THE INTERACTION BETWEEN FOREIGN FLOWS AND EMERGING MARKET STOCK RETURNS: THE CASE OF HUNGARY, TURKEY, AND POLAND

By

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Abstract

Using monthly data on foreign investors' net equity purchases in Hungary, Turkey and Poland, further, daily data in Turkey, and employing Granger causality tests and structural vector autoregression, I examine the interaction between foreign flows and domestic stock returns. I find evidence for temporary price pressure effect in Poland. Further, I find that at the monthly horizon foreign investors tend to engage in negative feedback trading (i.e. selling winning positions after markets rise) with respect to local currency denominated returns. This effect is much weaker if foreign currency returns are used. On the contrary to results at the monthly horizon, SVAR impulse response functions suggest strong positive feedback trading in Turkey at the daily horizon. I also show that in addition to developed market returns, individual country risk rating, investors' risk averseness and global emerging market returns significantly affect net foreign flows towards emerging European stock markets. Foreigners' net purchases increase after an unexpected shock in developed market returns and emerging market returns, but decrease after a rise in credit spread and country risk rating. The latter effect is insignificant in Poland. My findings imply that foreign investors have a sophisticated response to available information.

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1 INTRODUCTION

The “common sense” view about international capital flow is that rising rate of return in a country should increase capital flows to that country. The “finance literature” view of capital flows is that in a frictionless perfect finantial market every investor should hold the same global equity market portfolio. In such a world, rising returns in a country increase the “desire” to hold the country’s equity but should not trigger any capital flow. The empirical literature however, documents that perfect capital markets cannot explain available evidence on foreign equity portfolio flows and foreign traders’ dominant influence in emerging stock markets (Griffin et al., 2004). Foreign investors are interesting in that they, as a group, show some patters in their trading activity that differentiates them from the whole sample of investors in the way they react to price movements and affect equity prices. This paper presents new evidence on the determinants of foreign investment flows and the impact of foreign trading on domestic asset prices using monthly data over 1995-2010 on total foreign net equity portfolio flows into three European developing countries, Hungary, Turkey and Poland, and for a unique comparison, using daily data over 2005-2011 for Turkey. In particular, I examine whether foreign flow reacts to price movements in the domestic country, how local stock prices change after a sudden upsurge in foreign flows and how foreign flows into European emerging stock markets are influenced by mature market returns, emerging market returns and country risk ratings and the US credit spread.

The first contribution of the paper is attributed to the data used. The literature on foreign portfolio investors’ trading in emerging equity markets surprisingly neglects emerging Europe, despite the fact that European emerging economies are those which are most dependent on foreign capital. European emerging stock markets significantly differ from their Asian counterparts extensively studied in the literature in that foreign investor participation is much higher. For example, the ratio of market capitalization held by foreign investors has in recent years ranged between 60-75% in Hungary and Turkey, around or above 50% in Poland, whereas the same ratio is around 25-35% in Asian markets.

This data set contributes to the literature by providing a chance to assess to what extent the previous results obtained in samples heavily biased towards external-surplus Asian economies can be generalized. Moreover, data available for Turkey at a monthly and daily periodicity allow a comparison of the trading mechanisms working at different time horizons. In particular, a key finding is that the lagged flow effect of a sudden increase in domestic *local currency* denominated equity prices is significantly negative at the monthly horizon, but positive at the daily horizon. The monthly negative lagged response of flows is strong and robust for Turkey and Poland, however, somewhat weaker for Hungary. This contradicts to the empirical literature that generally labells foreign traders as momentum investors, who buy after a rise (Froot et al., 2001; Bekaert et al., 2002; Kim and Wei, 2002; Griffin et al., 2004; Richards, 2005), or portfolio rebalancers (Griffin et al., 2004; Hau and Rey, 2004). Evidence on contrarian trading together with results on positive daily feedback trading point to a hypothesis that foreign investors react to information instantaneously, as argued by Brennan and Cao (1997) and Griffin et al. (2004), but then shift to negative feedback trading over the next few months. This may be consistent with Hau and Rey's theory of rebalancing away from outperformers (i.e. selling after the market rises to bring the currency exposure back to the original – diversified – level).

The analysis also reveals, that no such negative lagged effect is present in the flow response to a positive shock in *US dollar* returns in Hungary and Poland. Since the contrarian trading effect is robust for Turkey, I conclude that the differential results for Hungary and Poland are attributed to biased (Euro Zone effects) US dollar - Hungarian forint and US dollar - Polish zloty exchange rates.

The current paper strongly calls for the inlcusion of exogenous control variables in any study on the flow-return interaction, partly due to the notorious problem of simultaneity, but mainly because, as will be shown, the flow-return relationship is strongly influenced by common third factors. Specifically, a significant interaction between exogenous variables, flows and returns, respectively, may be due to three factors: portfolio rebalancing, changes in risk assessment (in the home market or about the domestic market) and information about global economic conditions. The latter two have so far been mainly ignored in previous theoretical work. As emerging equities constitute a high-risk asset class, it is natural to expect flows towards them to be highly responsive to changes in risk appetite. The current paper uses indicators of time-varying price of risk such as the credit spread or the VIX index and the credit rating of the country as a control variable. Similarly, as foreign investors might be timing their investments based on an analysis of global macroeconomic conditions that will affect emerging markets as a whole and as global stock indexes stand as a good proxy for future global macroeconomic activity that will sooner or later affect the host emerging economy, it is natural to expect foreign investors to trade in emerging stock markets following signals provided by global stock indexes. The current paper employs a global emerging market index in addition to a global developed market index. As emerging markets are typically not source for international portfolio investment flows, using an emerging markets index as a third control variable excludes the portfolio rebalancing channel with respect to mature market returns, thus enables a break-down of net foreign flows' response to world returns.

I find a positive relationship between developed (home) market returns, emerging market returns and flows towards emerging markets, but negative relationship between credit spread (volatility index), credit default swap and foreign flows. These results together with the evidence on contrarian trading at monthly horizon and positive feedback trading at daily horizon exclude the naïve, mechanic positive feedback trading behavior of foreign investors in the examined markets.

The paper is organized as follows. Section II provides a review of the related literature on foreign investors trading patterns and their impact on domestic equity prices. Section III explains that data used. Section IV discusses the simultaneity problem and describes proposed methodology to handle the endogeneity problem. Section V presents the results and their implication. Section VI concludes by summarizing the main lessons from the study.

2 RELATED LITERATURE

The literature on foreign investors trading, relevant for the present work, has evolved along two major, strongly related strands: the first strand of the literature investigates the trading patterns of foreign investors, and the second examines the effects of foreign investors trading on the domestic stock market. In order to study the trading patterns of investors, the return-flow dynamic interaction is modelled and tests on feedback trading, sometimes referred to as "trend chasing[1]", are performed. These are designed to reveal whether investors react to recent price movements. More precisely, whether an increase in today's returns triggers an increase in future flows.

Theories on perfect finantial markets that assume no home bias effects and information symmetry among investors, cannot explain existing evidence on equity portfolio flows (Griffin et al., 2004). The model of Brennan and Cao (1997) characterizes finantial markets with information asymmetry between domestic and foreign investors. In particular, foreign investors have information disadvantage, and, when prices rise, they revise their expectations about future stock payoffs faster than local investors do. As a results, rising prices clear the market and foreign investors will be net buyers. The model predicts that increasing domestic returns are followed by net foreign equity portfolio inflow. Kim and Wei (2002) support this theory. They find that foreign investors outside Korea are more likely to pursue positive feedback trading than investors residing inside Korea. Choe, Khoe and Stulz (2000), Froot and Ramadorai (2001), and

[1] The definition of "trend chasing" is somewhat stricter. It assumes that current returns can predict future flows even after accounting for the effects of past flows.

Seasholes (2002) provide further work on information asymmetry. A related model is that of Griffin et al. (2004). The authors assume asymmetric information, and extrapolative expectations, yet, as opposed to previous models, they predict that not the increasing performance of the domestic country attracts foreign flows, but better home market performance will result in net outflow from the home market (foreign market) and net inflow into small (emerging) markets.

Without imposing assumptions on foreigners informational position Bohn and Tesar (1996) use a portfolio demand equation for individuals, and suggest that both portfolio rebalancing and return chasing considerations imply positive feedback trading with respect to domestic market returns. With portfolio rebalancing, following a rise in returns, investors sell equities that have become overweighted in their portfolio to keep portfolio weights at their target level. Return chasing on the contrary implies that foreign traders increase their investments in equities with positive excess return over home country retruns. Though with weak evidence, but the work of Bohn and Tesar (1996) is in favor of the latter argument. Bekaert et al.(2002) confirm results on increasing buying appetite after a rise in domestic prices, but are unsuccessful to attribute it to investors' chasing higher excess returns. While explanations for pursuing feedback trading are mixed, evidence on such a behavior is fairly general (for the Swedish case see Dahlquist and Robertsson (2004)[2], for a work on Japan Karolyi's (2002), for Korea Choe et al. (1999), and for an extensive work covering 44 countries see Froot et al. (2001)[3].

To investigate the flow-return interaction papers generally employ high frequency data. For example Clark and Berko (1997), Bekaert et al. (2002), Kim and Wei (2002), Dahlquist and Robertsson (2004) use monthly data, Karolyi (2002) uses weekly data, Froot et al. (2001),

[2] They use data on monthly equity portfolio investments of foreign investors in Sweden.
[3] Froot et al. study total portfolio flows into 16 developed and 28 emerging markets

Griffin et al. (2004) and Richards (2005) use daily data. But in his famous work, Brennan and Cao (1997) test their model on quarterly data. Similarly, Tesar and Werner (1994, 1995) use quarterly data to study the bhavior of international investors. The papers document a strong contemporaneous return-flow relationship but weak or no evidence on flows reacting to past returns. This may be due to lack of power, or as Froot et al. (2001) and Richards (2005) argue, it is possible that a positive correlation between lagged returns and current flows at a higher frequency is aggregated[4] over time and results in robust positive contemporaneous correlation between net equity holdings and stock market returns[5].

In spite of the common finding in the literature on positive feedback trading, there is growing evidence on investors engaging in negative feedback trading. Odean (1998) using a sample on individual investors of a brokerage firm was the first to document that investors tend to sell past winners earlier than past losers. Hamao and Mei (2001) find evidence of foreign investors' contrarian trading in Japan. More recently, examining the Turkish market and using monthly data both Adabag and Ornelas (2005) and Ikizlerli and Ülkü (2010) report evidence for negative feedback trading. Further support is given by Bae et al. (2011), who find that individual investors in Korea exhibit contrarian behavior in that they tend to buy past losers and sell past winners.

The second strand of the literature, relevant for my work, focuses on the question whether foreign investors' equity trading has any effect on local stock markets. It is often argued that foreign investors, as opposed to foreign direct investors, require a higher and faster return on their investments. Foreign investors' trading in emerging markets is therefore generally

[4] This argument is contradicted by Albuquerque et al. (2004) who record evidence for positive feedback trading using quarterly data on cross-border equity flows of US investors to G-7 countries.
[5] Froot et al. (2001) show that a positive contemporaneous relationship between flows and returns on a quarterly bases is partly due to returns leading flows on a daily basis. This contradicts to Edelen and Warner (2001) finding who argue that same-day correlation in daily data shows that flows affect returns.

associated with rapid position buildings followed by even faster position unwinds. These considerations serve enough reason to opponents of liberalized equity markets to identify foreign investors' trading as a source of destabilizing effects. This can be traced back to three reasons: unrestricted foreign flows are claimed to generate equity price pressure, especially if coupled with low liquidity on the local market, induce excessive market volatility and kurtosis upsurge[6]. Because concerns about the effects of foreign trading gain in significance in case of market liberalization (Bekaert et al., 2000), in financial distress, and in times of economic downturn (Kim and Singal, 2000), policy makers are prone to use these arguments to impose restrictions on foreign trading[7].

Choe et al. (1999) study the Asian crisis and find no evidence that foreign investors' trading could destabilize the stock prices[8]. Similarly, Hamao and Mei (2001) report no systematic evidence for foreign investors causing higher market volatility than domestic investors do. But, Froot et al. (2001) and Clark and Berko (1996) find that an increase in foreign equity flow raises stock market prices, however the studies disagree on whether the price increase is temporary or permanent. A temporary price increase may be a result of price pressure (Warther (1995)), though, if the price increase is permanent, it may reflect reduction in the cost of capital due to increased liquidity, better market integration and risk sharing benefits of liberalization. The latter effect is also referred to as investor base-broadening (for base-broadening hypothesis see Bekaert and Harvey, 2000; Henry, 2000; Kim and Singal, 1997; and Dahlquist and Robertsson, 2004). Bekaert and Harvey (2000) analyzed the effects of foreign

[6] An increase in kurtosis is generally associated with a growing perception of risk.
[7] For example Stiglitz (1998) argues that in developing markets there is more need for capital flow controls because these countries are more vulnerable to sudden changes in the capital streaming to the country. Empirical findings contradict this argument.
[8] This results is supported by Bowe and Domuta (2004) who study foreign investors herding in the Indonesian stock market, and find that both foreign and domestic investors herd among themselves, moreover, foreign investors herd more intensively, but conclude that even this behavior did not induce excessive market movements in Indonesia during the Asian crisis.

investors trading in 20 emerging markets after market liberalization. They find permanent price effect which they claim to be evidence for the base broadening hypothesis. More specifically, they document that the cost of capital is reduced after markets are opened up to foreign investors. For the Turkish market Adabag and Ornelas (2004) find strong persistence in foreign flows, which suggests foreign investors change their market positions slowly enough to avoid price pressure, or excess volatility. Similarly, Bekaert et al. (2002) find that only a very small portion of returns due to flows are reversed subsequently. Examining the Swedish market after liberalization, Dahlquist and Robertsson (2004) do not find evidence for price pressure. On the contrary they document that net equity purchases are associated with permanent price increases. They interpret their results as supporting evidence for increasing market integration and reduced cost of capital after market liberalization.

Another popular explanation of the prolonged price effect of foreign flows is that foreign investors are informed traders. According to the informational explanation foreign investors possess new or different information compared to their domestic counterparts and reveal this information advantage only gradually to decrease transaction costs (Dahlquist and Robertsson, 2002 and Froot et al., 2001). Depending on the time horizon investigated, foreign investors' trading may impact stock market prices differently. Therefore, it is crucial to differentiate among temporary and permanent effects.

3 DATA AND METHODOLOGY

3.1 DATA AND SAMPLE CHARACTERISTICS

The emerging European stock markets studied in this paper are the Budapest Stock Exchange, the Istanbul Stock Exchange and the Warsaw Stock Exchange. The two variables of main interest are net flows[9] defined as equity purchases minus sales by nonresident investors, scaled by market capitalization, and stock market return data. Since reliable high-frequency data for European emerging stock markets are very rare, both the sample period covered and data periodicity are limited by data availability. Monthly data were compiled for Hungary, Turkey and Poland, in addition, this is augmented with daily data for Turkey[10]. For a summary on the employed variables, see Table 1.

For return calculation I used the monthly (daily) closing values[11] for the following-capitalization weighted stock price indices: BUX for the Budapest Stock Exchange, ISE All Stocks for the Istanbul Stock Exchange and WIG-20 for the Warsaw Stock Exchange. The return relevant for foreign investors strongly depends whether investors hedge their equity positions for exchange rate risk or not. Particularly, if investors follow imperfect risk trading, exchange rate exposure may shift the return on their foreign investment well away from its local currency return, increasing or decreasing the benefit stemming from emerging market equity trading . As

[9] A possible shortcoming of the flow data time series is that they do no include trading in ADRs in foreign markets. As argued by Richards (2005), the omission of ADRs should not cause serious problems, since it is rational to assume that trading in ADRs is mostly done between foreigners, so the aggregated net effect is close to zero.

[10] The basic critique of low frequency data is that they do not help shed light on the true dynamic interactions between flows and returns due to intra-period effects that may feed back and aggregate over time (see Danielsson and Love, 2006) Yet, Alemanni and Ornelas (2007) argue that daily data may be affected by too much microstructure noise. Since international investors are likely to make their portfolio decisions on a monthly basis, monthly data are frequent enough to provide with "good insights about the bahavior" of foreign investors (Adabag and Ornelas, 2007).

[11] on the last trading day of the month

indicated by Alemanni and Ornelas (2007), if it reasonable to assume that foreigners do not make currency hedge, then returns should be expressed in US dollars or some other foreign currency. Alternatively, if information available suggests that foreigners use hedge instruments (forward contracts, bonds) to neutralize their exchange rate risk exposure, then domestic currency returns should be applied. In the present paper I assume that foreign investors are imperfect risk traders and focus on US dollar returns. For comparison, results based on local currency denominated returns will be also presented where the two differ considerably. The formula used to compute foreign currency return data is the following:

$$R_t = \log\left(\frac{V_t}{E_t}\right) - \log\left(\frac{V_{t-1}}{E_{t-1}}\right),$$

where V_t stands for the value of the stock market index expressed in domestic currency and E_t is the offer price of the exchange rate in domestic currency to US dollar terms. Hence, return is measured as the log-differenced change in the corresponding price index in US dollar terms. Price quotes for return calculation are easy to obtain, the availability of flow statistics on the contrary is more restricted. As opposed to the detailed transaction-level data available for the US, Western-European and Asian countries, emerging countries' stock markets lag behind in the data compilation on foreign equity portfolio flows.

Since the 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, data on foreign equity portfolio investments in Hungary were obtained from the National Bank of Hungary (MNB). This unpublished dataset is based on Balance of

Payment statistics, and has been collected from commercial banks'[12] monthly reports. The data exclude all direct investment flows (those investors who hold or trade 10% or more of the company shares).

Monthly data on the Istanbul Stock Exchange (ISE) can be freely accessed from the Turkish Clearing Custody bank , TAKASBANK. This dataset is compiled from monthly compulsory reports of member brokers. Daily data from the Clearing and Custody Bank are available from November 2005. Daily net foreign equity portfolio flow is proxied by the first difference of the percentage held by nonresident investors multiplied by the total market capitalization (as in Ülkü and Weber, 2011). To verify the accuracy of the proxy, daily data were aggregated into monthly frequency and compared to the original monthly flows data. The correlation between the two is above 80%, which indicates that the proxy is highly reliable.

Warsaw Stock Exchange (WSE) 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. Therefore, monthly data from Narodowy Bank Polski calculated from Balance of Payment statistics are used. These data exclude direct investment flows, and include trading only in quoted shares.

The study uses monthly data from January, 1995 for Hungary, from January, 1997 for Turkey and from January, 2000 in case of Poland. Daily data on the Turkish Stock Exchange are available from November, 2005. Summary statistics are presented in Table 2. The statistics imply a median first order autocorrelation of monthly net inflows is 0.27. For comparison, the corresponding daily value is 0.085. Both are strikingly smaller than the median daily first order autocorrelation of 0.47 found by Richards (2005) for six Asian markets, and Froot et al. (2001)

[12] These commercial banks have provided a monthly report to MNB on money transfers of nonresidents classified by the purpose of the transfer up to 2008, and to KELER (Hungarian Central Clearing and Custody Company) thereafter.

for a sample of 46 countries covering developed markets, Emerging Asian, Latin American, and also Emerging European countries. Further, the monthly cross-correlation between net inflows into different markets ranges between 0.03 and 0.19, with an average of 0.12. This corresponds to the magnitudes reported by Richards (2005) and is perfectly the same as the daily average for Emerging Europe reported by Froot et al. (0.12). A remarkable data is the same-day correlation between flows and returns: 0.82 between flows and local currency denominated returns and 0.94 between flows and US dollar returns. For comparison, the median value reported by Richards is 0.33 (almost the same as the median monthly contemporaneous correlation obtained for the present three countries of 0.34). As for the return cross-correlations in the three markets, the lowest value found is 0.30 between Turkey and Poland, and the highest value is 0.56 between Turkey and Hungary.

Classical models of price formation generally assume that new public information is incorporated fully, instantaneously and solely in prices. These models may be imprecise by excluding possible reaction in flows to new public information arrivals. As a consequence, there may be a third factor that simultaneously affects both flows and returns. This should be taken into account, otherwise the model would risk to improperly attach part of the contemporaneous relationship to the price impact instead of the influence of the common third factor (Ülkü and Weber, 2011). To handle this problem, exogenous control variables are introduced. Control variables are chosen to serve two main objectives. First, it can be reasonably assumed that these variables govern at least partly the fluctuations in foreign flows and domestic returns over and above the effect of autoregressive terms of flows and returns. Second, by controling for the discussed exogenous variables we can account for the price movements that would have presumably occurred in the local market irrespective of foreigners' trading decisions and also for changes in foreign flows that would have taken place regardless of changes in local market returns (Richards (2005))[13].

In line with the previous literature, I call exogenous global and local determinants of net foreign flows as *push* and *pull factors*, respectively. In my model, push factors are represented by the global control variables. Theory of portfolio rebalancing (Kodres and Pritsker, 2002; Griffin et al., 2004) predicts international investors to buy (sell) following positive (negative) returns in their home markets, due to wealth and portfolio-balance effects, thus net flows towards emerging markets to be positively correlated with global developed (source) market returns. In the present work global developed market returns are represented by the MSCI Europe Index[14]. However, global developed market returns also contain information about global risk appetite and expected future global macroeconomic conditions which will affect emerging markets. Net foreign flows' response to global developed market returns may also be (partly) due to changing risk appetite and changes in expectations about future global macroeconomic conditions that will affect emerging markets (rather than only portfolio rebalancing). Previous literature controlling for mainly US returns is unable to distinguish between these three possibilities. In the current study, I distinguish among these three determinants of net foreign flows, namely rebalancing, risk appetite, and information, by adding two more control variables that proxy for the latter two. Specifically, I use log changes in the credit spread as a proxy for risk perceptions.[15] Two

[13] Control variables were obtained from Bloomberg News Agency and the Federal Reserve Economic Data (FRED) database.

[14] The index is weighted for market capitalization and it is designed to measure equity market performance of European developed markets. The MSCI Europe Index consists of the following 16 developed market country indices: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom. I also use the MSCI World Index, which comprises 24 developed markets. Since results are very similar, and the MSCI World has been explored by other studies as well, I will focus on developed market returns represented by the MSCI Europe Index.

[15] I also use the VIX published by Chicago Board of Equities as an alternative measure of risk appetite. VIX is an index of expected future volatility of the S&P500 stock index derived from option premiums. Results with VIX are very similar.

measures of credit spread are explored. The first is defined as the difference between Moody's Seasoned Baa Corporate Bond Yield and the 10-Year Treasury Constant Maturity Rate. This incorporates default risk and the reward for bearing systematic risk. The second is directly calculated by the Bank of America, and defined as the difference between the market capitalization weighted option adjusted index on all bonds with an investment grading of BBB and the spot Treasury curve. This captures changing creditworthiness and associated changing risk tolerance on all maturities. An increase in this variable signifies a decrease in risk appetite. Similarly, I use returns of the MSCI Emerging Markets Index[16] (EM) as a proxy for global macroeconomic information that is relevant for emerging markets. Emerging markets are clearly not the source markets, hence use of emerging market index returns excludes the rebalancing channel. (rebalancing among host emerging markets).

To examine the relative importance of global (external) and local determinants of capital flows I also include the credit default swap rate (CDS) as a proxy for the individual country's creditworthiness and general macroeconomic conditions. This variable helps better understand whether investors general risk appetite, as proxied by the credit spread or the individual country's risk characteristics influence more investors' trading decisions.

Finally, to account for the effect of major crisis events that may plausibly affect both investment behavior and returns, a crisis dummy[17] is added to the model. By the extension of the

[16] The index is weighted for market capitalization and it is designed to measure equity market performance of emerging markets. The MSCI Emerging Markets Index consists of 21 emerging market country indices: Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Morocco, Peru, Philippines, Poland, Russia, South Africa, Taiwan, Thailand, and Turkey.

[17] The following major events were accounted for by using the crisis dummy: (i) Asian financial crisis (July, 1997 to May, 1998); (ii) the Russian bond default and the LTCM crisis (Russia: August, 1998 to December, 1998; LTCM: September, 1998 to October, 1998); (iii) the Brazilian crisis (January, 1999 to February, 1999), (iv) the dot-com crisis (February, 2000 to June, 2000); (v) the Argentinean crisis (October, 2001 to March, 2005); and (iv) the global fniancial crisis (July, 2007 to December, 2008) (Fry et al., 2010).

model with these variables the exogenous determinants of flows and returns can be eliminated and I can focus in the ultimate interest of this paper, the interaction between flows and returns.

3.2 Methodology

The most difficult part in a study on the return-flow interaction is imposed by the variables' simultaneity, often referred to as the endogeneity problem. Solutions to this puzzle can be traced back to microstructure models such as that of Hasbrouck's (1991). A large body of market microstructure models build on the assumption that trades convey information. In addition, as in Hasbrouck's (1991), if traders are asymmetrically informed, this information contains informed traders' private information. Further, the news conveyed by trades has two parts: expected and unexpected component, the latter incorporating the private information. The unexpected trade component and thus the private information is aggregated in the trading process which then effects prices. Since the expected part is predictable it is assumed that it contains trade related public information but no additional trade or non-trade related new information. In the model the magnitude of the price impact is an increasing function of the number of informed traders, which in turn can be interpreted as the degree of asymmetry. Since the new information conveyed by trades should be permanently imprinted in prices the true information effect will be that persists over a considerable time horizon[18] (Hasbrouck, 1991).

The focal point of the model is that the time t price is set by a market maker, who, before setting the price, first observes the order size (trade related new information) and non-trade related public information at t. Another crucial assumption is that non-trade related public

[18] It is important to emphasize that these market microstructure models assume no delay in price adjustment to the private information and imply that the price effect caused by price pressure should be reversed over time (Hasbrouck, 1991).

information is assumed to arrive after the trade volume is observed but before the price is actually set. Thus, the ultimate implication of the referred market microstructure models is that the price at time t reflects both public and private information, and it is influenced by the order volume at time t (but not vica versa). When forming the orders, the only relevant information at hand for the traders are time t-1, t-2, … price quotes and time t-1, t-2, … order sizes, therefore the order size placed at time t will be a function of past price quotes and orders, but not the current price and current public infromation. Hence, no contemporaneous price effect on flows is assumed and flows are restricted not to include non-trade related public information.

These assumptions are generally imposed and are more plausible when very high frequency data are used, but as suggested by Danielsson and Love (2006) they may be unfounded with lower data periodicity. Over a larger time horizon effects will become aggregated, they may feed back, changes in flows and prices appear as simultaneous, complicating the analysis. If availability of high frequency data would not be a problem, these complications should not be accounted for. But, since flow data are in the most cases not available at high enough periodicity, it is particularly difficult to decompose the observed present flow-return correlation into components attributable to feedback trading, price impact, return predictability and the common factor.

To gain some insights about the flow-return association, simple models examining Granger causality[19] are proposed (see for example Alemanni and Ornelas, 2007). The equation on returns used to test for Granger causality is then extended to examine evidence on price

[19] For example, Alemenni and Ornelas (2007). First, flow-return relationship is examined applying Granger causality. Then, to account for the possible endogeneity problem, their model is extended to include external control variables that the authors suggest may influence flows and returns simultaneously (FTSE AW Developed index is used to control for developed market stock index returns and JPMorgan EMBI+ to control for an emerging market risk premium).

impact. In a similar way, Clark and Berko (1996) regress current local currency returns[20] on current and three month lagged values of unexpected net flows[21] normalized by market capitalization. For a temporary price pressure hypothesis to hold, the authors expect a significant positive contemporaneous relationship with negative coefficients on the lagged values of net inflows. This would indicate, that the sudden price increase caused by net foreign inflows eventually reverses. This approach is rethought by Adabag and Ornelas (2004), who regress current monthly returns on lagged returns, current and lagged flows. For price pressure hypothesis to hold, the null that the coefficients on lagged flows are zero should be rejected.

Unfortunatelly, such simple methods and simple regressions are unable to reveal the true characteristics of the flow-return correlation. A common solution to deal with this problem is to apply the vector autoregression model developed by Hasbrouck (1991). A VAR framework with justifiable contemporaneous identification assumptions is a valid tool for analysis due to the fact that the bulk of the flow-return relationship is observed within the contemporaneous period. As explained above, Hasbrouck' (1991) model excludes the causality running from return to flow and only allows flows to contemporaneously affect prices. Since the model assumes that only unexpected trade conveys new (private information), the higher the response (as shown by the impulse response function) in prices to an innovation in flows, the higher private information content of trades is implied (Danielsson and Love, 2006). This vector autoregression model was originally applied to data at tick-by-tick frequency. In such a case the causality is plausible to run from orders to quotes. Therefore, imposing the same assumptions to data at lower frequencies might result in restrictive, misspecified models and misleading inferences. As argued by Danielsson and Love (2006), if it is rational to assume that traders are able to react to price

[20] Alternatively they use as dependent variable foreign currency returns and also excess returns defined as local currency returns minus local government bill rate

[21] Here, unexpected net flows are the residuals of an AR(1) model estimated to fit observed net inflows.

changes caused by their orders before the end of the sampling frequency, then it means that price changes feed back into trades and any inference that tries to capture the information content of a flow shock will be a biased estimate. Still, in the empirical literature the common way to handle the endogeneity problem is to exclude the contemporaneous flow effect of prices. Otherwise the vector autoregression model could not be identified.

One of the best known works in this area is that of Froot et al. (2001). In their paper, the flow-return interaction is studied in a bivariate unrestricted VAR and a VAR subject to restrictions. Identification is reached by using Choleski decomposition. In this setting identification is determined by the variable ordering. For a particular order of the model variables it is assumed that a primitive shock to one of the variables may contemporaneously affect variables of lower ordering but not the ones higher in the order. With these restrictions the parameter matrix in the VAR system will be a lower triangular matrix. The recursive ordering of the variables can be interpreted as imposing timing restrictions on the structural shocks. More precisely, a shock is restricted to affect a subset of the variables contemporaneously, while the rest of the variables with some time lag. More precisely, Froot et al. assume that current flows are determined by past flows and past returns, while current returns are determined by current flows, past returns and past flows. In their model, Froot et al. do not account for other factors than the two endogenous variables.

Their modeling scheme serves as starting point to the analysis of Dahlquist and Robertsson (2002). Patterns for the Swedish case are investigated with monthly data on foreign equity portfolio investors in a vector autoregression framework with exogenous variables. Their model mark an important step forward to better understant the flow-return dynamic interaction. On the one hand, Dahlquist and Robertsson relax Hasbrouck's unrealistic assumption that flows do not react to private information and on the other hand, they explicitly control for exogenous variables. The model's endogenous variables are: foreign flow and excess return on the local market (measured in local currency over the local 30-day bill issued by the government), and the exogenous variables: the excess return on a world market investment (FT/S&P) and an exchange rate index (TCW), respectively. The model is restricted to a first-order VARX and the exogenous variable enters only contemporaneously. They follow the same identifying assumptions as Froot et al. but test an alternative assumtion as well: current returns affect current flows, whereas current flows affect future returns and future flows.

By allowing the exogenous variables to enter the VAR only contemporaneously Dahlquist and Robertsson exclude the possibility that lagged control variables may influence current flows and current returns. This assumption is questionable in a context where it is assumed that traders use past data to extract information and form their expectation about the future. The model proposed by Froot et al. and Dahlquist and Robertsson is revised by Richards (2005). His model puts forward the implementation of US dollar returns instead of local currency returns. Following his argument US dollar returns should be used because US investors are strongly represented in the covered markets and as a simple preliminary regression analysis suggests, selected US stock indices are an important determinant of both flows and returns. The author strgonly calls for the inclusion of exogenous variables in the model. In his SVAR, Richards controlls for the S&P 500 index, MSCI world index, MSCI Emerging Markets Free index, and returns on US technology stocks (Nasdaq Composite Index and Philadelphia Semiconductor Index). The main strategy is to restrict fundamental shocks to be uncorrelated and to use Choleski decomposition to allow exogenous variables to affect flows and returns both contemporaneously and delayed.

The structural reinterpretation of the VAR system allows for testing some interesting empirical hypotheses:

i. What impact does an unexpected shock to net equity flows have on current returns and in addition what are the dynamics of such a shock? In particular, I am interested in, whether the effect of the shock is temporary (dies out fast) or is it a prolonged effect? Studying the dynamic properties serves the object of being able to distinguish a temporary price pressure effect from the permanent change in the cost of capital (Bohn and Tesar, 1996). For a transitory effect to hold I expect a significant positive contemporaneous relation between returns and the surprise component in flows that is temporary and eventually reverses. On the contrary, in case of a permanent effect an extended price rise is expected.

ii. How do flows respond to a positive unexpected own shock ? If such a shock is associated with future expansion in flows, then for how long does this upsurge hold? More concisely, I am interested whether flows are persistent or not.

iii. Do domestic past returns affect current capital flows? Do past returns predict future flows over and above the effect of past flows? If so, then are foreign investors positive or negative feedback traders?

iv.How do foreign returns (global, developed, emerging market returns) influence foreigners trading in emerging market equities?

v. How do foreign investors choose their emerging market portfolio? Is portfolio allocation based on return chasing, portfolio rebalancing or changes in risk assesment of foreign investors?

4 RESULTS

A first step in the ananalysis is to test whether the variables included are stationary. To reveal the stationary properties of the time series, formal statistical tests are used. The results of the Augmented Dickey and Fuller test indicate that the net foreign equity flow expressed as a percentage of market capitalization, the log difference of stock returns, foreign index returns and the log difference of the credit spreads and credit default swap are all stationary.

4.1 TESTING GRANGER CAUSALITY

4.1.1 BIVARIATE MODEL

Bivariate Granger causality is tested between domestic equity returns[22] and net purchases. This test is performed using monthly data on Hungary, Turkey and Poland, and in addition with daily data for Turkey. Then, it is extended to include the exogenous variables discussed in the previous chapter. The advantage of this specification is that robustness of the results can be easily evaluated. For the bivariate case the model to be estimated is the following:

$$R_t = c_1 + \sum_{i=1}^{n} \alpha_{1i} R_{t-i} + \sum_{i=1}^{n} \beta_{1i} NF_{t-i} + \varepsilon_{1t}$$

$$NF_t = c_2 + \sum_{i=1}^{n} \alpha 2_i R_{t-i} + \sum_{i=1}^{n} \beta_{2i} NF_{t-i} + \varepsilon_{2t}$$

where R_t denotes the return, NF_t denotes the net foreign equity portfolio flow at time t.

[22] With return denominated both in local currency and US dollars, respectively.

The hypotheses tested are:

1. Foreign net equity portfolio flow does not Granger cause return: $\beta_{1i} = 0$, i = 1 to n

2. Return does not Granger cause foreign equity portfolio flow: $\beta_{2i} = 0$, i = 1 to n

If the first hypothesis is rejected, it means return helps predict future flow. In case of the second assumption, a rejection of the null implies that flow helps predict future return. If both are rejected, then there is Granger bi-causality between flows and returns. The Schwarz-Bayes criterion is used to test the appropriate lag-length. The criterion implies a common lag-length of one for each case, both for monthly and daily data. Richards (2005) argues that since in case of daily data "degrees of freedom are not a constraint", a model with an optimal lag-length of one can be extended to include more lengths of the variables studied[23]. Several options were examined, and since results do not change significantly, following Richards (2005) a lag-length of five is chosen. A small number of lags is also suggested by the rapid decay in the flow and return autcorrelation, respectively. To compute Wald-F tests White heteroskedasticity-consistent standard errors are used. Summary results are presented in Table 3.

With monthly data and US dollar returns it is obvious that flow Granger causes returns in all the three countries (column (1), Table 4). Notably, just the first lag of flow is significant. Results are not so strong, however. Causality holds unanimously at 10% significance level but if a more stringent criteria of 5% significance level would be used, flow would Granger cause returns only in Turkey and Poland. Interestingly, while in case of Hungary and Turkey flows predict positive future returns, the corresponding coefficient in Poland becomes negative. A striking result is that in none of the three countries do we find significant lagged returns. This

[23] Following this argument, Richards investigates the Granger causality in a model with five period lag-lentgh, instead of the one suggested by the Schwarz-Bayes criterion. However, this is still far more less than the 45 lag-lentgh employed by Froot et al. (2001).

implies that current monthly returns do not help predict returns in the next month. The estimates on Turkey daily data with US dollar returns are somewhat different (Table 6, column (1)). Flow still Granger causes returns (and the significance improves to 1% significance level), but the predicted sign changes. Hence, today's flow predict negative returns tomorrow. Further, the one period lag return also becomes significant.

Investigating the second assumption reveals that we cannot reject the hypothesis that return does not Granger cause flow (Table 5, column (1)). This result unanimously holds for Hungary, Turkey and Poland. Daily data on Turkey contradict this finding (Table 7, column (1)). One period lagged value of both return and flow are significant at 10% significance level (even at 1%). While an increase in current returns predicts positive future flows, an increase in today's net purchases predicts a reduction in tomorrow's net purchases. Hence, for daily data I find Granger bi-causality.

Domestic return results are almost echoing the ones with foreign currency returns. Flows Granger cause returns with the same prediction direction as previously. Returns do not Granger cause flows for Hungary and Poland, but do help predict future flows in case of Turkey. Particularly, an increase in current returns predicts a future net outflow. This result on Turkey is consistent with Adabag and Ornelas[24] (2004) if a common 10% significance level is assumed. With daily domestic returns in Turkey it cannot be rejected that flow does not Granger cause returns. This is opposite to what we have seen with foreign currency returns. As for the second assumption, it perfectly replicates previous findings (return Granger causes flow and a sudden

[24] Adabag and Ornelas (2004) perform the same Granger causality test with monthly data on Turkey. If for the first hypothesis, I compare equations that include only one period lagged values of the endogenous variables, my results are in line with theirs. But, while in the mentioned study, after adding further lags, joint significance tests reject Granger causality, in the present case, adding further lags decreases joint significance, but still leaving one period lagged flow bear predictive power (at 10%, it does not however at 5% significance level).

surge in returns predicts net inflows). To perform robustness checks, in the next section I extend the bivariate Granger causality test to include control variables as well.

4.1.2 Adding control variables

Such an extended version of Granger causality implies the following form of equations studied:

$$R_t = c_1 + \sum_{i=1}^{n} \alpha_{1i} R_{t-i} + \sum_{i=1}^{n} \beta_{1i} NF_{t-i} + \sum_{i=1}^{n} \gamma_{1i} X_{t-i} + \varepsilon_{1t}$$

$$NF_t = c_2 + \sum_{i=1}^{n} \alpha 2_i R_{t-i} + \sum_{i=1}^{n} \beta_{2i} NF_{t-i} + \sum_{i=1}^{n} \gamma_{2i} X_{t-i} + \varepsilon_{2t}$$

where X_t denotes any of the controls discussed in the previous chapter. The lags included are the same as previously: one for monthly data, and five for daily. Control variables enter the equations with the same lag-length as the endogenous variables. I find that if returns for developed Europe, emerging markets or global world returns are added, flow still Granger causes return with an adjusted R-square improving in almost all cases. However, when a measure proxying for risk averseness is added, lagged flows lose their significance for Hungary and Turkey (at the daily horizon, see Table 6), but not for Poland and Turkey at the monthly horizon, where Granger causality is robust even after controling for exogenous variables (Table 4).

As for the second hypothesis, return does not Granger cause flow even after including control variables. Interestingly, in none of the model specifications do we find significant lagged returns for Hungary or Poland. On the contrary, for Turkey one month lagged return is significant if European developed markets index return or Emerging markets return is included, but if instead world return, or credit spread is added, significance of lagged returns vanishes (Table 5). It is also evident that daily results on the second hypothesis are robust for controling for exogenous variables (Table 7).

With domestic returns and monthly data, after controling for exogenous variables, I get that flow Granger causes return in Turkey, but not for Hungary and Poland. Further, return Granger causes flow in Turkey even after including mature and emerging market returns and variables controling for investors' changing risk assessment. Outcomes based on daily data do not change after controling for exogenous variables. For better understanding, Table 3 summarizes the results on the Granger causality tests.

It is worth emphasizing, how conclusion on association relationship changes when switching from monthly data to daily. A comparison of the extended model estimated on Turkey at different horizons and with US dollar returns reveals that while for low frequency data it seems that flow Granger causes returns, for high frequency data exactly the opposite seems to prevail. It is also important to remember that results are not perfectly the same for the covered three countries, they also differ depending on the assumed hedge position of foreign investors, and on the periodicity of the data analyzed. In general, results put forward that on a monthly basis causality goes from flows to returns. Daily results indicate the opposite.

It is informative to investigate how adjusted R-square differs depending on the model specification and frequency of the data. With monthly data, one period lagged flow, lagged return and a control variable included can account for up to 7% (12%) in the return (flow) variation (see last row of Table 4 and 5). The difference is more evident if we focus on equations with return as the dependent variable. The additional explanatory power of lagged control variables is quite low, but increases somewhat with daily periodicity. In regressions for the daily sample, lagged returns and flows only explain 1% of the current return variation, but, if volatility index is added, this rises to 14%. Similar adjusted R-square is found if instead the volatility index the world return is added[25]. The magnitudes documented here for R-square are similar to the values obtained by Adabag and Ornelas (2004) but well below the 38% reported by Richards (2005) and confirm instead Brennan and Cao, who find, that regressions with lagged endogenous variables as depenendent variables can only account for a small portion of the endogenous variable variance. The basic difference between Richards' model and the present approach is that his flow regression includs also the contemporaneous domestic returns as independent variable. This is a plausible explanation for the disparity between the reported R-squares. Indeed, by adding contemporaneous returns to the flow regression (to be consistent with Richard (2004)), adjusted R-square jumps to 69%.

4.1.3 Price pressure hypothesis

To test the price pressure hypothesis I use the approach proposed by Clark and Berko (1997) and extended by Adabag and Ornelas (2004). According to this, current return is regressed on past returns, current and lagged flows. Past return values are included to test whether the explanatory power of lagged flows holds over and above the explanatory power of past returns. Current flow is added to the regression because current return and flow are strongly correlated in each country, irrespetive of the periodicity of the data and there is also positive autocorrelation in net purchases. Adding current flow has no implication on causality, but by omitting it, I would risk that lagged flow will be found as significantly explaining return just because it picks up the omitted contemporaneous return-flow correlation. The equation used is similar to the one for testing Granger causality:

$$R_t = c + \sum_{i=1}^{n} \alpha_i R_{t-i} + NF_t + \sum_{i=1}^{n} \beta_i NF_{t-i} + \varepsilon_t$$

[25] The contemporaneous correlation of the two exogenous variables is -66%.

The hypothesis tested are:

1. There is no price pressure: $\beta_i = 0$, i = 1 to n

Considerations based on the price pressure hypothesis with temporary effect indicate that for the price pressure hypothesis to hold, in the estimated regression, coefficients on lagged flows should be negative, and the coefficient for the current flow should be positive. To test robustness of the results, several regression estimates are presented with lagged coefficients from one up to six month (and from one up to five days in case of daily data). Estimated regressions confirm the strong contemporaneous correlation between flows and returns documented by other papers as well (such as Richards, 2005; Edelen and Warner, 2001; and Froot et al., 2001). Strong evidence for price pressure is only found in Poland, where a sudden increase in net flows is associated with a price increase and a temporary rise in returns followed by a decrease in returns in the next month due to a correction in prices (Table 8). The effect dies out very fast. At the daily horizon, no evidence for temporary price pressure is found (Table 10). The coefficient on the contemporaneous flow is significant for up to six lags, but lagged flow coefficients are not individually significant, except for the positive coefficient of the two day lagged flow. With domestic currency returns, monthly outcomes replicate previous findings. No price pressure effect is found for Hungary and Turkey, but it seems to be robust for Poland. Lack of evidence on Turkey is in line with the conclusions of Adabag and Ornelas (2004). For daily domestic returns I find again positive contemporaneous and lagged flow coefficients (Table 11). Compared to the previous regressions with US dollar returns, significance is robust even after including further lags, . Joint significance is very strong. As opposed to the price reversal found for Poland, daily price dynamics show some differences. If flows rise suddenly, prices increase for three consecutive days, then the effect disappears.

After extending the basic setup to account for exogenous variables, the price effect of flows is still evident both in Turkey (with daily data), and Poland (Table 9 and 12). The temporary characteristic of the price increase obtained for Poland contradicts Clark and Berko (1996) who do not find significant negative lagged flow coefficients for Mexico. Therefore, as they conclude, lack of price reversal is a sign of improved liquidity and greater risk sharing.

Findings on Turkey and Poland may be linked to major concerns about foreign investors' presence on the domestic market in that they push prices away from their fundamentals . According to this view, foreigners induce temporary overshoot in stock prices followed by price reversion and therefore increased market volatility. This overreaction among market participants may be present if local markets are sensitive to sudden price movements, or foreign investors lead domestic investors. Price pressure is commonly interpreted as possible explanation for the generally observed positive contemporaneous flow-return correlation. In this interpretation, a rise in flows induces a price increase and thus a temporary return increase, which ultimately results in a positive contemporaneous relationship. Oppinions on the persistence of this effect differ among researchers. In the interpretation of Warther (1995) the rise in prices due to price pressure is only temporary, as found for Poland, and is a result of the sudden illiquidity generated by the increased demand for local stocks. According to Warther (1995), as soon as demand is met by the corresponding equity supply, illiquidity disappears and prices will return to their original value. The alternative explanation indicates that the price increase induced by an unexpected net inflow is permanent. Proponents of this theory argue that the increased foreign participation is equivalent to the effect of an increased investor base. Growing presence of market participants increases risk sharing, which eventually results in the enduring decline of the required risk premium for the country specific volatility (and the expected return at the same time (Clark and

Berko, 1997). Daily results seem to support this view but since the effect disappears within a month, the pattern present in Turkey does not confirm decrease in the required risk premium due to increased presence of foreign investors.

4.2 Vector autoregression

4.2.1 Unrestricted VAR

Examining Granger causality helps gain insights into the association properties of the two variables of interest: stock price changes and equity portfolio holdings. It does not help however, reveal the direction of causality. To improve the understanding of the relationship of these variables, following Froot et al. (2001), Dahlquist and Robertsson (2004), and Richards (2005), a more elaborate approach is proposed. This goes beyond the tools permitted by a simple Granger causality test and puts the empirical analysis on a more structural basis. Such, the study of the flow-return interaction is put in the context of vector autoregression (VAR). The VAR is a useful way to investigate the dynamic interaction and properties of exogenous flow and return shocks. The final model is developed step by step to shed light on the deficiencies of previous approaches and to provide robutness checks. Therefore, first I present results based on a bivariate unspecified model without controling for the effect of a common third factor, then assumptions are imposed on the causality relation between flows and returns. Finally, the model is augmented to control for general economic conditions as proxied by global stock market returns, European developed market and emerging market returns, and investors' risk averseness.

Consider first a model that has the following form:

$$y_t = \alpha + A_1 y_{t-1} + A_2 y_{t-2} + ... + A_n y_{t-n} + u_t ,$$

This is a“reduced-form representation of an unspecified structural model” (Bekaert et al. (2002)), where $y^T_{(1\times 2)} = [NF_t, R_t]$ is the data vector, α is parameter vector, $(A_i)_{(2\times 2)}$, i = 1 to n is the matrix with reduced-form coefficients, n is the order of the VAR, and u_t are the reduced-form disturbances, where u_t are zero mean white noise process with $E(u_t u_t^{'}) = \sum_u$. The unrestricted VAR can be written in a two-equation system:

$$\begin{bmatrix} NF_t \\ R_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} + \begin{bmatrix} a_{11}(L) & a_{12}(L) \\ a_{21}(L) & a_{22}(L) \end{bmatrix} . \begin{bmatrix} NF_{t-1} \\ R_{t-1} \end{bmatrix} + \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix}$$

The diagonal elements, a_{11} and a_{22} as argued by Froot et al. are the conditional momentum in flows and returns. The off-diagonal elements, a_{12} and a_{21} represent the conditional feedback trading and the anticipation effect, respectively. To determinde the appropriate lag-length I use the Schwarz selection criterion. This indicates that the model that best fits the sample data is a first order VAR for each of the three countries, both at the monthly horizon and at the daily horizon for Turkey. Table 13(A) presents the estimated model coefficients (with US dollar returns) for each of the three countries: Hungary, Turkey and Poland.

At the monthly horizon estimates of the regression coefficients show that one month lagged flows are positive and significant in both the flow and return regression. This suggests momentum in flows and flows leading returns in Hungary and Poland where lagged return is insignificant in the flow regression. Further, the coefficient estimates show some weak evidence for negative feedback trading in Turkey, i.e. returns negatively predicting flows. Such a result is documented also in Turkey by İkizlerli and Ülkü (2010). Results with local currency returns are very similar except for they show conditional return predictabiliy only for Turkey. Daily data

(Table 13(B)) suggest that lagged flows significantly (and negatively) predict future flows, but not returns and that one period lagged return is strongly significant both for returns and flows (Table 13(B)). This is consistent with the findings of Froot et al.for Emerging Europe region.

Since by a simple estimation of the VAR model, regression coefficients capture only the direct effects between the variables, coefficient estimates are used to generate impulse response functions. This way, the indirect variable dynamics can be examined more precisely. An impulse response function portrays the dynamic response of a variable to a one unit surprise in another variable until the effect dissipates, therefore it provides a useful tool to distinguish temporary effects from permanent effects. By portraying the lagged response it enables the measurement of the economic significance of the forecast ability. The one unit innovation is measured as one standard deviation in the present case. Standard errors of model parameters and the 90% confidence interval (dashed lines) are calculated using bootstrapping. On the graphs (Figure 1-4) the focus should be on the solid line in the middle of the confidence bound as this tracks the variable response to the surprise component in another variable. Statistical significance for the point estimates is implied when the bands are not crossed by the zero line.

Monthly results unanimously confirm positive impact to an own flow shock for all the three countries [26] (Figure 1-3), but signs on predictability differ considerably. In Turkey, following a price increase, foreign investors tend to unwind their positions instead of further buying. In Poland flow response is significantly positive, while in Hungary it is insignificant, but more suggestive for an increased buying behavior. Similarly, the price impact of flows suggest different price mechanisms working in the countries. A sudden shock to flows is followed by a price increase in Turkey, price decrease in Poland and no significant reaction in Hungary. Local

26 Considerable research on individual equity markets has documented persistent foreign equity flows (for the Korean market see for example Kim and Wei (2002), Choe, Kho and Stulz (1999), for the Thai and Taiwanese market see Seasholes (2001)).

currency results change only in case of Poland, where no evidence for positive feedback trading is evident.

Impulse responses at a daily horizon (Figure 4) show that both flow and return effects vanish very soon. This contradicts to Froot et al. who argue that after a weak immediate response in the endogenous variables considerable reaction will follow over the coming weeks. The authors attribute the prolonged price effect of flows to foreign investors' informational advantage, and Richards (2005) notes that such a result is remarkable in that it implies that foreign investors may trade with no contemporaneous but considerable lagged influence which is "suggestive of a strong type of inefficiency" in the markets studied. Besides its short-lived reaction mentioned above the flow response makes one more interesting point. After an immediate jump to a higher level it decreases on the next day. Further, as opposed to monthly results on Turkey, the flow impact of a price shock is an increase in net purchases for two days. This indicates the presence of positive feedback trading and suggests that very different trading mechanisms are present at the different time horizons. Domestic currency results support these findings.

4.2.2 Restricted VAR

Reduced form models suffer from basic weaknesses. With such a system of simultaneously determined variables we face a fundamental econometric problem, the identification of the VAR[27]. Without clearly specifying and imposing an economic structure, reduced form VARs are hard to understand.Therefore, I make additional assumptions that characterize the interaction between flows and returns and identify the mechanism of unobserved shocks. This leads to the

[27] Identification is done on the level of the error terms of the system. These error terms are defined to be a linear combinations of exogenous shocks (Lütkepohl and Kraetzig, 2004, p. 159)

structural vector autoregression approach. Using this framework, first I replicate the bivariate model of Froot et al. (2001) using the identification assumptions proposed by Hasbrouck (1991), then I relax the restriction that flows do not react to public information.

The considerations based on Hasbrouck's model suggest a VAR system of the form:

$$Ay_t = \alpha^* + A_1^* y_{t-1} + A_2^* y_{t-2} + ... + A_3^* y_{t-n} + B\varepsilon_t$$

To identify the structural model, restrictions on the parameter matrices are needed. Here, $y^T_{(1\times 2)}$ is the same as vector of endogenous variables as before, matrix $A_{(2\times 2)}$ identifies the contemporaneous flow-return relations, $\alpha^*_{(2\times 2)}$ is the matrix of constans, $(A_i)^*_{(2\times 2)}$ with i = 1 to p is the matrix of structural coefficients, and ε_t are the structural shocks. ε_t is a zero mean white noise process with the variance-covariance matrix $E(\varepsilon_t \varepsilon_t^{'}) = \sum_\varepsilon$ being a diagonal matrix. This structural form results in the previously defined reduced-form VAR if we premultiply the system by A^{-1}, and set $A_i = A^{-1} A_i^*$, i = 1 to n, $\alpha = A^{-1}\alpha^*$ and $u_t = A^{-1} B\varepsilon_t$.

To perform tests of the main hypotheses, again, impulse response analysis based on the structural interpretation of the VAR is used (Figures 5-8). I look at one standard deviation shocks. Responses are also measured in standard deviation and are calculated for up to 15 months and 15 days, respectively. I use the AB model where identification is reached by imposing restrictions on matrices A and B. In the exactly identified system of Froot et al. (2001) flows are determined by past flows and past returns, whereas, returns are determined by current flows, past flows and past returns. This implies that A will be a lower triangular matrix and B a diagonal matrix:

$$A = \begin{bmatrix} 1 & 0 \\ a_{21} & 1 \end{bmatrix} \qquad B = \begin{bmatrix} b_{11} & 0 \\ 0 & b_{22} \end{bmatrix}$$

I follow the general consensus that structural innovations should be jointly and serially uncorrelated (orthogonal). This assumption is crucial to be able to consider the dynamic impact of an isolated shock.

First I examine the response in net purchases (normalized by total market capitalization) to innovations in domestic US dollar denominated returns (Figures: Flow response to a return shock). Whereas for Hungary and Poland the monthly responses are individually insignificant, in Turkey the negative relationship between current flows and the unexpected positive surprise in previous month's prices is borderline significant. The result is more evident in the response of net purchases to a shock in local currency returns, showing that monthly net purchases are negatively influenced by past monthly returns, irrespective of the currency of denomination. Further, it suggests that positive feedback trading found by others for emerging Asian and Latin American countries may not be general to the whole universe of emerging markets. Foreigners' trading pattern in Turkey contradicts conclusions by Alemanni and Ornelas (2007). According to their work, unhedged investors engage in negative feedback trading while hedged investors engage in positive feedback trading (or do not feedback trade at all). Interestingly, it is evident again that if daily return-flow dynamics are examined, the lagged flow impact of a positive surprise in returns stands in marked contrast with the monthly dynamics. Following a sudden jump in returns, foreign net purchases increase. This effect lasts only for two days, afterwords the individual flow response becomes insignificant.

Next, I examine the contemporaneous flow effect on prices (figures: Return response to a flows shock). Figures suggest that it is positive and significant in each case (such an effect was excluded in the unidentified model). One period later, the flow effect already varies for the three countries. Still significantly positive for Hungary (and this lasts till the second month after the impact), marginally significant and positive for Turkey (effect disappears completely in the second month after the shock) and borderline significantly negative in case of Poland (after the second month point estimates become insignificant except for the fifth month). Except for Hungary, first month lagged responses are the same as in the unrestricted model.

The immediate increase in prices can be interpreted as price pressure. As argued by Warther (1995) this is due to the increased demand for domestic equity and resulting illiquidity. Richards (2005) relates this explanation to the perceptions of foreign investors about the valuation of the respective emerging market stocks. According to this view, foreign market participants may perceive domestic prices as being cheap. This increases their appetite to buy emerging market equities, and provided supply is not perfectly elastic, increasing demand pushes current prices up. Moreover, under the contemporaneous identification assumption employed in this subsection the strong contemporaneous positive flow-return association seems to be consistent with the theories based on the *uninformedness* of foreign investors with respect to local information, such as Brennan and Cao (1997) and Griffin et al. (2004),. However, as net foreign flows may also affect local returns, the documented contemporaneous association does not necessarily provide conclusive support for these theories.

Shock dynamics in Poland show signs for temporary price pressure. As Froot et al. argue, positive contemporanoues effect followed by negative lag effect suggests that a sudden upsurge in flows is accompanied by a temporary price increase, and hence a brief increase in current returns, it does not mean however, that current flows would predict negative future returns. This argument is based on two fundamental assumptions (originated from Hasbrouck's, 1986 work). First, market participants adjust their expectations about current flows according to observed lagged net flows. Second, expected high net inflows build in the prices and push prices up[28]. In addition, the larger the observed past net flows, the higher are expected current net purchases. With the actual current net purchases known, the higher the ex ante expected value, the lower is the ex post unexpected surprise flow component. If this surprise component decreases, prices fall since expectations are not met and too high prices are not rational anymore. Since in the present case price increase was triggered by the sudden increase in flows, we should expect high prices to endure if investors' expectations about further inflows are met. However, we see instead prices to plunge, which means market participants overestimate subsequent net inflows. It is important to note that flows do not need to subside after the shock, it is perfectly enough that the growth in flows is not as high as expected. Results employing returns denominated in local currency show the very similar impulse responses.

The flows response to an unexpected own shock marks strong persistence in Poland (up to six months) (Figure7, Flow response to a flow shock), somewhat less in Hungary (three months) and very weak in Turkey. This persistence supports that net purchases need not decline after a rise for prices to fall, as they do in Poland. This autocorrelation may be caused by foreign investors trading in the same direction but with different response time in adjusting their trading to new information or as classical models argue, observed flow persistence is a sign of informed trading (see for example Froot and Donohue, 2002; Albuquerque et al. 2004; and Odean and Gervais, 2001). The latter contradicts Brennan and Cao (1997) in that the authors assume foreign investors have an information disadvantage.

[28]This is perfectly in line with the evidence seen previously that high net inflows induce contemporaneous price increase.

The VAR analysis at daily horizon shows that the only major difference between the restricted and unrestricted model (at daily horizon) is, that defining the causality running from flows to returns results in a significant immediate price response to innovation in flows.

As discussed previously it is rational to assume that the strong contemporaneous relationship between flows and returns may be partly a result of a common third factor influence in that both flows and prices react to public information. Based upon these considerations the bivariate model is too restrictive and it should be extended to account for exogenous factors as well. If not, the model may fail to reveal the true dynamic relationship between flows and returns.

4.2.3 Extended VAR

In the extended VAR framework the data vector will be augmented to include the developed[29] (E) and emerging market (EM) return, credit spread (CS), and credit default swap (CDS), respectively. By reason of the relatively short sample size, the number of variables that can be included into the model is limited. Therefore, different specifications of a four-variable VAR will be estimated with the data vector including: i. the developed market returns, and global emerging market returns, net purchases and stock returns[30] ii. developed market returns, credit spread and the two endogenous variables iii. credit spread, credit default swap, net purchases and domestic returns.

The control variables are not mutually exclusive as evident from the significant contemporaneous correlations among them. The endogeneity among these variables leaves the

[29] Results with the MSCI World Index are very similar, therefore results are presented with only one variable, MSCI Europe, controlling for developed market returns.

[30] Results if substituting the developed markets index return with the world return are very similar, therefore, these are omitted.

contemporaneous identification ambiguous. I tackle this problem by employing a strategy that is biased against finding a significant role for the new control variables introduced in this paper (E, EM, CS, CDS). Namely, I order EM after E in the first specification, in the second specification E after CS, and in the third CDS after CS. This way I would find significance only if these variables contain additional exclusive information that is not captured by the global developed market index returns (or, the variable at the top of the ordering). Hence, any significance would confirm the efficacy of adding these variables into the specification, while the actual significance could be larger than implied by these results. Further, I assume that the exogenous variables are not determined by lagged values of the endogenous variables, therefore lag restrictions will be imposed[31]. In addition, the two control variables in the four-variable VAR are allowed to affect both current and future values of foreign flows and domestic returns, but not vica versa. This way, control variables will appear as endogenous variables in the system but still exogenous to the variables of main interest. Between flows and returns the causality runs from flows to returns as in Hasbrouck (1991)

With the bivariate model extended for each specification by two of the exogenous variables, identification is established using the AB model[32]. More precisely, the following SVAR specification is estimated:

$$Ay_t = \alpha^* A_1^* y_{t-1} + A_2^* y_{t-2} + ... + A_3^* y_{t-n} + B\varepsilon_t$$

[31] This is a rational assumption (however, in some cases it might be questioned). Take Hungary as an example. It is perfectly plausible to expect that lagged Hungarian returns will not affect European developed countries'current equity returns. Maybe they would if the country would be a part of the Euro Zone, but this is not the case (similarly for Turkey and Poland). Further, the country's share in the MSCI Emerging Markets index is negligable[31].

[32] This model was proposed by Amisano and Giannini (1997). It combines restrictions on both matrices, A and B.

where:

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 \\ a_{41} & a_{42} & a_{43} & 1 \end{bmatrix} \qquad B = \begin{bmatrix} b_{11} & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 \\ 0 & 0 & b_{33} & 0 \\ 0 & 0 & 0 & b_{44} \end{bmatrix}$$

and the data vector with the stationary variables has the form: $y^T_{(1\times4)} = \left[X_{1t}, X_{2t}, NF_t, R_t\right]$. Here, X_{1t} and X_{2t} denote the two control variables, which are different depending on the model specification. This set of restrictions reflect the credible assumption that general economic conditions, conditions in developed markets, the general appetite towards emerging markets (to the degree that these are captured in the relevant returns) affect domestic emerging stock markets, but “domestic market variables are unlikely to affect these variables” (Ülkü and Weber, 2011, p. 14). Such a hypothesis would not necessarily hold if the stock markets considered would have a big enough weight in the aggregate world of stock market transactions or if the time period covered would be characterized by some major event(s) that had significant influence on the other external control variables used. As none of these characterizes my sample, the model is identified using the above discussed restrictions. First I examine the impulse response functions for the first specification. The data vector has the following form: $y^T_{(1\times4)}$ = [MSCI Europe, MSCI Emerging Markets, Net flows, Domestic returns] .

4.2.3.1 *Impulse response analysis: a shock in foreign returns*

The impulse response functions for Turkey (Figure 10) reveal two key findings. First, there is a significant contemporaneous and one month lag positive relationship between foreign flows and developed European and global emerging market returns, respectively. This is even more remarkable in the light of the second finding: the robust evidence for negative feedback trading in Turkey. The negative feedback trading for Turkey is also documented by İkizlerli and Ülkü (2010), but here I find evidence for the contrarian trading behavior of foreigners being robust even after accounting for developed market and emerging market returns. The negative lagged response to domestic returns and the positive lagged response to foreign returns is even more evident with impulse response functions based on local currency returns. Together these findings show that foreign investors are more sophisticated traders than assumed by models describing foreign traders as return chasers (Bohn and Tesar (1996)) or traders with information disadvantage who extrapolate their expectations further in the future than domestic investors do. Therefore when returns rise, they revise their expected returns more than local investors do, and end up as net buyers. (Brennan and Cao (1997), Griffin et al. (2004)). 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. An alternative explanation, put forward by Ikizlerli and Ülkü (2010), suggests that in an environment characterized by volatile fundamentals, sentiment trading associated with foreign investors being sophisticated informed traders, who take advantage from high fluctuations would also lead to the conclusion that foreigners pursue contrarian trading.

Forecast error variance decompositions based on the same specification are presented in Table 14. It is useful to assess the relative role played by variables in the VAR system in explaining foreign flows and local returns. For Turkey, global emerging market returns have a significant explanatory power in determining net foreign flows that operates with lags of several months (column e, Turkey). It is also noteworthy that a significant portion of the error variance in flows (unlike that in returns) is accounted for by own lagged values.

Figure 9 portrays somewhat different picture for impulse responses in Hungary than in Turkey. It seems that developed market returns exert more influence on foreign flows directed to Hungary than do emerging market return changes. Foreign flows significantly positively react to innovations in European developed markets, but respond to changes in emerging market returns with a considerable delay (as it can be seen from the positive significant third month lagged response). This may be a reflection of the effect of European Union membership resulting in more relevance of European benchmarks at the expense of global emerging market factors. The flow response to US dollar return shock shows some weak signs for negative feedback trading in Hungary, this effect becomes more evident with local returns (Figure 13). The error variance decomposition shows that the largest portion in the flow error variance is to be attributed to own lagged effects (as in Turkey), and domestic US dollar denominated returns plays no role until the fourth month of the forecast horizon. Compared to Turkey, evidence on negative lagged response to US dollar return shocks seems unplausible.

In Poland (Figure 11), results are very similar to those in Hungary. Impulse responses imply that flows significantly and positively react to innovations in developed market returns, both contemporaneously and with one month lag, the delayed response being even greater than the same month response. Further, no contemporaneous relationship can be discovered between flows and innovations in emerging market returns. Yet, the most important finding for Poland is the striking difference between the flow impact of local currency denominated price shock and US dollar denominated price shock. Whereas no significant response can be seen in the former case, the negative feedback trading in the latter is as strong as in Turkey. The error variance decompositions paralells the relations found for Hungary.

The extended VAR model with daily (Figure 12) data strengthens the previous signs on positive feedback trading at a daily horizon, furthermore, it shows a very strong contemporaneous and one day lagged response to a positive surprise in foreign returns (global emerging market returns and European developed market returns). The intuition on different trading mechanisms working at different time horizons is robust, as well as, the previous finding that all the effects die out very soon after the impact. More interesting are the intuitions provided by the error variance decompositions of the flow and return response. The error variance decomposition confirms that foreign flows to Turkey are more sensitive to changes in emerging markets as a whole than to changes in developed markets in Europe. And, more importantly, lagged values of daily flows and daily returns, respectively, account for almost the same percent (20%) of error variance in US dollar returns. This is an impressive difference compared to the magnitudes obtained with monthly data. It is also noteworthy that lagged flow values play a significantly smaller role in the flow error variance than at the monthly horizon (59% as opposed to 96).

To evaluate robustness of the results, I performed the VAR analysis with reverse ordering of the MSCI Europe and MSCI Emerging Markets indices (with emerging markets index coming first). Nothing changes for Hungary and Turkey. Contemporaneous and one period lagged flow responses are significant to innovations in both indices. With emerging markets index preceding developed Europe index, the contemporaneous flow response to the former becomes significant in Poland as well.

Three relevant conclusions can be drawn. First, emerging market conditions play a significant role in foreign investors' portfolio decisions. Previous studies either emphasized the importance of home market factors (the so-called "push factors"), or investigated the relative role played by local market conditions in international capital flow (the so-called "pull factors"), but emerging markets as a whole were generally ignored. Second, (negative) feedback trading is evident using local currency denominated returns. In a model with local currency returns, negative feedback trading seems to be a general pattern, provided both flows and returns are allowed to react to public information (contemporaneously and delayed). This is consistent with Hau and Rey (2004) rebalancing theory where the contrarian trading behavior is triggered by a motive of managing foreign exchange exposure. They argue that a rise in equity returns in the domestic market inreases the share of investors' wealth in domestic equity assets and thus their exchange rate exposure, which in turn induces foreign investors to liquidate some of their positions[33]. Since net purchases reflect changes in portfolio weights, as foreign traders try to bring these back to their desired level, their activity appears as engaging in negative feedback trading, i.e. selling the winning positions after a rise in prices. According to Hau and Rey's theory, I should observe the same (even stronger) contrarian trading patterns with local currency returns, since by using local instead of US dollar returns, I basically assume that investors do not hedge their position. This would imply that they should be even more sensitive to market movements than when perfect (or imperfect) exchange rate risk trading is assumed. These differential results remain a puzzle, and I attribute it to possible bias in the exchange rates used.

[33] This implies that portfolio rebalancing effect is induced by a shock to the domestic stock market performance (Hau and Rey, 2004).

And finally, foreigners pursue different trading strategies at the daily and monthly horizons respectively.

Available evidence on negative feedback trading at the monthly horizon, combined with positive feedback trading at higher frequencies, and the strong positive contemporaneous flow-return interaction points to a hypothesis that foreign investors react to information instantaneously, as argued by Brennan and Cao (1997) and Griffin et al. (2004), but then shift to negative feedback trading over the next few months.

4.2.3.2 IMPULSE RESPONSE ANALYSIS: A SHOCK IN FOREIGN RETURNS AND INVESTORS' RISK APPETITE

For the second specification the data vector will have the following form: $y^{T}_{(1\times 4)}$ = [Credit spread[34], MSCI Europe, Net flows, Domestic returns]. The above impulse response analysis and error variance decomposition show that innovations in the MSCI Europe index variable have a higher influence on both foreign flows and domestic returns than a surprise in global emerging market returns. This setup is designed to reveal whether foreign flows react to changes in investors risk appetite as proxied by the credit spread. Monthly results (Figure 14 and 15) are remarkable in that the impulse responses imply that as soon as credit spread is added to the model, the response to innovations in European developed market returns renders to insignificance in Hungary and Poland, while in Turkey it decreases in magnitude and is significant only in the month of the impact. This is a very strong contrast to previous results. Error variance decomposition (Table 15) also shows that credit spread accounts for a higher share in the flow forecast error variance than developed market returns. The impulse responses

[34] I also tested the specification with the volatility index proxying for risk appetite and obtained somewhat weaker results than with the credit spread.

imply that investors' risk averseness plays an influencial role in their portfolio decisions in the emerging markets examined, higher than the information that can be inferred from developed market returns in Europe. This is a very strong and plausible result. As emerging equities constitute a high-risk asset class, it is natural to expect flows towards them to be highly responsive to changes in risk appetite.

Figures also imply, that previous findings on evidence for negative feedback trading remain unaffected. The flow impact of a price shock has the characteristics as before including the credit spread. The same conclusion can be drawn if switching to returns denominated in local currency. Impulse responses at the daily horizon remain mostly unaffected. Both flows and returns respond negatively to an unexpected increase in credit spread, which is a credible result, the flow response to innovations in foreign and domestic returns is significantly positive, only contemporaneously in the first case and instantaneously and delayed in the latter (indicating positive feedback trading).

At the present stage the analysis implies that investors risk appetite has an influencial role in determining international equity portfolio flows, and it is still consistent with a portfolio rebalance theory. To better understant what role the risk factor plays in portfolio decisions, I examine how a sudden change in any of the examined country's credit rating affects foreign equity holdings in that country. Since CDS rates are not available for the whole sample period of the endogenous variables, in order to avoid erroneous inferences, I reestimate the second specification for the same sample period for which credit ratings are available to see whether contrarian trading is robust for different sampling periods. Results show no significant evidence for negative feedback trading after 2000 with respect to US dollar returns[35] On the contrary, with local currency returns, negative lagged response is still present.

4.2.3.3 IMPULSE RESPONSE ANALYSIS: A SHOCK IN FOREIGN INVESTORS' RISK APPETITE AND THE CREDIT DEFAULT SWAP RATE

In this section the data vector will include the following variables: $y^{T}_{(1\times4)}$ = [Credit spread, Credit default swap rate, Net flows, Domestic returns]. The flow response to an unexpected increase in credit ratings and the credit spread are in line with expectations. This confirms validity of my control variables as well. As an immediate reaction, flows plunge following a rise in the CDS rate and the spread, respectively. What is even more interesting, is the flow response to innovations in local currency returns after accounting for investors' risk appetite and the host country's changing risk rating (Figures 16 and 17). It is clear that negative feedback trading with respect to local returns is present in Turkey and Poland. This suggests that investors actively manage their exchange rate risk in that they rebalance their holdings in emerging equities following domestic market movements (Hau and Rey, 2004). As for Hungary, portfolio rebalancing might be present, but it seems that it is dominated by investors' general risk averseness, the country's creditworthiness, and general macroeconomic conditions.

[35] The impulse response for Turkey with the restricted sample size portrays exactly the same picture that I got previously for Hungary when using the whole sample period.

5 CONCLUSION

This paper fills an important gap in the literature by providing evidence on the behavior and impact of foreign investors in European emerging stock markets. The empirical analysis in this paper enables me to assess the generalizability of previous conclusions, and to discover some new characteristics.

First, the current paper provides evidence that the general risk assessment of a country, investors' risk averseness and information about global macroeconomic conditions relevant to emerging economies, proxied by credit rating, credit spread, and MSCI Emerging Markets index returns, respectively, have significant additional explanatory power on net foreign flows towards emerging markets, after controlling for global developed market returns. In particular, there is a positive relationship between flows, European developed market returns and emerging market returns, respectively, but a negative relationship between flows, credit spread and the country's credit rating (except for Poland where the latter is insignificant).

This implies, that home market factors (so-called "push factors") relevant for international equity flows include risk averseness and information about global emerging markets' macroeconomic conditions. At the same time, a universal change in the risk assessment of a particular emerging market is also an important determinant of foreign flows into that country. Hence, models investigating the interaction between net foreign flows and local returns should control for these three factors in addition to global developed market returns. These results suggest that portfolio rebalancing following returns in the home market may not be the only explanation for the positive relation between foreign investor flows and global stock returns.

Second, foreign investors engage in negative feedback trading with respect to domestic local currency denominated returns at the monthly frequency. This result is strong and significant in Turkey and Poland, but weaker in Hungary. The finding is not robust to the currency of denomination used to calculate returns. The contrarian trading effect vanishes in Hungary and Poland, provided foreigners do not hedge their positions for exchange rate risk at all. If I assume that investors pursue perfect risk trading, evidence on negative feedback trading in Poland and Turkey is robust even after accounting for the influence of third factors. On the contrary, if credit spread or the country's risk rating is added to the model, the evidence on Hungary eventually disappears. This type of differential behavior may be a reflection of foreign investors long-term perception of the riskiness of a particular market.

The paper suggests that earlier results of positive feedback trading at the monthly frequency might have driven by failure to control for third factors appropriately and in a few cases (e.g. Dahlquist and Robertsson, 2004, on Sweden) by the post-liberalization effects. The finding on positive feedback trading on a daily basis support Ülkü and Weber (2011) who show that in Turkey, Korea and Taiwan, foreigners positive feedback-trade at the daily frequency but negative feedback-trade at the monthly frequency. Thus, available evidence points to a hypothesis that foreign investors react to information instantaneously, as argued by Brennan and Cao (1997) and Griffin et al. (2004), but then shift to negative feedback trading over the next few months. This may be consistent with Hau and Rey's theory of rebalancing away from outperformers (i.e. selling after the market rises to bring the currency exposure back to the original – diversified – level). However, Hau and Rey's theory needs a revision: it predicts a contemporaneous negative relationship between net foreign flows and local returns, but the results documented in this paper suggest that such rebalancing takes place with a lag of at least one month, which is intuitive given possible delays in international institutional investors' decision making processes.

Hence, my findings imply that foreign investors have a sophisticated response to available information.

References

Adabag, M. C. and Ornelas J. R. H. (2004), "Behavior and Effects of Foreign Investors on Istanbul Stock Exchange", Working Paper, SSRN.

Albuquerque, R., Bauer G. H., and Schneider, M. (2004), "International Equity Flows and Returns: A Quantitative Equilibrium Approach. Bank of Canada", Working Papers Series, number 04-42.

Alemanni, B. and Ornelas, J. R. H. (2007), "Behavior and Effects of Equity Foreign Investors on Emerging Markets" Working Paper.

Amisano, G. and Giannini, C. (1997), "Topics in Structural VAR Econometrics", 2^{nd} ed., Springer - Verlag, Berlin.

Bae, S. C., Min, J. H., and Jung, S. (2011), "Trading Behavior, Performance and Stock Preference of Foreigners, Local Institutions, and Individual Investors: Evidence from the Korean Stock Market", Asia-Pacific Journal of Finantial Studies, 40, 199-239.

Bekaert, G. and Harvey, C. R.(2000) "Foreign Speculators and Emerging Equity Markets." Journal of Finance, 55, 565-613.

Bekaert, G.; Harvey; C. R., and Lumsdaine, R. L. (2002), "The Dynamics of Emerging Market Equity Flows", Journal of International Money and Finance, 21, 295-350.

Bohn H. and Tesar I. L. (1996), "U.S. Equity Investment in Foreign Markets: Portfolio Rebalancing or Return Chasing?" American Economic Review, 86, 77-81

Bowe, M. and Domuta, D. (2004), "Investor Herding During Financial Crisis: A Clinical Study of the Jakarta Stock Exchange", Pacific-Basin Finance Journal 12, 387– 418.

Brennan, M. J. and Cao, H. (1997), "International Portfolio Flows", Journal of Finance, 52, 1851-1880.

Cao, C., Chang, E., and Wang, Y. (2008), "An Empirical Analysis of the Dynamic Relationship between Mutual Fund Flow and Market Return Volatility", Journal of Banking and Finance 32, 2111–2123.

Choe, H., Kho; B. C., and Stulz, R. M. (1999), "Do Foreign Investors Destabilize Stock Markets? The Korean Experience in 1997", Journal of Financial Economics, 54 , 227264.

Choe, H., Kho; B. C., and Stulz, R. M. (2000), "Do Domestic Investors Have more Valuable Information about Individual Stocks than foreign investors", Working Paper, Ohio State University.

Clark. J. and Berko E. (1997), "Foreign Investment Fluctuations and Emerging Market Stock Returns: The Case of Mexico", Federal Reserve Bank of New York Staff Report 24.

Dahlquist M., and Robertsson, G. (2004), "A Note on Foreigners' Trading and Price Effects across Firms", Journal of Banking and Finance, 28, 615-632.

Danielsson, J.and Love, R. (2006), “Feedback Trading”, International Journal of Finance and Economics, 11, 35-53.

Edelen, R. M., Warner, J. B. (1999),. “Why are Mutual Fund Flow and Market Returns Related? Evidence from High-Frequency Data”, Unpublished Working Paper, University of Rochester, Rochester, NY.

Froot, K., and Donohue, J. (2002), “The Persistence of Emerging Market Equity Flows”, Emerging Markets Review, 3 (2002), 338-364.

Froot, K. A., and Ramadorai, T. (2001), “The Information Content of International Portfolio Flows”, Working Paper 8472, NBER.

Froot, K.; O'Connel; P., and Seasholes, M. (2001), “The Portfolio Flows of International Investors”, Journal of Financial Economics, 59, 151-193.

Fry, R., Hsiao, Y. L., and Tang, C. (2010), “A Comparison of Seven Crises: Coskewness Contagion Testing”, Unpublished Working Paper, Australian National University and La Trobe University.

Griffin, J. M..; Nardari; F., and Stulz, R.M. (2004), “Are Daily Cross-Border Equity Flows Pushed or Pulled?”, The Review of Economics and Statistics, 86, 641-657.

Grinnblatt, M. and Keloharju, M. (2000). "The Investment Behavior and Performance of Various Investor Types: A Study of Finland's Unique Data Set”, Journal of Financial Economics, 55, 43-67.

Hamao, Y., Mei, J. (2001), “Living with the “Enemy”: an Analysis of Japanese Experience with Foreign Investment”, Journal of International Money and Finance, 20, 715-735.

Harris, L. and Gurel, E. (1986),“Price and Volume Effects Associated with Changes on the S&P 500 List: New Evidence for the Existence of Price Pressures”, Journal of Finance, XLI, 815–829.

Hasbrouck, J. (1991), “Measuring the Information Content of Stock Trades”, Journal of Finance, 46(1), 179-206.

Hau, H., and Rey, H. (2004): “Can Portfolio Rebalancing Explain the Dynamics of Equity Returns, Equity Flows and Exchange Rates?”, American Economic Review, 94, 126133.

Henry, P. B. (2000),”Stock Market Liberalization, Economic Reform, and Emerging Market Equity Prices”, Journal of Finance, 55, 529-564.

Ikizlerli, D. and Ülkü, N. (2010), “The Interaction between Foreigners' Trading and Stock Returns: Evidence from Turkey”, Working Paper, Central European University (2010).

Karolyi, G. A. (2002), “Did the Asian Financial Crisis Scare Foreign Investors out of Japan?”, Pacific Basin Finance Journal, 10, 411-442.

Kim, E. H. and Singal, V. (1997), “Are Open Markets Good for Foreign Investors and Emerging Nations?”, Journal of Applied Corporate Finance, 10, 18-33.

Kim, W. and Wei, S.J. (2002), “Foreign Portfolio Investors Before and During a Crisis”, Journal of International Economics, 56, 77-96.

Kodres, L.E. and Pritsker, M. (2002), “A rational expectations model of financial contagion”, Journal of Finance, 57, 769–799.

Lütkepohl, H. and Kraetzig, M. (2004), “Applied Time Series Econometrics”, Cambridge University Press, p. 159.

Odean, T. (1998), “Are investors reluctant to realize their loses?”, Journal of Finance, 53, 1775-1798.

Odean, T. and Gervais (2001), “Learning to be Overconfident”, The Review of Financial Studies, 15, No 1, 1-27.

Richards, A. (2005), “Big Fish in Small Ponds: The Trading Behavior and Price Impact of Foreign Investors in Asian Emerging Equity Markets”, Journal of Financial and Quantitative Analysis, 40, 1-27.

Seasholes, M. (2002), “Smart Foreign Traders in Emerging Markets”, Working Paper, University of California at Berkeley.

Stulz, R. (1999), “International Portfolio Flows and Security Markets”, In Feldstein, M., (Ed.), International Capital Flows, National Bureau of Economic Research.

Tesar, L., Werner, I. (1994), “International Equity Transactions and US Portfolio Choice”, In: Frankel, J. (Ed.), The Internationalization of Equity Markets, University of Chicago Press, 185-220.

Tesar, L., Werner, I. (1995), “Home Bias and High Turnover”, Journal of International Money and Finance, 14, 467-492.

Warther, V. A.(1995), “Aggregate Mutual Fund Flows and Security Returns”, Journal of Financial Economics, 39, 209-235.

World Bank (1997), “Private Capital Flows to Developing Countries: The Road to Financial Integration”, Oxford University Press.

6 TABLE APPENDIX

Table 1. List of variables

Description	Frequency	Units	Period
Total net foreign purchases of equities - Hungary	Monthly	Percent of market capitalization	1995/2-2010/11
Total net foreign purchases of equities - Turkey	Monthly, daily	Percent of market capitalization	1997/1-2010/11, 11/29/2005-05/06/2011
Total net foreign purchases of equities - Poland	Monthly	Percent of market capitalization	2000/1-2010/11
Domestic currency return on BUX index	Monthly	Percent change	1995/2-2010/11
Domestic currency return on ISE All stocks index	Monthly, daily	Percent change	1997/1-2010/11, 11/29/2005-05/06/2011
Domestic currency return on WIG index	Monthly	Percent change	2000/1-2010/11
USD return on BUX index	Monthly	Level, Percent change	1999/1-2010/11
USD return on ISE all stocks index	Monthly, daily	Level, Percent change	1998/12-2010/11, 11/29/2005-05/06/2011
USD return on WIG index	Monthly	Level, Percent change	2000/1-2010/11
Return on MSCI Emerging Markets dollar index	Monthly, daily	Percent change	1995/2-2010/11, 11/29/2005-05/06/2011
Return on MSCI Europe dollar index	Monthly, daily	Percent change	1995/2-2010/11, 11/29/2005-05/06/2011
Return on MSCI World dollar index	Monthly, daily	Percent change	1995/2-2010/11, 11/29/2005-05/06/2011
Percent change in Chicago Board Options Exchange Market Volatility Index	Monthly, daily	Percent change	1995/2-2010/11, 11/29/2005-05/06/2011
Credit spread	Monthly, daily	Level, Percent change	1995/2-2010/11,11/29/2005-05/06/2011
Crisis dummy	Monthly	values. 0,1	1995/2-2010/11
Credit default swap rate on a 5 year bond, Hungary	Monthly	Percent change	2000/11-2010/11
Credit default swap rate on a 5 year bond, Turkey	Monthly, daily	Percent change	2002/4-2010/11
Credit default swap rate on a 5 year bond, Poland	Monthly	Percent change	2000/11-2010/11

Table 2. Summary statistics

	Monthly									Daily		
	Net flow			Return, Domestic currency			Return, USD			Nat flow	Return, TRL	Return, USD
	Hungary	Turkey	Poland	Hungary	Turkey	Poland	Hungary	Turkey	Poland	Turkey	Turkey	Turkey
Mean	0.13%	0.05%	0.02%	0.67%	0.23%	0.03%	1.20%	0.57%	0.55%	-0.86%	0.02%	0.02%
Median	0.05%	0.06%	0.04%	1.55%	1.69%	0.96%	2.36%	3.68%	0.88%	5.11%	0.05%	0.05%
Maximum	4.70%	1.19%	1.13%	27.14%	54.30%	19.36%	28.12%	54.33%	19.01%	228.62%	5.06%	9.16%
Minimum	-4.35%	-1.19%	-1.11%	-45.34%	-54.45%	-26.94%	-47.77%	-52.53%	-21.21%	-525.58%	-3.87%	-5.28%
Std. Dev.	1.06%	0.28%	0.36%	8.75%	14.18%	7.83%	10.12%	15.81%	8.72%	71.60%	0.81%	1.11%
Skewness	0.29	-0.29	0.18	-0.93	0.03	-0.22	-1.13	-0.54	-0.08	-0.83	-0.17	-0.10
Kurtosis	7.37	6.27	4.32	7.52	5.67	3.58	7.48	4.74	2.66	6.28	6.45	9.39
1st order AC	0.27	0.22	0.35	0.10	-0.03	0.05	0.15	-0.01	0.07	0.09	0.05	0.10
Observations	190	167	131	190	167	131	190	167	131	1369	1358	1358

Table 3. Summary table on Granger causality tests

Panel (a)

	MONTHLY											
	USD return						Local currency return					
	bivariate			exogenous			bivariate			exogenous		
Null hypothesis	Hungary	Turkey	Poland	Hungary	Turkey	Poland	Hungary	Turkey	Poland	Hungary	Turkey	Poland
Flow does not Granger cause return	FALSE	FALSE	FALSE	TRUE	FALSE	FALSE	FALSE	FALSE	FALSE	TRUE	FALSE	TRUE
Return does not Granger cause flow	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	TRUE	FALSE	TRUE	TRUE	FALSE	TRUE

Panel (b)

	DAILY			
	USD return		Local currency return	
	bivariate	exogenous	bivariate	exogenous
Null hypothesis	Turkey	Turkey	Turkey	Turkey
Flow does not Granger cause return	FALSE	TRUE	TRUE	TRUE
Return does not Granger cause flow	FALSE	FALSE	FALSE	FALSE

Table 4. Testing Granger causality, H_0. Flow does not Granger cause US dollar returns at the monthly horizon

Panel (a)

		Hungary							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept		0.00892	0.008821	0.008446	0.008916	0.008464	0.010217	0.011688	0.007494
Returns	Lag 1	0.104983	-0.009234	-0.044783	0.090779	0.104751	0.036848	0.019948	0.008405
Net flows	Lag 1	1.219732*	1.160497*	1.220316*	1.234657*	2.009934**	1.118742*	0.910199	0.838057
MSCI Europe	Lag 1		0.394035*						
MSCI Emerging Europe	Lag 1			0.342397*					
MSCI World	Lag 1				0.015428				
Crisis dummy*Net flows	Lag 1					-1.376214			
Volatility index	Lag 1						-0.095352		
Credit spread (1)	Lag 1							-0.276848**	
Credit spread (2)	Lag 1								-0.246312*
Wald p value		0.0766	0.0332	0.0179	0.0635	0.024	0.0314	0.0076	0.0094
Adjusted R2		0.025865	0.042759	0.042945	0.020989	0.025848	0.041972	0.053801	0.061662

Panel (b)

		Turkey							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept		0.002580	0.002125	0.001398	0.002993	0.005040	0.003145	0.004324	0.005043
Returns	Lag 1	-0.082574	-0.196776**	-0.171860*	0.044387	-0.066776	-0.139669	-0.135655	-0.143273
Net flows	Lag 1	8.971518**	7.795612***	7.183090*	9.158805**	1.818721	8.613172**	8.210780**	8.548871**
MSCI Europe	Lag 1		0.652391**						
MSCI Emerging Europe	Lag 1			0.398933					
MSCI World	Lag 1				-0.132185***				
Crisis dummy*Net flows	Lag 1					12.41374*			
Volatility index	Lag 1						-0.145088		
Credit spread (1)	Lag 1							-0.232022	
Credit spread (2)	Lag 1								-0.213330
Wald p value		0.0409	0.0264	0.1090	0	0.0229	0.0673	0.1149	0.1009
Adjusted R2		0.007555	0.030260	0.017482	0.002969	0.013666	0.023886	0.011189	0.015712

Panel (c)		Poland							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept		0.004637	0.004317	0.006673	0.005055	0.004573	0.004415	0.004778	0.004653
Returns	Lag 1	0.102580	0.130208	0.148218	0.134690	0.104305	0.123972	0.089701	0.102134
Net flows	Lag 1	-4.707717**	-4.772481**	-4.955069**	-4.565537**	-5.668968*	-5.036187**	-4.839496**	-4.709989**
MSCI Europe	Lag 1		-0.206586						
MSCI Emerging Europe	Lag 1			-0.243981*					
MSCI World	Lag 1				-0.058981				
Crisis dummy*Net flows	Lag 1					1.410698			
Volatility index	Lag 1						0.086379*		
Credit spread (1)	Lag 1							-0.068405	
Credit spread (2)	Lag 1								-0.003118
Wald p value		0.0276	0.0870	0.0298	0.0796	0.0996	0.0301	0.0727	0.1372
Adjusted R2		0.024242	0.029851	0.044711	0.027894	0.017230	0.043441	0.020255	0.016510

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 5. Testing Granger causality, H_0. US dollar Return does not Granger cause flow at the monthly horizon

		Hungary							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept		0.000855	0.000847	0.000835	0.000855	0.000894	0.000953	0.000985	0.001042
Returns	Lag 1	0.010143	0.000454	0.003636	0.010579	0.010163	0.005012	0.006155	0.006705
Net flows	Lag 1	0.232717***	0.227692***	0.232742***	0.232259***	0.164525*	0.225112***	0.218200**	0.203044**
MSCI Europe	Lag 1		0.033425						
MSCI Emerging Europe	Lag 1			0.014876					
MSCI World	Lag 1				-0.000474				
Crisis dummy*Net flows	Lag 1					0.118763			
Volatility index	Lag 1						-0.007180		
Credit spread (1)	Lag 1							-0.012984	
Credit spread (2)	Lag 1								-0.010851
Wald p value		0.0021	0.005	0.0058	0.0062	0.0043	0.0047	0.0044	0.0105
Adjusted R2		0.068195	0.077598	0.066978	0.063191	0.066698	0.074134	0.069772	0.062892

		Turkey							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept		0.000374	0.000366	0.000330	0.000380	0.000403	0.000385	0.000393	0.000436
Returns	Lag 1	-0.003443	-0.005425**	-0.006760***	-0.001577	-0.003260	-0.004574*	-0.004007	-0.005022**
Net flows	Lag 1	0.305871***	0.285455**	0.239429***	0.308623***	0.223245**	0.298773***	0.297778***	0.292102***
MSCI Europe	Lag 1		0.011327***						
MSCI Emerging Europe	Lag 1			0.014821***					
MSCI World	Lag 1				-0.001942**				
Crisis dummy*Net flows	Lag 1					0.143400			
Volatility index	Lag 1						-0.002874**		
Credit spread (1)	Lag 1							-0.002468	
Credit spread (2)	Lag 1								-0.005778**
Wald p value		0.0012	0.0003	0	0.0008	0.0014	0.0013	0.0029	0.0002
Adjusted R2		0.063668	0.085624	0.128597	0.058950	0.063100	0.086012	0.061414	0.090634

		Poland							
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept		0.000151	0.000154	8.90E-05	0.000148	0.000154	0.000150	0.000156	0.000168
Returns	Lag 1	0.000785	0.000483	-0.000601	0.000566	0.000696	0.000873	0.000334	0.000291
Net flows	Lag 1	0.369692***	0.370400***	0.377206***	0.368723***	0.419012***	0.368334***	0.365083***	0.367172***
MSCI Europe	Lag 1		0.002260						
MSCI Emerging Europe	Lag 1			0.007412					
MSCI World	Lag 1				0.000402				
Crisis dummy*Net flows	Lag 1					-0.072380			
Volatility index	Lag 1						0.000357		
Credit spread (1)	Lag 1							-0.002392	
Credit spread (2)	Lag 1								-0.003457
Wald p value		0.0002	0.0006	0.0003	0.0005	0.0005	0.0005	0.0005	0.0004
Adjusted R2		0.116430	0.110321	0.124141	0.109717	0.110508	0.109679	0.112017	0.117615

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 6. Testing Granger causality, H_0. Flow does not Granger cause US dollar return at the daily horizon

		Turkey						
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		-2.80E-05	-4.96E-05	-4.20E-05	1.04E-05	-9.43E-05	3.25E-05	-4.25E-05
Returns	Lag 1	0.197252***	0.097893	0.107700	0.008984	0.095885	0.177426**	0.178020***
	Lag 2	-0.035749	0.077712	0.044811	0.099822	0.019405	0.039792	-0.027661
	Lag 3	0.003632	0.035993	0.030060	0.038095	0.016317	0.015635	0.010690
	Lag 4	0.084151	0.048126	0.058783	0.047499	0.108796	0.082160	0.077345
	Lag 5	0.010542	-0.012120	-0.023099	-0.005399	0.001068	-0.008898	-0.008629
Net flow	Lag 1	-0.001632*	-0.001813**	-0.001859**	-0.001532*	-0.001236	-0.001745*	-0.001563*
	Lag 2	6.90E-05	1.34E-05	-0.000114	-0.000254	0.000246	-0.000267	0.000210
	Lag 3	-0.000560	-0.000354	-0.000585	-0.000523	-0.000935	-0.000816	-0.000714
	Lag 4	-0.000117	8.77E-06	3.22E-05	-0.000109	-0.000655	-0.000463	-8.70E-05
	Lag 5	-0.000567	-0.000552	-0.000528	-0.000615	-0.000322	-0.000484	-0.000586
MSCI Europe	Lag 1		0.127323***					
	Lag 2		-0.084860**					
	Lag 3		-0.061822					
	Lag 4		0.011957					
	Lag 5		0.033417					
MSCI Emerging Europe	Lag 1			0.102314**				
	Lag 2			-0.072671				
	Lag 3			-0.016132				
	Lag 4			0.011039				
	Lag 5			0.035275				
MSCI World	Lag 1				0.311557***			
	Lag 2				-0.126645***			
	Lag 3				-0.047083			
	Lag 4				0.00397			
	Lag 5				0.04104			
Volatility index	Lag 1					-0.056918***		
	Lag 2					0.005331		
	Lag 3					-0.000144		
	Lag 4					0.001208		
	Lag 5					-0.005037		
Credit spread (1)	Lag 1						-0.096038**	
	Lag 2						0.016086	
	Lag 3						0.031139	
	Lag 4						-0.006567	
	Lag 5						-0.005476	
Credit spread (2)	Lag 1							-0.069165
	Lag 2							0.081523
	Lag 3							-0.006169
	Lag 4							-0.030479
	Lag 5							-0.053996
Wald p value		0.2293	0.0001	0.1349	0	0	0.3995	0.2866
Adjusted R2		0.013651	0.043859	0.024403	0.120811	0.139005	0.015537	0.018468

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 7. Testing Granger causality, H_0. US dollar return does not Granger cause flow at the daily horizon

		Turkey						
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
Intercept		-0.019846	-0.024188	-0.020120	-0.017547	-0.035441	-0.026358	-0.023478
Returns	Lag 1	16.13830***	13.03460***	15.79959***	6.804145	9.253175**	15.00806***	15.72837***
	Lag 2	2.661119	8.282127*	6.407513	10.04822**	5.151273	5.326031	2.541704
	Lag 3	1.040732	0.100959	0.397963	0.499104	1.127797	1.627085	0.392549
	Lag 4	1.243841	-1.328806	0.820141	-1.241159	1.488947	0.108704	0.063547
	Lag 5	-0.126174	-1.900382	-1.495500	-0.672687	-3.188232	-3.753081	-1.766214
Net flow	Lag 1	-0.135256**	-0.158493**	-0.145796**	-0.128498**	-0.090329	-0.123414**	-0.139288**
	Lag 2	-0.075728	-0.074394	-0.075952	-0.091770	-0.071385	-0.073420	-0.056098
	Lag 3	-0.000810	0.016617	-0.000869	0.003659	-0.035269	-0.030530	-0.006617
	Lag 4	0.051297	0.062643	0.057669	0.052989	0.040915	0.052363	0.056845
	Lag 5	-0.033409	-0.019308	-0.032651	-0.034352	0.014629	0.010092	-0.020780
MSCI Europe	Lag 1		5.461718**					
	Lag 2		-4.914268**					
	Lag 3		-1.054698					
	Lag 4		1.650978					
	Lag 5		2.000360					
MSCI Emerging Europe	Lag 1			1.193961				
	Lag 2			-3.655437				
	Lag 3			1.027491				
	Lag 4			-0.111714				
	Lag 5			1.487211				
MSCI World	Lag 1				16.75763***			
	Lag 2				-8.301314***			
	Lag 3				0.271148			
	Lag 4				0.977112			
	Lag 5				1.762151			
Volatility index	Lag 1					-3.683929***		
	Lag 2					0.420514		
	Lag 3					-0.478286		
	Lag 4					0.098754		
	Lag 5					-0.537799		
Credit spread (1)	Lag 1						-6.337784**	
	Lag 2						1.744126	
	Lag 3						3.046128	
	Lag 4						-0.171083	
	Lag 5						-3.000572	
Credit spread (2)	Lag 1							-3.799728
	Lag 2							5.311982**
	Lag 3							-2.501324
	Lag 4							-3.638821
	Lag 5							-1.228437
Wald p value		0.0033	0.0001	0.0140	0	0	0.0126	0.0034
Adjusted R2		0.020728	0.034246	0.019873	0.090410	0.145004	0.029013	0.025337

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 8. Testing price pressure at monthly horizon with US dollar returns

Panel (a)		Hungary					
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		0.006367	0.007358	0.005853	0.005290	0.005348	0.006313
Returns	Lag 1	0.074694	0.084807	0.099655	0.103325	0.122977*	0.116919*
Returns	Lag 2		-0.125851*	-0.138571***	-0.145113*	-0.165353**	-0.155934
Returns	Lag 3			0.112258	0.106085	0.129951	0.132731
Returns	Lag 4				-0.026638	-0.030206	-0.033250
Returns	Lag 5					0.133657*	0.144983**
Returns	Lag 6						-0.047237
Net flow	Lag 0	2.986131***	2.903525**	2.972478**	2.816207***	2.626756**	2.672152**
Net flow	Lag 1	0.524809	0.589459	0.588242	0.685228	0.899900	0.769435
Net flow	Lag 2		0.499840	0.382872	0.319282	0.268036	0.406554
Net flow	Lag 3			-0.212295	-0.416122	-0.331929	-0.443848
Net flow	Lag 4				1.029054	1.277057	1.272891*
Net flow	Lag 5					-1.758678**	-1.514304*
Net flow	Lag 6						-0.556487
Wald p value		0.4228	0.5135	0.7290	0.4887	0.1003	0.2066
Schwarz criterion		-1.768839	-1.724001	-1.678593	-1.627230	-1.603863	-1.547958
Adjusted R2		0.112844	0.117255	0.120002	0.119635	0.143794	0.140053

Panel (b)		Turkey					
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		-0.007471	-0.008802	-0.009043	-0.010075	-0.009501	-0.008644
Returns	Lag 1	0.009890	0.005888	0.011642	0.020574	0.020856	0.008963
Returns	Lag 2		-0.089253	-0.093989	-0.119336*	-0.103696	-0.095160
Returns	Lag 3			0.136377*	0.123339	0.124512	0.138701*
Returns	Lag 4				-0.130628	-0.125359	-0.116096
Returns	Lag 5					-0.068787	-0.061787
Returns	Lag 6						-0.048726

Net flow	Lag 0	26.85845***	26.74875***	26.21572***	25.94077***	26.15520***	25.94337***
Net flow	Lag 1	0.756286	-0.551129	-0.511752	-2.124505	-1.718676	-1.166096
Net flow	Lag 2		5.593360	6.289833	6.974668	7.159415	7.442487
Net flow	Lag 3			-0.783571	-2.522291	-2.781282	-2.083902
Net flow	Lag 4				8.858791**	8.705905**	8.206007*
Net flow	Lag 5					-1.613551	-1.319077
Net flow	Lag 6						-3.740068
Wald p value		0.8794	0.3925	0.5121	0.1011	0.2149	0.4625
Schwarz criterion		-0.996218	-0.939820	-0.893278	-0.860128	-0.799570	-0.742665
Adjusted R2		0.214389	0.213421	0.220631	0.231567	0.227900	0.226439

Panel (c)		Poland					
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		0.003603	0.003111	0.002913	0.003360	0.003447	0.003995
Returns	Lag 1	0.097200	0.082505	0.084480	0.086123	0.090141	0.085168
Returns	Lag 2		-0.008037	0.002731	0.009875	0.005280	0.020034
Returns	Lag 3			0.027531	-0.000145	0.007445	0.012876
Returns	Lag 4				0.085211	0.115665	0.114982
Returns	Lag 5					0.017568	0.054156
Returns	Lag 6					5.963234	-0.129182
Net flow	Lag 0	6.853552***	6.556254***	6.461784**	6.290676**	-6.788141**	6.002029**
Net flow	Lag 1	-7.241420***	-6.994352***	-7.062520***	-6.696085***	-0.898550***	-7.316463***
Net flow	Lag 2		-0.457175	-0.898585	-0.701980	2.226996	-1.015284
Net flow	Lag 3			1.108688	2.144239	-3.925081	1.704347
Net flow	Lag 4				-2.988593	2.557719	-3.314631
Net flow	Lag 5						1.861114
Net flow	Lag 6						2.191399
Wald p value		0.0004	0.0023	0.0082	0.0025	0.0017	0.0038
Schwarz criterion		-2.026354	-1.951615	-1.869865	-1.808336	-1.734613	-1.667750
Adjusted R2		0.090473	0.068550	0.053768	0.050194	0.045223	0.047740

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 9. Testing price pressure at monthly horizon with US dollar returns and exogenous variables

Panel (a)

		Hungary					
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		0.006409	0.006023	0.006361	0.007488	0.008875	0.004273
Returns	Lag 1	-0.010528	-0.055343	0.059175	0.022492	0.002371	-0.012315
Net flow	Lag 0	2.848331***	2.904127***	2.987390***	2.864109***	2.855770***	3.090316***
Net flow	Lag 1	0.511954	0.544403	0.540810	0.473997	0.287070	0.210587
MSCI Europe	Lag 1	0.298830					
MSCI Emerging Europe	Lag 1		0.299195*				
MSCI World	Lag 1			0.016843			
Volatility index	Lag 1				-0.074787		
Credit spread (1)	Lag 1					-0.239769**	
Credit spread BAML (2)	Lag 1						-0.212780
Wald p value		0.4324	0.4018	0.4133	0.4796	0.6736	0.7712
Adjusted R2		0.120638	0.125107	0.108488	0.121086	0.132884	0.164712

Panel (b)

		Turkey					
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		-0.007373	-0.007472	-0.007204	-0.006927	-0.006126	-0.006488
Returns	Lag 1	-0.056115	0.009663	0.086672	-0.020152	-0.029034	-0.010399
Net flow	Lag 0	25.92608***	26.85369***	26.81198***	26.13157***	26.60627***	26.45813***
Net flow	Lag 1	0.394881	0.753526	0.884001	0.805770	0.288011	0.820393
MSCI Europe	Lag 1	0.358727					
MSCI Emerging Europe	Lag 1		0.000941				
MSCI World	Lag 1			-0.080107**			
Volatility index	Lag 1				-0.069983		
Credit spread (1)	Lag 1					-0.166347	
Credit spread BAML (2)	Lag 1						-0.060444
Wald p value		0.9373	0.8774	0.8605	0.8717	0.9555	0.8727
Adjusted R2		0.218023	0.209510	0.210078	0.214610	0.214539	0.210425

Panel (c)		Poland					
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		0.003244	0.006003	0.004033	0.003397	0.003721	0.003494
Returns	Lag 1	0.126851	0.152742*	0.130780	0.118047	0.087430	0.100126
Net flow	Lag 0	6.953352***	7.522101***	6.905178***	6.784787***	6.789932***	6.908845***
Net flow	Lag 1	-7.348005***	-7.792451***	-7.111636***	-7.535252***	-7.318386***	-7.246726***
MSCI Europe	Lag 1	-0.222299					
MSCI Emerging Europe	Lag 1		-0.299732**				
MSCI World	Lag 1			-0.061756			
Volatility index	Lag 1				0.083955		
Credit spread (1)	Lag 1					-0.052161	
Credit spread BAML (2)	Lag 1						0.020767
Wald p value		0.0003	0.0001	0.0007	0.0002	0.0004	0.0004
Adjusted R2		0.098766	0.125407	0.095785	0.108845	0.085392	0.083719

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 10. Testing price pressure at daily horizon with US dollar returns

		Turkey				
		(1)	(2)	(3)	(4)	(5)
Intercept		0.000237	0.000260	0.000263	0.000269	0.000241
Returns	Lag 1	-0.026234	-0.018614	-0.013336	-0.006140	-0.004786
Returns	Lag 2		-0.057475*	-0.068861*	-0.075031**	-0.070608*
Returns	Lag 3			0.007561	-0.012993	-0.019166
Returns	Lag 4				0.034696	0.056349
Returns	Lag 5					-0.001548
Net flow	Lag 0	0.012545***	0.012494***	0.012477***	0.012456***	0.012424***
Net flow	Lag 1	0.000299	0.000282	0.000174	4.99E-05	4.44E-05
Net flow	Lag 2		0.000913**	0.001039**	0.001058**	0.001049**
Net flow	Lag 3			-0.000595	-0.000498	-0.000432
Net flow	Lag 4				-0.000440	-0.000631
Net flow	Lag 5					1.94E-05
Wald p value		0.5464	0.0788	0.0644	0.1131	0.1729
Schwarz criterion		-7.414727	-7.404741	-7.389759	-7.396811	-7.378273
Adjusted R2		0.692045	0.689026	0.689103	0.693684	0.691261

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 11. Testing price pressure at daily horizon with local currency returns

		Turkey				
		(1)	(2)	(3)	(4)	(5)
Intercept		0.000337	0.000341	0.000362	0.000383	0.000368
Returns	Lag 1	-0.217447***	-0.239782***	-0.242911***	-0.234431***	-0.232104***
Returns	Lag 2		-0.061758**	-0.090991***	-0.103826***	-0.101412***
Returns	Lag 3			-0.067790**	-0.085444**	-0.090476**
Returns	Lag 4				-0.001968	0.014615
Returns	Lag 5					-0.006102
Net flow	Lag 0	0.009454***	0.009419***	0.009418***	0.009405***	0.009381***
Net flow	Lag 1	0.001625***	0.001826***	0.001868***	0.001768***	0.001745***
Net flow	Lag 2		0.000796***	0.001182***	0.001297***	0.001318***
Net flow	Lag 3			0.000274	0.000375	0.000372
Net flow	Lag 4				-0.000140	-0.000249
Net flow	Lag 5					0.000109
Wald p value		0	0	0	0	0.001
Schwarz criterion		-7.978432	-7.981227	-7.974479	-7.986488	-7.976393
Adjusted R2		0.682937	0.682616	0.685201	0.690500	0.689605

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 12. Testing price pressure at daily horizon with US dollar returns and exogenous variables

		Turkey					
		(1)	(2)	(3)	(4)	(5)	(6)
Intercept		0.000283	0.000258	0.000257	0.000377	0.000439	0.000300
Return	Lag 1	-0.061367	-0.092536**	-0.074717*	-0.018042	-0.015300	-0.025199
	Lag 2	-0.026715	-0.034088	-0.022775	-0.038779	-0.042259	-0.061643*
	Lag 3	0.048597	0.045820	0.042711	0.023076	0.005409	0.013543
Net flow	Lag 0	0.012403***	0.012444***	0.012049***	0.012130***	0.012309***	0.012550***
	Lag 1	0.000194	0.000108	0.000135	-4.52E-05	-4.06E-05	0.000266
	Lag 2	0.000953**	0.000875**	0.000913**	0.001182**	0.000964**	0.000987**
	Lag 3	-0.000521	-0.000625	-0.000623***	-0.000585***	-0.000502	-0.000576
MSCI Europe	Lag 1	0.050589**					
	Lag 2	-0.023385					
	Lag 3	-0.056927***					
MSCI Emerging Europe	Lag 1		0.078965***				
	Lag 2		-0.028299				
	Lag 3		-0.033995				
MSCI World	Lag 1			0.100643			
	Lag 2			-0.029586**			
	Lag 3			-0.053683			
Volatility index	Lag 1				-0.011003		
	Lag 2				0.002132**		
	Lag 3				0.006825		
Credit spread (1)	Lag 1					-0.020630	
	Lag 2					-0.001742	
	Lag 3					-0.002039	
Credit spread (2)	Lag 1						-0.022750
	Lag 2						0.013050
	Lag 3						0.022666
Wald p value		0.1040	0.0947	0.0741	0.0605	0.1661	0.0879
Adjusted R2		0.697386	0.695552	0.700550	0.690872	0.683347	0.690773

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 13 (A). Unrestricted VAR, monthly data

		Hungary		Turkey		Poland	
		flow	USD return	flow	USD return	flow	USD return
Intercept		0.001	0.009	0.001	0.005	0	0.005
p-value		(0.259)	(0.226)	(0.04)	(0.728)	(0.617)	0.538
Net flow	Lag 1	0.233***	1.22*	0.293***	9.235*	0.37***	-4.708**
p-value		(0.002)	(0.094)	(0.002)	(0.096)	(0)	(0.031)
Returns	Lag 1	0.01	0.105	-0.003*	-0.086	0.001	0.103
p-value		(0.199)	(0.172)	(0.088)	(0.382)	(0.824)	(0.244)

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 13 (B). Unrestricted VAR, daily data

		Turkey daily	
		flow	return
Intercept		-0.028	0
p-value		(0.166)	(0.848)
Net flow	Lag 1	-0.109**	-0.001
p-value		(0.031)	(0.187)
Net flow	Lag 2	-0.099*	-0.001
p-value		(0.051)	(0.535)
Net flow	Lag 3	-0.045	0
p-value		(0.37)	(0.781)
Net flow	Lag 4	0.009	0
p-value		(0.856)	(0.994)
Net flow	Lag 5	-0032	0
p-value		(0.519)	0.567
Returns	Lag 1	14.458***	(0.155)***
p-value		(0)	0.002
Returns	Lag 2	5.026	0.028
p-value		(0.117)	(0.579)
Returns	Lag 3	2.829	-0.009
p-value		(0.378)	(0.858)
Returns	Lag 4	-0.349	-0.013
p-value		(0.913)	(0.801)
Returns	Lag 5	0.457	-0.002
p-value		(0.887)	(0.969)

Note: *** significance at 1%, ** significance at 5% and * significance at 10%

Table 14. Forecast error decomposition, specification (1)

	MONTHLY												DAILY			
	Turkey				Hungary				Poland				Turkey			
	Proportions of forecast error in FLOW				Proportions of forecast error in FLOW				Proportions of forecast error in FLOW				Proportions of forecast error in FLOW			
Horizon	e	em	f	r	e	em	f	r	e	em	f	r	e	em	f	r
1	0.12	0.06	0.82	0	0.02	0.01	0.97	0	0.03	0	0.96	0	0.29	0.12	0.59	0
2	0.15	0.07	0.76	0.03	0.04	0.01	0.95	0	0.07	0.01	0.92	0	0.3	0.11	0.58	0.01
3	0.16	0.07	0.74	0.03	0.04	0.01	0.94	0	0.11	0.01	0.87	0.01	0.3	0.11	0.58	0.01
4	0.17	0.07	0.73	0.03	0.04	0.04	0.89	0.02	0.12	0.01	0.86	0.01	0.3	0.11	0.58	0.01
5	0.22	0.07	0.67	0.04	0.04	0.04	0.89	0.02	0.12	0.02	0.85	0.01	0.3	0.12	0.58	0.01
6	0.23	0.07	0.66	0.04	0.05	0.04	0.88	0.02	0.13	0.02	0.84	0.01	0.3	0.12	0.58	0.01
7	0.23	0.07	0.66	0.04	0.05	0.05	0.88	0.02	0.13	0.02	0.83	0.01	0.3	0.12	0.57	0.01
8	0.23	0.07	0.66	0.04	0.05	0.05	0.88	0.02	0.13	0.02	0.83	0.01	0.3	0.12	0.57	0.01
9	0.24	0.07	0.66	0.04	0.05	0.05	0.88	0.02	0.14	0.02	0.83	0.01	0.3	0.12	0.57	0.01
10	0.24	0.07	0.66	0.04	0.05	0.05	0.88	0.02	0.14	0.02	0.83	0.01	0.3	0.12	0.57	0.01
	Proportions of forecast error in USD RETURN				Proportions of forecast error in USD RETURNS				Proportions of forecast error in USD RETURN				Proportions of forecast error in USD RETURN			
Horizon	e	em	f	r	e	em	f	r	e	em	f	r	e	em	f	r
1	0.47	0.13	0.06	0.34	0.36	0.14	0.02	0.48	0.52	0.12	0.01	0.35	0.38	0.2	0.2	0.22
2	0.47	0.12	0.06	0.34	0.38	0.13	0.02	0.46	0.52	0.12	0.01	0.35	0.39	0.19	0.2	0.22
3	0.47	0.14	0.06	0.33	0.38	0.14	0.02	0.45	0.52	0.12	0.01	0.35	0.39	0.19	0.2	0.22
4	0.46	0.16	0.06	0.33	0.37	0.17	0.02	0.44	0.5	0.16	0.01	0.33	0.39	0.19	0.2	0.22
5	0.46	0.16	0.06	0.33	0.36	0.18	0.03	0.43	0.5	0.16	0.01	0.32	0.39	0.19	0.2	0.22
6	0.46	0.16	0.06	0.33	0.36	0.18	0.03	0.43	0.5	0.16	0.01	0.32	0.39	0.19	0.2	0.22
7	0.46	0.16	0.06	0.33	0.36	0.18	0.03	0.43	0.5	0.16	0.01	0.32	0.39	0.19	0.2	0.22
8	0.46	0.16	0.06	0.33	0.36	0.18	0.03	0.43	0.5	0.16	0.01	0.32	0.39	0.19	0.2	0.22
9	0.46	0.16	0.06	0.33	0.36	0.18	0.03	0.43	0.5	0.16	0.02	0.32	0.39	0.19	0.2	0.22
10	0.46	0.16	0.06	0.33	0.36	0.18	0.03	0.43	0.5	0.16	0.02	0.32	0.39	0.19	0.2	0.22

Table 15. Forecast error decomposition, specification (2)

	MONTHLY												DAILY			
	Turkey				Hungary				Poland				Turkey			
	Proportions of forecast error in FLOW				Proportions of forecast error in FLOW				Proportions of forecast error in FLOW				Proportions of forecast error in FLOW			
Horizon	CS	e	f	r	CS	e	f	r	CS	e	f	r	CS	e	f	r
1	0.04	0	0.96	0	0.05	0.03	0.92	0	0	0	1	0	0.04	0.25	0.71	0
2	0.1	0.01	0.89	0	0.15	0.03	0.77	0.05	0.04	0.03	0.92	0	0.06	0.25	0.68	0.01
3	0.14	0.01	0.85	0	0.15	0.03	0.77	0.06	0.06	0.05	0.89	0	0.06	0.25	0.68	0.01
4	0.14	0.03	0.82	0.02	0.15	0.03	0.77	0.06	0.06	0.05	0.88	0	0.06	0.25	0.68	0.01
5	0.15	0.03	0.78	0.05	0.15	0.03	0.75	0.06	0.07	0.05	0.87	0	0.06	0.25	0.68	0.01
6	0.15	0.03	0.77	0.05	0.16	0.03	0.75	0.06	0.08	0.06	0.86	0	0.06	0.25	0.68	0.01
7	0.15	0.03	0.77	0.05	0.16	0.03	0.75	0.06	0.09	0.06	0.85	0	0.06	0.25	0.68	0.01
8	0.16	0.03	0.77	0.05	0.16	0.03	0.75	0.06	0.09	0.06	0.85	0	0.06	0.25	0.68	0.01
9	0.16	0.03	0.77	0.05	0.16	0.04	0.75	0.06	0.09	0.06	0.85	0	0.06	0.25	0.68	0.01
10	0.16	0.03	0.77	0.05	0.16	0.04	0.75	0.06	0.09	0.06	0.85	0	0.06	0.25	0.68	0.01
	Proportions of forecast error in USD RETURN				Proportions of forecast error in USD RETURNS				Proportions of forecast error in USD RETURN				Proportions of forecast error in USD RETURN			
Horizon	CS	e	f	r	CS	e	f	r	CS	e	f	r	CS	e	f	r
1	0.05	0.23	0.03	0.68	0	0.23	0.07	0.7	0.05	0.37	0.03	0.56	0.06	0.33	0.34	0.27
2	0.26	0.18	0.03	0.54	0.28	0.16	0.05	0.51	0.21	0.3	0.02	0.46	0.07	0.33	0.33	0.27
3	0.3	0.19	0.02	0.49	0.29	0.16	0.05	0.5	0.21	0.3	0.03	0.46	0.07	0.33	0.33	0.27
4	0.29	0.19	0.03	0.49	0.29	0.16	0.05	0.51	0.21	0.3	0.03	0.46	0.07	0.33	0.33	0.27
5	0.3	0.19	0.03	0.48	0.29	0.15	0.06	0.5	0.22	0.3	0.03	0.45	0.07	0.33	0.33	0.27
6	0.3	0.19	0.03	0.48	0.29	0.15	0.06	0.5	0.22	0.3	0.03	0.44	0.07	0.33	0.33	0.27
7	0.3	0.19	0.03	0.48	0.29	0.15	0.06	0.5	0.22	0.3	0.03	0.44	0.07	0.33	0.33	0.27
8	0.3	0.19	0.03	0.48	0.29	0.15	0.06	0.5	0.22	0.3	0.03	0.44	0.07	0.33	0.33	0.27
9	0.3	0.19	0.03	0.48	0.29	0.15	0.06	0.5	0.22	0.3	0.03	0.44	0.07	0.33	0.33	0.27
10	0.3	0.19	0.03	0.48	0.29	0.15	0.06	0.5	0.22	0.3	0.03	0.44	0.07	0.33	0.33	0.27

Table 16. Forecast error decomposition, spcification (3)

	MONTHLY												DAILY			
	Turkey				Hungary				Poland				Turkey			
	Proportions of forecast error in FLOW				Proportions of forecast error in FLOW				Proportions of forecast error in FLOW				Proportions of forecast error in FLOW			
Horizon	CS	CDS	f	r	CS	CDS	f	r	CS	CDS	f	r	CS	CDS	f	r
1	0.05	0.05	0.9	0	0.03	0.1	0.86	0	0	0.01	0.99	0	0.04	0.3	0.67	0
2	0.12	0.06	0.81	0	0.14	0.1	0.75	0.01	0.04	0.02	0.94	0	0.06	0.3	0.64	0
3	0.2	0.07	0.73	0	0.15	0.1	0.74	0.01	0.05	0.03	0.91	0.02	0.06	0.3	0.64	0
4	0.19	0.07	0.72	0.01	0.15	0.1	0.74	0.01	0.05	0.03	0.9	0.02	0.06	0.3	0.64	0
5	0.23	0.07	0.68	0.02	0.16	0.1	0.73	0.01	0.07	0.03	0.88	0.02	0.06	0.3	0.64	0.01
6	0.23	0.07	0.68	0.02	0.16	0.1	0.73	0.02	0.08	0.03	0.87	0.02	0.06	0.3	0.64	0.01
7	0.23	0.07	0.68	0.02	0.16	0.1	0.72	0.02	0.09	0.03	0.86	0.02	0.06	0.3	0.64	0.01
8	0.23	0.08	0.68	0.02	0.16	0.1	0.72	0.02	0.09	0.03	0.86	0.02	0.06	0.3	0.64	0.01
9	0.23	0.08	0.68	0.02	0.16	0.1	0.72	0.02	0.09	0.03	0.86	0.02	0.06	0.3	0.64	0.01
10	0.23	0.08	0.68	0.02	0.17	0.1	0.72	0.02	0.09	0.03	0.86	0.02	0.06	0.3	0.64	0.01
	Proportions of forecast error in USD RETURN				Proportions of forecast error in USD RETURNS				Proportions of forecast error in USD RETURN				Proportions of forecast error in USD RETURN			
Horizon	CS	CDS	f	r	CS	CDS	f	r	CS	CDS	f	r	CS	CDS	f	r
1	0.03	0.22	0.05	0.69	0	0.47	0.05	0.48	0.04	0.22	0.03	0.71	0.05	0.44	0.27	0.23
2	0.38	0.15	0.03	0.44	0.32	0.32	0.03	0.33	0.25	0.17	0.04	0.54	0.07	0.45	0.26	0.23
3	0.43	0.14	0.03	0.4	0.32	0.31	0.03	0.33	0.26	0.17	0.04	0.53	0.07	0.45	0.26	0.23
4	0.42	0.14	0.06	0.39	0.33	0.31	0.04	0.33	0.25	0.18	0.04	0.52	0.07	0.45	0.26	0.23
5	0.43	0.14	0.06	0.37	0.32	0.3	0.06	0.32	0.27	0.18	0.04	0.52	0.07	0.45	0.26	0.23
6	0.44	0.14	0.06	0.37	0.33	0.3	0.06	0.32	0.27	0.18	0.04	0.52	0.07	0.45	0.26	0.23
7	0.44	0.14	0.05	0.37	0.33	0.3	0.06	0.31	0.27	0.18	0.04	0.52	0.07	0.45	0.26	0.23
8	0.44	0.14	0.05	0.37	0.33	0.3	0.06	0.31	0.27	0.18	0.04	0.52	0.07	0.45	0.26	0.23
9	0.44	0.14	0.06	0.37	0.33	0.3	0.06	0.31	0.27	0.18	0.04	0.52	0.07	0.45	0.26	0.23
10	0.44	0.14	0.06	0.36	0.33	0.3	0.06	0.31	0.27	0.18	0.04	0.52	0.07	0.45	0.26	0.23

7 FIGURE APPENDIX

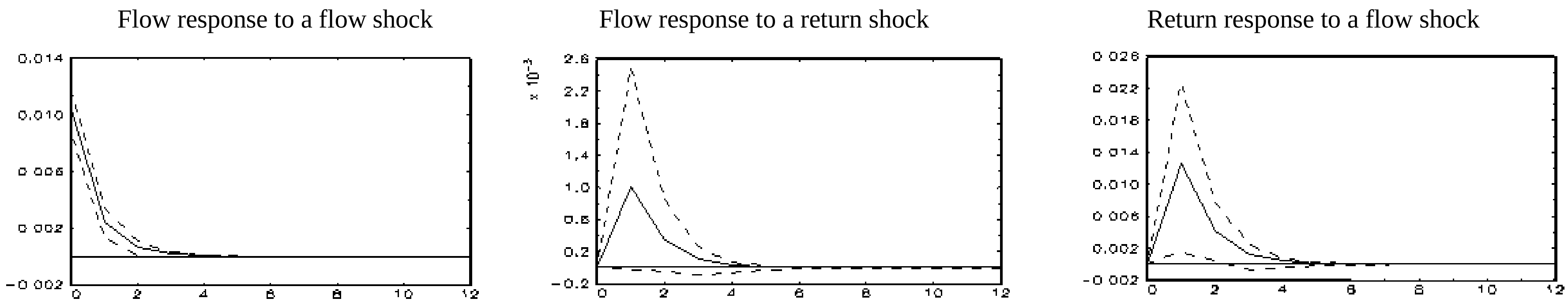


Figure 1 Estimating the unrestricted VAR for Hungary (USD returns)

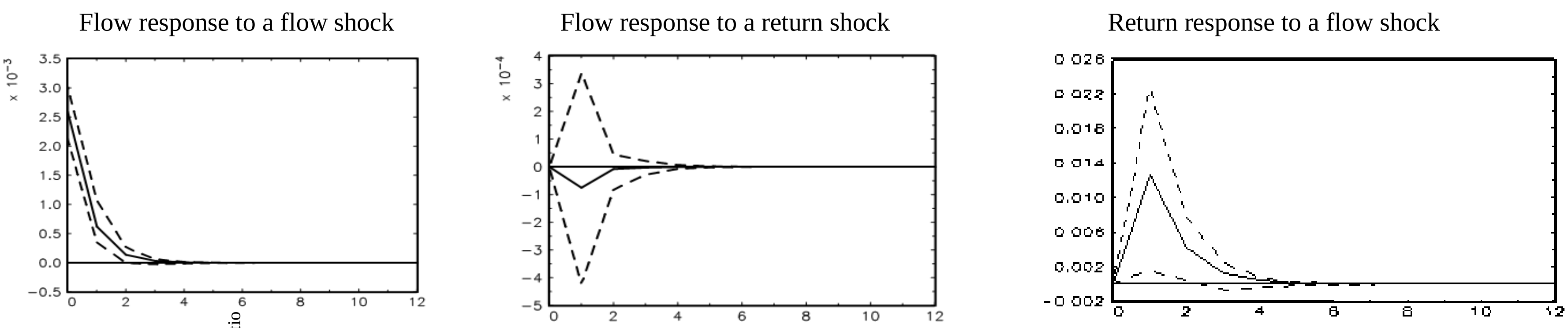


Figure 2 Estimateing the unrestricted VAR forTurkey (USD returns)

Flow response to a flow shock | Flow response to a return shock | Return response to a flow shock

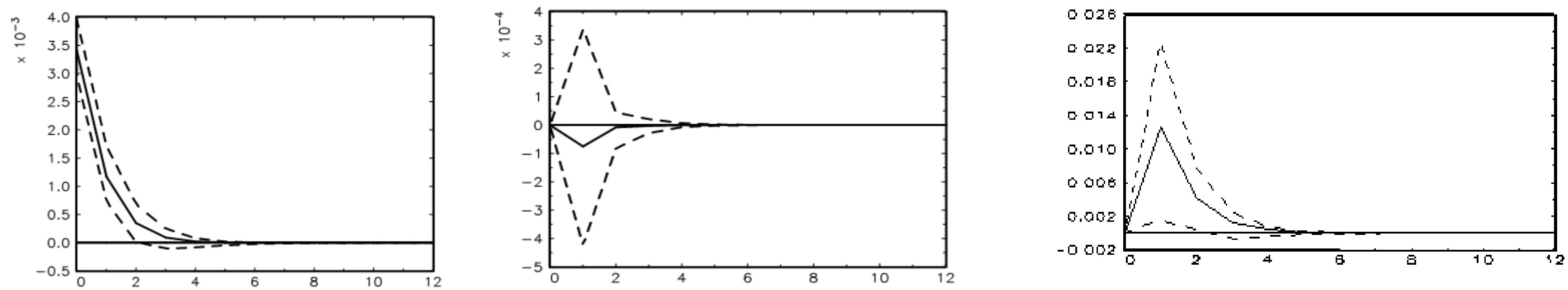


Figure 3 Estimating the unrestricted VAR for Poland (USD returns)

Flow response to a flow shock | Flow response to a return shock | Return response to a flow shock

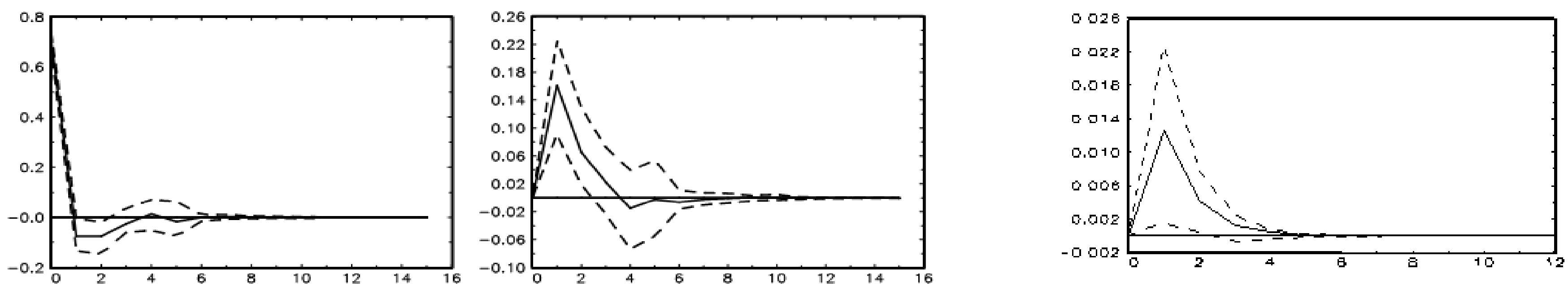


Figure 4 Estimating the unrestricted VAR for Turkey daily data (USD returns)

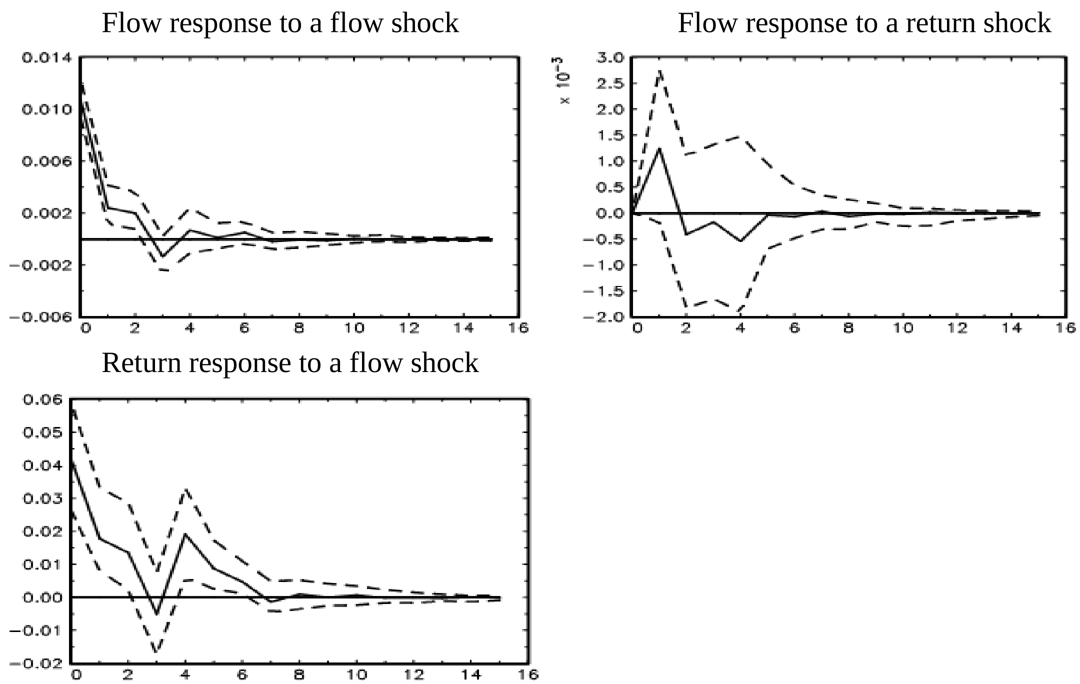


Figure 5 Impulse response functions for the identified VAR, Hungary, USD returns

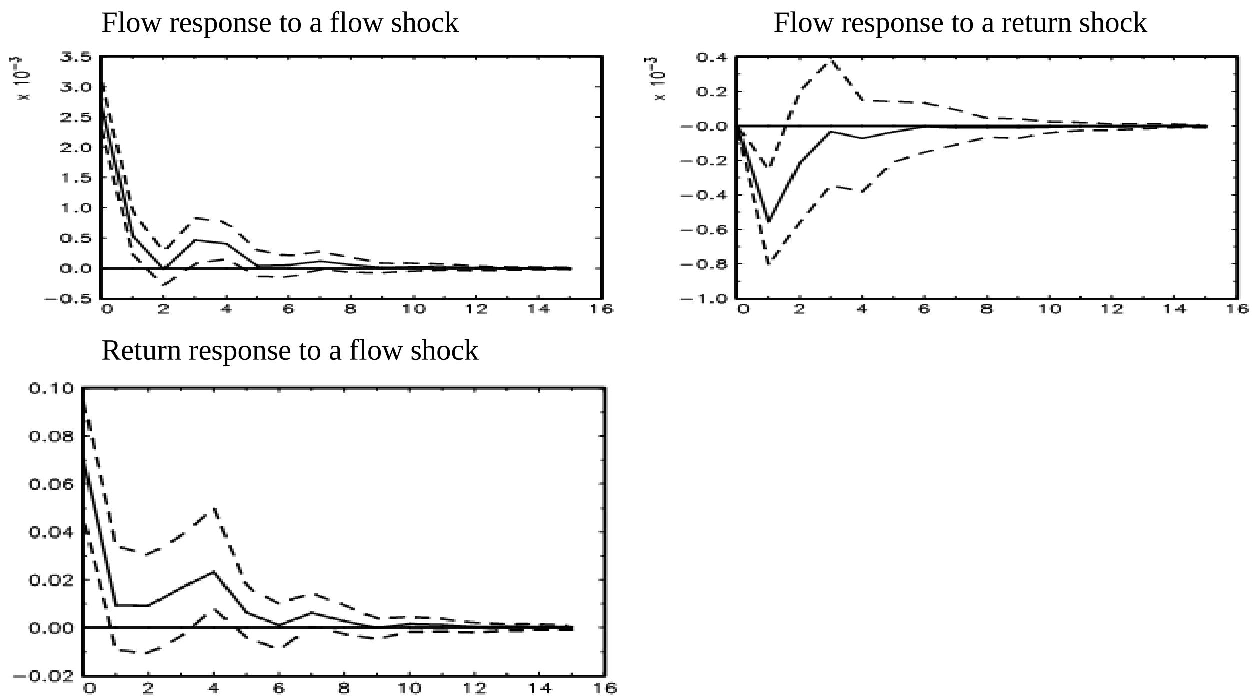


Figure 6 Impulse response functions for the identified VAR, Turkey, USD returns

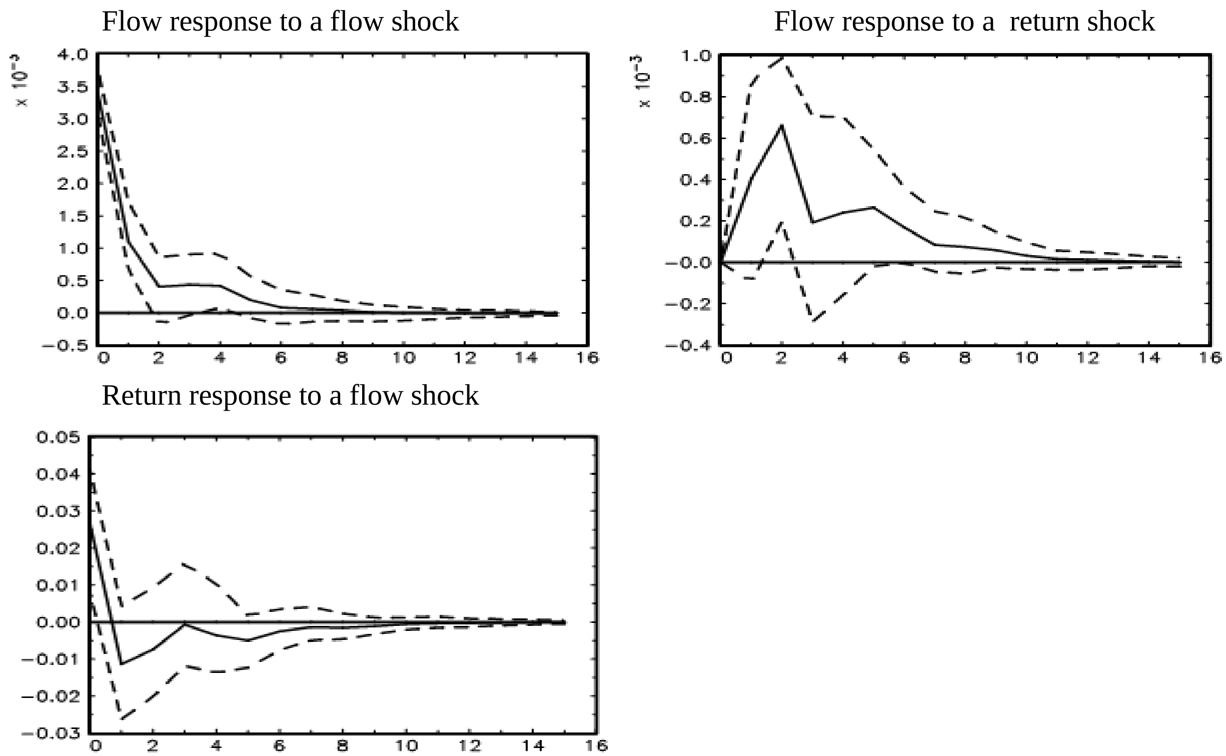


Figure 7 Impulse response functions for the identified VAR, Poland, USD returns

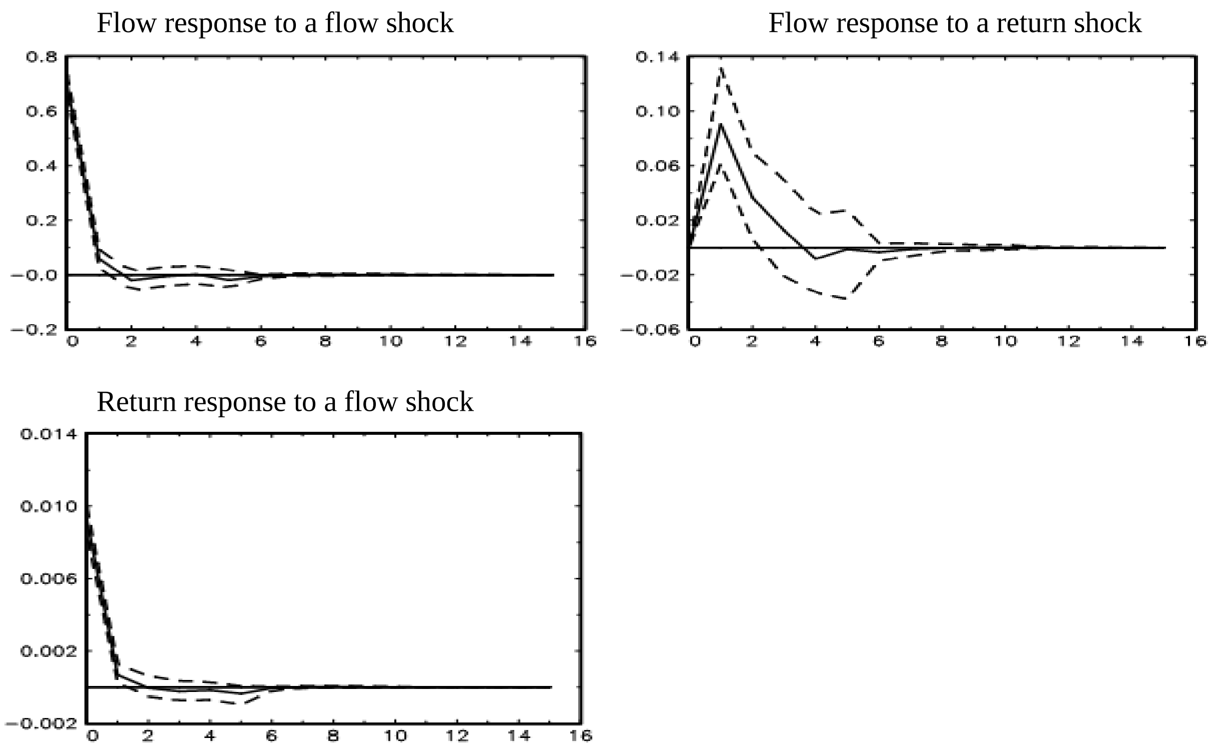


Figure 8 Umpulse response functions for the identified VAR, Daily data, USD returns

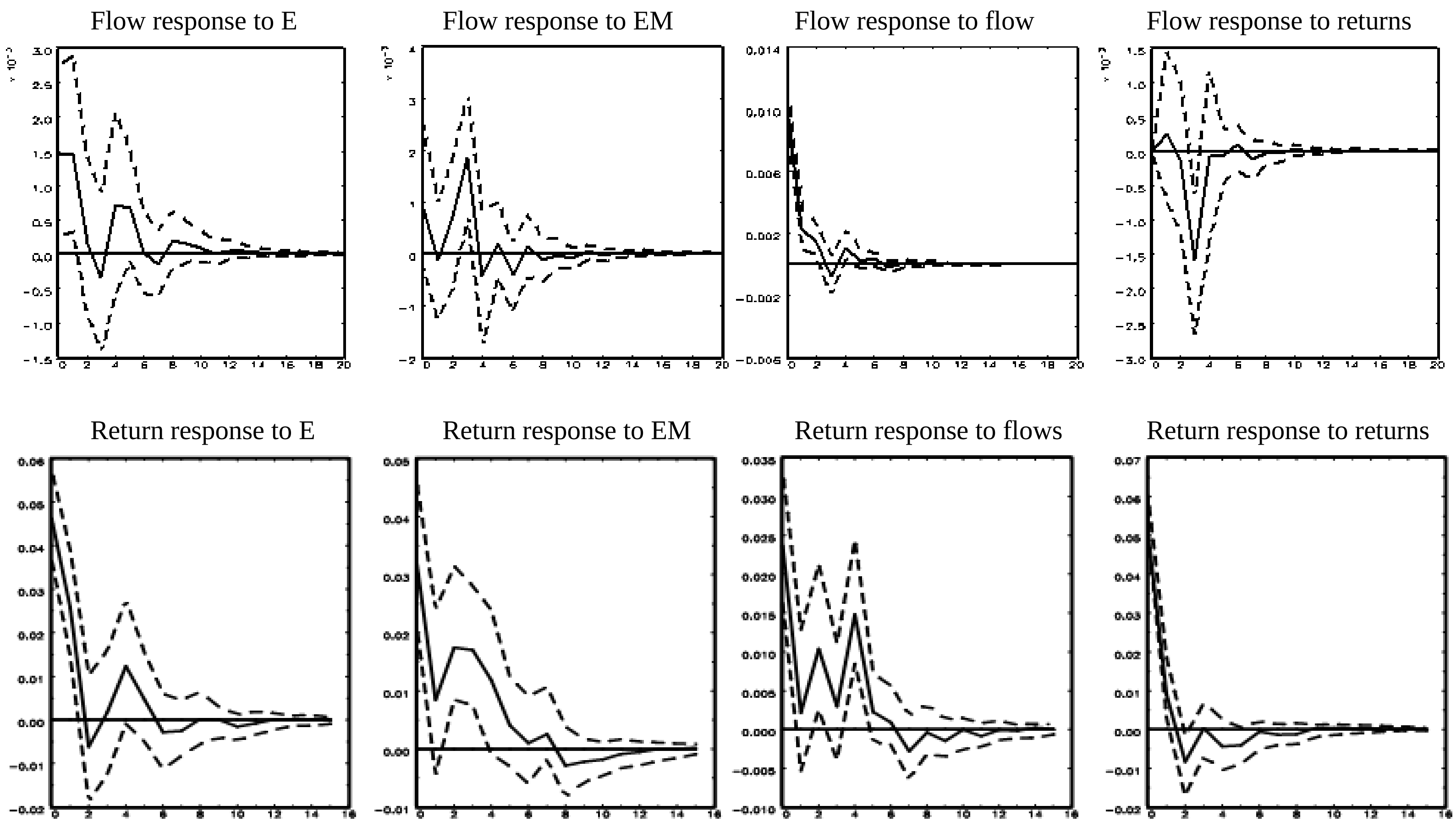


Figure 9 Extended VAR, testing the first specification for Hungary, USD returns

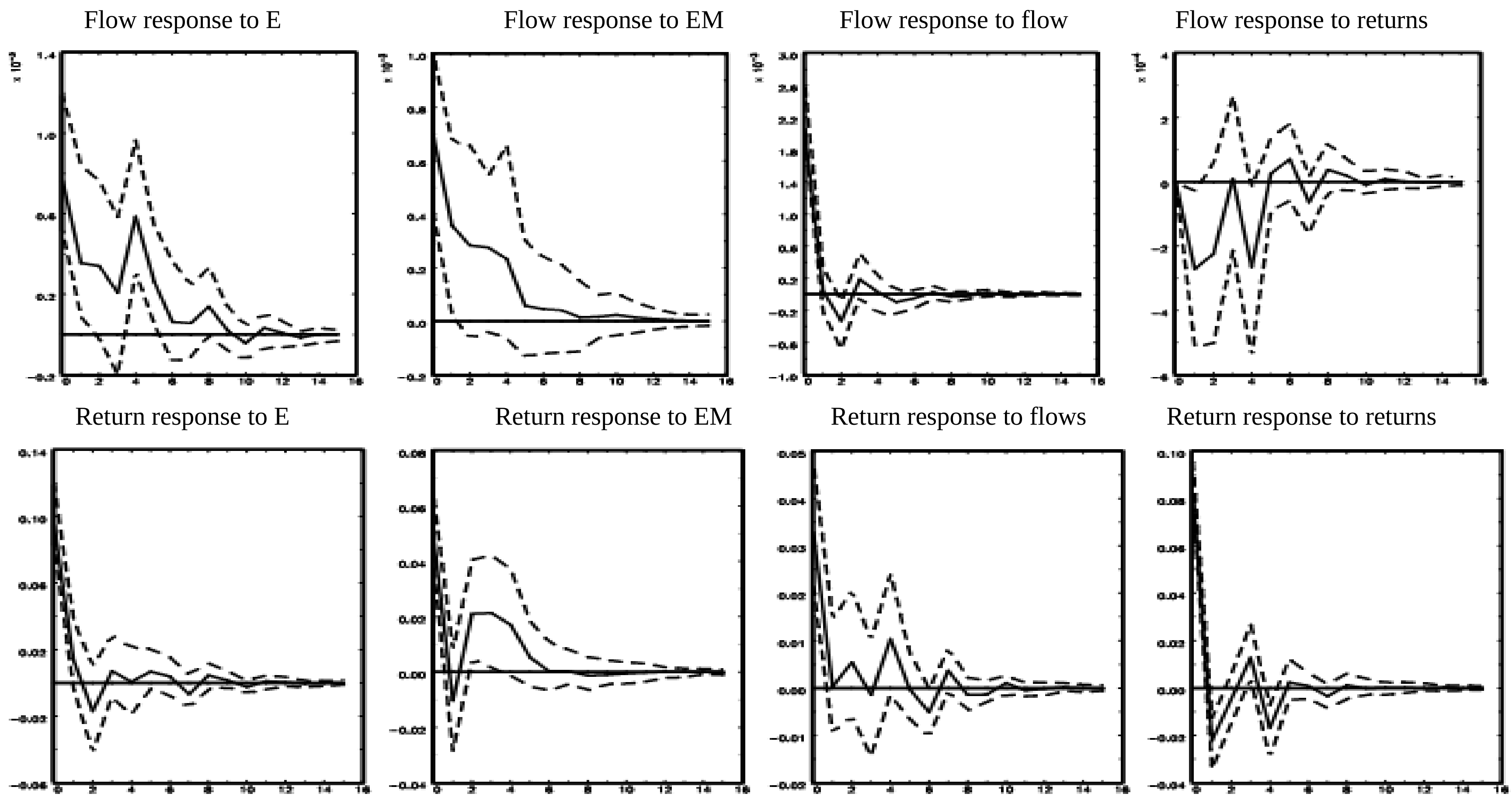


Figure 10 Extended VAR, testing the first specification for Turkey, USD returns

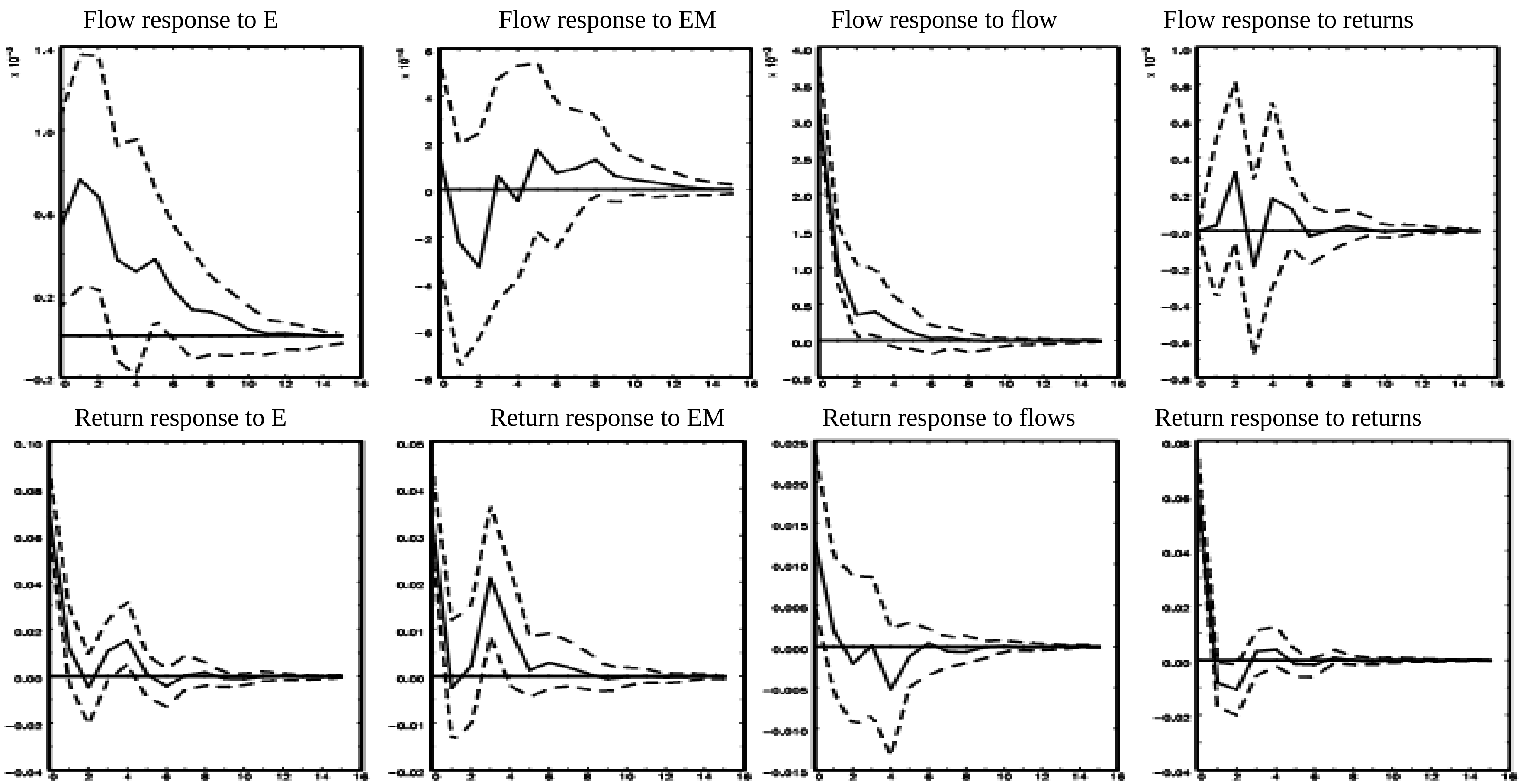


Figure 11 Extended VAR, testing the first specification for Poland, USD returns

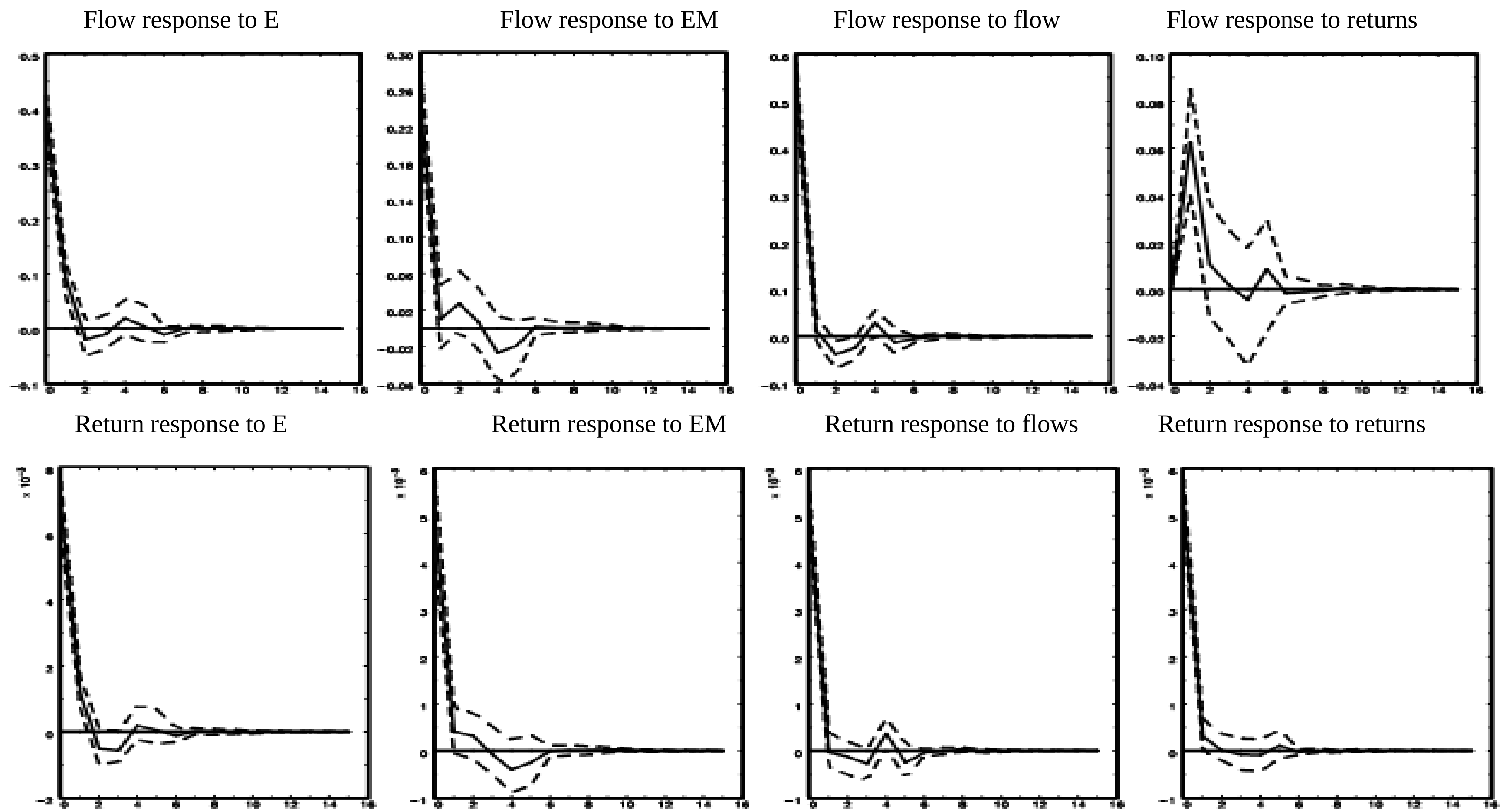
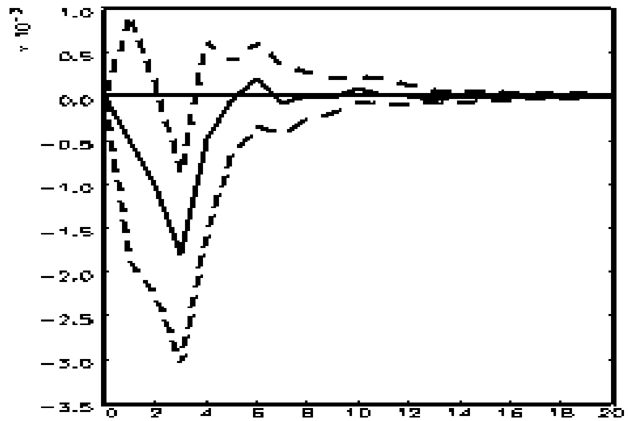
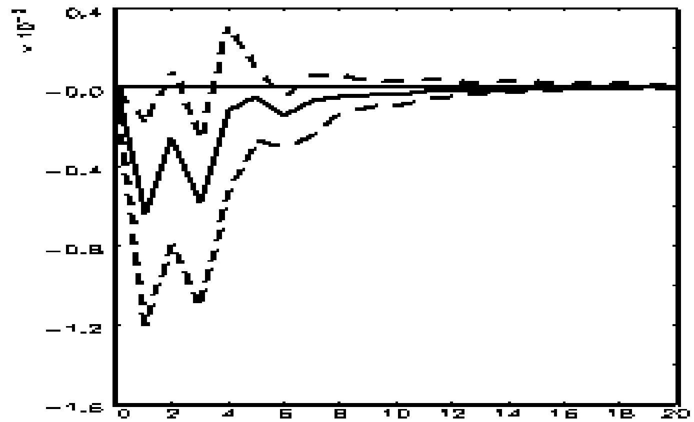


Figure 12 Extended VAR, testing the first specification with daily data, USD returns

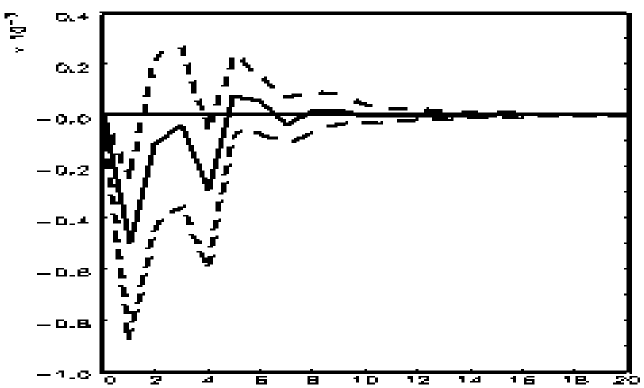
Hungary: flow response to domestic returns



Poland: flow response to domestic returns



Turkey: flow response to domestic returns



Daily: flow response to domestic returns

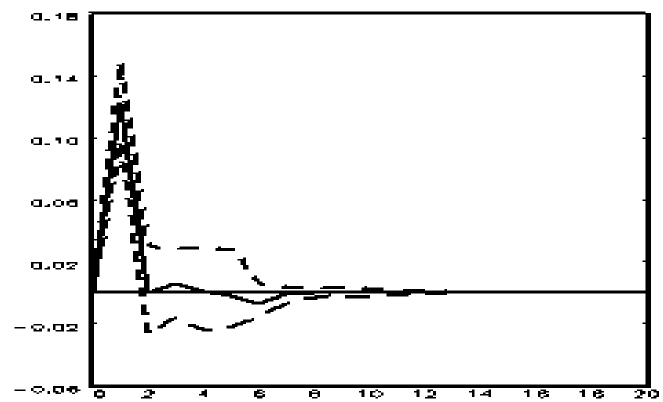
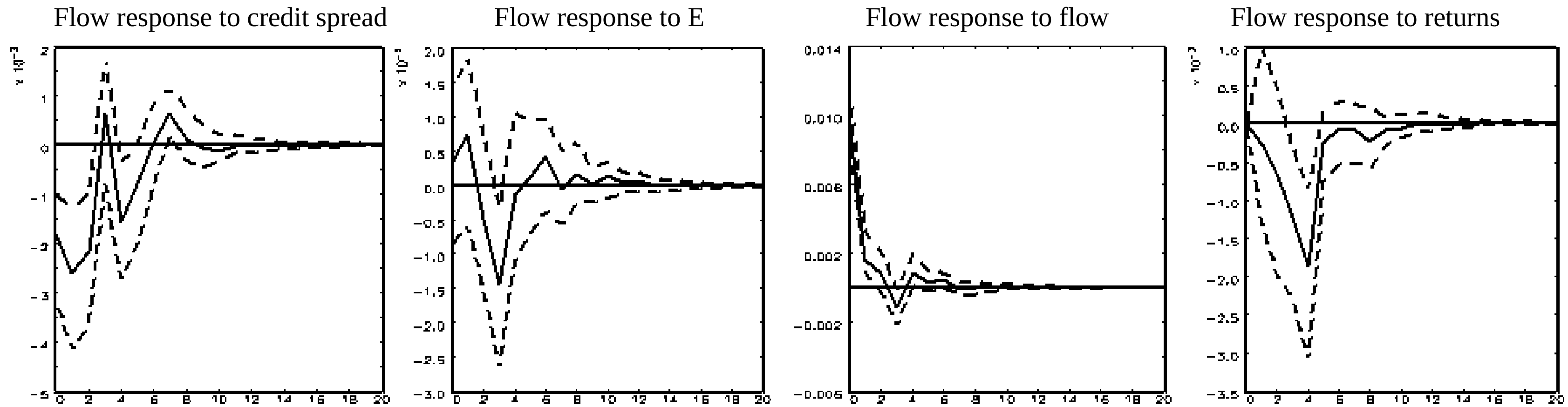
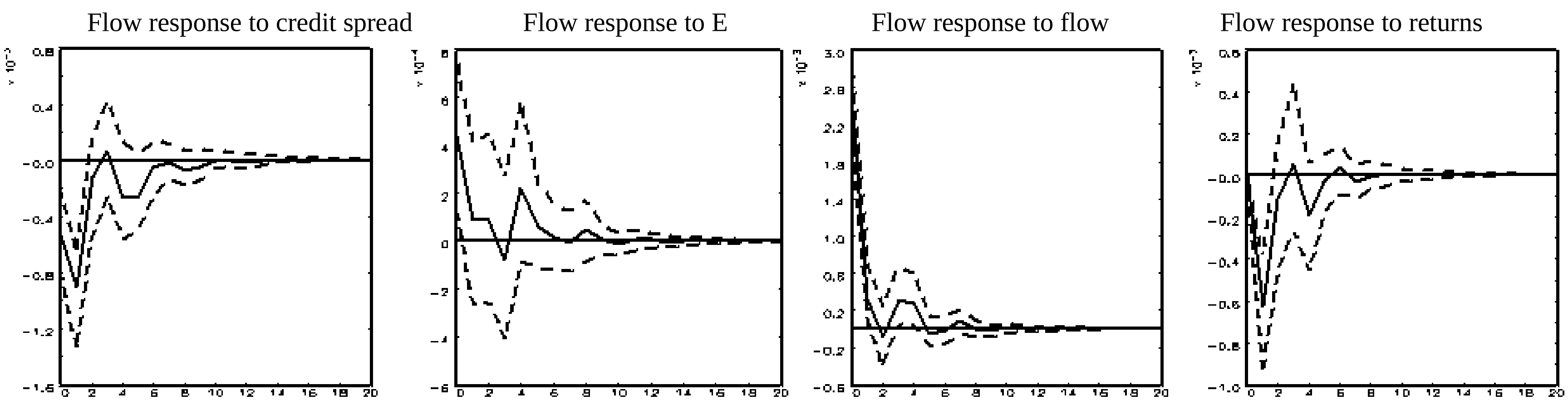


Figure 13. Extended VAR, testing the first specification with domestic returns

(a) Hungary

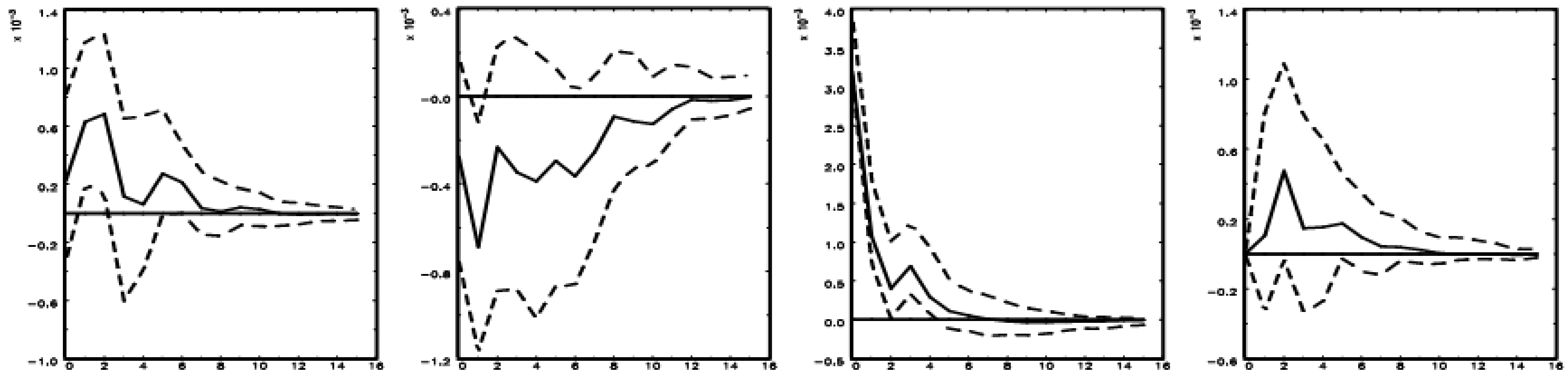


(b) Turkey



(c) Poland

Flow response to credit spread | Flow response to E | Flow response to flow | Flow response to returns



(d) Turkey daily

Flow response to credit spread | Flow response to E | Flow response to flow | Flow response to returns

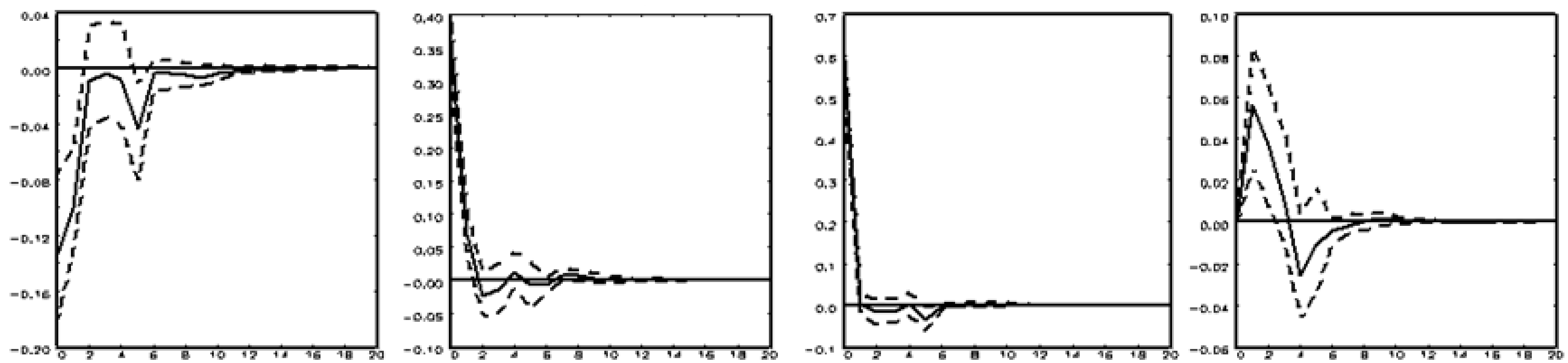
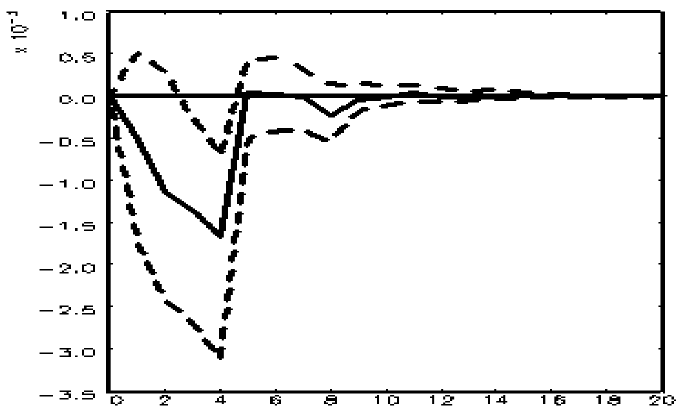
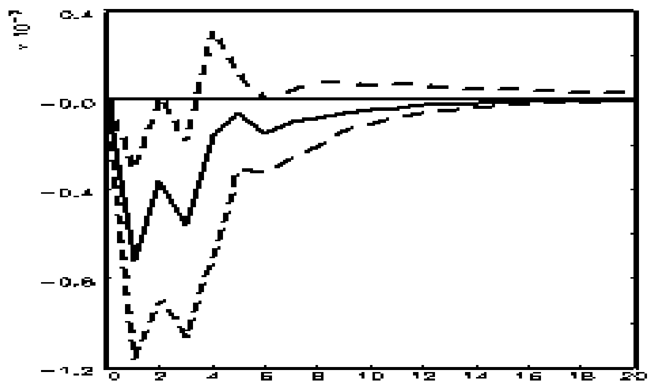


Figure 14 Extended VAR, testing the second specification with USD returns

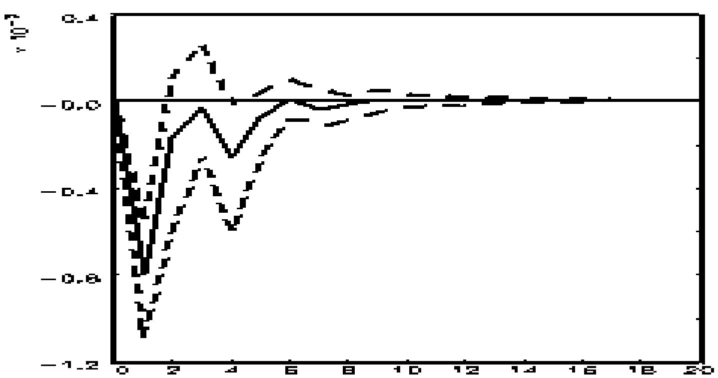
Hungary: flow responds to domestic returns



Poland: flow response to domestic returns



Turkey: flow response to domestic returns



Daily: flow response to domestic returns

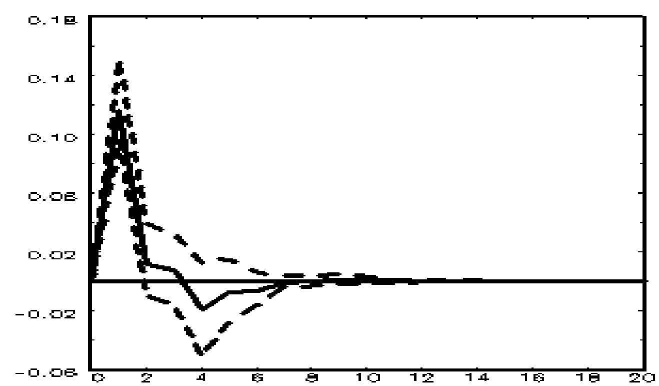
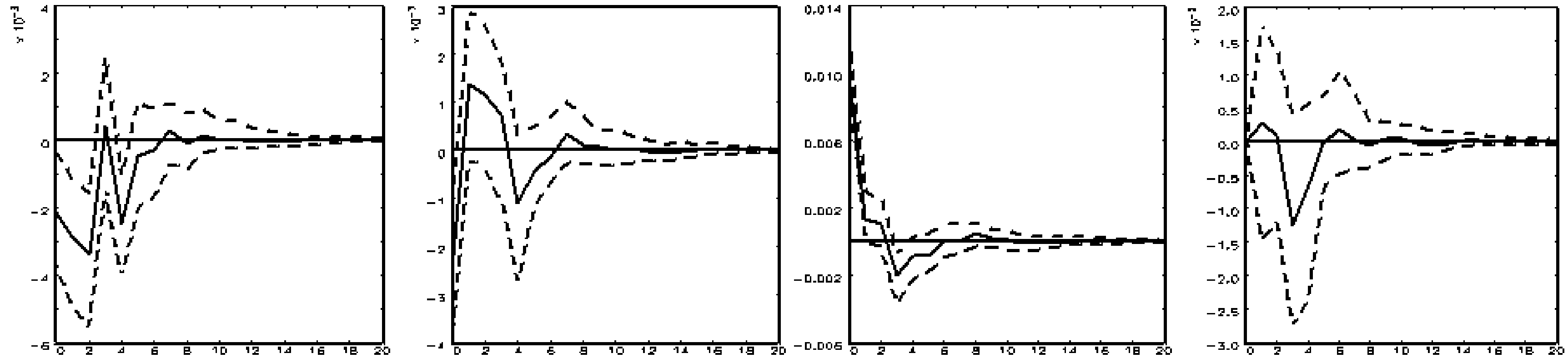


Figure 15. Extended VAR, testing the second spcification with domestic returns

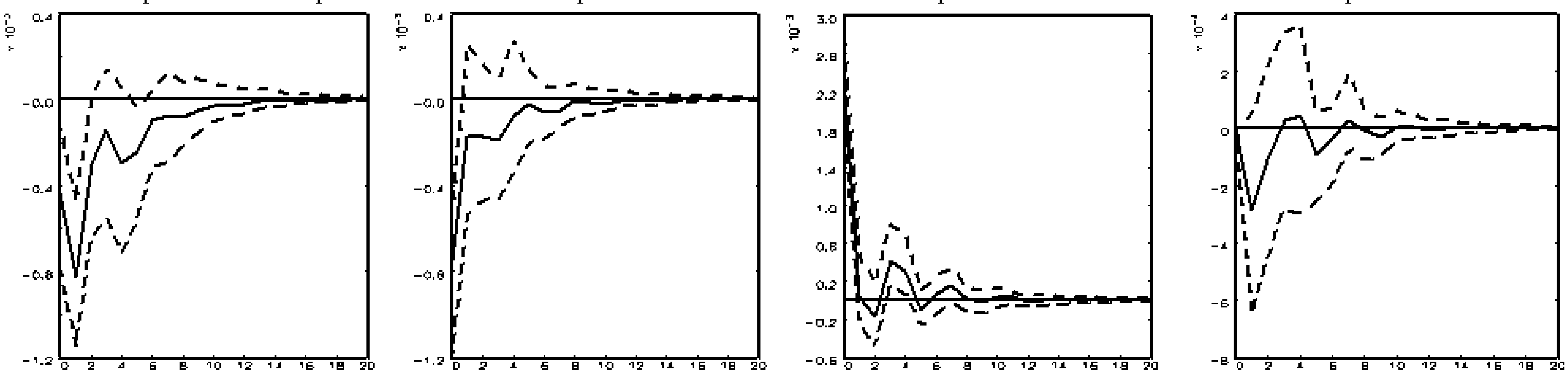
(a) Hungary

Flow response to credit spread | Flow response to CDS | Flow response to flow | Flow response to returns



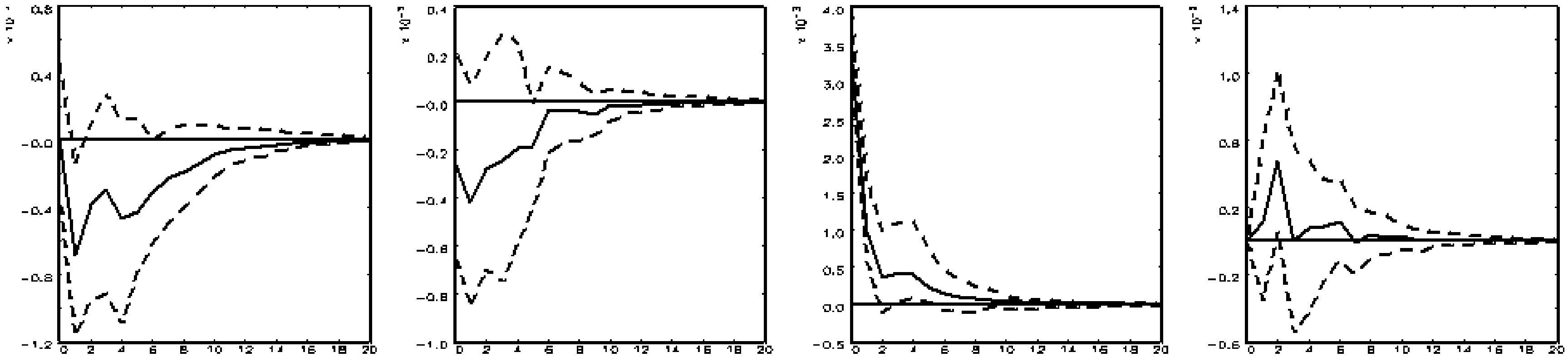
(b) Turkey

Flow response to credit spread | Flow response to CDS | Flow response to flow | Flow response to returns



(c) Poland

Flow response to credit spread | Flow response to CDS | Flow response to flow | Flow response to returns



(d) Turkey daily

Flow response to credit spread | Flow response to CDS | Flow response to flow | Flow response to returns

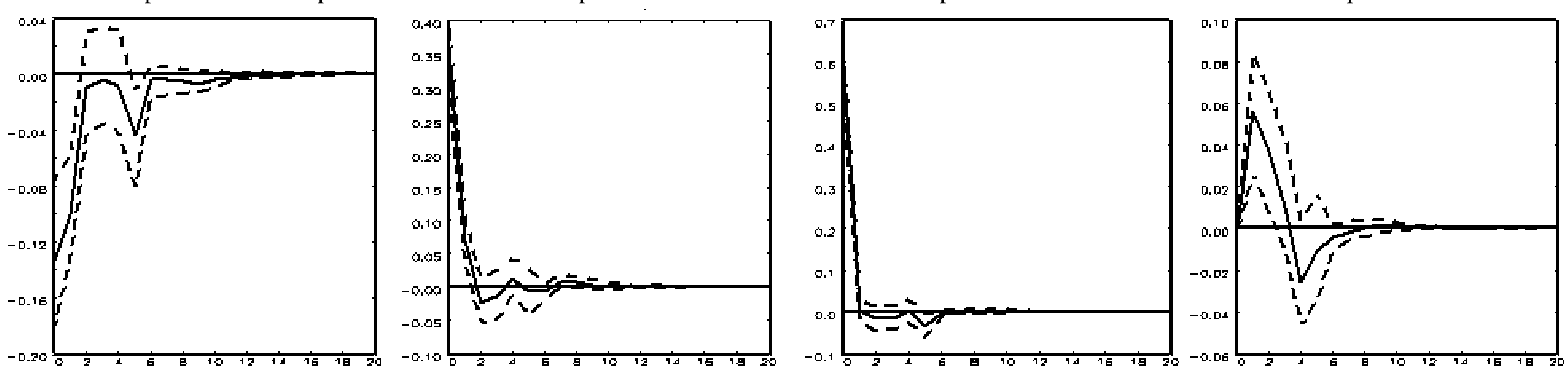


Figure 16 Extended VAR, testing the third specification using USD returns

Hungary: Flow response to USD return   Turkey: Flow response to USD return   Poland: Flow response to USD return

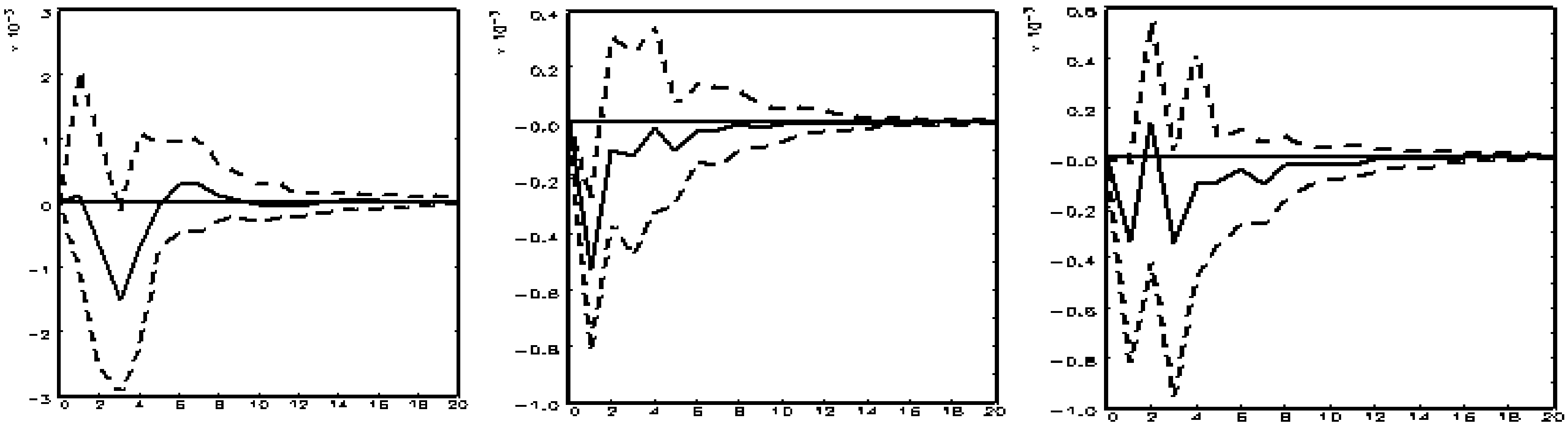


Figure 17. Extended VAR, testing the third spcification with domestic returns