkjaer (2008) and Campbell et al. (2009), however, warn that this relationship disappears in recent years as a result of increased splitting of institutional orders thanks to computerized trading.

The current study is similar to Griffin et al. (2003) as their data are also identified at the broker level. Hence, inferring trader category from broker level data is not new to the literature. Their broker level classification shows a strong correspondence between trade size and being executed by a broker specializing with institutions (i.e. trades they classify as institutional based on the broker that executed the trade make up 86% of block trades of 10,000 shares or more). They also employ data at daily frequency and VAR methodology, and address the same questions as in this article. However, the current article differs in that the investor category under analysis is big traders instead of institutions. Griffin et al. (2010) document that big and sophisticated investor groups herd on each other's trading. Hence, combining the institutions, foreigners and wealthy individuals under one category of "big players" is warranted given the established results in recent literature.

III. Data and Methodology

The data set used in this study consists of the net buying (i.e. purchases minus sales) value by the largest net buying and net selling member brokers over a unit period of time. A positive (negative) reading in a particular broker's figure implies net buying (net selling) by that broker. These data are derived from cumulative trades of each and every member broker in ISE. Specifically, all broker members[62] are ranked in terms of their cumulative net buying during a unit period of time, then n largest net buyers at the top and n largest net sellers at the bottom of the ranking are identified. Let's call the sum of the net buying values of the top n largest net buyers LNB^n_t and the sum of the net selling values of the largest n net sellers as LNS^n_t. Then, the key figure of interest, which will be notated as N_t throughout this article, is computed as $N^n_t = LNB^n_t - LNS^n_t$. Most market participants and commentaries in ISE inaccurately refer to N^5 or N^{10} as the "net money inflow", with a negative number implying "money outflow". In reality, the sum of net buys of all brokers in ISE is always zero; in other words, there can be no in- or outflows, as ISE operates under an order driven electronic system with no specialist dealers. What they refer to as inflow (outflow) is, in fact, that largest net buyers (sellers) have bought from (sold to) the rest of the market participants ("crowd"). Thus, the "net buys" figures are a proxy for big players' trading.

We do not group individual trades by trade size, nor by the identity of the parties (e.g. institutional vs. individual). Rather, we employ an ingenious derivation technique utilized by market

[62] As of April 2010, there are 103 member brokers in ISE.

practitioners. While *N* is a functionally good proxy for big players' trading, one can argue, for example, that it cannot be ruled out that a broker with a large number of small investors, all of them being simultaneously net buyers (sellers) in a particular period, appears as a big net buyer (seller), although in reality it reflects small players' trading. However, that all of the small traders of a particular broker, and not of the others, trade in the same direction in a period is highly unlikely. Most typically, a few big traders' transactions far outweigh in value the sum of many small traders' transactions.[63] Small traders of a particular broker making it appear in the list of top net buyers or sellers might have been a likely case if some particular large brokers would have specialized on small (retail) clients. However, statistics from ISE suggest just the opposite: the highest percentage of domestic individual investors is seen with the smaller brokers, and the percentage of big player groups –foreign, proprietary institutional- are higher with larger, bank- and/or foreign owned brokers (the Association of Capital Markets Intermediary Institutions of Turkey, 2009 statistics). Thus, trader size appears to be in parallel with broker size.[64] Therefore, these figures typically provide an accurate vision of big versus small players' direction of trading (i.e. whether big investors are selling to or buying from the crowd). Any counterarguments fail to pass tests of logic: if all small traders respond to public news, then none of the brokers of small traders would stand out as a large net trader. That all of the small clients of a particular broker, but not those of other brokers, trade in the same direction to make their broker appear as a large net trader would be possible only if all of the small clients of this broker faithfully and strictly follow a broker-specific signal such as their broker's private investment advises. Then, trading by this broker would be functionally no different than an institutional portfolio manager.

As this data set is argued to reflect the trading of institutions, big individual traders and foreigners, external checks would help verify this proposition. However, in ISE no data on institutional or individual trading are made available to public. One opportunity, however, is presented by the marketwide foreign ownership ratios published by the *Clearing and Custody Bank* on a daily basis. The correlation between N^{10} and the changes in the percentage market value held by foreigners over our sample period is +0.269, which is significant at $p<0.001$.[65] As foreigners

[63] The high concentration is well-documented in other markets as well. For example, Menkoff and Schmeling (2010) report that 100 out of 723 traders in their sample account for 50% of total trading volume.

[64] In a similar manner, Barber et al. (2009) document that small-trade-size order imbalance correlates well with order imbalance from retail brokers.

[65] It is desirable that this correlation is significantly smaller than +1, as big individual investors and domestic institutions are two other important components of big players. Otherwise, this article would collapse into a study of foreigners' trading.

represent 83.8% of total institutional holdings as of December 2009, this implies that our data set captures a large portion of institutional trading, as well.

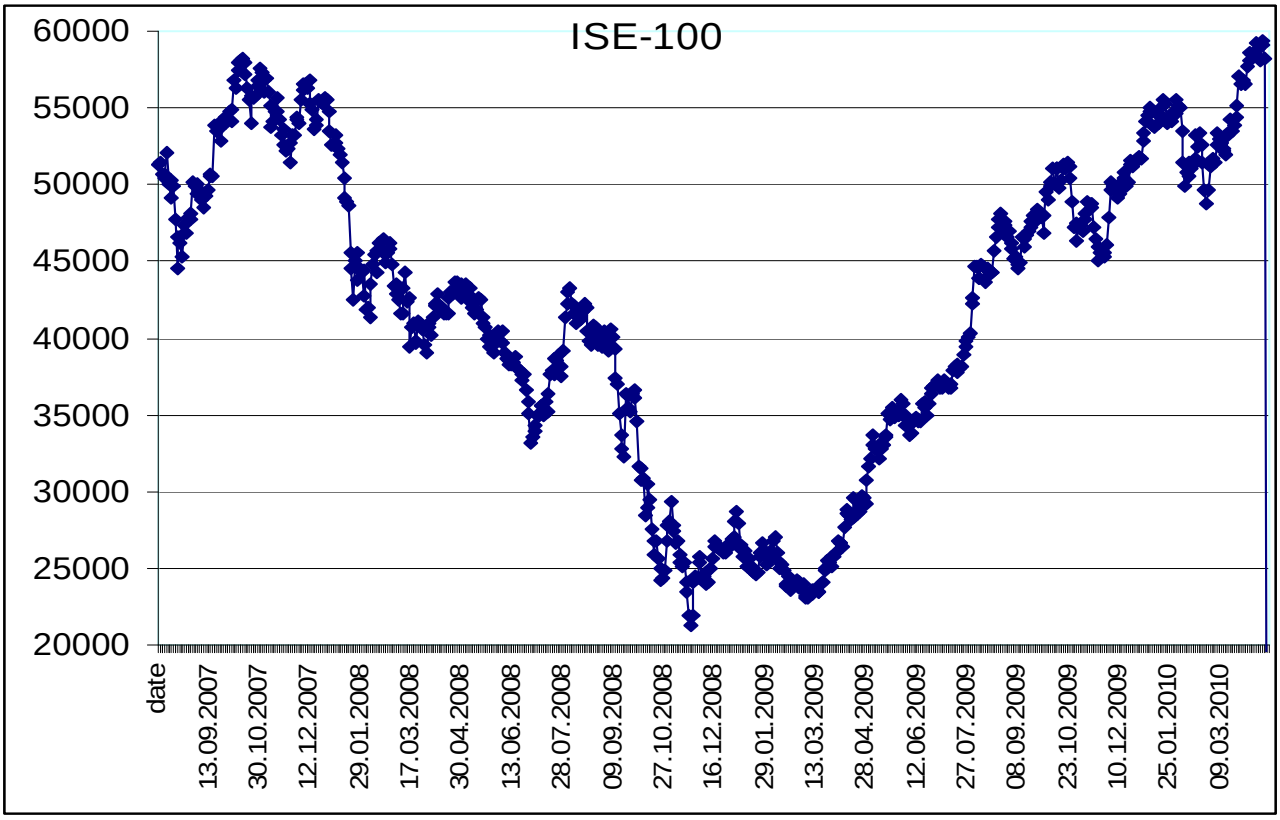
A risk of misinterpreting this data set may, however, result from big players' strategic behavior. A big client in the stock market may trade via numerous brokers, even simultaneously buying via one and selling via another. The continuous auction, limit- and market order electronic trading system of ISE with irreversible limit orders, no market-making specialists, progressively low brokerage commission rates and a high level of transparency encourage such fictive trades in ISE. There is some belief among experienced traders that big investors sometimes try to conceal their trading intentions by appearing as large net buyer through a broker known to have foreign client base and being small net sellers through a number of other brokers, to mislead those who try to infer information from this data set. A remedy for this problem could be to include a higher number for *n* in the analysis, since the number of different brokers a trader may use in the same period has some practical limits. We therefore experiment with three different values for *n*: 5, 10 and 15. That the results with the three versions are similar suggests that the data set was not significantly affected by such strategic behavior. Throughout the article, results for n=10 are reported.

The data was obtained from *Euroline*®, a domestic data vendor who redistributes data from ISE. Cumulative net buys data are summarized over periods of 1 day, so the study is at the daily frequency.[66] Our sample period spans from 1 August 2007 to 16 April 2010 (679 trading days).[67] This period corresponds to the sharp downtrend due to the recent global crisis and the symmetric recovery following the bottom in March 2009, hence presents an excellent opportunity to incorporate the global crisis as a significant information event into the analysis, in particular to exploit world market returns as a significant information factor. Furthermore, dividing the sample into two parts from the March 2009 bottom, one obtains an almost perfect V-shape in ISE index which enables a clean test of the argument raised by Chiyachantana et al. (2004) by comparing the price impact of big traders' purchases and sales in bull versus bear markets. The price/time chart of the ISE-100 index is plotted in Fig. 1 below.

[66] In general, this data set can be obtained over any frequency, hence intraday analysis is possible. However, data at intraday frequencies are not stored, nor data for individual stocks. Ülkü (2008) manually collects a short sample of marketwide intraday data and daily data for 15 individual stocks, and finds that results are overall similar to those with daily marketwide data.

[67] These data are broadcast on a real-time basis, and lost unless stored. *Euroline* stores these data only for moving windows of several months. The sample used in this study is obtained by combining windows collected at different time points.

Fig. 1: The daily closing levels of the ISE-100 index during the sample period



Unit root tests remain indecisive on whether N_t is stationary or not. Specifically, ADF test rejects the null of a unit root only at 10% level, while PP test safely rejects at 1%. It is natural to think that *N* may trend together with market capitalization. Hence, a prudent approach would be to scale *N* by dividing by market capitalization (*MC*). This would also enable us to standardize big investors' net trading relative to the value of shares in circulation. Thus, we define the key variable used in this study as follows:[68]

$$N_t = (LNB^n_t - LNS^n_t) / MC_t \qquad (1)$$

To address the research questions, we employ VAR methodology to portray the dynamic interaction between big trader flows and returns. In particular, this framework has the ability to simultaneously test feedback trading tendency, information (predictive) content and persistence in big player flows; to distinguish between temporary and permanent price impact of big players' trading,

[68] An alternative way of normalization can be obtained by dividing by the total trading value. Results with this version are similar. However, variation in trading volume appears to add some noise, hence dividing by market cap is preferred. This way of normalization is also compatible with previous articles such as Griffin et al. (2003).

hence to test price pressure and information hypotheses.[69] Our VAR model includes *N* and *R* as endogenous variables in the system, where *R* is log returns of the ISE-100 index, defined as:

$$R_t = ln(ISE100)_t - ln(ISE100)_{t-1} \quad (2)$$

Hence, we run the following VAR model:

$$\begin{bmatrix} N_t \\ R_t \end{bmatrix} = \begin{bmatrix} a_n \\ a_r \end{bmatrix} + \begin{bmatrix} b_{11}(L) & b_{12}(L) \\ b_{21}(L) & b_{22}(L) \end{bmatrix} \begin{bmatrix} \sum_1^p N_{t-p} \\ \sum_1^p R_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_t^n \\ \varepsilon_t^r \end{bmatrix} \quad (3)$$

where the *a*'s represent intercept terms, *b*(*L*) denotes a polynomial in the lag operator *L*, and ε_t^n and ε_t^r are zero-mean error terms that are assumed to be intertemporally uncorrelated.

Since global market returns are a major information factor that strongly affects both ISE returns and big investors' trading, we also employ another version, where the bivariate-VAR model in (3) is augmented with world market returns that are affected only by their own lags. Thus, we employ a structural VAR (SVAR) model. The advantage of utilizing this specification instead of a conventional VAR is that none of the lags of big investor flows and ISE returns affect the world returns, but contemporaneous values of them are affected by the instantaneous and lag values of world returns. Thus, world returns are treated as an exogenous variable. This ensures a more accurate characterization of the joint dynamic relationship between big trader flows and returns. The identified VAR model can be specified as:

$$A(L)w(t) = \varepsilon(t) \quad (4)$$

where *A(L)* is an 3x3 matrix polynomial in the lag operator *L*, *w(t)* is the 3x1 observation vector, and $\varepsilon(t)$ is the 3x1 vector of structural disturbances. Specified model is shown in Equation 2:

$$w(t) = \begin{bmatrix} N(t) \\ R(t) \\ W(t) \end{bmatrix} \qquad A(L) = \begin{bmatrix} A_{11}(L) & A_{12}(L) & A_{13}(L) \\ A_{21}(L) & A_{22}(L) & A_{23}(L) \\ 0 & 0 & A_{33}(L) \end{bmatrix} \qquad \varepsilon(t) = \begin{bmatrix} \varepsilon_1(t) \\ \varepsilon_2(t) \\ \varepsilon_3(t) \end{bmatrix} \quad (5)$$

where *W* is the world market return. The assumptions are that $\varepsilon(t)$ is uncorrelated with past $w(t-k)$ for $k>0$, and the coefficient matrix of L^0, A_0, is non-singular. The block exogeneity is represented by the zero entries in the *A(L)* which imply that *W* is exogenous to *N* and *R* both contemporaneously and for lagged values. In the impulse response analysis, standard Choleski normalization and asymptotic confidence bands are employed. As the standard inference procedure of the Maximum Likelihood

[69] See Hasbrouck (1991) who was the first to suggest the interaction of trades and returns be modeled as a VAR system.

estimation of VAR model is not applicable to structural VAR with block exogeneity, we compared the results to modified error bands of Sims and Zha (1999), and obtained identical bands.

We use MSCI–Europe index returns as a proxy for world market returns. Use of MSCI – Europe index instead of MSCI-World index or US indices avoids time-zone differences which may confound the analysis at the daily frequency. Moreover, MSCI-Europe index has the highest correlation with ISE returns during our sample period, hence appears to best capture the world market factor. The lag order of SVAR is 9 as suggested by Akaike information criterion.[70] The system is estimated via seemingly unrelated regressions (SUR), since the right-hand side variables explaining global returns are different. In line with the common treatment in the literature, we place net flows before ISE returns in the Cholesky ordering, which implies that net flows have contemporaneous effect on ISE returns but not vice versa; ISE returns can only have effect on net flows with a lag.

As previous literature finds big players' trading to be correlated with information, and as global market returns constitute a major source of information for ISE during our sample period, a comparison of results under the basic model in Equation 3 and the augmented model represented by Equations 4 and 5 will provide useful insight. Specifically, it will enable to see whether the association between big trader flows and contemporaneous day and previous day returns reflects naïve positive feedback trading or reaction to information with differential response time. For example, Griffin et al. (2003) find that most of the contemporaneous association is driven by the response of institutional flows to intraperiod lagged returns, however cannot distinguish whether it is a response to lagged returns themselves, or the information associated therein. By defining world return as an information factor strongly correlated with returns, we are able to provide an answer to this question left unanswered in the extant literature.

4. Results

We present results by studying impulse-response functions. Impulse response functions (IRF) show the dynamic behavior of a variable due to a shock in another variable in the system. In all IRF graphs to follow, the blue line in the middle represents a point estimation of impulse responses. A two-SE confidence interval is shown by the upper and lower dashed red lines. Statistical significance is

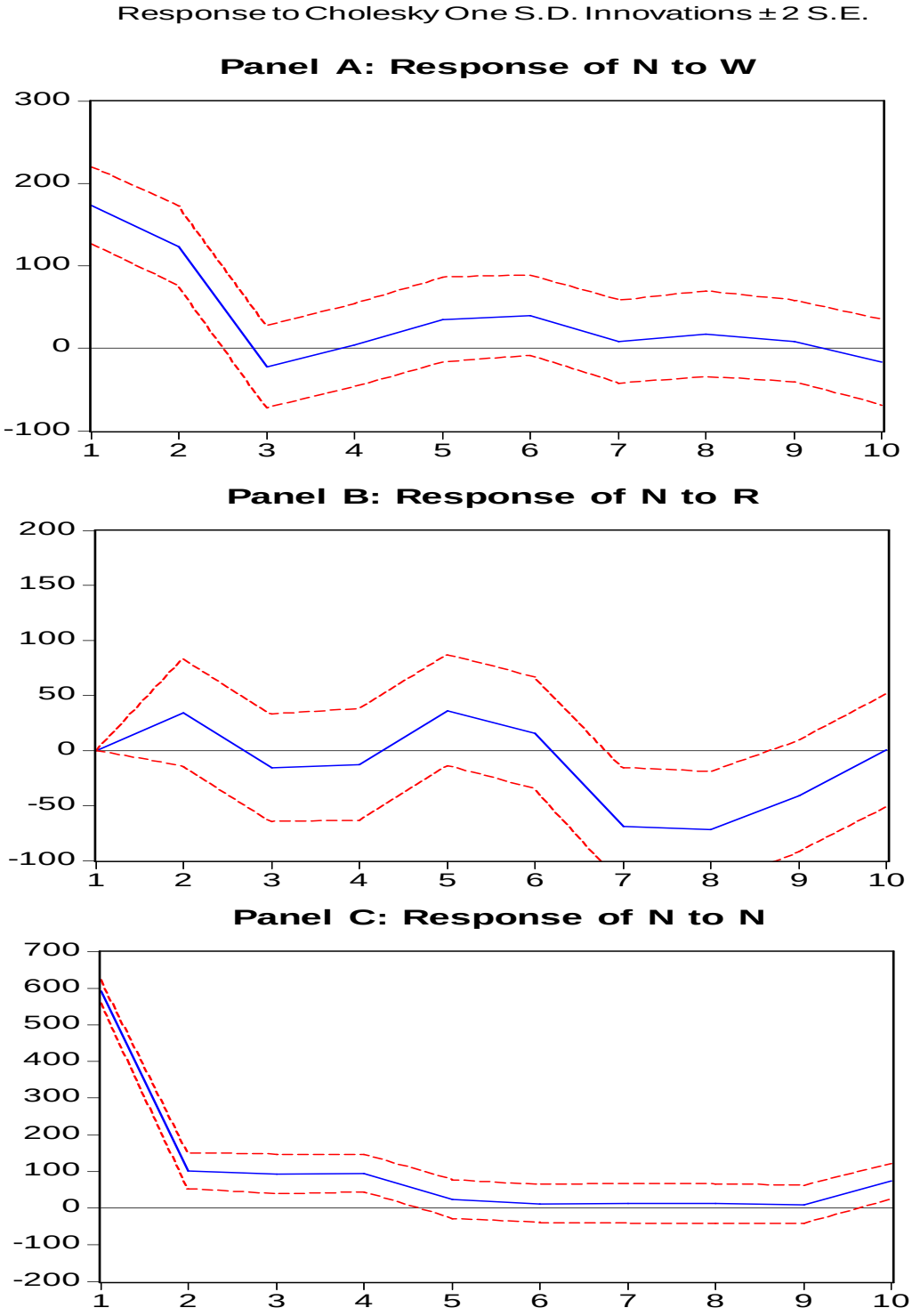
[70] Schwarz and Hannan-Quinn criteria suggested 2 lags, however a generous specification is preferred as the sample size is large enough. This rich lag structure uncovers some borderline significant responses at higher lags.

implied when neither of the confidence bands crosses the x-axis. If, to the contrary, the x-axis falls within the confidence bands then the null hypothesis that a shock has no effect cannot be rejected. Below, the results of the SVAR specification are presented. The results with the specification in Equation 3, which is not augmented by the world returns, are presented in Appendix 1. A comparison of these results confirms that omission of world returns would lead to misspecification and biased results.

The behavior of big trader flows

The determinants of big players' trading are characterized by studying the impulse responses of big trader net flows (N) to a shock in global returns (W), local returns (R) and itself (N), respectively, in Panels A, B, and C of Fig. 2.

Fig. 2: The impulse responses of big trader net flows



The impulse response of net big trader flows (N) to a 1 SD shock in world returns (W), ISE returns (R) and itself (N) is portrayed in Panels A, B, and C, respectively. The x-axis shows the number of days (day 1 refers to the contemporaneous period). The blue line in the middle represents the point estimates of the impulse response coefficients, while the dashed red lines represent 2 SE confidence bands.

Panel A suggests that big trader flows are significantly correlated to global returns both contemporaneously and at the first lag. This finding is consistent with results on foreigners' trading (Griffin et al., 2004; Richards, 2005). Considered in the context of institutional or big trader flows and returns, this relation might be consistent with both "positive feedback trading" (including the possibility of intraday positive feedback trading) and "reacting to information". Previous literature finding a positive relationship between institutional/block trades and contemporaneous and lagged returns is unable to distinguish between "positive feedback trading" and "reacting to information" in explaining this positive association. Recalling that the sample period corresponds to the recent global crisis which spread out of developed markets, global returns can be considered as a significant information variable. Hence, specific characteristics of our sample period and the construction of our model enable us to distinguish between these two alternative hypotheses, as seen below.

Panel B suggests a much weaker tendency of positive feedback trading with respect to local returns (see period 2). As big trader flows are significantly related to global returns but only weakly related to returns of the underlying market, our results favor "reacting to information" over "positive feedback trading". Hence, it appears that big traders do herd on information with slightly differential response times rather than naively conditioning on past returns. This is an important result answering a main question which has not been satisfactorily addressed in the previous literature because it has been difficult to condition the return-flow interaction on an information variable of high relevance for which a continuous time series is available.[71]

Note that failure to augment the VAR specification with exogenous global returns (see Appendix 1) would lead to a misleading inference of significant positive feedback trading because ISE returns are very highly correlated with global returns. In a small emerging market context, the need to include global returns as an information factor is obvious. In previous research, however, any possible conditioning information variable in the return-flow interaction has been simply omitted. Thus, the pervasive conclusion of positive feedback trading by institutions may in reality be a reflection of institutions' herding on the same information signals with differential response and order execution times.

[71] A caveat applies here: foreign investors have been shown to respond to global market returns (Griffin et al., 2004; Richards, 2005), and this response may be due to portfolio rebalancing rather than new information. However, world market returns have been omitted as a potential information variable in the studies of institutional or big individual trading. As foreign investors capture only a relatively small portion of the big player flows proxy used in this study, our finding goes beyond the already documented pattern of foreign investors.

The negative responses on 7th and 8th days are worth mentioning, as they more than offset the initial positive response to ISE returns. It seems that any weak positive feedback trading by big players is reversed shortly, or some big players tend to take advantage of ISE return reaction after several days. It also implies that local information factors have little enduring effect on big players' trading in ISE during our sample period.

Panel C suggests significant persistence of big trader flows extending up to 4 days. Several articles such as Sias (2004) measure institutional herding by the positive correlation between current and lagged net demand by institutions. In our context, the SVAR model employed in this article is particularly informative, as the impulse response of *N* to its own shocks reveals the correlation between current and lagged net big trader flows after controlling for momentum (feedback) and information (world return) effects. Our results suggest significant herding by big players. As the response of *N* to lagged *N* is much more significant than to lagged *R*, the tendency to herd appears to be more significant than the tendency to positive feedback trade, consistent with Sias' (2004) result in a cross-sectional context. This may be consistent with big (or sophisticated) players herding on each other's information, as suggested by Griffin et al. (2010).[72]

The variance decomposition in Table 1 below suggests that about 11% of forecast error variance of big trader flows can be explained by global returns. While 3% can be explained by local returns, it should be noted that most of it comes in the form of contrarian action after the 6th day.

Table 1: Variance decomposition of big trader flows

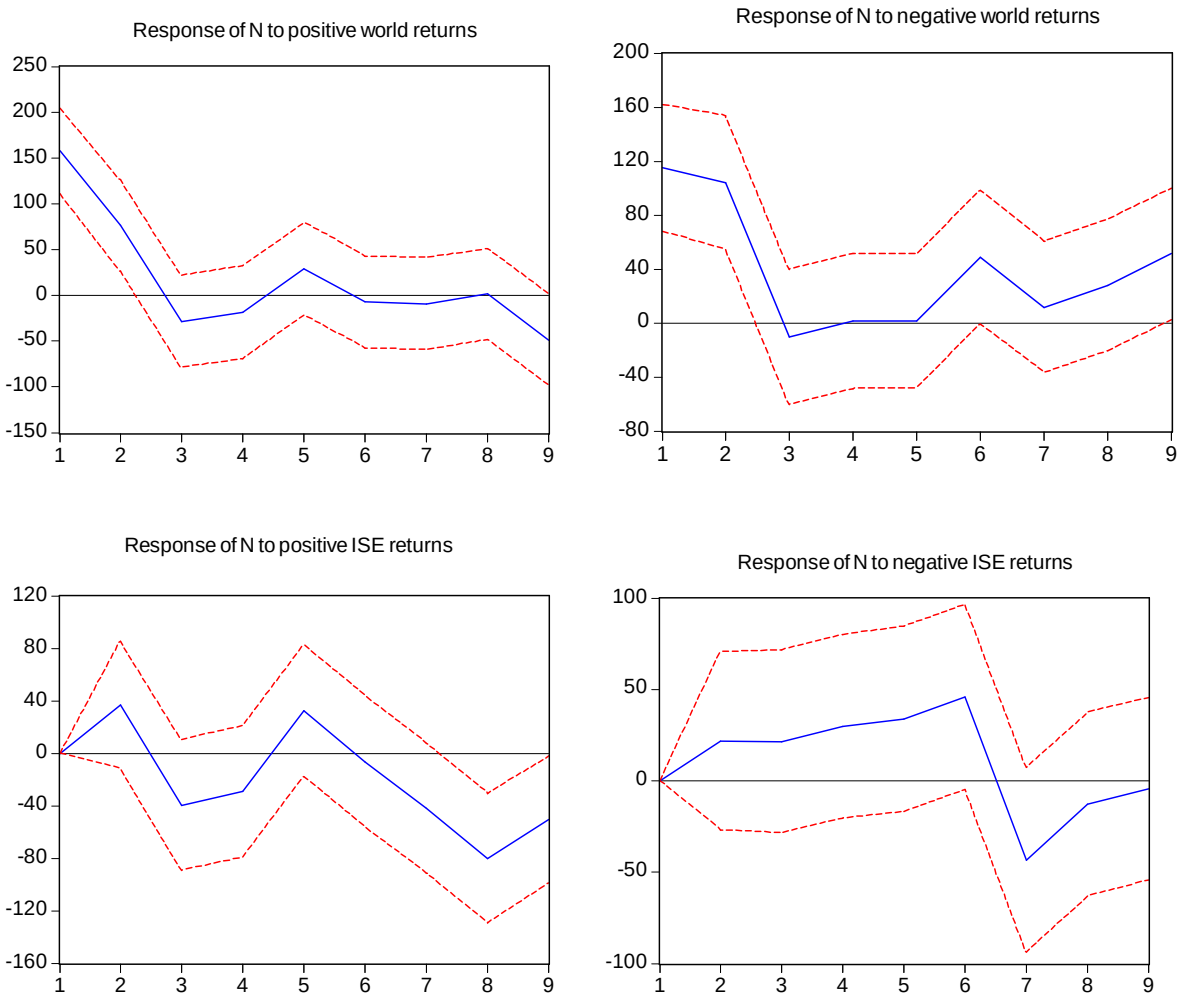
Period	S.E.	W	N	R
1	616.86	7.90	92.10	0.00
2	638.10	11.14	88.57	0.29
3	645.35	11.01	88.64	0.34
4	652.46	10.78	88.85	0.37
5	654.84	10.99	88.33	0.68
6	656.35	11.31	87.96	0.73
7	660.12	11.19	86.99	1.81
8	664.37	11.12	85.92	2.96
9	665.77	11.09	85.58	3.33
10	670.09	11.01	85.70	3.29

SE is the forecast error of net big player flows (*N*). The figures in columns W and R show the percentage of forecast error variance of *N* explained by world market and ISE returns, respectively, up to 10 days. The remaining forecast error variance, shown under column N, is attributed to *N* itself.

[72] Order splitting is not the most likely explanation in a marketwide analysis.

In a further analysis, we distinguish big players' response to positive and negative past returns to see if the feedback trading tendencies differ. Results presented in Fig. 3 below suggest a visible asymmetry: Big players respond more strongly to negative past returns[73], consistent with O'Connell and Teo's (2009) result that institutional investors are less prone to the disposition effect and tend to aggressively reduce risk following losses but mildly increase risk following gains. Contrary findings on lower frequency data (e.g. Grinblatt et al., 1995) might have been driven by flows into and out of mutual funds.

Fig. 3: The impulse response of big trader net flows to positive and negative past returns



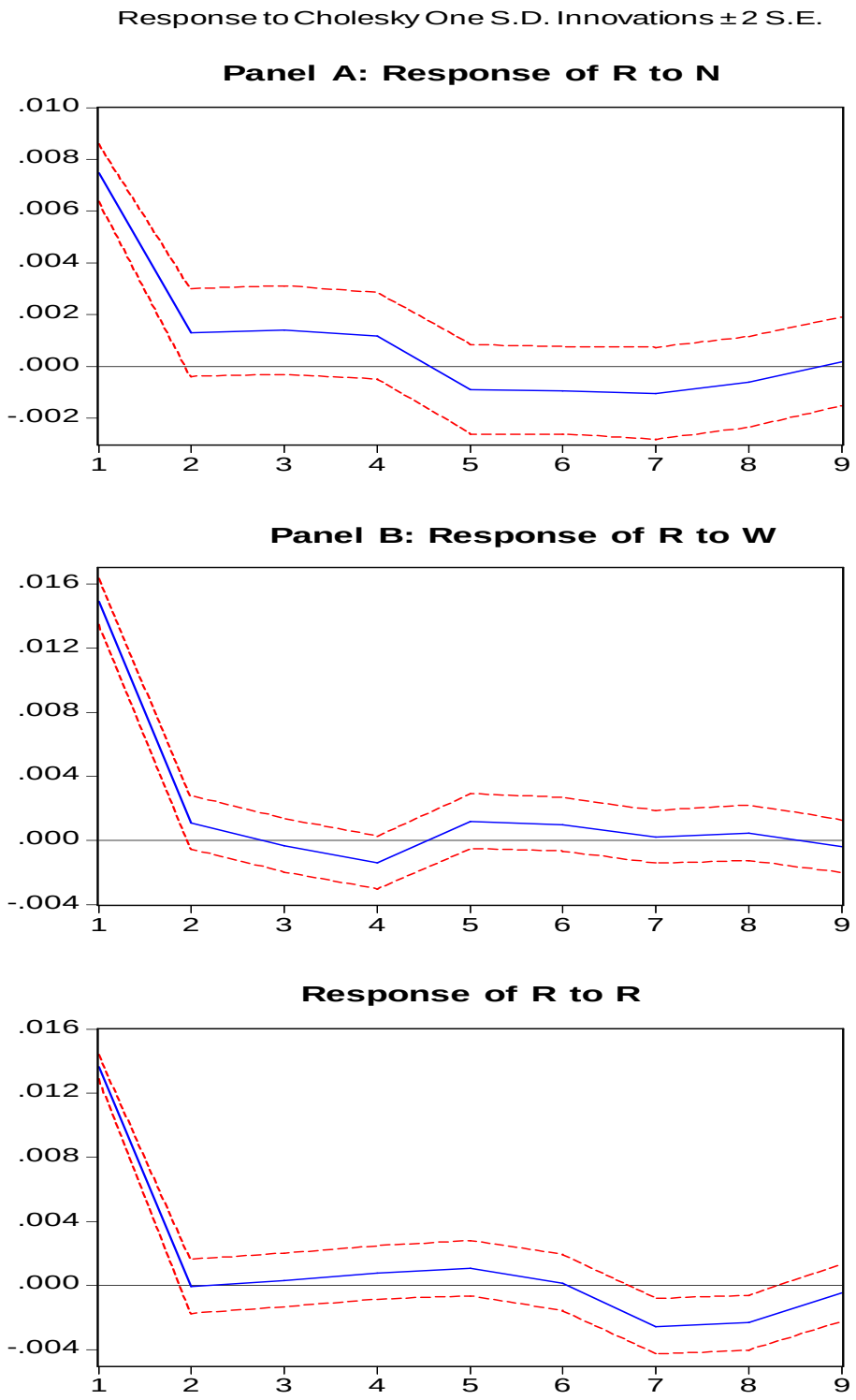
World and ISE returns data are partitioned by the sign of the returns. Other explanations are the same as in Fig. 2.

[73] In unreported analysis, we have confirmed that this finding applies both to bull and bear market subperiods.

The price impact of big players' trading

Big players' price impact is characterized by studying the impulse responses of ISE market returns (R) to a shock in big trader flows (N) in Panel A of Fig. 3. To complement this analysis, responses of ISE market returns to a shock in global returns (W) and itself (R) are also presented in Panels B and C, respectively.

Fig. 3: The impulse responses of ISE returns



The impulse response of ISE returns (R) to a 1 SD shock in big trader net flows (N), world returns (W), and itself (R) is portrayed in Panels A, B, and C, respectively. The x-axis shows the number of days (day 1 refers to the contemporaneous period). The blue line in the middle represents the point estimates of the impulse response coefficients, while the dashed red lines represent 2 SE confidence bands.

The contemporaneous response of ISE returns to a shock in big trader flows is significantly positive, as expected. The responses at the first 3 lags are borderline significant, which is driven by the persistence in big trader flows.[74] A one-standard deviation shock in big trader flows (TL 27.2 million or approximately US$ 18 million) results in a 0.75% change in ISE index on the contemporaneous day, and followed by 0.42% further cumulative change in the next three days. However, the latter is subsequently reversed. Thus, while the bulk of the price impact of big trader flows is incorporated contemporaneously, a nontrivial follow-through is left to next three days, which is due to future big trader flows signaled but not arbitraged away. This implies some predictability, however as the follow-through part is subsequently reversed it does not imply information. The positive contemporaneous response is not reversed subsequently, which is consistent with information rather than pure price pressure. All these results can be interpreted as follows: information contained in big trader flows is incorporated simultaneously, and triggers some follow-through, which can be attributed to either positive feedback trading or delayed reaction to information, that has no permanent price impact. The true permanent information content of big players' trading is priced-in within the contemporaneous period.[75]

Panel B shows that ISE returns incorporate global market information to a large extent instantaneously, with very little reaction left to the second day. Panel C shows no significant autocorrelation in ISE market returns. Thus, ISE seems to incorporate all types of shock within 1 day but not price-in the noninformative persistence in big trader flows.

The variance decomposition in Table 1 below suggests 13.5% of ISE returns can be attributed to big trader flows, while global market returns is the most important factor accounting for 46% of the forecast error variance of ISE returns.

Table 2: Variance decomposition of ISE returns

[74] A regression analysis that controls for current N_t values, as in Chordia and Subrahmanyam (2004), confirms this conclusion (available upon request from the author).

[75] Lee et al. (2005) reach a similar conclusion on Taiwan Stock Exchange operating under a batch processing call auction system without designated market makers: price pressures created by order imbalances are effectively absorbed and do not persist beyond 1 day.

Period	S.E.	W	N	R
1	0.01683	47.79	12.04	40.17
2	0.01686	47.76	12.32	39.92
3	0.01701	47.56	12.68	39.76
4	0.01709	47.58	12.86	39.56
5	0.01733	47.54	12.94	39.52
6	0.01739	47.56	13.07	39.37
7	0.01758	46.81	13.09	40.10
8	0.01759	46.28	13.01	40.72
9	0.01761	46.27	13.01	40.72
10	0.01783	45.94	13.53	40.54

SE is the forecast error of ISE returns (*R*). The figures in columns W and N show the percentage of forecast error variance of ISE returns explained by world market returns and big player net flows, respectively, up to 10 days. The remaining forecast error variance, shown under column R, is attributed to itself.

Differential price impact of big players' net purchases and sales

One of the unresolved issues in this line of research is the price impact asymmetry (i.e. the stronger price impact of institutional/block purchases compared to sales). By comparing the price impact of institutional trades in two different sample periods characterized by bull versus bear market conditions, Chiyachantana et al. (2004) raised doubt on earlier findings that the price impact and information content of block purchases is stronger than block sales, which were all obtained in bull market sample periods (Kraus and Stoll, 1972; Holthausen et al., 1897, 1990; Keim and Madhavan, 1996; Chan and Lakonishok, 1993, 1995). Chiyachantana et al. find that the price impact of institutional buys is stronger in a bullish market period and the price impact of institutional sells is stronger in a bearish market period. Saar (2001) attributes the price impact asymmetry to institutional factors such as selective information search and short selling constraints, and develops a model to explain it in relation to past price performance of the stock. Specifically, he argues the longer the run-up in a stock's price the less the permanent price impact asymmetry between buys and sells. Saar also shows that the implications of his model hold when the asymmetry is defined in terms of the net order flow during the day instead of individual blocks.

The large V-shaped price action during our sample period provides an excellent opportunity to replicate Chiyachantana et al.'s (2004) finding. Chiyachantana et al. compare results obtained on the January 1997 – March 1998 and the January 2001 – September 2001 subperiods, which are of unequal length and 3 years apart from each other. As the V-shape in our sample period is symmetric and as both subperiods are adjacent, our sample offers a healthy test of Chiyachantana et al.'s (2004) finding, avoiding possible structural changes when two subsamples are far apart from each other. We also provide the first empirical test of Saar's (2001) model by comparing the price impacts of big

player net inflows and net outflows during the early and late parts of the run-up subperiod (the right wing of the V-shape) in our sample.

As our data is marketwide aggregated, however, a caveat applies here: Chan and Lakonishok (1993) and Keim and Madhavan (1995) explain the asymmetric information content of block/institutional purchases versus sales by the possibility that purchases in a specific stock might be more informationally motivated than sales as the purchase of a specific stock involves a choice among many potential assets to buy whereas sales are mostly due to liquidity motives and limited to assets already held. Thus, the asymmetry hinges on stock selection. In our context, a purchase decision does not involve a choice among many potential assets, thus we may not observe an unconditional (full sample) asymmetry if information-motivated stock selection in purchases is the major source of asymmetry. However, another factor contributing to the price impact asymmetry is the short sale restrictions, as argued by Saar (2001). In ISE, short sales are practically nonexistent, hence sales are less likely to be informationally motivated than purchases. In sum, the full-sample asymmetry may be less visible or nonexistent in our case. However, this does not prevent us from testing alternative hypotheses: the testable implications of Chiyachantana et al.'s (2004) and Saar's (2001) arguments lie in the variation in the degree of asymmetry.

To check for price impact asymmetry of big players' net buys versus net sells, we partition the data by using a dummy variable when $N_t > 0$ and when $N_t < 0$. Because impulse response functions portray the response to a one-SD shock and SD of positive and negative net big trader flows are unequal, we report results by comparing the coefficients in the return equation of the SVAR system. Only contemporaneous and lag 1 coefficients are reported as the other lags are small and insignificant. Results for the full sample are presented in Panel A of Table 3 below. The contemporaneous price impact of buys and sells are not significantly different. Thus, no price impact asymmetry is observed (if any, the cumulative impact of sells is greater than buys). This suggests that the asymmetry may not be present when the purchase decision does not involve a choice among many potential assets to buy, thus favors Chan and Lakonishok's (1993) and Keim and Madhavan's (1995) hypotheses. At lag 1, the impact of net sells exhibits a small continuation whereas the impact of net buys exhibits a small reversal. This differential behavior at lag 1 is consistent with short sale restrictions slowing down the incorporation of information in big trader flows (discussed in more detail in the next section).

Table 3: The differential price impact of big trader net purchases and sales

Panel A: Full sample (testing price impact asymmetry)					
Nb	Ns	sig(Δ)	Nb(-1)	Ns(-1)	sig(Δ)
0.0000116	0.0000137	0.40	-0.0000025	0.0000025	0.05
Panel B: testing Chiyachantana et al.'s (2004) argument					
The first half (bear market)					
Nb	Ns	sig(Δ)	Nb(-1)	Ns(-1)	sig(Δ)
0.0000091	0.0000165	0.05	-0.0000018	0.0000045	0.10
The second half (bull market)					
Nb	Ns	sig(Δ)	Nb(-1)	Ns(-1)	sig(Δ)
0.0000148	0.0000071	0.05	-0.0000017	-0.0000028	0.78
Panel C: testing Saar's (2001) argument					
The first 1/3 of the run-up period					
Nb	Ns	sig(Δ)	Nb(-1)	Ns(-1)	sig(Δ)
0.0000134	0.0000065	0.29	-0.0000019	-0.0000026	0.92
The third 1/3 of the run-up period					
Nb	Ns	sig(Δ)	Nb(-1)	Ns(-1)	sig(Δ)
0.0000147	-0.0000009	0.23	-0.0000006	0.0000277	0.03

Nb (Ns) is the contemporaneous coefficient of net buys (net sells) in the return equation. Nb(-1) and Ns(-1) are the coefficients of previous day's net buys (net sells), respectively. Sig(Δ) is a t-test for the equality of the Nb and Ns coefficients. A significantly larger Nb implies positive price impact asymmetry, as documented in previous literature. In Panel B and C, Chiyachantana et al.'s (2004) and Saar (2001)'s arguments, respectively, are tested by comparing subperiod results.

To test Chiyachantana et al.'s (2004) argument that the price impact of purchases and sales simply depends on the underlying market conditions during the sample period, we partition the sample: the first half of our sample period represents bear market and the second half represents bull market. Panel B of Table 3 compares the price impact of big players' net purchases and net sales in bull market and bear market conditions. Results clearly confirm Chiyachantana et al.'s (2004) argument that the asymmetry in the price impact is driven by underlying market conditions. Specifically, the price impact of big players' buys is significantly larger than that of sells during the bull market (second half) whereas it is significantly smaller during the bear market (first half). Overall, these results imply that leaving aside information-motivated stock selection in purchase decisions, the previous findings on the price impact asymmetry of block/institutional trades may have been driven by underlying bull market conditions prevailing in respective sample periods, as argued by Chiyachantana et al. (2004).

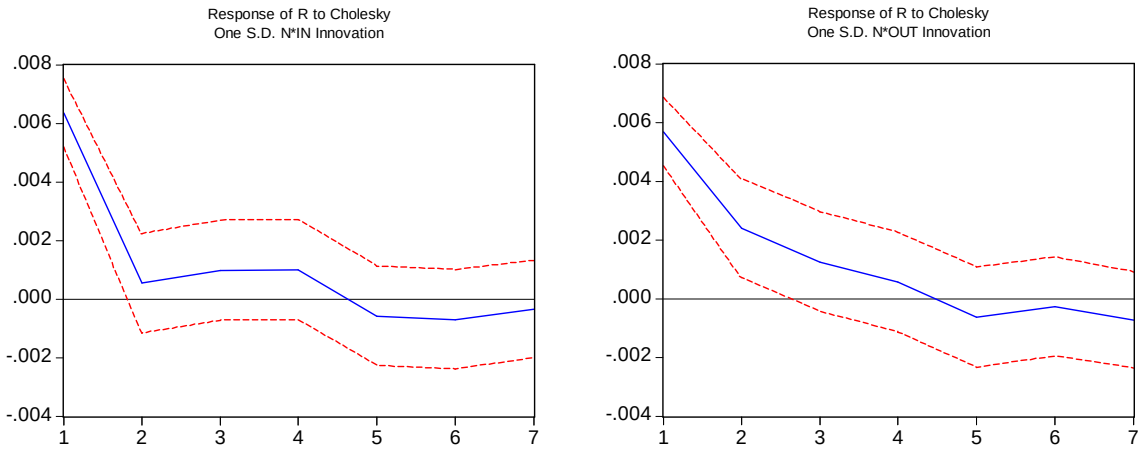
Finally, we test the implications of Saar's (2001) model by dividing the second half into three subperiods and comparing the first and third subperiod results. Saar's model implies that the price impact of big players' buys should be much stronger during the early part of a bull market than during the late part, when the price impact asymmetry may even turn negative. Thus, Panel C of Table 3 compares price impact coefficients of big players' net buys and sells in the first and last third

of the second half. Contemporaneous coefficients do not seem to support Saar's hypothesis, as price impacts are similar, even more positive, during the last third of the bull market period compared to the first third. However, lagged coefficients exhibit a significant difference in the late part of the run-up period. The cumulative price impact asymmetry turns negative as predicted by Saar. It may be that the selective information content of sells is recognized with a lag during the late stages of a bull market.

Predictive information content of big players' trading

The full sample impulse response of ISE returns to a shock in big trader net buy in Panel A of Fig. 3 suggests borderline significant coefficients at first, second and third lags (periods 2, 3 and 4), which imply statistical predictive value. However, the break-down in Fig. 4 below suggests that this result is mainly driven by net sells of big players. There is a clear asymmetry in the predictive value of big players' net buys versus net sells. In ISE short sales are practically nonexistent. As the data set used in this study is vigilantly utilized by market participants in ISE on a real-time (intraday) basis, it is legitimate to assume that many short-term traders revise their trading decisions utilizing the information contained in big players' trading. The information implications of big players' purchases are faster incorporated into prices on the same day, as purchases require only the availability of cash; however, the incorporation of information contained in big players' sales takes time as selling, in the absence of short selling in ISE, is an option for only those who own the stock. Thus, this asymmetry is to be explained by structural characteristics of the ISE, that is, practical absence of short sales.

Fig. 4: The impulse response of returns to big player net buys and net sells



See the explanations below Fig. 3. The left (right) panel shows the response of ISE returns to a 1 SD shock in positive (negative) big trader net flows.

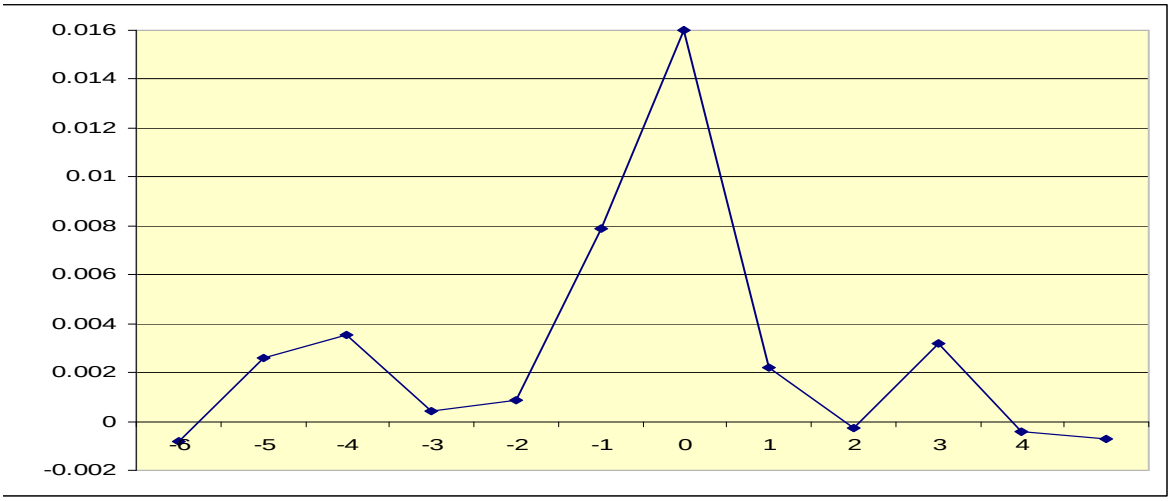
The implication of these results for practitioners is that net selling by big traders offers trading signals and possibly (to the extent that mispricing in the index futures is not correlated to these signals) profitable arbitrage opportunities.

Event study methodology

While the SVAR methodology employed in this article proves to be more informative, it may still be useful to repeat the event study methodology employed in earlier articles on the price impact of block trading for the sake of comparison. For this purpose we define net big trader inflows and outflows grater than a specified size[76] as event days, and portray the market returns around those event days. Results are depicted in Fig. 5 below:

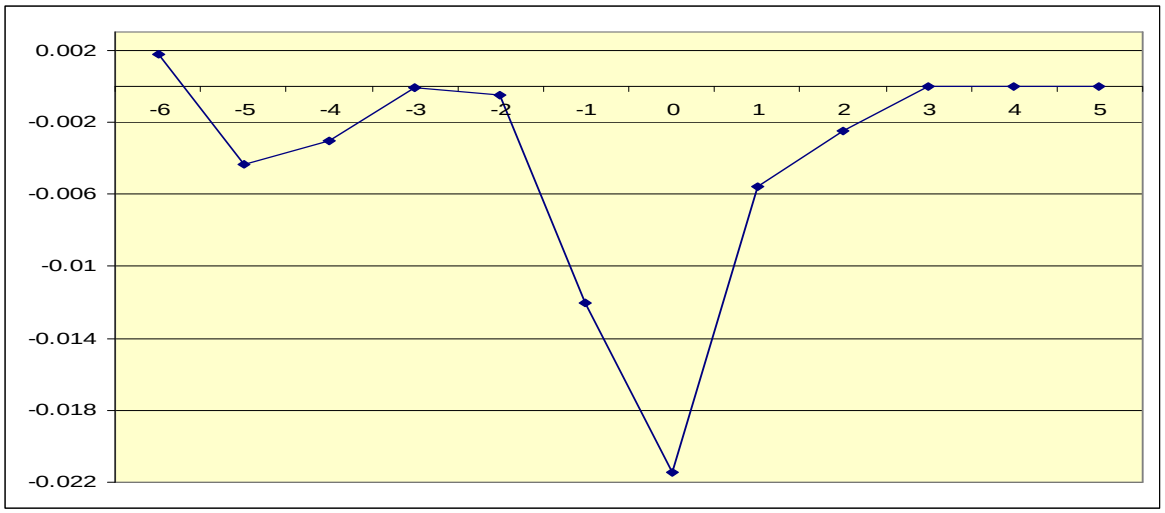
Fig. 5: Returns around large net big trader flows

Panel A: Returns around large positive net big trader flows



Panel B: Returns around negative large net big trader flows

[76] The size is set at 0.01% of market cap for net buys and 0.007% for net sells. The asymmetry is due to the positive daily mean big trader flow over the sample period. This differential size criterion leaves us with 128 large net buying and 87 large net selling days.



X-axis shows the days (0 is the event day), and y-axis shows average returns.

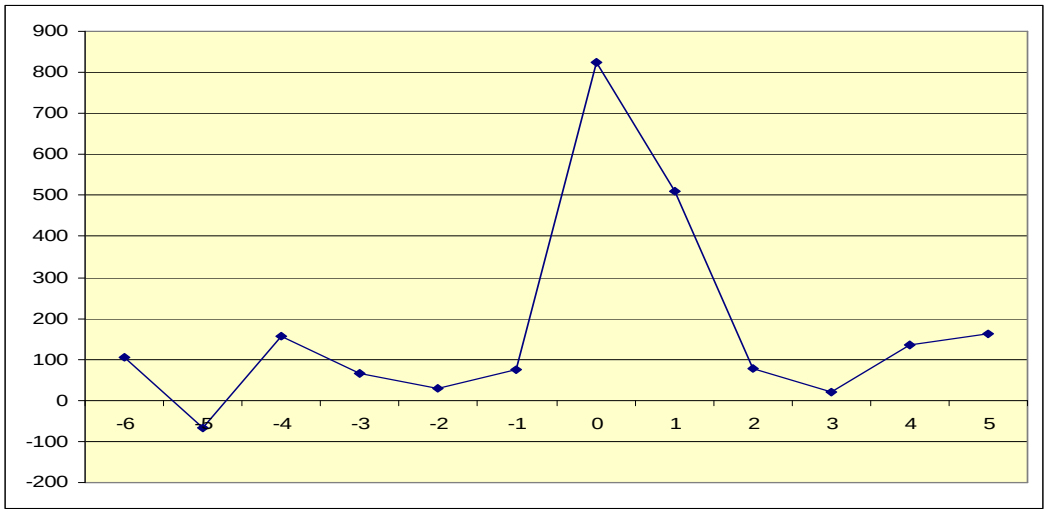
Large net flows of big traders are preceded by returns in the same direction, and followed by a small magnitude of return continuation. There is no evidence of reversal, hence price pressure hypothesis is rejected over information. The significant returns on day (-1) can be consistent with positive feedback trading; delayed reaction to (possibly private) information; or leakage of information on large big trader flows and "front running". However, because the magnitude of negative returns preceding block sales is no smaller than that of positive returns preceding block purchases, the "leakage and front running" explanation is not supported: as short sales are practically absent in ISE, one would expect less front running activity ahead of block sales compared to block purchases. The asymmetry between days (-1) and (+1) suggests a larger tendency of past returns to shape big trader flows rather than big trader flows shaping future returns. Thus, positive feedback trading and differential response time (delayed response) to information are two strong candidates, and event study methodology mostly used in the previous literature is not able to distinguish between these alternatives. Our SVAR results in the previous section, however, have shown that big trader flows do not respond very strongly to past (local) returns, but do so very strongly to world returns, which is considered as an information variable strongly correlated with returns. Hence, our SVAR results suggest that delayed response to information, rather than positive feedback trading, is more likely to be the main explanation behind the positive relationship between big trader flows and previous days' returns, which is not easy to see under the event study methodology.

To have another view of the predictive ability of big trader flows, we define extreme return days as event, and monitor average big trader flow behavior surrounding these days. For this purpose,

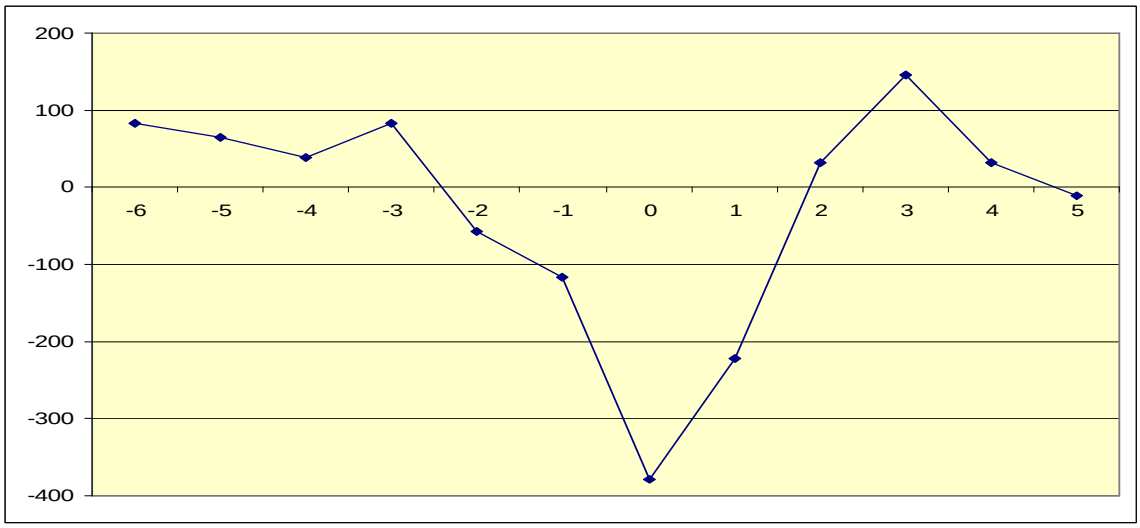
we define days with a return greater than 3% in absolute value as an event. Fig. 6 portrays average normalized net big trader flows surrounding these event days.

Fig. 6: Average big trader flows around extreme return days

Panel A: Average big trader flows around extreme positive return days



Panel B: Average big trader flows around extreme negative return days



X-axis shows the days (0 is the event day), and y-axis shows average normalized net flows of big traders..

Big trader flows both before and after extreme return days have the same sign as the event-day return, suggesting heterogeneous reaction time to information. Net big trader flows following extreme return days are much larger in magnitude compared to those preceding the extreme return days. This confirms the view that, rather than big players predicting future returns, previous day's returns (or

information contained therein) determine big trader flows, and part of the big traders' reaction comes with a 1-day delay. In other words, positive feedback trading or delayed response to information seems to be more prominent than trading on private information. There is also evidence of some contrarian trading a few days later after large negative returns.

5. Conclusions

The fact that all typical results on big players' trading were replicated in our empirical analysis should convince any reader skeptical about the structure of the data set used in this study. This indicates that the way market participants in ISE utilize this data set picks an important driver of the market. The fact that this data set is available on a real-time and continuous basis raises the possibility that important information can be derived from similar broker level data and be utilized by market participants in other stock markets around the world. In addition, as trade size is shown to matter only in interaction with trader size, the key variable *N* used in this study appears to successfully pick highly relevant information, which is not easy to pick via order size breaks used in earlier research.

Our results confirm that big players' trading is strongly positively correlated with market returns. Conditioning by an information variable in our analysis makes clear that this relationship exists mainly because their trading is correlated with information; rather than due to naïve intraperiod positive feedback trading or pure price pressure. Big players' trading both leads and follows returns, however "following" is more significant than "leading" which would lead to an impression of positive feedback trading in the absence of a relevant conditioning information variable. Our specification enables to distinguish delayed response to information conveyed by world market returns from positive feedback trading.

Big players' trading significantly affects stock prices, but do not significantly predict future returns. Their trading co-moves with stock prices, and at the same time exhibits persistence. The apparent predictive ability is accounted for by the positive autocorrelation in big trader flows. Hence big players' interim portfolio performance may appear to be more superior than their realized entry-to-exit returns. This implication is in line with Aragon et al. (2007), who using privately obtained data on complete trading history of all stocks in ISE over the 1999-2003 period, find that realized risk-adjusted returns of institutions are no better than individuals. As our variable *N* partitions

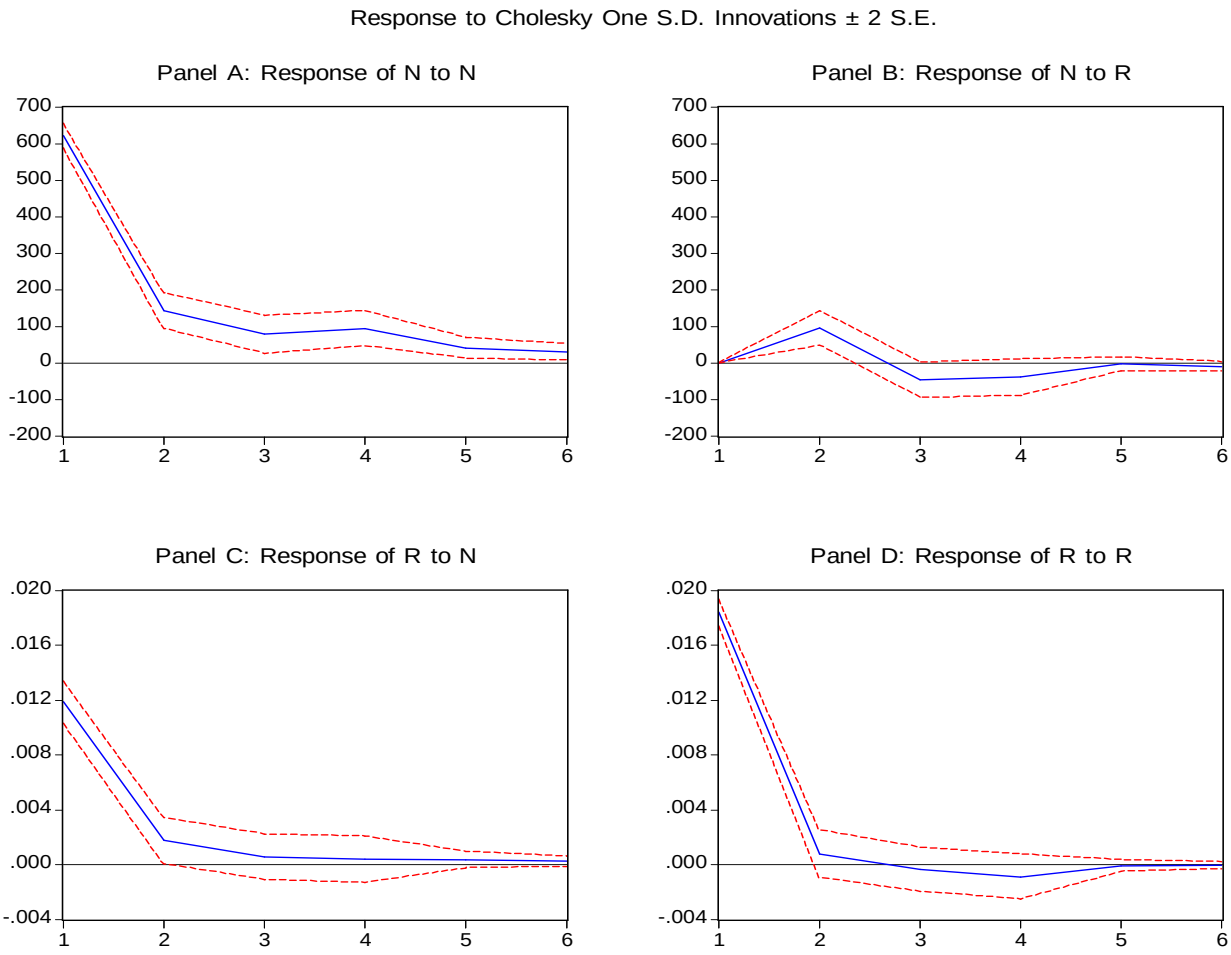
markets participants as “big players” vs. “the rest of the market”, one of the important implications of the results in this article is the contrast between big players’ trading and smaller players’ trading: while big players’ trading is correlated with information, smaller players seem to provide liquidity for them, as suggested by Lee et al. (1999) and Lee et al. (2004). The information contained in big players’ buying appears to be incorporated into prices on the same day. The delay in incorporating the information contained in big players’ selling, which is apparently due to practical absence of short selling in ISE, suggests that traders monitoring big player flows in a blind-matching, continuous auction system fulfill the information aggregation role of a specialist.

Finally, our results in a cleaner test confirms Chiyachantana et al.’s (2004) argument that the price impact asymmetry between block/institutional buys and sells may have been driven by underlying market conditions (bull market sample periods). In the first empirical test of Saar (2001), we find that the delayed reaction to big players’ net sells in the late stage of a bull run is significantly different than that in the early stage.

Appendix: Results of the bivariate VAR model

Impulse responses presented in Fig. A.1 below indicate significant differences from the SVAR model employed throughout the article. For example, the response of big player flows (*N*) to past ISE returns (*R*) below is highly significant, however the significance disappears once global returns are controlled for (as shown in Panel B of Fig. 2). Moreover, failure to control for global returns slightly understates the forecast ability of big trader flows (compare Panel C here to Panel A of Fig. 3). Taken together, these imply that big player flows are correlated with information. Hence, a comparison of results under both specifications suggests that failure to control for global returns in an emerging market context, or more generally failure to control for information, might have caused misspecification and biased results in the previous literature. In particular, it may give a false impression of positive feedback trading by big players at high frequency, when in fact they are simply responding to information with differential response and order execution times. This would imply the need for a reassessment of the results of many previous studies.

Fig. A.1. Results of the bivariate model



See explanations below Fig. 2 and 3.

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APPENDIX III

Political Risk and Foreigners' Trading: Evidence from An Emerging Stock Market

Deniz İkizlerli[a] and Numan Ülkü[b]

a Durham University, UK

b Central European University Budapest

ABSTRACT

This paper analyzes the impact of political risk on foreigners' trading in an emerging stock market, using quantified political risk ratings reported by ICRG and foreign flows data compiled by Istanbul Stock Exchange. Besides illuminating the impact of political risk on foreign investors' trading, currently a gap in the literature, we track the differential effect of political risk upgrades and downgrades on market returns. We also repeat the analysis for industry portfolios. The reaction to upgrades is slow and small in magnitude, while the reaction to downgrades is immediate. Foreigners' reaction to political risk seems to vary with the market sensitivity of the industry, except for the tourism sector where their response to political risk is particularly salient.

JEL Classification: F21; F30; G15
KEY WORDS: political risk, foreign flows, emerging stock markets

Political risk has been commonly assumed to be one of the main drivers of emerging stock markets. The earlier evidence on the impact of political risk on stock market returns has mainly been anecdotal because it is difficult to quantify political risk. Several papers in the literature, however, accomplished a systematic analysis by using the ICRG (International Country Risk Guide) indices published by *Political Risk Services*, in particular the political risk (PR) component.[i] Diamonte et al. (1996) find a significant impact of political risk changes, as measured by ICRG PR ratings, on contemporaneous returns in emerging markets. Average returns in emerging markets experiencing PR upgrades exceed those in emerging markets experiencing political risk downgrades by 11% a quarter, while the difference is not significant for developed markets. Erb et al. (1996) document a positive contemporaneous relationship between PR changes and returns over 6-month windows, in emerging and developed markets (more significant in the former). However, political risk changes are

poor in predicting future 6-month returns. On the other hand, lagged levels of political risk are positively related to future expected returns and fundamental valuation ratios such as book-to-market ratio and dividend yield, which have been used as a proxy for risk. Bilson et al. (2002) controlled for other risk factors that may affect emerging stock market returns, and found that PR bears some additional explanatory power which cannot be captured by many widely-used risk factors.

While the impact of political risk on emerging stock market returns has been investigated, no study has enquired its effect on foreign investors' trading (i.e. foreign flows in stock markets). Given that foreign investors are more vulnerable to political risk, especially in emerging markets, their trading would be expected to respond to PR changes.[ii] This paper fills this gap by employing foreign flows data from Turkey, world's 7th largest emerging stock market where political risk has shown substantial variation and always been perceived as an important factor driving stock markets. We use foreign flows data compiled by Istanbul Stock Exchange (ISE) as previous research on foreign investor flows has indicated that accurate data should be compiled at the destination point, and data compiled from a source country or a custody may be biased. Such data are not available for many emerging markets. Moreover, Turkey has never implemented any (partial) restrictions on foreigners' trading, which might confound the analysis. Hence, Turkey presents an ideal case to enquire how foreigners' trading is affected by political risk.

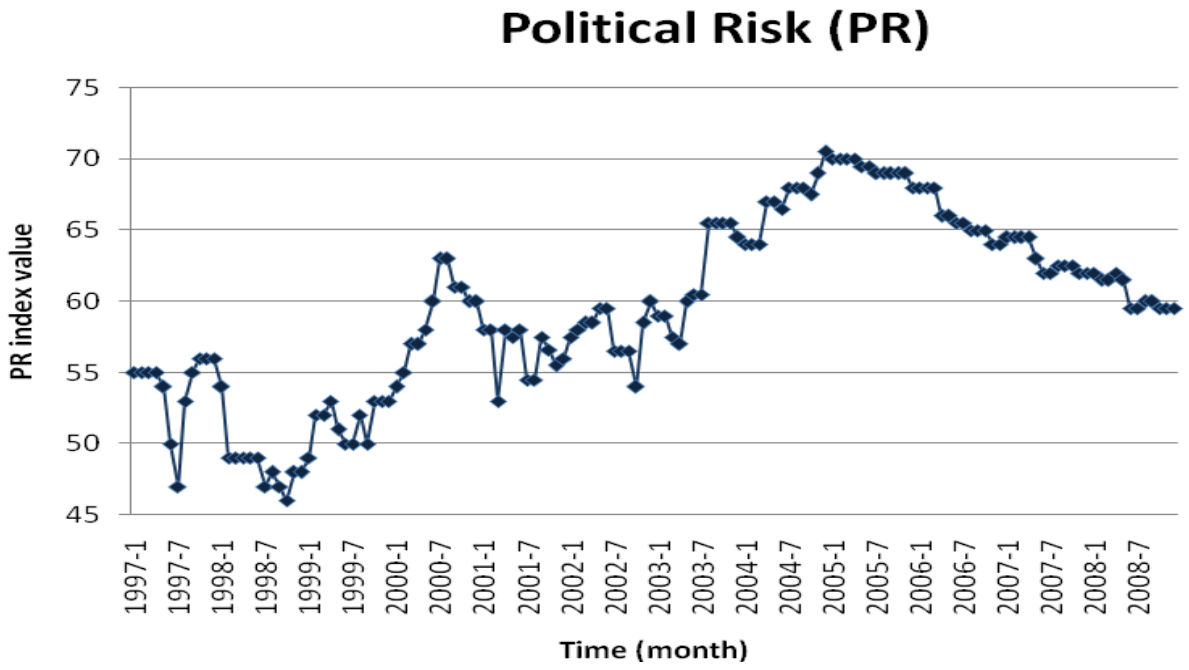
We employ a structural VAR framework that enables to portray the dynamic response of foreigners' trading and stock market returns[iii] to changes in PR, and the differential effect of political risk upgrades and downgrades. A further contribution of this paper is to provide an analysis of the impact of political risk on foreigners' trading in different industries as different sectors may have differential sensitivity to political risk.

Data and Methodology

Our data set consists of monthly levels of the ICRG PR index, monthly net foreign flows (defined as foreigners' purchases minus sales, normalized by dividing by market capitalization) and monthly log returns of ISE indices (in local currency) and MSCI World index. For all local indices, we use inflation adjusted returns, calculated as monthly return minus annual CPI inflation divided by 12, since inflation rates, hence expected nominal returns, exhibit huge variation over our sample period (fell from around 101.6% in January 1998 to as low as 8.3% in April 2008).

Political Risk: PR index scores vary within the range 0-100, with a lower score implying higher risk. As the 0-100 range conflicts with the normality assumption, we apply log transformation; and, as it is still nonstationary, we take the first differences. Using first logged difference of the PR index makes sense, because foreign investors may be more sensitive to a 1-point decrease in the PR index, say from 41 to 40, compared to 1-point decrease from 81 to 80 for the same country. A 1-point decrease from 81 to 80 is not likely to spur macroeconomic instability, however a 1-point decrease from 41 to 40 can be perceived as political instability which has the potential to cause macroeconomic instability. By taking the first logarithmic difference of the PR index, a 1-point change at lower levels is given more weight relative to a 1-point change at higher levels.[iv] The PR index for Turkey is portrayed in Figure 1 below.

Figure 1: The time series of the political risk index for Turkey



In the first part of the empirical analysis, we use ISE all-share index and marketwide aggregated net foreign flows, to see how political risk affects ISE market returns and foreign investors' trading marketwide. We control for global returns, which strongly affect both ISE returns and foreigners' trading in ISE (see Griffin et al., 2004 and Richards, 2005). We use MSCI World index as a proxy for the global market. Thus, as political risk is a country-specific factor, we focus on country-specific (idiosyncratic) component of ISE market returns and foreign flows. Our sample

period, dictated by the availability of foreign flows data, starts in January 1997 and goes through December 2008.

In the second part of empirical analysis, we focus on industry portfolios, employing sector indices published by ISE. As these indices are equally-weighted averages, we compute net foreign flows for each industry as the equally-weighted average of normalized net purchases in individual firms. The sample period for industry portfolio analysis is from January 1997 to June 2007. The industries and the number of companies listed in each industry portfolio (in parentheses) as of June 2007 are as follows:

1) Banks (17)
2) Food, Beverage (23)
3) Wood, Paper, Printing (14)
4) Textile, Leather (25)
5) Basic Metal (13)
6) Chemical, Petroleum, Plastic (23)
7) Non-Metal Minerals (24)
8) Tourism (6)

In our structural Vector Autoregression (SVAR) specification, net foreign flows and ISE returns are two endogenous variables in the system which is augmented by PR and MSCI World index returns that are affected only by their own lags. This enables a more accurate characterization of the dynamic interaction between foreign flows, domestic returns and political risk after controlling for world market returns. The advantage of this specification instead of a conventional VAR is that none of the lags of foreign flows and local returns affect the PR and world market returns, but contemporaneous values of them are affected by the instantaneous and lag values of PR and world returns. Thus, political risk and world market returns are treated as exogenous variables. The identified VAR model can be specified as:

$$A(L)y(t) = \varepsilon(t) \qquad (1)$$

where *A(L)* is an *n* x *n* matrix polynomial in the lag operator *L*, *y(t)* is the *n* x 1 observation vector, and $\varepsilon(t)$ is the *n* x 1 vector of structural disturbances (n is the number variables in the system).

$$y(t) = \begin{bmatrix} W(t) \\ PR(t) \\ NF(t) \\ R(t) \end{bmatrix} \quad A(L) = \begin{bmatrix} A_{11}(L) & 0 & 0 & 0 \\ 0 & A_{22}(L) & 0 & 0 \\ A_{31}(L) & A_{32}(L) & A_{33}(L) & A_{34}(L) \\ A_{41}(L) & A_{42}(L) & A_{43}(L) & A_{44}(L) \end{bmatrix} \quad \varepsilon(t) = \begin{bmatrix} \varepsilon_1(t) \\ \varepsilon_2(t) \\ \varepsilon_3(t) \\ \varepsilon_4(t) \end{bmatrix} \qquad (2)$$

W is the world market return, PR is the first difference of the logged PR index, NF is the net purchases of foreigners, and R is the returns of the relevant ISE index.[v] The assumptions are that

$\varepsilon(t)$ is uncorrelated with past $w(t-k)$ for $k>0$, and the coefficient matrix of L^0, A_0, is non-singular. The block exogeneity is represented by zero entries. The lag order of SVAR is 1 as suggested by both Akaike and Hannan-Quinn information criteria. All the variables entering the system are stationary. The system is estimated via seemingly unrelated regressions (SUR), since the right-hand side variables W and PR equations are different. In line with the common treatment in the literature, net flows are assumed to have contemporaneous effect on local returns but not vice versa, thus NF enters prior to R in the Cholesky factorization.

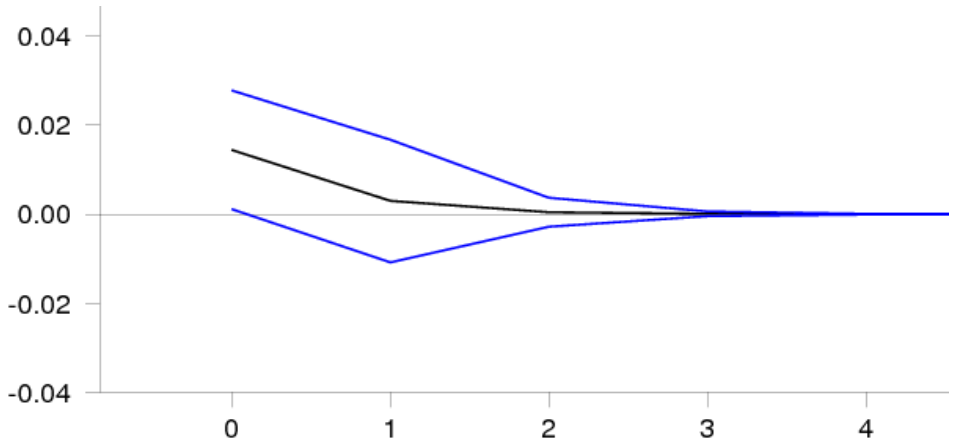
In this setting, our focus is the impulse response of net foreign flows to a shock in PR, after controlling for the effects of world market returns and possible feedback effects from local market returns. Before that, however, we analyse the impact of PR changes on local market returns, by studying the impulse response of ISE returns to shocks in PR.

Results

We present our results by studying impulse response functions (IRFs). In all IRF graphs to follow, the black line in the middle represents a point estimation of impulse responses together with 90% bootstrapped confidence bands shown by the upper and lower blue lines. Statistical significance is implied when neither of the confidence bands crosses the x-axis.

Figure 2 portrays the response of ISE market returns to a shock in PR. Most of the effect is priced in the instantaneous month and a very small portion is left to the following month after which the response is virtually null. The cumulative effect is significantly positive. This result confirms, under VAR methodology, the findings of earlier articles that changes in PR are significantly associated with contemporaneous returns of emerging stock market indices. Further, it shows that most of the contemporaneous effect in 3- or 6-month intervals takes place within the month during which the shock is observed.

Figure 2: The impulse response of ISE return to a shock in PR

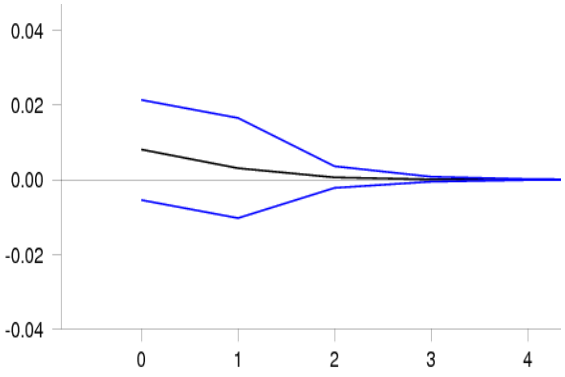


Notes: The line in the center is the impulse response function obtained from VAR model described above, and the blue lines around it represent 90% confidence interval bands.

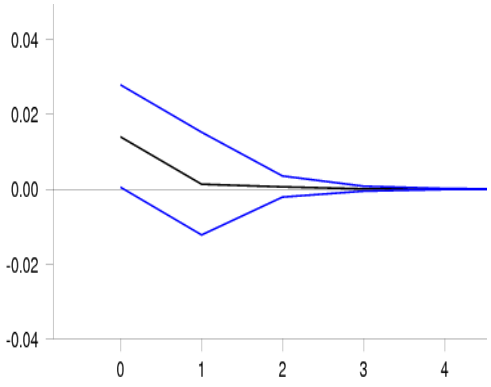
In Figure 3 we distinguish the response to upgrades and downgrades using dummy variables that partition changes in PR index as positive and negative shocks. The response to an upgrade is slow, with a nontrivial portion of the response left to the next month, implying some underreaction. In contrast, the response to a downgrade is immediate and stronger.

Figure 3: The impulse response of ISE returns to an upgrade and downgrade in PR

Panel A: The response to an upgrade



Panel B: The response to a downgrade



Next, we focus on the impact of PR shocks on foreigners' trading. Figure 4 depicts the impulse response of foreigners' net purchases to a shock in PR index. The bulk of foreigners' reaction occurs in the contemporaneous month, while a little more is left to the following month. The cumulative effect is borderline significant.

A variance decomposition analysis based on the same specification suggests that PR can explain approximately 1.5% and 0.7% of the forecast error variance in ISE returns and foreign flows, respectively.

Figure 4: The impulse response of net foreign flows to a shock in PR

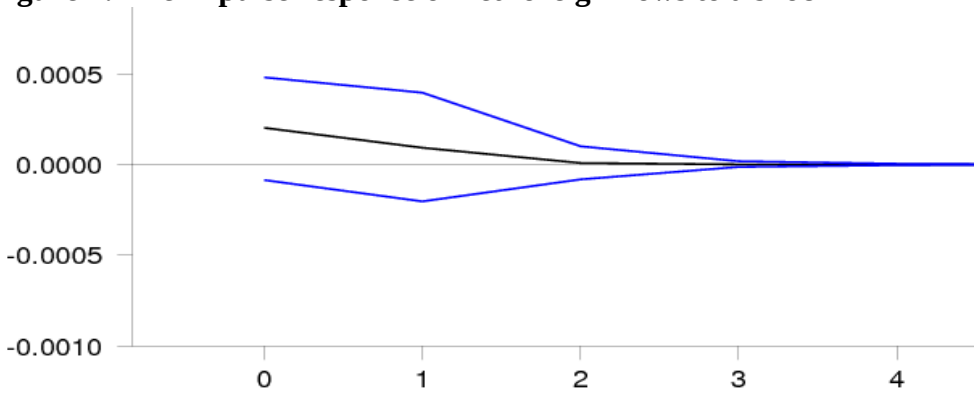
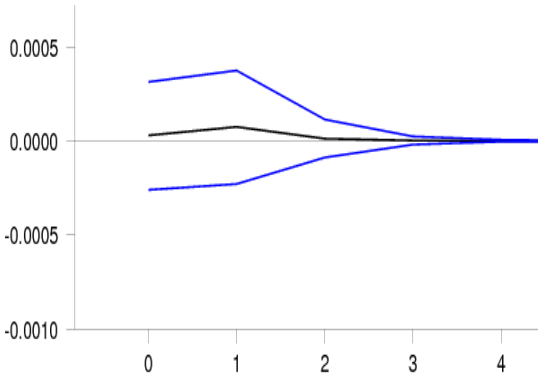


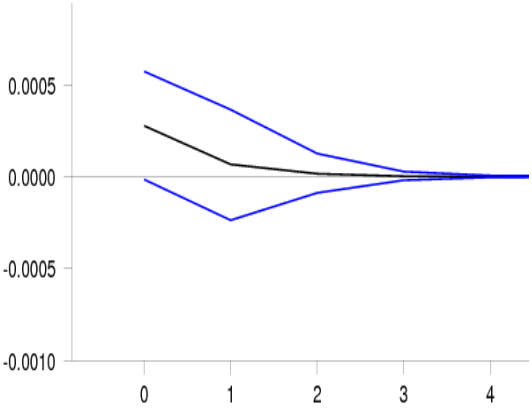
Figure 5 below breaks down the response of foreigners' net purchases to an upgrade and downgrade in PR index. The main message is that their reaction to good political news is slow (more of the response takes place in the following month) and of smaller magnitude,[vi] while their reaction to bad political news is stronger and immediate. This is consistent with slow build-up and quick loss of confidence. It should be mentioned here that changes in PR index do not exhibit any significant autocorrelation.

Figure 5: The response of net foreign flows to a positive and negative shock in PR index

Panel A: The response to an upgrade



Panel B: the response to a downgrade



Industry Portfolio Results

First, we note that all industry portfolio returns exhibit a significantly positive contemporaneous relationship to global markets, with the first lag also being borderline significant in most cases (see Panel C in Figures 6-13). The highest world beta is seen in the banking sector. These sensitivities are important as they may affect foreigners' trading in different sectors. The impact of PR on industry portfolio returns is typically positive, but insignificant in many industries. Banking sector returns exhibit the strongest response to PR shocks, followed by wood-paper-printing sector. The impact of PR on chemical-petroleum-plastic and non-metal minerals sector returns is negligible. Other industry returns exhibit insignificantly positive relationship to PR (see Panel D in Figures 6-13).

Our main interest is the impact of PR shocks on foreigner's trading in different industries. Below, in Panels A and B of Figures 6-13, are the impulse responses of net foreign purchases (NF) in several industries to a shock global return (WR) and in PR, respectively.

A first interesting observation is that in the food and beverage sector (Figure 7), foreigners act in a contrarian manner to PR. While this industry's returns are weakly positively related to PR, foreigners seem to take advantage of this positive reaction, possibly considering that the performance of firms in this sector should not be very sensitive to political risk. The strongest response to political risk in the expected direction is seen in the banking sector. Foreigners' trading in the banking sector also exhibits the strongest response to world returns. In other sectors, the response of net foreign flows to world returns and PR is positive but only marginally significant. Thus, one can contrast banking sector with the food and beverage sector, and argue that foreigners' trading pattern is rationally related to firm's sensitivity to market factors. Generally speaking, the response of net foreign flows to global returns and to PR exhibit parallel variation across industries. Foreigners seem to employ strategies based on sensitivity of industries to market factors.

A notable exception is the tourism sector (Figure 13). It has a significantly positive world beta, however foreigners exhibit little response global market returns, while they exhibit a strong positive response to PR, even though tourism sector returns do not significantly respond to PR. As our data partition market participants as domestic versus foreign investors, the above finding implies a significant difference in the response of foreign and domestic investors in the tourism industry to political risk. A possible explanation is that political risk is perceived differently by international investors. Likewise, the impact of political instability on tourists' decisions (tourism demand) may be evaluated differently. Political instability is documented to have negative influence on tourism industry (Sönmez, 1998), consistent with foreigners' response.

Figure 6: Banks

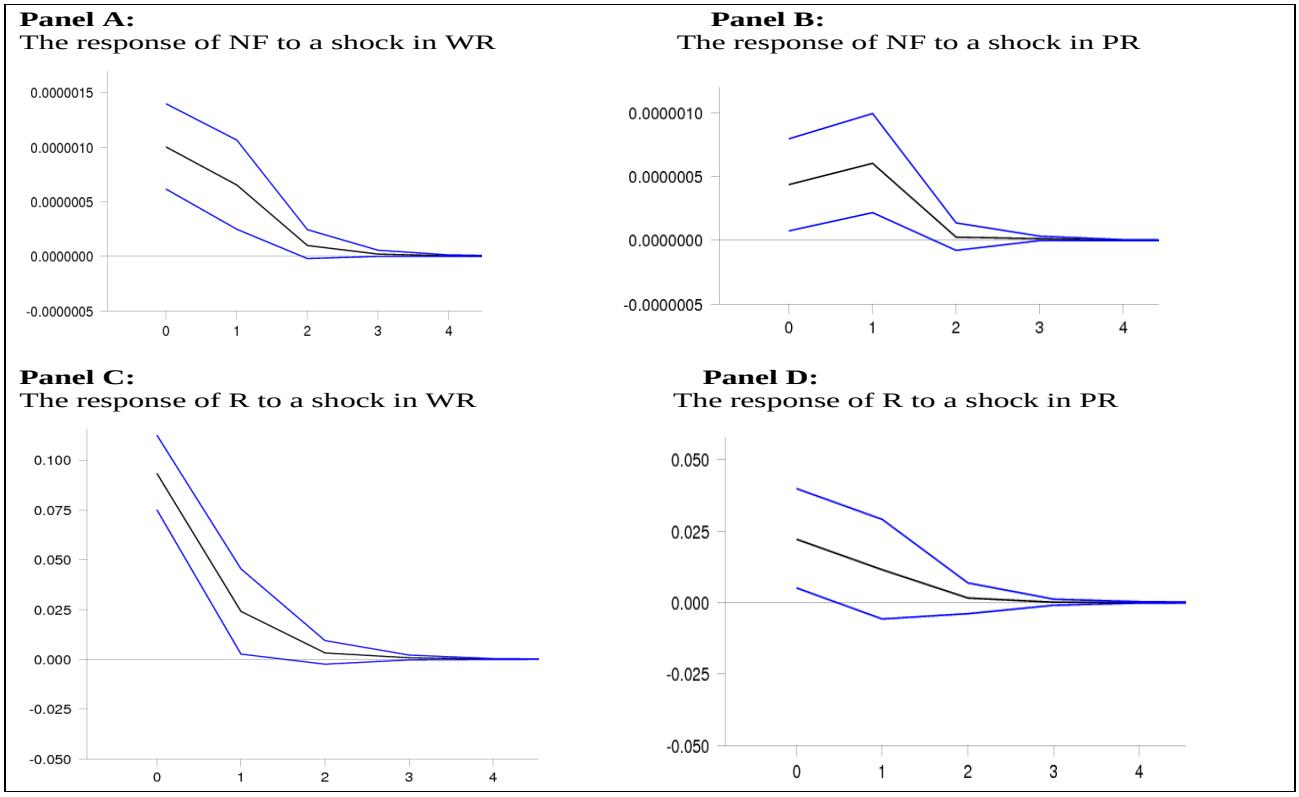


Figure 7: Food & Beverage

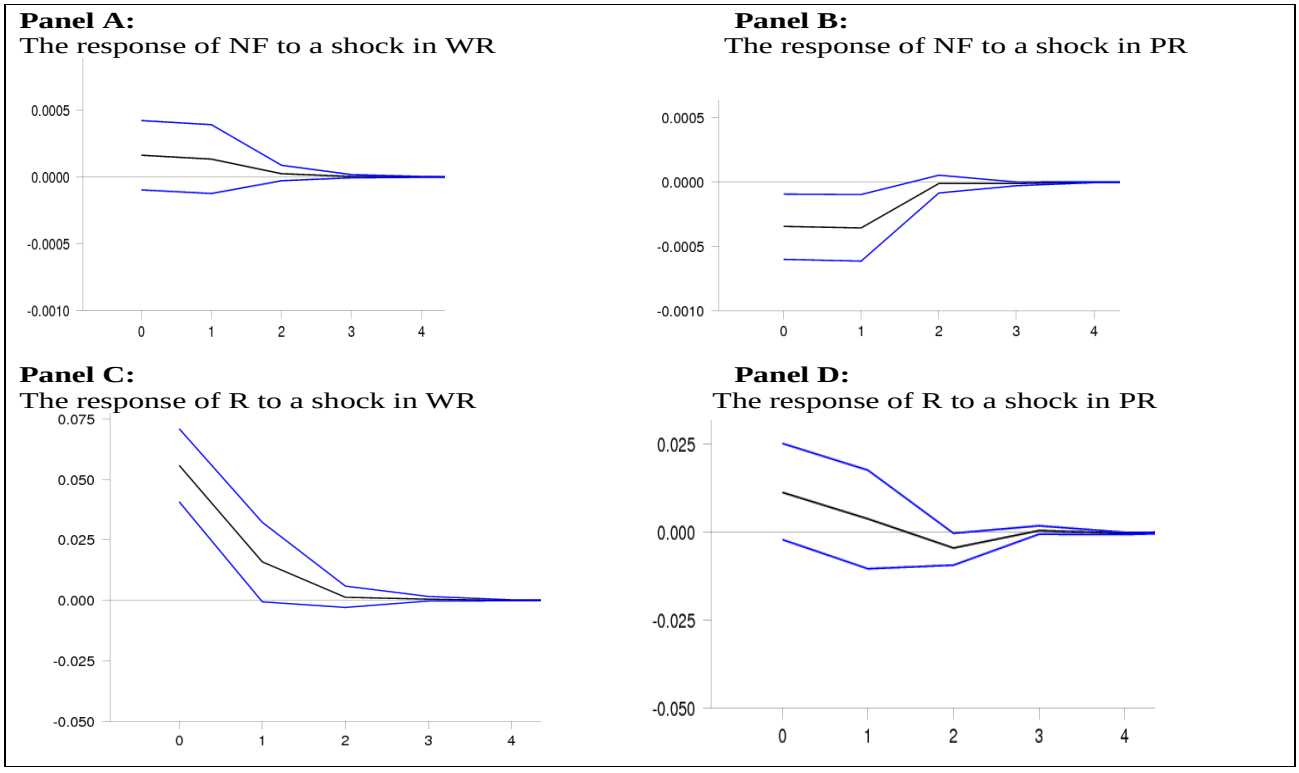


Figure 8: Wood-Paper-Printing

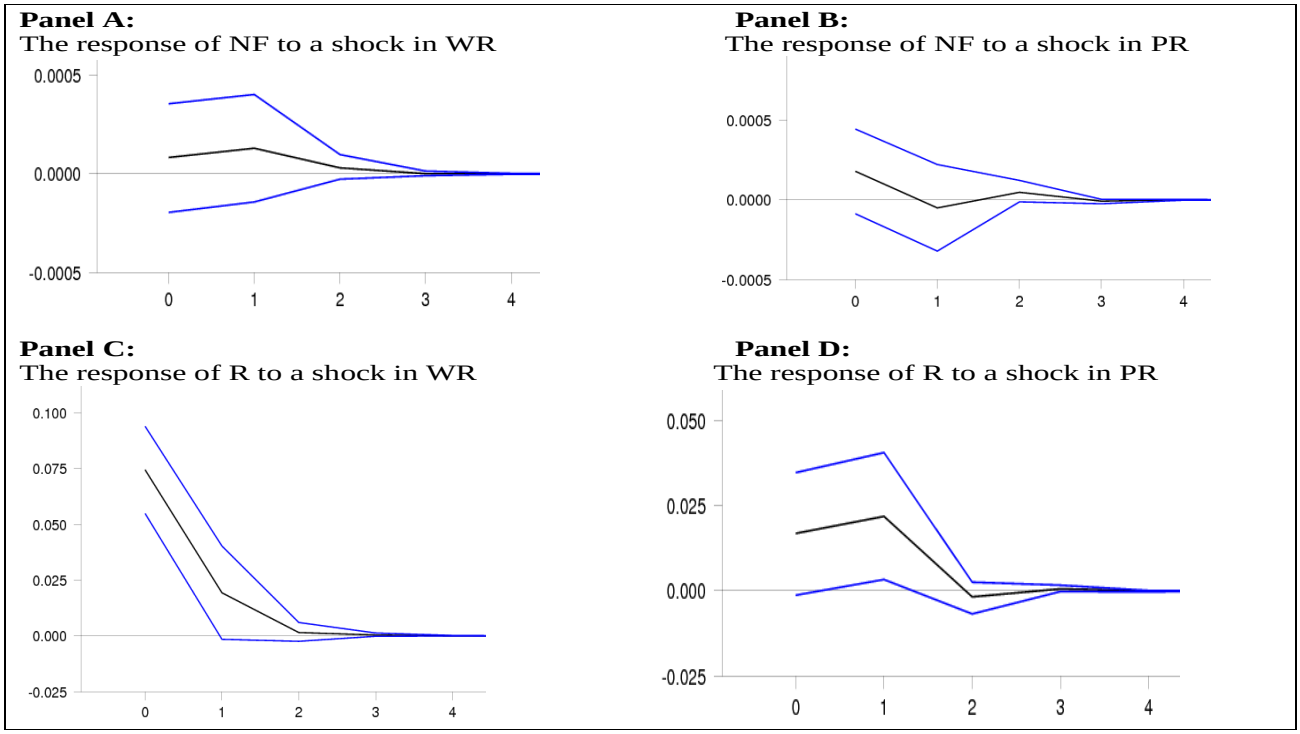


Figure 9: Textile and Leather

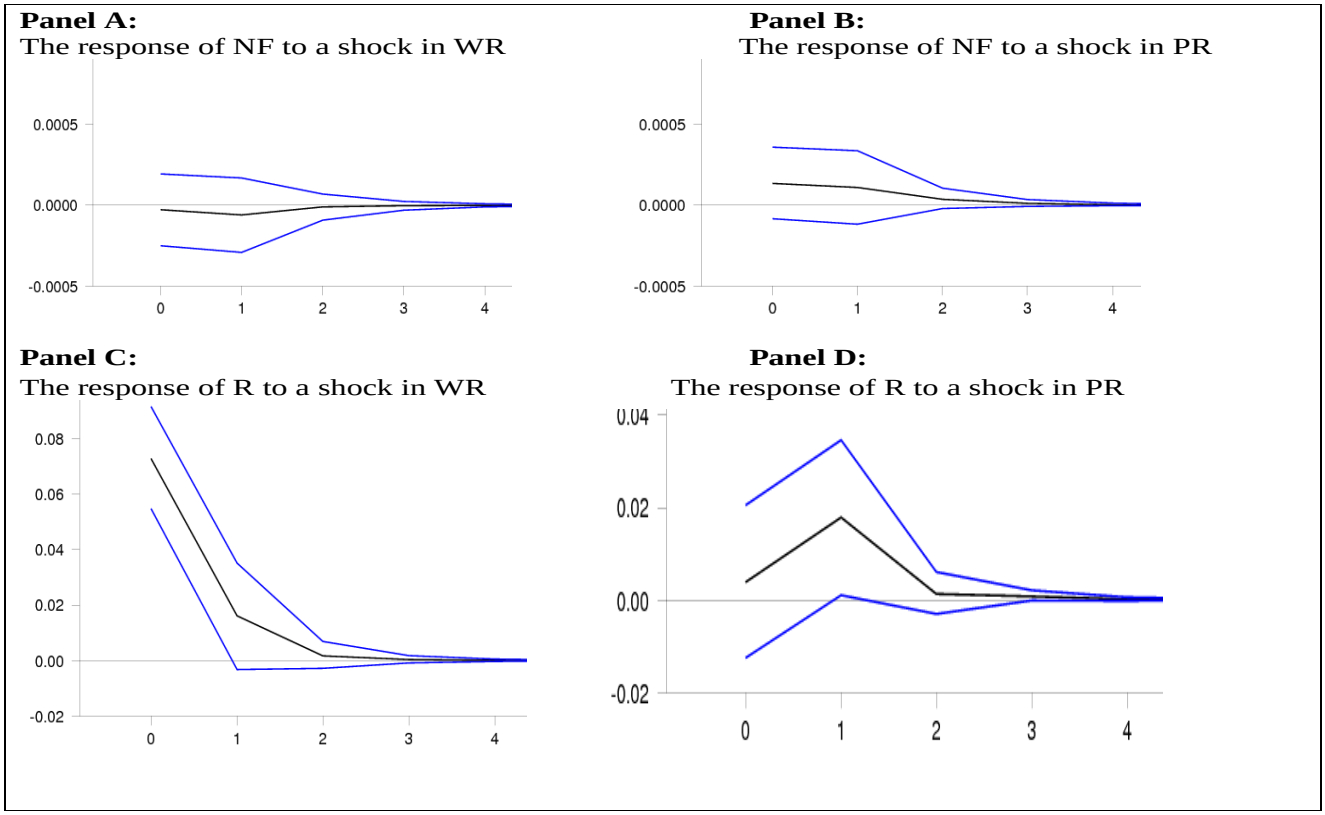


Figure 10: Basic Metal

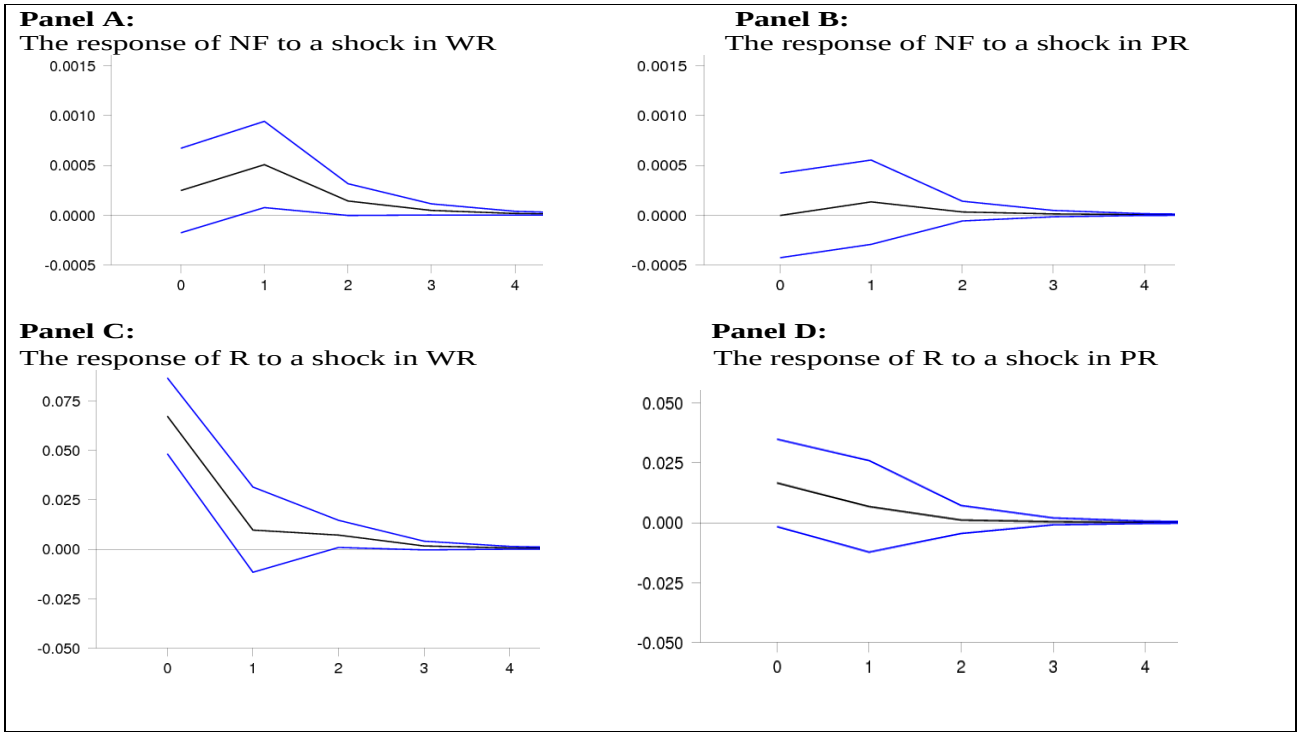


Figure 11: Chemical-Petroleum

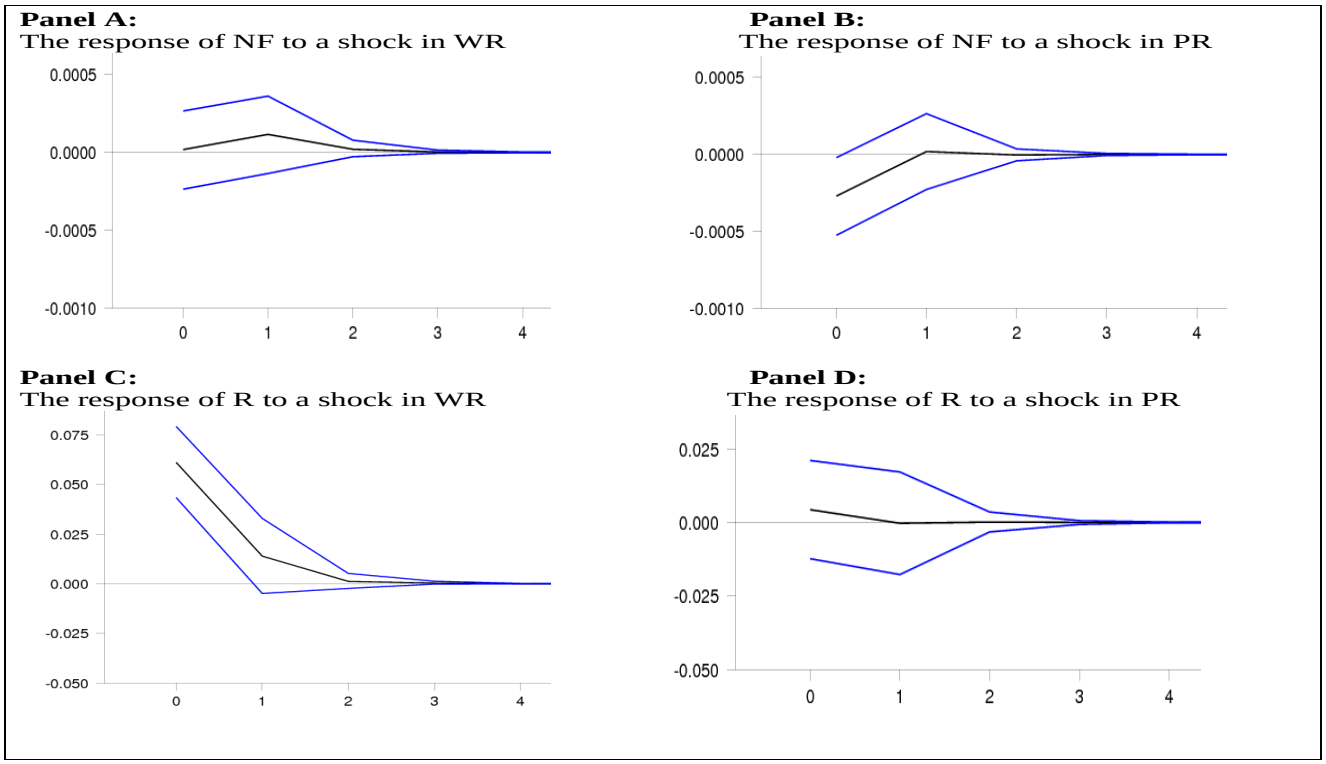


Figure 12: Non-metal Minerals

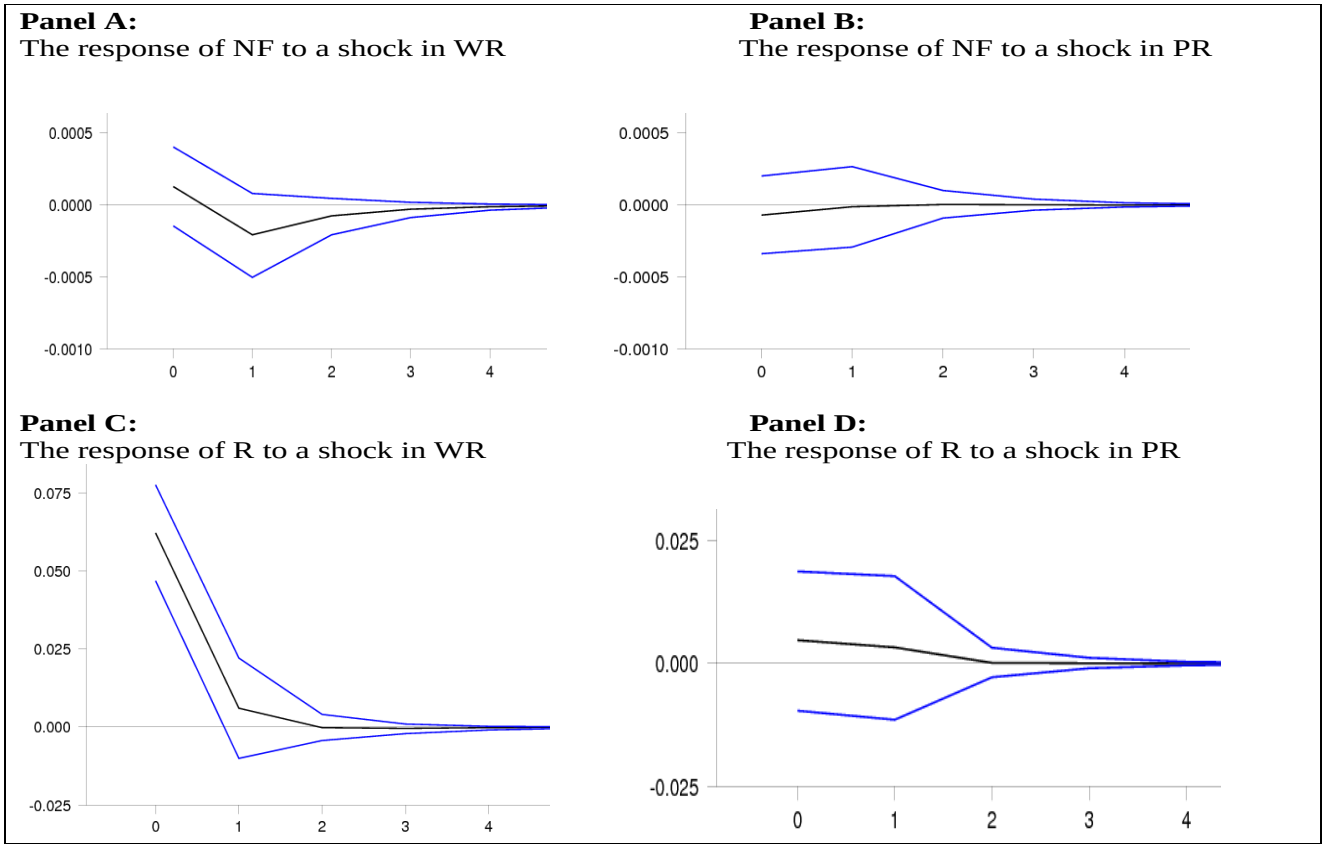
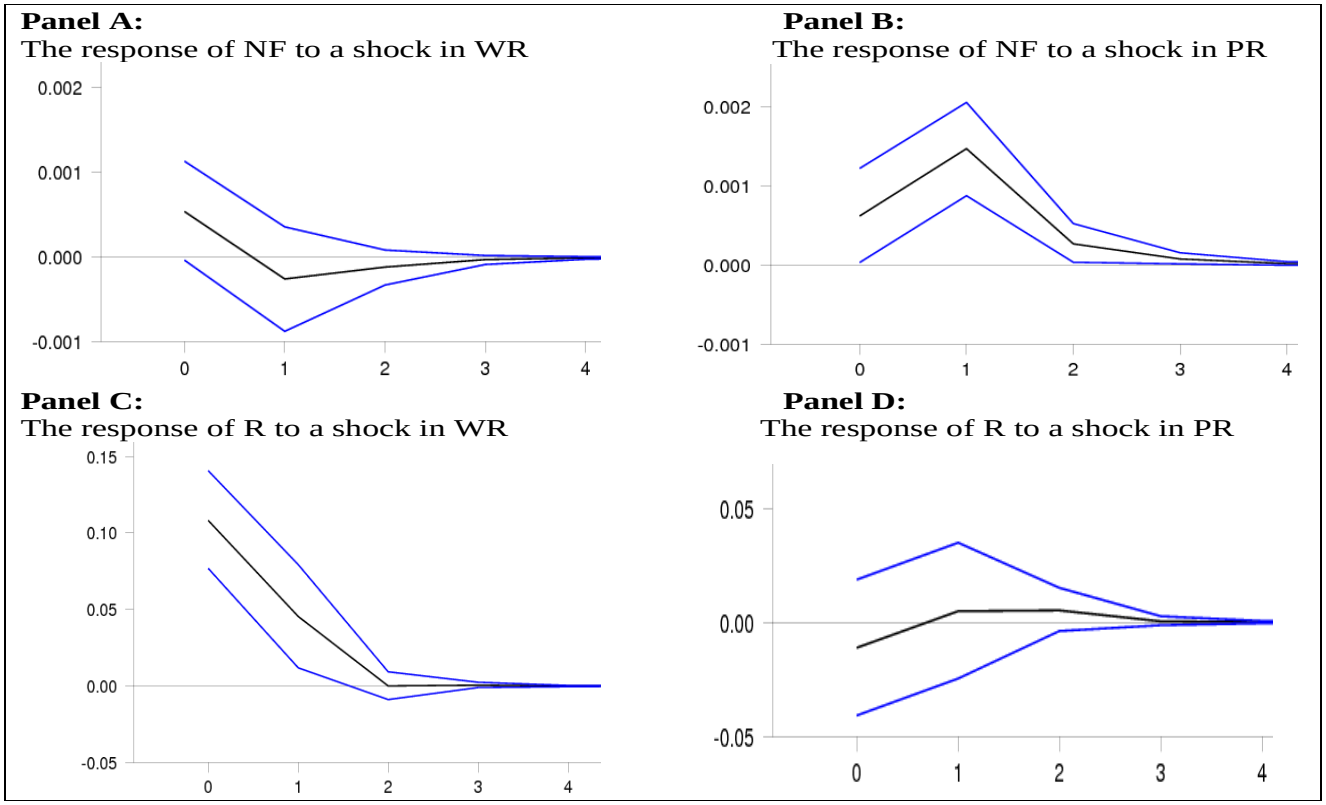


Figure 13: Tourism Sector



Conclusion

This article provides the first evidence on the dynamic response of foreigners' trading to political risk shocks in an emerging stock market. Political risk affects foreigners' marketwide trading in the expected direction, but only moderately. Foreigners' response to PR downgrades is immediate and larger in magnitude, while their response to PR upgrades is slow. We also find that the bulk of the effect of PR changes is priced-in within the contemporaneous month, and the response to upgrades is slower.

Foreign investors' reaction to PR changes in different industry portfolios varies mainly with the sensitivity of the industry to market factors (usually in parallel to their reaction to world market returns). They respond positively to PR changes in sectors, such as banking, which are sensitive to market factors. They exhibit contrarian trading with respect to PR changes in food and beverage sector. Given that food and beverage sector returns are positively related to PR, these results suggest that foreigners do not follow herds or pursue naïve feedback trading strategies.

An interesting dimension of these results stems from the fact that our data partition market participants as domestic versus foreign residents. This implies that domestic investors trade in the opposite direction of PR shocks, and more so in industries that are more sensitive to market risk. In other words, domestic traders seem to provide liquidity to foreign investors who trade on information. This suggests that a significant difference exists between foreign and domestic investors' response to political risk. The difference is particularly salient in the tourism sector where foreigners strongly respond to political risk whereas domestic investors seem to be more comfortable with it.

Notes

[i] In the absence of this index, some papers tried to find proxies for political risk. For example, use of bond yield spreads as a proxy for political risk in Mexico by Bailey and Chung (1995) illustrates the difficulty of dealing with the absence of a quantified measure of it. See also papers which infer political events from return

jumps and then match to the anecdotal history of political news arrivals in Hong Kong (Chan and Wei, 1996; Kim and Mei, 2001).

[ii] The effect of political risk on foreign direct investment is well documented. See Clare and Gang (2010), and references therein.

[iii] While previous studies mentioned above have analysed the impact of political risk on market returns on a cross-sectional basis focusing on return differentials across extreme deciles of countries sorted by PR changes, this article is the first to characterize the dynamic response of local market return to a shock in PR using VAR framework and to differentiate the effect of upgrades and downgrades.

[iv] For more details on the methodology and composition of the PR index, see Erb et al. (1996) and Bilson et al. (2002).

[v] In fact, we define *A(L)* to consist of three blocks, namely *W*, *PR*, and a third block of endogenous variables *NF* and *R*.

[vi] The standard deviation of PR upgrades is 0.0197 while that of PR downgrades is 0.0173, hence the difference in magnitudes of responses in Figure 5 cannot be attributed to the possibility that negative impulses to PR are larger in magnitude than positive impulses.

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