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"Behavior of Equity Foreign Investors on Emerging Markets"

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ABSTRACT

This dissertation analyzes empirically the behavior of foreign investors on emerging equity markets in a cross-country setting, including 14 emerging markets from the year 2000 to 2005. Tests of flow persistence, feedback trading and herding behavior were performed. Also, the effects of these investors on emerging markets are evaluated. We could find little evidence that these investors have brought problems to local emerging markets. Confirming the previous literature, we identify a strong persistence on the foreign flows. Foreign investors seem to build and unwind their positions on emerging stock markets slowly enough to avoid problems as price pressure or volatility and kurtosis upswings on the stock market. Also, no negative effects on the foreign exchange market could be found. Regarding feedback trading, we support two hypotheses: positive feedback trading by hedged investors and negative feedback trading by unhedged investors. The latter has stronger evidence and is beneficial to the local markets, while the first has weaker evidence and may exacerbate the stock's movements when we consider the local currency. But we cannot refute the possibility that both occur together, and the behavior of currency returns is the responsible to make this possible. Regarding the herding behavior among foreign investors, we found it statistically significant in our sample, but in a lower intensity if compared with previous studies with emerging equity markets. Our regressions analysis showed no effects on the stocks' volatility, but the fat tails of equity return's distribution may be due to this herding behavior of foreigners. We conclude that there is no reason to impose long-term restrictions to their flows since they bring benefits such as greater risk sharing and higher market liquidity, with negligible negative effects.

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1) Introduction

After being the major paradigm on finance for a long time, the efficient market paradigm has been challenged by the behavioral approach. One main difference of the behavior approach is that rational investors are often not numerous and powerful enough to keep the market efficient against the so-called noise traders. This type of investor is assumed to have some behavioral biases when trading. Several studies empirically analyze the behavior of investors looking for these biases, grouping them by categories: individual or institutional, foreigner or domestic.

The main goal of this dissertation is to analyze empirically the behavior of foreign investors on emerging equity markets in a cross-country setting. In order to analyze this behavior, tests of feedback trading and herding are performed. Also an assessment is done to investigate whether these investors produce positive or negative effects on local markets, and if some kind of restriction or regulation should be imposed to capital flows.

The main contribution of this study is to analyze the behavior of foreign investors in a diversified set of emerging markets. Also, the study will be the first to deal with the behavior of foreign equity investors in some markets, especially those from Eastern Europe. Previous papers analyzing foreign investors' behavior in emerging markets with emphasis on feedback trading, either use a sub-set of foreign investors (US investors in Bohn and Tesar [1996] and Brennan and Cao [1997] and Clients of a Global Custodian in Froot et al [2001]) or a sample very concentrated in Asian countries (Richards [2004] and Griffin et al [2004]). Our study also considers the possibility of foreigners to invest with or without currency hedge, while previous studies overlook this important point.

Regarding the herding behavior, this dissertation is the first study to address this issue on a cross emerging market analysis. Previous papers were focused on single countries only (Bowe and Domuta (2004), Kim and Wei (2002)) or use data from emerging equity funds (Borensztein and Gelos (2003)). Also, we consider the period of time from 2000 to 2005, while previous studies covered the late 1990's, a period of crisis on emerging markets.

The remaining of this dissertation is structured as follows: Chapter 2 makes a literature review of the behavioral biases connected to this research, including an extensive analysis of research about foreign investors' behavior; Chapter 3 focuses on feedback trading behavior by foreign investors; Chapter 4 analyses the effects on local markets of foreign trading; Chapter 5 deals with herding by foreigners; and Chapter 6 concludes the dissertation with some implications for policy and other regulatory issues.

2) Literature Review

In traditional asset pricing models, with efficient capital markets and symmetric information, investors would hold the market portfolio, and trading should be almost inexistent since all new information is incorporated into prices quickly and efficiently. Real world evidence, however, shows that the volume trading is above the prediction of traditional asset pricing models (see Odean (1999) and Barber and Odean (2000)) and also the volatility is higher than expected (Shiller (1981)). The reason for these anomalies may lie in the deviation from rationality of a good proportion of the investors.

In the behavioral literature, a number of possible trading biases that challenge the efficient market paradigm can be found - Disposition Effect, Myopic Loss Aversion, Representativeness Bias, Feedback Trading, Herding, Home Bias, among others. These behaviors tend to keep the markets away from efficiency.

One of the main arguments for the efficiency of markets is that arbitrage trading by rational investors should correct market anomalies caused by these biases. However, this correction has limits as showed by Shleifer and Vishny (1997): arbitrageurs could not have power enough to engage in arbitrage operations until the end – sometimes they are forced to quit the arbitrage operation because they run out of cash or margin, especially when noise traders are strong and trading in the opposite direction.

The next sections review the theory and evidence of some behavioral biases and anomalies that are linked to the goals of this research. A special emphasis is given to studies about the behavior of equity foreign investors and its effects on emerging markets.

2.1) The Disposition Effect

The Disposition Effect is one of the behavioral biases that have been studied in the behavioral finance literature. It was initially documented by Shefrin and Statman (1985). It is the tendency of investors to sell winners but hold on losers: investors are reluctant to sell assets by a price below purchased price, whereas they sell assets too early when they are making profits.

The explanations for this effect by Shefrin and Statman (1985) come from irrational behavior. Investors may have an irrational belief in mean reversion. Another explanation uses prospect theory of Kahneman and Tversky (1979) with narrow framing and mental accounting. Investors would keep a separate mental account for each asset. Within that account, investors maximize a valuation function. This function is concave in the region of gains, and convex of the value function in the region of losses. Then, if the asset price goes up, above the purchase price, investors will be on the concave (or risk-averse) part of the valuation function, which makes a sale more likely. On the other hand, if the asset is being traded below its purchase price, investors will be on the convex part of the valuation function, and so they tend to hold on to the asset. Investors hope that the stock will eventually break even, saving them from having to experience possible painful losses.

Later on, some rational explanations have been proposed to explain the disposition effect. Lakonishok and Smidt (1986) argued that portfolio rebalancing could be partially responsible for this effect, since investors should sell assets that have recently increased if they want to restore their benchmark portfolio. Another explanation is the informational differences across investors. If an investor purchased an asset based on positive information, he may sell it when the price goes up because he believes now that the asset price reflects the previous positive information. But if the asset price goes down, he may continue to hold it, believing that his information is yet to be incorporated into the price.

Harris (1988) also provides a rational explanation, based on transaction costs. Stocks with low prices tend to have relatively higher transaction costs. As loser stocks tend to have lower prices, its transaction costs tend to be higher if compared with winner stocks. Therefore, investors may refrain from selling losers simply to avoid the higher transaction costs. The article of Odean (1998), however, refutes these rational explanations with empirical data.

Regardless of the explanation, the empirical evidence strongly supports the existence of the disposition effect. This evidence comes from aggregate data on US mutual fund redemptions like in Shefrin and Statman (1985), as well as from professional futures traders as described by Locke and Mann (2000), and from US individual investors trading as reported by Odean (1998), Lim (2005), Dhar and Zhu (2002), among others. The disposition effect has also been identified in other countries such as Finland as reported by Grinblatt and Keloharju (2001) and Australia as showed by Brown et al (2002). Also, evidence for disposition effect can be found in an experimental setting (Weber and Camerer [1998]).

One interesting consequence of the disposition effect is that it favors reversals in stock market returns, i.e., past winners tend to perform poorly in the future, and past losers tend to perform well. Section 2.7 will deal with this phenomenon.

2.2) Information Asymmetry and Home Bias

One of the postulates of efficient markets theory is that information is quickly spread among all agents. No group of investors would have an information advantage against the others. This assumption has been dropped in several types of models. One interesting case is when foreign and domestic investors have available a different set of information. Usually, domestic investors are supposed to have more information than foreigners, which would lead to another anomaly: the Home Bias, which is the tendency of domestic investors to allocate an excessive proportion of the wealth in their home country, throwing away diversification opportunities of foreign markets. This bias has been studied extensively - see Lewis (1999) for a survey of home bias literature.

Among the reasons for this home bias, Tesar and Werner (1995) cite language, institutional and regulatory differences, as well as the cost of obtaining information about foreign markets. French and Poterba (1991) cite also the difficulties in generating and interpreting

information about foreign markets as a reason to explain the home bias[1]. Therefore, maybe the home bias can be a consequence of transaction costs, among which the informational cost is included.

Brennan and Cao (1997) were the first to propose a model to the international flow of foreign equity investors, considering information asymmetry. They assume that domestic investors have access to information faster than foreigners, creating an information asymmetry, and this would generate a home bias. Foreign investors would update their portfolios in the local markets according to public information that has already been incorporated by local investor's portfolios. The result of the model is that the net foreign flow has a contemporaneous relationship with local market returns. However, they point out that this information advantage of local investors should accrue gradually over time. Although their empirical application of the model uses quarterly data, the model of Brennan and Cao talk about "contemporaneous relationship" of returns and flows and information advantage that "accrue gradually over time" without specifying the periodicity a dataset should have to be used with the model. We will come back to this point later on section 2.6.

One important issue related to this model is whether foreigners should in fact have an information disadvantage. The argument would be that domestic investors have this advantage because of linguistic or cultural differences, or even physical distances. On the other hand, foreign investors may have an information advantage given their investment scale, experience and expertise. Empirical evidence on this question is mixed. Choe, Kho, and Stulz (2001) using Korean data and Dvorak (2005) using Indonesian data find short-term information advantage. Frankel and Schmukler (1996) also provide evidence that local market investors have informational advantages over foreign investors, analyzing specifically the Mexican closed-end funds at the time of the Mexican crisis of 1995. On the other hand, Grinblatt and Keloharju (2000) using Finnish data, and Froot et al (2001) using a data from 44 countries found that foreigners have better performance than local investors[2]. Bhattacharya et al (1999) study the reaction of foreign and domestic investors from the Mexican Stock Exchange to earnings announcements. Their results reveal absence of reaction by domestic investors, evidence that suggests the existence of insider trading, so that prices fully incorporate the information before its public release. However, foreign investors are more surprised than the domestic about the announcements, suggesting that an information asymmetry in benefit of local investors.

2.3) Feedback Trading – Theoretical Models

The assumption of rational investors of the efficient capital market models also includes another implicit assumption: investors are homogenous. Shiller (1984) proposes a model[3] that drops this assumption of rational and homogenous investors:

"*It is widely and mistakenly believed that (1) institutional investors hold most stocks, (2) most wealthy individuals have delegated authority to manage their investments, and (3) smart money*

[1] The model of Merton (1987) assumes that some investors may even pay a premium for *familiar* assets.
[2] However, this would mean that foreigners have better processing abilities, and not better information.
[3] Known as fads model, since he argues that social interactions and fashion would influence investors' decisions.

dominates the market. By suggesting that the market is more professionalized than it is, these misconceptions lend spurious plausibility to the notion that markets are very efficient."

Therefore, Shiller (1984) considers an equilibrium model two types of investors: Smart-money and Ordinary. Smart-money investors are those who respond quickly and appropriately to publicly available information, subject to their wealth limitations. Their stock demand is:

$$Q_t = \frac{\mathrm{E}_{t-1}[r_t] - \alpha}{\mu} \tag{2.1}$$

Where Q is the demand for shares by smart money at time t expressed as a proportion of the total shares outstanding; E_t is the denotes expectation conditional on all public information at time t; r_t is the rate of return at time t; α is the expected real return such that there is no demand for shares by the smart money; and μ is the risk premium that would induce smart money to hold all the shares.

Ordinary investors are those who do not respond to expected returns optimally forecasted. They may, for example, overreact to news or receive strong influence from fads. However, Shiller makes no assumptions of about the ordinary demand, calling it just Y_t. Then, the equilibrium requires that:

$$Q_t + Y_t / P_t = 1 \tag{2.2}$$

The solution for the price is:

$$P_t = \sum_{k=0}^{\infty} \frac{\mathrm{E}_t[D_{t+k}] + \mu \mathrm{E}_t[Y_{t+k}]}{(1+\alpha+\mu)^{k+1}} \tag{2.3}$$

Where D_t is the dividend at time t.

Note that if smart money investors were very powerful, μ would be very small (let's say zero). Then this formula becomes the traditional present value of expected dividends of efficient markets model.

Another equilibrium model with heterogeneous investors was proposed by Sentana and Wadhwani (1992). Their model is in some way a special case of Shiller's fads model where the ordinary investors have a specific characteristic: they are feedback traders. The positive feedback trading consists of a strategy where investors buy after a market or asset rise and sell after a market or asset decline. Similarly, negative feedback trading consists of a strategy of buying after a decline and selling after a rise. While positive feedback trading is usually considered as a destabilizing behavior, since it exacerbates market movements, negative feedback trading tends to smooth market movements.

The feedback trading is modeled by Sentana and Wadhwani (1992) with the following stock demand:

$$Y_t = \gamma r_{t-1} \tag{2.4}$$

They consider initially a constant γ. They also assume that the risk premium μ that would induce smart money investors to hold all shares is a function of the conditional variance of returns. In the equilibrium we have:

$$\mathrm{E}_{t-1}[r_t] = \alpha + \mu\left(\sigma_t^2\right) - \gamma\mu\left(\sigma_t^2\right) r_{t-1} \qquad (2.5)$$

Note that this is the traditional CAPM model plus an additional term $-\gamma\mu\left(\sigma_t^2\right) r_{t-1}$, which depends on past returns. Therefore, returns are autocorrelated, and the degree of autocorrelation depends on volatility. If γ is positive, i.e., there are positive feedback traders, the autocorrelation is negative. With negative feedback traders the autocorrelation is positive. This result is controversial, since positive feedback trading is known as a phenomenon that exacerbates trends, but their model predicts negative autocorrelation. Conversely, negative feedback traders tend to "buck the trend" and their model associates them with positive autocorrelation. The idea behind this model is that rational investors would more than offset the action of feedback traders.

The Sentana and Wadhwani (1992) model also allows γ to vary over time, also according to volatility. They propose that negative feedback trading ($\gamma < 0$) would appear with low volatilities so that returns would have positive autocorrelation. On the other hand, high volatility would induce positive feedback trading ($\gamma > 0$), which then leads to returns with negative autocorrelation. So, this model suggests that anomalies would appear in a strong form when volatility is high.

The article of Cutler, Poterba and Summers (1990) also develops an equilibrium model with heterogeneous investors. Besides the Smart Money and Feedback traders, they use also a third kind of investors: the Fundamental Traders. The demand of these investors will be a function of market prices and prices derived from the perceived fundamentals. When market prices are high relative to perceived fundamentals, their demand is low, and vice-versa. They also allow for the possibility that perceived fundamentals reflect actual fundamentals with some lag. This can generate positive serial correlation in returns. We will see later that Jegadeesh and Titman (1993) use a similar argument to justify the momentum phenomenon. The equilibrium solution gives the asset price as a function of past prices and fundamentals, and expected future fundamentals. As in the Sentana and Wadhwani model, Cutler, Poterba and Summers (1990) also associate negative (positive) feedback traders with positive (negative) autocorrelation in returns. Again, rational investors would offset the effects of feedback traders.

The model of De Long et al (1990) also considers three groups of investors – feedback traders, fundamental investors and rational investors[4]. However, there is a major difference in the behavior of rational investors compared with the Cutler-Poterba-Summers and the Sentana-Wadhwani models. The presence of positive feedback investors might lead rational investors to "jump on the bandwagon" instead of "buck the trend". Rational investors who expect future buying (selling) by feedback traders will buy (sell) today hoping to sell (buy) at a higher (lower) price tomorrow. Moreover, the article shows that under certain conditions there is no equilibrium. So depending on the strength of feedback traders and rational investors, the model shows that the

[4] They call them "rational speculators"

market may become unstable. This is in line with the common sense idea that positive feedback traders tend to exacerbate the trend and that negative feedback traders are trend smoothers.

Balduzzi, Bertola and Foresi (1995) propose a model that also obtains results corroborating the negative effects of positive feedback traders. In a market with two kinds of investors - speculators who maximize expected utility and feedback traders - they show that positive-feedback strategies increase the volatility of stock returns, and the response of stock prices to dividend news. Conversely, the presence of negative-feedback traders decreases the volatility, and makes prices less responsive to dividends.

Another approach to analyze equity markets is to model the international equity flows. As seen before, Brenan and Cao (1997) model these flows with an asymmetric information model. The article of Albuquerque, Bauer, Schneider (2004) proposes a model for international equity flows of developed countries with heterogeneous investors. Also, both the foreign and domestic investor populations contain investors of different sophistication. Sophisticated investors have information advantages like knowing the persistent component of dividends. The calibrated model for the flow of US investors to G7 countries shows that there is contemporaneous correlation between foreign flows and local returns, and that local returns predict foreign flows. They found also that American investors build and unwind their equity positions in G7 countries gradually over time. The calibration is performed only for developed countries – Emerging Markets would have high transaction frictions, and the model does not consider this.

The model of Griffin, Nardari and Stulz (2004) for equity flows considers the existence of barriers to the entrance of foreign investors in a local market. Foreign investors find past stock prices more informative about future domestic returns than domestic investors. One of the results of the model is that foreign equity flows increase with the local return of the country. Also, when a country is small, the model predicts that foreign equity flows toward the country increase with stock returns in bigger markets. However, this model does not consider heterogeneity inside domestic investors.

2.4) Feedback Trading – Empirical Evidence

Existing empirical studies in feedback trading behavior encompass different types of investors and markets. Some studies analyze the entire market, making no distinctions among investors, relying only on data about prices. This kind of studies uses the model of Sentana and Wadhwani (1992). Other studies focus on a specific kind of investor (for instance institutional, individual, foreign), relying on flow data.

Besides proposing the theoretical model described in the last section, Sentana and Wadhwani (1992) also make an empirical investigation of US stock market. They find that hourly stock returns have positive autocorrelation during low volatility periods and negative autocorrelation during high volatility periods. As their theoretical model shows that positive feedback trading is associated with negative autocorrelation and vice-versa, they conclude that feedback trading is associated with volatility. However, it is worth to remember that this conclusion relies on the assumption that rational investors offset feedback traders. Many other

articles make use of this Sentana-Wadhwani model to test empirically feedback trading, relying on this assumption as well.

Koutmos (1997) extended the empirical investigation of the Sentana-Wadhwani model to other six stock markets from developed countries using daily data, finding similar results. He found negative autocorrelation in all six markets, which rises, in absolute terms, with the level of volatility. According to the model, this means feedback-trading activity. Also, in four markets the feedback trading is more intense during market declines.

Another article that applies the Sentana-Wadhwani model is Koutmos and Saidi (2001). They present evidence of daily positive feedback trading activity in six Asian emerging markets, but mostly during market declines. During such periods stock return autocorrelations become negative and volatility rises. Bohl and Siklos (2004) also apply Sentana-Wadhwani model to Emerging Markets, but restricted to four Eastern European countries. They compare results for these countries with developed markets using daily data. The results show that positive and negative feedback trading strategies exist in both types of markets but are more pronounced in Emerging European markets than in the developed markets.

Finally, the framework of Sentana-Wadhwani model has also been applied to Foreign Exchange markets by Aguirre and Saidi (1999) and Laopodis (2005). They found evidence for several countries of positive autocorrelation, which according to the model indicates negative feedback trading. Also, for emerging countries they got evidence of asymmetric behavior of autocorrelation: when these currencies are losing value, feedback trading is more intense than when it is appreciating. According to their interpretation, this means lack of confidence on the currency, and that trader's hope that central banks will make interventions and realize their profits.

One of the first studies to use flow data to analyze return's patterns was Lakonishok, Shleifer and Vishny (1992), which investigate equity pension funds in the U.S. They found evidence of positive feedback trading only in small capitalization stocks. Warther (1995) analyses the impact of mutual fund flows on U.S. stocks, and found that, from 1984 to 1992, monthly mutual fund flows explained a significant fraction of monthly U.S. equity returns, but he found no evidence of positive feedback trading.

Grinblatt, Titman and Wermers (1995) analyze the investment behavior of mutual funds and report that 77% of them used to buy stocks that were past winners, but they did not systematically sold past losers, and they earned significantly better performance than the other funds.

The article of Nofsinger and Sias (1999) examines the relationship between annual changes in institutional ownership and returns of NYSE stocks, finding a strong positive relation. One possible interpretation of their result is that institutional investors engage in intrayear positive feedback more intensively than individual investors.

Froot and Teo (2004) show that institutional investors are also positive feedback traders considering stocks as a group (or style). That is, they buy into groups of stocks that have performed well in the past even if some of the stocks have not individually performed well.

However, evidence for individual investors show that they are negative-feedback traders, as reported by Shefrin and Statman (1985), Odean (1998) and Bange (2000). Negative feedback trading can be caused by the disposition effect, since investors tends to sell early their profitable investments.

Further empirical evidence about feedback trading will be analyzed on section 2.6, which deals specifically with feedback trading by foreign investors.

2.5) Herding

Another anomaly that challenges the efficient market paradigm is the herding behavior. Although this behavior is blamed to be irrational, in some cases it can be rational at an individual level. Anyway, it is still irrational at group level since it can lead to mispricing, especially bubbles.

One general concept of herding is a simple *convergence of behaviors* (see Hirshleifer and Teoh (2003)). However, many researchers argue that the "true" herding arises from the interaction among the agents, when agents tend to copy each other's decisions. But it may happen that the behavior convergence is due to some common external factor or information available for the group that is supposedly herding. In this case we would have a "spurious herding" as defined by Bikhchandani and Sunil Sharma (2001). It is very difficult to empirically identify whether a herding behavior is spurious or not since the number of factors that may influence an investment decision is very ample.

Several theoretical models of herding behavior have been proposed in the literature. Scharfstein and Stein (1990), Bannerjee (1992) and Bikhchandani et al (1992) considered that agents follow the behavior of other individuals, sometimes ignoring private information. Although this behavior is inefficient from a collective point of view, it can be rational from the individual perspective. The motivation for this kind of individual behavior may be the group pressure.

The models of Bikhchandani et al (1992) and Bannerjee (1992) consider that individuals make their decisions sequentially at a time, taking into account the decisions of the individuals preceding them. This seems not to be a realistic assumption since traders submit orders simultaneously. The model proposed by Cont and Bouchaud (2000) avoids this sequential decision process by considering a random communication structure, with groups of agents making independent decisions. These random interactions between agents lead to a heterogeneous market structure.

Another stream of the literature combines herding behavior with the statistical properties of empirical returns, giving special emphasis to fat tails. For example, the articles of Bak et al (1997), Lux (1998), and Cont and Bouchaud (2000) have tried to explain the fat tail feature of returns' distribution as a consequence of a market, where fundamentalist traders interact with noise traders, which use to herd. Bak et al (1997) use a model with heterogeneous investors, considering several types of trading rules. Results from computer simulations show that fat-tailed

distributions arise from this setting. Cont and Bouchaud (2000) propose a similar model, but some simplifications allowed them to make analytic calculations.

The article of Persaud (2002) argues that Value at Risk (VaR) models led banks to herd and that this is not offset by other classes of investors, causing a lack of liquidity on equity markets. As investors are increasingly using the same VaR models, the tendency is convergence of the behavior of market participants. So he argues that regulators should incentive diversity of behavior among the market participants, through the use of different risk management systems.

The empirical research of herding behavior in financial markets has different methodologies and relies on different kinds of data. Also, it has been applied to different markets and group of investors.

Several measures have been developed to investigate herd behavior in financial markets. Lakonishok, Shleifer, and Vishny (1992) based their criterion on the trades conducted by a group of market participants (fund managers on their empirical application), comparing the actual behavior with an ideal behavior considering independent and random trades. The Lakonishok, Shleifer, and Vishny measure (hereafter LSV) is:

$$LSV_{i,t} = \left| p_{i,t} - \mathrm{E}\left[p_{i,t} \right] \right| - \mathrm{E}^{NH}\left[\left| p_{i,t} - \mathrm{E}\left[p_{i,t} \right] \right| \right] \qquad (2.6)$$

Where:

$p_{i,t}$ is the actual percentage of fund managers that buy stock i at time t.

$\mathrm{E}[P_{i,t}]$ is the expected value of $p_{i,t}$, defined as the average buying percentage of all managers trading at period t.

$\mathrm{E}^{\mathrm{NH}}[.]$ is the expectation operator under the hypothesis that there is no herding.

$\mathrm{E}^{\mathrm{NH}}[|p_{i,t}- \mathrm{E}[p_{i,t}]|]$ is an adjustment factor which is the expected value of the first term under the null hypothesis that there is no herding. The theoretical distribution of $p_{i,t}$ considering independent and random trades for each manager is a binomial distribution with mean $\mathrm{E}\left[p_{i,t} \right]$.

Therefore, if there is no herding the LSV measure tends to zero. This measure has one major drawback: it does not consider the volume of manager's trading. The measure uses only the number of managers buying and selling, without regard to the monetary value they trade. Note that this measure is not able to identify if the herding is spurious, i.e., due to common external factors.

LSV empirically use their measure to test for herd behavior using a sample of US tax-exempt equity funds covering the period 1985 to 1989. They concluded that managers do not exhibit significant herding. There is some evidence of herding being more intense among small companies compared to large stocks.

Wermers (1999) proposes a modification of this herding measure in order to capture differences of behavior when traders are buying or selling. So they have two measures, one for buying and another for selling. He used a dataset of the US mutual fund industry from 1975 to

1994, finding little herding by mutual funds in the average stock, but much higher levels of herding for small stocks and growth-oriented funds.

Grinblatt, Titman and Wermers (1995) also focus on mutual funds, finding a herding behavior strongly correlated with a tendency to buy past winners as well as with its portfolio performance.

Studies of herding behavior among foreign investors on emerging markets are also found in the literature. These studies are especially concerned on the herding during crisis periods. Choe, Kho and Stulz (1999) investigate the Korean Stock Market around the Asian crisis of 1997 with daily data (purchases and sales) for each stock. They used the LSV herding measure and find strong evidence of herding by foreign investors before the Asian crisis of 1997. Nevertheless, the evidence is much weaker during the crisis period.

Kim and Wei (2002) also use the LSV herding measure and data from Korean Stock Market around the 1997 crisis. They use a dataset of monthly portfolio holdings at individual account level. Their results show that non-resident investors herd significantly before, during and after the crisis. But the intensity is slightly lower during the crisis. Individual residents also herd (but with lower intensity than foreigners) while local institutions exhibit no herding behavior.

The article of Bowe and Domuta (2004) uses data from Jakarta Stock Exchange to analyze the investment patterns of foreign and domestic investors around the Asian crisis of 1997. Their results indicate that both foreign and local investors herd, foreigners herd more than locals, and foreign herding increases following the onset of the crisis.

Borensztein and Gelos (2003) do not focus on a particular country, but instead uses monthly data from Emerging Markets Funds from 1996 to 2000. They found significant herding by these funds, and there is a small variation between crisis and non-crisis periods. An interesting finding is that herding is more intense in larger markets, which is consistent with the hypothesis that these funds prefer to adjust their portfolios more often on markets that offer higher liquidity.

An additional assessment of herding is done by Borensztein and Gelos (2003) and Wermers (1999). Besides comparing the actual and theoretical expected value of $|p_{i,t}- \mathrm{E}[p_{i,t}]|$, they compare also the actual distribution with a theoretical distribution using Monte Carlo simulation. The theoretical distribution is built considering independent and random trades for each manager. They plot both distributions and make a visual assessment concluding that there are significant differences between them, corroborating the evidence of herding. It is worth to note that they do not make a statistical test like the Kolmogorov-Smirnov or Kuiper to evaluate if the two distributions are different.

Other kind of herding measures relies only on price data such as those proposed in Christie and Huang (1995), Hwang and Salmon (2001) and Demirer and Lien (2001). These measures look at whether the returns on individual stocks cluster more intensively around the market during periods of market stress. However a major critique can be made to this kind of herding measures: it is just a clustering measure. Perhaps stocks are moving in a similar way due to parallel independent influence of a common external factor, like macroeconomic factors. For example, a movement of the Term Structure of Interest Rates would affect all stocks at the same

time. So we cannot say whether the convergence is due to investors updating their valuation models using the new information or due to actual interactions among investors, i.e., we cannot distinguish between *spurious* herding and the *true* herding.

Hwang and Salmon (2001) find statistically significant evidence of herding towards the market portfolio during relatively quiet periods rather than when the market is under stress, using data from US, UK, and South Korean stock markets. Chang, Cheng and Khorana (2000) find no evidence of herding for US and Hong Kong and partial evidence of herding in Japan. However, for South Korea and Taiwan, significant evidence of herding is found. In all five markets, the rate of increase in security return dispersion as a function of the aggregate market return is higher in the up market, relative to the down market days (directional asymmetry). Demirer and Lien (2001) find evidence of herding during periods of unusually large upward and downward movements, for US data. However, no evidence of the directional asymmetry is found.

There are also interesting event studies such as Golec (1997), which provides an empirical example of herding on noise: Johnson Redbook's case. Johnson Redbook used to publish weekly retail sales figures that somehow predicted bond returns for a short time, probably because a significant number of bond traders used this data to trade. This significant relationship between the data and bond returns disappeared just after the Wall Street Journal started to report it.

2.6) Foreign Investors: Behavior and Effects

The literature about the behavior and the effects of foreign investors on stock markets has two main points. One focuses on granger causality or concurrent movement between stock's returns and foreign flows. The other focuses on anomalies that may cause destabilizing effects of foreign investors such as positive feedback trading, herding, volatility jumps and price pressure.

As seen on section 2.2, some articles build theoretical models based on information asymmetries of foreign and local investors. One of the results (Brennan and Cao, 1997) is that there is a contemporaneous relationship between local market returns and foreign portfolio flows. The empirical research of Bohn and Tesar (1996) and Brennan and Cao (1997) uses quarterly data of US investments on foreign equity markets (developed and emerging), finding a positive contemporaneous correlation of these flows and local returns on most of the countries analyzed. However, this may be due to positive correlation of flows with lagged returns at higher frequencies.

The article of Froot, O'Connell, Seasholes (2001) analyzes daily foreign equity flow data from one of the world's largest global custodians. They find evidence of positive feedback trading, and also that these flows have forecasting power for future returns of emerging markets, i.e., foreigners may be able to anticipate price movements. Comparing results of daily, monthly and quarterly data they argue that most of the contemporaneous correlation of flows and returns at monthly and quarterly frequencies are due to positive feedback at daily frequency. These results should be considered with caution because of possible bias of their database. First, they consider just one custodian, that although is very large, may not be representative of the universe of foreign investors in the world. Also, their database records have the settlement date of trades,

instead of actual trading date. They rely on country's usual settlement conventions to convert settlement date to trade date. This may induce some systematic errors.

Other two empirical studies use daily data to analyze foreign flow to emerging markets, but mainly Asian markets. Richards (2004) studies five Asian countries while Griffin, Nardari and Stulz (2004) consider a sample with 9 emerging countries (seven of them in Asia, plus Slovenia and South Africa). Both find evidence of positive feedback trading at daily frequency. Also, flow impacts future returns on daily basis for most of the countries in their sample.

There are several other articles that analyze the issue of feedback trading and contemporaneous relationship between foreign flows and local returns. Table 1 shows a survey of these articles. Evidence of feedback trading is found on 9 of the 11 studies, while evidence of contemporaneous relationship between flow and returns is present in all articles that have tested it.

One issue usually overlooked by the literature is the choice of the currency used to calculate index returns and evaluate feedback trading. If foreigners invest in emerging markets without making currency hedge, then one should use returns in USD or other foreign currency. However, if foreigners use hedge instruments to neutralize the local currency return, then one should use returns in local currency. As there is no survey or source of information available to identify if foreigners invest hedged or unhedged on emerging markets, this choice is a difficult matter. All the studies on this area focus on just one way to identify feedback traders, and usually they consider hedged foreign investors. For small emerging economies, the derivatives markets are not very developed and so hedging opportunities seem not to be very widely available. Even on the big emerging markets, it is not clear whether foreigners use hedge instruments, and if they use, the cost of the hedge should be considered when calculating the returns.

One possible explanation for the contemporaneous relationship between foreign flows and local returns is the price pressure: it may be the case that trading volumes of foreign investors are very high for the size of emerging markets, what may cause price pressures due to low liquidity of such markets. Clark and Berko (1996) used Warther (1995) approach to evaluate price pressure by foreign investors in the Mexican stock market, but they did not find any price pressure in the Mexican market. Also Dahlquist and Robertsson (2004) found no evidence of price pressure for the Swedish market: foreigners' net inflows are coupled with significant increases in prices, but there is no price reversion after these price increases. Also Froot and Ramadorai (2001) found no evidence of price pressure on institutional equity flows.

Table 2.1 – Survey of the Literature

Article	Frequency	Flows' Origin	Flows' Destination	Period	Contemporaneous Relationship	Feedback Trading
Bohn and Tesar (1996)	Quarterly	US	17 Developed and 5 EM	1980-1994	Yes	-
Brennan and Cao (1997)	Quarterly	US	5 Developed and 16 EM	1982-1994	Yes	-
Albuquerque et al (2004)	Quarterly	US	G7	1977-2000	Yes	Yes, Positive
Froot, O'Connell, Seasholes (2001)	Daily	Global Custody	16 developed and 28 EM	1994-1998	-	Yes, Positive
Griffin, Nardari and Stulz (2004)	Daily	All	9 EM, mostly Asian	1996-2001	Yes	Yes, Positive
Richards (2004)	Daily	All	5 Asian EM	1999-2002	-	Yes, Positive
Clark and Berko (1996)	Monthly	All	Mexico	1989-1996	Yes	No
Choe, Kho and Stulz (1999)	Daily	All	Korea	1996-1997	Yes	Yes, Positive
Chen (2002)	Daily	All	Taiwan	1995-2000	Yes	Yes, Positive
Batra (2003)	Daily	All	India	2000-2002	Yes	Yes, Positive
Tabak (2003)	Monthly	All	Brazil	1990-1998	Yes	-
Bowe and Domuta (2004)	Daily	All	Indonesia	1997-1999	-	No
Dahlquist and Robertsson (2004)	Monthly	All	Sweden	1993-1998	Yes	Yes, Positive
Adabag and Ornelas (2005)	Monthly	All	Turkey	1998-2004	Yes	Yes, Negative

The analysis of flow and returns may also be extended to consider other variables. Some articles include the returns of world or developed markets to explain flows and returns. Although they can explain part of the variation, lagged flow and returns are still relevant explanatory variables. A number of other exogenous explanatory variables are used such as bonds' returns, country risk, etc (see for instance Dahlquist and Robertsson 2004 and Adabag and Ornelas 2005). The paper of Portes and Rey (2000) tries to explain flows using variables linked to information asymmetry, such as the real distance between countries and the phone call traffic.

Another interesting issue to analyze is the statistical properties of equity flows, especially the persistence and correlation. Froot and Donohue (2002, 2004) find evidence of highly persistent portfolio flows of institutional investors, both across countries and at the level of individual funds. Froot et al (2001) find highly persistent inflows and outflows of the equity flows they analyzed, with slightly positively correlation across countries, but with a stronger correlation within regions.

The explanation for this persistence may be informed trading: foreign investors have some private information, and try to use it not instantaneously but gradually during a certain interval of

time. Albuquerque et al (2004) reports this gradual behavior by American investors. Similar explanation relies on overconfidence, where investors trade gradually, but using imaginary private information (Odean and Gervais 2001). The persistence may be also explained by contagion or herd behavior, where investors mimic the actions of others. An explanation using wealth effects is also given: the richer the investors become less risk-averse as their wealth increases and then they continue to invest.

Several studies show that foreign trading may lead to destabilizing effects on local markets especially during crisis and so some countries imposed rules to prevent sudden outflow (Kim and Singal, 2000). However, some authors argue that neither positive feedback trading nor herding are necessarily destabilizing. Choe, Kho and Stulz (1999) find no evidence that trades by foreign investors had a destabilizing effect in the Korean case, as the market adjusted quickly and efficiently to large sales by foreign investors and these sales were not followed by negative abnormal returns amplifying their impact. The results of Bowe and Domuta (2004) suggest that the trading of foreign investors did not severely exacerbate market movements in Indonesia at the time of the 1997 Asian crisis. In the case of herding, if institutional investors are better informed than individual investors, they would be likely to follow a herding behavior to undervalued stocks and away from overvalued stocks. Bekaert and Harvey (2000) analyzed market liberalization of 20 emerging markets during late 1980s or early 1990s, finding a small but mostly insignificant increase in the volatility of stock returns following capital market liberalizations.

If these destabilizing effects are not a consensus, some positive effects appear in several papers in the literature, especially the greater risk sharing and higher market liquidity, which lead to lower expected returns (see for example Clark and Berko (1996) and Henry(2000a)). Bekaert and Harvey (1998) documented also other positive effects as lower Exchange Rate volatility, less long-term country debt and lower inflation, among others. Henry (2000b) documented a favorable effect also on the growth rates of private investment, after emerging markets liberalize their stock markets.

Concluding, the study of the behavior of foreign investors can provide good insights of how regulators should cope with the effects of foreign trading on emerging equity markets. Foreign trading on stock markets may also affect foreign exchange market as shown in Gagnon (2004), so the implications of this kind of regulation are not restricted to the stock market.

2.7) Momentum and Reversals

The momentum and reversal anomalies have also been studied in the behavior finance literature. While momentum is the continuation of the past returns' behavior, i.e., past winners continue to outperform past losers, the reversal phenomenon is the inverse, i.e., past losers outperform past winners. These phenomena have been identified both at stock level and at country-index level. The study of momentum and reversals may shed a light about the profitability or motivations of feedback trading. If stock or indexes returns exhibit momentum, a positive feedback trading may be adequate. Conversely, if they possess reversals, a negative feedback may be suitable.

DeBondt and Thaler (1985) were one of the pioneers of the research with strategies based on past returns. They documented a reversal phenomenon with US data: long-term past losers outperform long-term past winners over a subsequent period of 3 to 5 years. On the other hand, Jegadeesh and Titman (1993) proved that on the short-term there is a momentum in US data: from 3 to 12 months, past winners continue to outperform past losers.

There are two lines of explanations for these phenomena: behavior-based and risk-based. Among the behavior-based explanations for such phenomena, the underreaction and overreaction are the most common (see Barberis, Shleifer and Vishny [1998], Hong and Stein [1999], and Chopra, Lakonishok and Ritter [1992]). The underreaction of asset prices to news (for example, rating upgrade or earnings announcements) may cause the momentum, since a slow diffusion of information among investors would make the convergence of the asset price to the "true" value also very slow. For longer periods, the behavioral explanation is an overreaction of asset prices, that may occur due to extrapolation of a series of good or bad news, in special if investors are overconfident. The reversal phenomenon can also be linked to the behavior called *disposition effect* seen on section 2.1. This disposition effect could be interpreted as negative feedback strategy with respect to past returns, which could lead to reversals in prices.

Another type of explanation for the momentum and reversal phenomena is that these abnormal returns may be due to some risk factor, and therefore the risk adjusted return may not show these abnormal returns. An obvious first candidate for risk factor is the systematic risk. Jegadeesh and Titman (1993) tested whether systematic risk would explain momentum profits and found no evidence. Fama and French (1993) proposed a three-factor model where, besides the systematic risk, two other factors can explain excess returns: size and book-to-market[5]. However, Fama and French (1996) showed that this three-factor model could not explain momentum. Griffin, Ji and Martin (2003) investigated if macroeconomic factors could explain momentum, and also found no evidence. In Emerging Markets, a factor that specially attracts attention is liquidity, but Rouwenhorst (1999) found no evidence that turnover is related to past returns.

Emerging Markets have been used to test momentum and reversals phenomena since these markets tend to be regulated, and therefore provide independent samples. Rouwenhorst (1999) used data from 20 emerging markets to analyze the risk factors that affect stock's returns, among them, the momentum. He found that in 17 countries past winners outperform past losers on average, but these excess returns are significant in only six.

Griffin, Ji and Martin (2003) also analyses emerging markets among other countries. They found that the momentum profits are largely significant around the world, although for Asian countries the evidence is weakest. Momentum profits at stock level for emerging markets are weaker than for developed countries: only two emerging countries (Chile and South Africa) showed significant momentum profits and one (Turkey) showed contrarian profits. But in general, momentum profits are positive, but not significant for emerging markets. Hart, Slagter

[5] The Size factor is defined as the difference between the return on a portfolio of small stocks and the return on a portfolio of large stocks (SMB, small minus big); and the book-to-market factor is defined as the difference between the return on a portfolio of high-book-to-market stocks and the return on a portfolio of low-book-to-market stocks (HML, high minus low).

and Dijk (2002) also analyze stock selection strategies, with data of 32 emerging markets, finding significant momentum profits in 6 countries, although in some of these countries the number of stocks was too low to make this kind of analysis. Many other papers analyze momentum and reversal in individual emerging countries and regions. For example, Bonomo and Dall'Agnol (2003) and Bildik and Gülay (2002) found evidence of reversals in Brazil and Turkey respectively. This is quite interesting, since these are two major emerging countries, and the evidence of reversals instead of momentum like in developed countries.

Another approach to analyze momentum and reversals is to consider the returns of national stock indices instead of stocks. Richards (1995, 1997) finds statistically significant evidence of reversals for a sample of 16 national stock indices of developed countries, for periods with more than one year. His results cannot be explained by risk factors such as standard deviations, covariance with the world market or performance in adverse economic states of the world. Asness, Liew, and Stevens (1996) also analyses stock market indices, but found only statistically insignificant evidence of momentum. Richards (1996) studies emerging market country indices and found results indicating reversals.

One important issue when analyzing momentum and reversals is the time span of the sample. This is critical especially for reversals, which are usually analyzed over periods of 1 to 5 years, so that a long-range sample is necessary. On this dissertation the issue of momentum and reversals will not be analyzed, since the time period of the sample obtained is too short for this kind of study. As we have only 5 years of sample period, the reversals calculation is not possible, and the momentum calculations would have very little statistical significance.

3) Feedback Trading and Information Asymmetry

This chapter investigates two issues. First, if foreign investors engage in feedback trading on emerging equity markets. Second, if there is some kind of information asymmetry between foreign and local investors, i.e., if foreigners are better informed than local investors or not. It is important to note that this hypothesis of information asymmetry cannot be distinguished from the price pressure hypothesis, i.e., if foreign trading causes a pressure on local prices.

The main contribution of this chapter is to make an analysis of the above-mentioned issues in a diversified set of emerging markets. Previous papers analyzing foreign investors' behavior in emerging markets either use a sub-set of foreign investors (US investors in Bohn and Tesar [1996] and Brennan and Cao [1997] and Clients of a Global Custodian in Froot et al [2001]) or a sample very concentrated in Asian countries (Richards [2004] and Griffin et al [2004]).

Section 3.1 will describe the variables and the dataset used. Section 3.2 makes some preliminary analysis about cross- and auto- correlation of the variables. Section 3.3 makes a Vector Autoregressive model with a Granger-causality test between the main variables. Section 3.4 makes a Structural VAR by adding control variables to the regressions. Finally section 3.5 concludes the chapter.

3.1) Variables and Data

The two main variables to be used are the net flow of foreign investors to emerging equity markets (equity purchases minus equity sales) and the returns of the emerging markets stock indexes.

Returns of stock indexes are not difficult to obtain or calculate. However, it is not easy to obtain data from equity foreign flows. The ideal situation is when a daily time series of the purchase and sales by foreign investors is available. However, daily time series are available only for Asian countries. In order to enlarge the number of countries in the analysis, the periodicity used on this research will be monthly. Table 3.1 shows the sample of countries (or markets) where I was able to obtain the net portfolio flow of foreigners[6]. Also the source of information is showed as well as the number of observations and time period. This sample was obtained after a search on websites of stock exchanges, central banks and market regulators of over 60 emerging markets.

[6] Data from Kenya and Zambia is also available. However, due to infrequent trading by foreigners and low liquidity of local markets, I decided not to use these countries. It is also available data from Chile and Czech Republic, but due to the low number of observations to perform an econometric analysis, these countries were not included also.

TABLE 3.1 - Sample of Foreign Flow Data

Country	Time period		Number Observ.	Source
Bulgaria	10/2000	07/2005	58	Bulgarian National Bank
Brazil	01/2000	08/2005	68	Central Bank of Brazil
Estonia	01/2000	07/2005	67	Bank of Estonia
Hungary	01/2000	04/2004	52	Central Bank of Hungary
Indonesia	01/2000	09/2005	69	Jakarta Stock Exchange
India	01/2000	09/2005	69	SEBI - Securities & Exchange Board of India
South Korea	01/2000	08/2005	68	Korea Stock Exchange
Lithuania	01/2001	07/2005	55	Bank of Lithuania
Philippines	01/2000	08/2005	68	Central Bank of Philippines
Poland	01/2000	07/2005	67	National Bank of Poland
Romania	01/2000	08/2005	68	Bucharest Stock Exchange
Turkey	01/2000	09/2005	69	Istanbul Stock Exchange
Taiwan	01/2000	08/2005	68	Taiwan Stock Exchange
South Africa	01/2000	08/2005	68	Johannesburg Stock Exchange

One possible shortcoming with the data is that net purchases by foreigners of ADRs are not included, except for Brazil. As trading with ADRs is likely to be largely between foreigners, it should not alter the results significantly. For India, we have only the flow of institutional foreign investors. The high information and transaction costs to invest small amounts makes this kind of investor use mutual funds in order to enter foreign markets. So the error in ignoring small investors should be small, although previous papers identify that they use to behave in a different manner.

The period of time covers approximately 5 years from 2000 to 2005, which is almost entirely after the period of first papers in this area (Bohn and Tesar [1996], Brennan and Cao [1997], Froot et al [2001]). Also, the sample of countries used here contains a diversified set of emerging countries, including seven European countries that have never been analyzed yet. Although for several countries in the sample there is data available for some years before the year of 2000, I decided not to use this period, in order to make the time period more or less homogenous across countries, so that results are comparable.

The use of monthly data is not the ideal for studying the short-term lead-lag dynamics between flows and returns since eventual contemporaneous relationships at monthly frequency would be due to feedback trading at a lower frequency. Daily data, however, may include microstructure noise. As most international investors are more likely to have their decision and evaluating process at a monthly or even quarterly frequency, I believe that the use of monthly data may give good insights about the behavior of such investors.

The foreign flow used in this study will be normalized by the market capitalization in order to make them comparable across countries. The stock indices and market capitalization used here come from the broad index given by the stock exchanges to the World Federation of Exchanges (www.world-exchanges.org). For the markets where index data is not available at World Federation of Exchanges or the available data does not cover the period, the DataStream index and market capitalization is used, when available. Finally, for the two Baltic countries and

Bulgaria, the index and market capitalization were obtained at their stock exchanges, since neither DataStream nor World Federation of Exchanges provide index information for these countries. Table 3.2 shows the source and name of the indices used.

TABLE 3.2 - Source of Index and Market Capitalization Data

Country/ Market	Source	Index's Name
Bulgaria	DataStream	BSE SOFIX
Brazil	World Federation of Exchanges	IBOVESPA
Estonia	OMX	OMX Tallinn index
Hungary	DataStream	DataStream
Indonesia	World Federation of Exchanges	Composite
India	DataStream	DataStream
South Korea	World Federation of Exchanges	KOSPI
Lithuania	OMX	OMX Vilnius index
Philippines	World Federation of Exchanges	PSE COMPOSITE
Poland	World Federation of Exchanges	WIG
Romania	DataStream	DataStream
Turkey	World Federation of Exchanges	ISE NATIONAL 100
Taiwan	World Federation of Exchanges	TAIEX
South Africa	World Federation of Exchanges	FTSE/JSE All Share

The main characteristics of the sample are showed on Table 3.3. The net flow of foreign investors is normalized by the market capitalization to facilitate comparison among countries. For 11 out of 14 markets, the average net inflow is positive during the sample period, while for 3 countries - the smallest in terms of market capitalization - the mean is negative.

One important issue regarding the returns is whether they should be calculated using the local currency or some foreign currency as the US dollar. If we consider returns in local currency, we are assuming that foreigners make currency hedge when investing in emerging markets, while using US dollar returns assumes unhedged investments for investors that uses US dollar as working currency[7]. Thus, the concept of feedback trading will depend on the type of investment: hedged or unhedged. It can be found on the literature studies using both returns in local currency and USD. On this research, both types of returns will be used when analyzing feedback trading in order to identify what (if any) influence foreign investors.

[7] The ideal would be to consider a basket of currencies with weights based on the nationality of the foreign investors, but this information is not available. A possible robustness test is to consider returns in a basket of currency like the Special Drawing Rights (SDR) provided by the International Monetary Fund (IMF) or to consider the returns in Euro for the European countries. However, as the volatility of the emerging markets local currency against the USD is in general much higher than the volatility of the main world currencies against the USD, the Returns in USD can be considered a good proxy for foreign investors in general.

TABLE 3.3 – Main Characteristics of the Sample

			Net Flow / Market Capitalization		Market Capitalization
Country	**Time period**		**Mean**	**Std Deviation**	**(USD Millions)**
Bulgaria	10/2000	07/2005	-0.18%	1.19%	686
Brazil	01/2000	08/2005	0.10%	0.20%	204,850
Estonia	01/2000	07/2005	-0.15%	1.98%	2,978
Hungary	01/2000	04/2004	0.04%	0.56%	10,326
Indonesia	01/2000	09/2005	0.11%	0.54%	40,441
India	01/2000	09/2005	0.21%	0.25%	156,985
South Korea	01/2000	08/2005	0.20%	0.42%	213,771
Lithuania	01/2001	07/2005	-0.01%	0.32%	2,888
Philippines	01/2000	08/2005	0,09%	0,32%	27,683
Poland	01/2000	07/2005	0.01%	0.39%	35,719
Romania	01/2000	08/2005	0.15%	0.62%	3,839
Turkey	01/2000	09/2005	0.07%	0.30%	60,707
Taiwan	01/2000	08/2005	0.21%	0.36%	336,759
South Africa	01/2000	08/2005	0.08%	0.14%	235,026

3.2) Preliminary Analysis: Stationarity and Correlation

This section provides some preliminary analysis of the time series involved on this research. They focus on individual time series or pair wise correlations, so that it serves just as a starting point to further analysis using regressions with other variables.

Unit root tests on the time series of returns and net flows reject common and individual unit root processes[8], so that these time series are stationary on their levels. This result is in line with previous literature for returns, but for net flows Tabak (2003) found that Brazilian flows are stationary on the first difference. This different result can be attributed to the sample period: while Tabak (2003) used data back to 1990, we use data starting in 2000. As mentioned by Tabak (2003), there was a structural break on the time series on 1994, probably due to the inflation stabilization plan on this year.

Table 3.4 shows autocorrelation tests for time series of monthly returns. Although the literature reports (see for instance Khil and Lee 2002) the presence of positive serial autocorrelation with high frequency data (daily and weekly) and negative serial autocorrelation at long run horizons (one year and more), the results for monthly and quarterly frequencies usually show weaker evidence of autocorrelation. Results using USD returns on Panel A of table 3.4 corroborate this, showing little evidence of autocorrelation: only two small countries (Estonia and Lithuania) exhibit significant autocorrelation. However, when using returns in local currency, we

[8] Not reported. Available under request. For common unit root process, the Levin, Lin & Chu and the Breitung tests were applied; while for individual unit root process the ADF Fischer and PP Fischer were applied.

find stronger evidence of positive serial autocorrelation up to 3 lags in 9 markets as can be seen on Panel B of Table 3.4.

The analysis of autocorrelation of net flows shows significant positive autocorrelation for 9 of the 14 markets (see Table 3.5). For some markets, this evidence of flow persistence goes up to three lags. Froot and Donohue (2002) found also country persistence using data from daily equity flows of 15 emerging markets. The persistence can be seen as an evidence of positive feedback trading with positions being constructed slowly during some weeks.

Table 3.6 shows the contemporaneous correlation structure of returns. Figures of returns' correlation provide a highly integrated structure of USD returns' pattern (Panel A), except for Bulgaria. The correlation of local returns shows a weaker figure (see Panel B), suggesting that the foreign exchange component of USD returns is strongly correlated. The correlation pattern of local returns is strong within Eastern Europe (Estonia, Hungary, Lithuania and Poland) and also among big markets (Brazil, India, South Korea, Taiwan and South Africa). Some small countries like Bulgaria, Philippines and Romania have almost no correlation with the rest of the sample. However, as these are pair wise correlations, further analysis is needed to check whether these correlations are due to an exogenous factor like developed market stock indices.

The contemporaneous correlations of flows provide a picture different from returns as seen on and Table 3.7. Although coefficients are mainly positive, they are rarely significantly different from zero. There are some exceptions in Asia, where India, South Korea and Taiwan are strongly correlated which each other. A significant correlation also appears between South Africa and two regional powers: Brazil and Poland. A special case here is Philippines, which presents three significant negative correlations.

TABLE 3.4 - Autocorrelation of Monthly Returns

Panel A: Returns in USD

	Autocorrelation Coefficients			p-values		
	1 Lag	2 Lags	3 Lags	1 Lag	2 Lags	3 Lags
Bulgaria	-0,014	0,055	-0,024	91,5%	90,7%	97,3%
Brazil	0,005	0,049	-0,055	97,0%	91,8%	94,3%
Estonia	0,323	-0,102	-0,101	0,7%	1,9%	3,4%
Hungary	0,045	-0,255	0,100	74,2%	15,8%	23,5%
Indonesia	0,171	0,039	-0,077	14,9%	33,5%	45,4%
India	0,128	-0,005	0,094	28,1%	55,9%	61,4%
South Korea	0,044	-0,066	0,201	71,1%	79,9%	33,7%
Lithuania	0,434	0,341	0,163	0,1%	0,0%	0,0%
Philippines	0,073	-0,004	0,048	54,0%	82,8%	90,9%
Poland	0,079	-0,125	-0,124	51,3%	46,7%	45,5%
Romania	0,123	-0,117	-0,083	30,3%	36,2%	46,9%
Turkey	-0,119	-0,147	0,170	31,7%	27,8%	19,7%
Taiwan	0,115	0,170	-0,016	33,6%	22,4%	39,0%
South Africa	0,060	-0,078	-0,047	61,3%	70,9%	83,9%

Panel B: Returns in Local Currency

	Autocorrelation Coefficients			p-values		
	1 Lag	2 Lags	3 Lags	1 Lag	2 Lags	3 Lags
Bulgaria	-0,035	-0,025	-0,033	78,9%	94,7%	98,1%
Brazil	0,267	0,201	0,152	2,6%	2,0%	2,3%
Estonia	0,346	-0,030	-0,190	0,4%	1,6%	1,2%
Hungary	-0,006	-0,199	0,194	96,8%	33,7%	23,1%
Indonesia	0,167	-0,148	0,010	16,0%	16,8%	31,1%
India	0,421	0,328	0,290	0,0%	0,0%	0,0%
South Korea	0,535	0,326	0,364	0,0%	0,0%	0,0%
Lithuania	0,519	0,279	0,107	0,0%	0,0%	0,0%
Philippines	-0,059	-0,007	-0,028	62,6%	88,6%	96,0%
Poland	0,066	-0,022	-0,021	58,3%	84,5%	94,7%
Romania	0,413	0,130	-0,041	0,1%	0,1%	0,4%
Turkey	0,464	0,442	0,327	0,0%	0,0%	0,0%
Taiwan	0,585	0,409	0,291	0,0%	0,0%	0,0%
South Africa	0,344	0,199	0,115	0,4%	0,4%	0,7%

This table shows Autocorrelation Coefficients up to 1, 2 and 3 lags and p-value for the null hypothesis of no autocorrelation for up to 1, 2 and 3 lags.

TABLE 3.5 - Autocorrelation of Monthly Net Flows as Percentage of Market Capitalization						
	Autocorrelation Coefficients			p-values Box-Ljung's Q Statistic		
	1 Lag	2 Lags	3 Lags	1 Lag	2 Lags	3 Lags
Bulgaria	0.005	0.041	-0.006	96.7%	94.7%	99.1%
Brazil	0.300	0.005	-0.286	1.2%	4.1%	0.6%
Estonia	0.429	-0.032	-0.040	0.0%	0.2%	0.4%
Hungary	0.117	0.152	-0.112	38.4%	35.9%	43.0%
Indonesia	0.012	0.330	-0.053	91.7%	1.9%	4.3%
India	0.313	0.134	0.166	0.8%	1.5%	1.5%
South Korea	0.380	0.237	0.150	0.1%	0.1%	0.1%
Lithuania	-0.130	-0.219	-0.115	32.2%	14.8%	20.2%
Philippines	0.701	0.599	0.470	0.0%	0.0%	0.0%
Poland	0.281	0.070	0.163	1.9%	5.2%	5.0%
Romania	0.030	0.046	-0.006	80.4%	89.7%	97.4%
Turkey	0.269	0.025	0.106	2.2%	7.2%	10.7%
Taiwan	0.271	0.036	0.098	2.2%	6.8%	10.7%
South Africa	0.273	0.216	0.225	2.2%	1.3%	0.6%

This table shows Autocorrelation Coefficients up to 1, 2 and 3 lags; and p-value for the null hypothesis of no autocorrelation for up to 1, 2 and 3 lags.

TABLE 3.6 - Correlation Matrix of Monthly Returns

Panel A: Returns in USD

	Bulgaria	Brazil	Estonia	Hungary	Indonesia	India	South Korea	Lithuania	Philippines	Poland	Romania	Turkey	Taiwan	South Africa
Bulgaria		20%	17%	10%	14%	10%	13%	16%	23%	3%	25%	35%	15%	15%
Brazil	20%		49%	56%	23%	51%	51%	32%	27%	56%	13%	43%	44%	54%
Estonia	17%	49%		64%	42%	57%	38%	51%	26%	58%	26%	32%	30%	45%
Hungary	10%	56%	64%		28%	39%	42%	43%	14%	70%	33%	55%	28%	44%
Indonesia	14%	23%	42%	28%		52%	39%	24%	56%	19%	31%	12%	22%	36%
India	10%	51%	57%	39%	52%		57%	44%	38%	55%	19%	32%	38%	51%
South Korea	13%	51%	38%	42%	39%	57%		32%	50%	50%	16%	50%	63%	60%
Lithuania	16%	32%	51%	43%	24%	44%	32%		21%	31%	21%	28%	29%	25%
Philippines	23%	27%	26%	14%	56%	38%	50%	21%		16%	25%	22%	39%	35%
Poland	3%	56%	58%	70%	19%	55%	50%	31%	16%		25%	43%	41%	57%
Romania	25%	13%	26%	33%	31%	19%	16%	21%	25%	25%		19%	13%	39%
Turkey	35%	43%	32%	55%	12%	32%	50%	28%	22%	43%	19%		39%	37%
Taiwan	15%	44%	30%	28%	22%	38%	63%	29%	39%	41%	13%	39%		30%
South Africa	15%	54%	45%	44%	36%	51%	60%	25%	35%	57%	39%	37%	30%	

Panel B: Returns in Local Currency

	Bulgaria	Brazil	Estonia	Hungary	Indonesia	India	South Korea	Lithuania	Philippines	Poland	Romania	Turkey	Taiwan	South Africa
Bulgaria		-12%	8%	3%	0%	-20%	-12%	11%	-10%	0%	-11%	-23%	-13%	-11%
Brazil	-12%		1%	15%	45%	52%	52%	-15%	18%	11%	14%	27%	42%	56%
Estonia	8%	1%		61%	8%	-13%	-12%	44%	-6%	54%	-9%	-11%	-22%	5%
Hungary	3%	15%	61%		15%	-5%	-7%	48%	-18%	69%	-15%	-4%	-15%	28%
Indonesia	0%	45%	8%	15%		46%	42%	-16%	7%	2%	14%	19%	22%	26%
India	-20%	52%	-13%	-5%	46%		50%	-23%	10%	2%	8%	29%	35%	40%
South Korea	-12%	52%	-12%	-7%	42%	50%		-16%	9%	-2%	10%	35%	69%	56%
Lithuania	11%	-15%	44%	48%	-16%	-23%	-16%		1%	31%	-12%	-36%	-29%	-2%
Philippines	-10%	18%	-6%	-18%	7%	10%	9%	1%		-8%	4%	2%	3%	14%
Poland	0%	11%	54%	69%	2%	2%	-2%	31%	-8%		-25%	-20%	-4%	34%
Romania	-11%	14%	-9%	-15%	14%	8%	10%	-12%	4%	-25%		14%	-3%	-17%
Turkey	-23%	27%	-11%	-4%	19%	29%	35%	-36%	2%	-20%	14%		32%	25%
Taiwan	-13%	42%	-22%	-15%	22%	35%	69%	-29%	3%	-4%	-3%	32%		59%
South Africa	-11%	56%	5%	28%	26%	40%	56%	-2%	14%	34%	-17%	25%	59%	

Each cell contains the correlation coefficient between the two countries, using all the data available for the country with lower number of observations. The coefficients significantly different from zero are in gray.

TABLE 3.7 - Correlation Matrix of Net Flow as a percentage of Market Capitalization

	Bulgaria	Brazil	Estonia	Hungary	Indonesia	India	South Korea	Lithuania	Philippines	Poland	Romania	Turkey	Taiwan	South Africa
Bulgaria		-6%	6%	6%	-30%	5%	3%	5%	19%	9%	-12%	18%	20%	5%
Brazil	-6%		9%	3%	15%	22%	14%	2%	10%	16%	30%	15%	31%	33%
Estonia	6%	9%		28%	48%	0%	19%	2%	-61%	-6%	9%	1%	24%	-3%
Hungary	6%	3%	28%		8%	15%	-6%	7%	26%	24%	-10%	7%	25%	6%
Indonesia	-30%	15%	48%	8%		9%	19%	10%	-32%	3%	3%	14%	-5%	13%
India	5%	22%	0%	15%	9%		30%	18%	31%	15%	-20%	33%	36%	12%
South Korea	3%	14%	19%	-6%	19%	30%		-6%	-25%	12%	11%	8%	44%	-11%
Lithuania	5%	2%	2%	7%	10%	18%	-6%		6%	10%	33%	-10%	2%	-9%
Philippines	19%	10%	-61%	26%	-32%	31%	-25%	6%		30%	-13%	36%	0%	26%
Poland	9%	16%	-6%	24%	3%	15%	12%	10%	30%		10%	1%	22%	32%
Romania	-12%	30%	9%	-10%	3%	-20%	11%	33%	-13%	10%		-12%	-5%	13%
Turkey	18%	15%	1%	7%	14%	33%	8%	-10%	36%	1%	-12%		10%	9%
Taiwan	20%	31%	24%	25%	-5%	36%	44%	2%	0%	22%	-5%	10%		13%
South Africa	5%	33%	-3%	6%	13%	12%	-11%	-9%	26%	32%	13%	9%	13%	

Each cell contains the correlation coefficient between the two countries, using all the data available for the country with lower number of observations. The coefficients significantly different from zero are in gray.

3.3) Foreign Flow x Returns: VAR and Granger Causality

To analyze the Granger causality of between the net foreign flows and returns and between the net flow and the volatility, a bivariate VAR (Vector Autoregressive) model is estimated for each market:

$$R_{k,t} = c_{1,k} + \sum_{i=1}^{n} \alpha_{k,i} R_{k,t-i} + \sum_{i=1}^{n} \beta_{k,i} FF_{k,t-i} + \varepsilon_{1,k,t} \qquad (3.1)$$

$$FF_{k,t} = c_{2,k} + \sum_{i=1}^{n} \delta_{k,i} FF_{k,t-i} + \sum_{i=1}^{n} \gamma_{k,i} R_{k,t-i} + \varepsilon_{2,k,t} \qquad (3.2)$$

Where $FF_{k,t}$ is the Net Foreign Equity Portfolio Investment as a percentage of market capitalization of country k at time t; $R_{k,t}$ is the return in local currency or USD of the equity index of country k at time t, and the c's are constants.

Testing some restrictions on the above equations is possible to evaluate the Granger causality between the variables for each country. Specifically, a Wald-F test can be used to check the following hypothesis:

- H1: FF does not Granger cause Return: $\beta_i = 0, \ i = 1 \text{ to } n$
- H2: Return does not Granger cause FF: $\gamma_i = 0, \ i = 1 \text{ to } n$

One important issue is to choose *n*, i.e., the lag structure of the model. We tested for lags up to 13 months and used the Schwarz and Akaike criteria to choose the optimal lag structure. For most of the countries, the 1-lag model provides the best specification, while for some countries the 2-lag structure was better for Flow or Return regressions[9]. Therefore, regressions were run using 2-lag structure for all markets in order to keep them comparable.

As mentioned before the analysis will be carried out using both returns in local currency and in USD. Table 3.8 shows results using USD returns. Panel A has mixed evidence about feedback trading. Three countries show strong evidence of negative feedback trading (Bulgaria, Estonia and South Korea) since the return's first lag coefficient is negative and significant. Also, for these countries the hypothesis of no Granger-causality of Returns in Flows is rejected at 10%.

However, three markets show weak evidence of positive feedback trading. India and Lithuania have the second lag return's coefficient positive and significant, having the Granger causality not rejected at 10%. But the first lag coefficient of returns is not significant. Taiwan has the first lag return's coefficient positive and significant, but the Granger causality of Returns in Flows is rejected. The other eight countries show no evidence of feedback trading or Granger causality.

These results are based on a bivariate analysis so we will check them on the next section using a set of control variables. Panel A also confirms the autocorrelation of flows since for six countries the coefficients of lagged flows are positive and significant.

Panel B of Table 3.8 shows that the granger-causality of flows on returns does not have support from the data, except for two countries. So we have evidence that foreigners are not able to anticipate price movements. Table 3.8 also shows that the autocorrelation on monthly USD returns is restricted to the two Baltic republics only, corroborating results of Panel A of Table 3.4.

The above VAR analysis is also performed using returns in local currency and results are very different regarding feedback trading if compared to the previous analysis. We can see on Panel A of table 3.9 that return's coefficient are positive for 9 markets indicating positive feedback trading. Also for these 9 markets there is evidence (with 10% significance level) that Returns Granger-cause flows. Thus, changing the currency of returns leads to a result almost opposed. So we have two possibilities to explain these results: first, foreigners are currency-hedged investors engaging in positive feedback trading as seen in Table 3.9; second, foreigners are currency-unhedged investors using negative feedback trading as seen on Table 3.8. We cannot distinguish between these two possibilities (or even both together) since we do not know the hedging strategy of foreign investors. The key for this puzzle may be a possible negative correlation between local equity returns and local currency returns. On this case, both possibilities may be true at the same time. In the next section we will come back to this point, adding currency returns to the analysis in order to find an explanation for this puzzle.

Panel A of table 3.9 also confirms flow persistence for half of the countries since Flow's coefficients are positive. Panel B corroborates the positive autocorrelation for the Returns of the two Baltic Republics. However, for the other countries there is no more the positive

[9] Not reported.

autocorrelation found on Panel B of Table 3.4 (Turkey has negative autocorrelation). All the coefficients of Flows on Panel B are not significant, so there is no support for foreigners having informational disadvantage or advantage. This also rejects the price pressure hypothesis.

TABLE 3.8 – Granger Causality and VAR Flow x USD Returns

PANEL A - Flow as Dependent Variable – Equation (3.1)

	Flow		USD Returns		Constant	Adj R^2	Granger Causality
	Lag: 1M	Lag: 2M	Lag: 1M	Lag: 2M			
Bulgaria	0.0091	0.0818	-0.0422	0.0046	-0.0001	6.9%	2.0%
Brazil	0.2391	-0.0732	0.0037	0.0018	0.0008	10.1%	13.2%
Estonia	0.5644	-0.2294	-0.0875	0.0274	0.0005	26.6%	7.5%
Hungary	0.0738	0.1032	0.0090	0.0005	0.0002	-3.9%	71.2%
Indonesia	0.0166	0.3516	0.0061	-0.0081	0.0008	8.7%	40.3%
India	0.2648	-0.0767	0.0014	0.0098	0.0016	15.6%	2.2%
South Korea	0.5176	0.0536	-0.0149	-0.0022	0.0009	20.2%	2.9%
Lithuania	-0.1701	-0.3219	-0.0018	0.0160	-0.0007	9.8%	8.2%
Philippines	0.4188	0.3170	0.0068	0.0049	0.0004	57.8%	6.6%
Poland	0.2587	-0.0200	0.0023	0.0018	-0.0001	1.9%	88.1%
Romania	0.0254	0.0458	-0.0012	-0.0015	0.0015	-6.1%	94.5%
Turkey	0.3064	0.0046	-0.0002	0.0009	0.0007	4.6%	88.2%
Taiwan	-0.0074	-0.0006	0.3915	-0.0110	0.0012	4.2%	23.0%
South Africa	0.2274	0.1735	0.0010	0.0007	0.0005	5.1%	90.2%

Granger Causality: It is shown the p-value of a Wald test with null hypothesis that all Return's coefficients are equal to zero, or that Returns Granger-cause Flow.

PANEL B – USD Return as Dependent Variable – Equation (3.2)

	Flow		USD Returns		Constant	Adj R^2	Granger Causality
	Lag: 1M	Lag: 2M	Lag: 1M	Lag: 2M			
Bulgaria	1.0254	-1.1725	0.0026	0.0907	0.0421	-4.5%	45.9%
Brazil	-0.6270	-20.1236	-0.0300	0.1243	0.0303	4.2%	3.5%
Estonia	0.3918	0.0777	0.4307	-0.1912	0.0208	14.9%	50.5%
Hungary	4.9075	0.2042	0.0125	-0.3625	0.0066	14.1%	3.7%
Indonesia	0.9099	-0.5657	0.1791	-0.0235	0.0076	-2.6%	88.8%
India	-0.0821	-2.4950	0.1156	0.0050	0.0152	-4.4%	86.0%
South Korea	1.8956	-5.2938	-0.0159	0.0718	0.0161	-2.6%	34.2%
Lithuania	1.8470	1.2628	0.3268	0.1828	0.0193	17.2%	72.1%
Philippines	-1.3879	4.3594	0.0610	0.0094	-0.0026	-3.2%	44.3%
Poland	-2.3313	-0.6519	0.1004	-0.1285	0.0124	-2.2%	63.6%
Romania	0.1469	-4.6549	0.1461	-0.1633	0.0392	3.8%	16.3%
Turkey	12.9907	-0.0182	-0.2148	-0.1910	0.0069	1.4%	33.0%
Taiwan	-0.0600	0.1775	6.0701	0.2937	-0.0173	3.2%	50.3%
South Africa	1.5880	-4.3864	0.0728	-0.0491	0.0139	-4.8%	77.2%

Granger Causality: It is shown the p-value of a Wald test with null hypothesis that all Flow's coefficients are equal to zero, or that Flow Granger-cause Returns.
The coefficients significantly different from zero at 5% are in gray.
Estimation Method: Ordinary Least Squares (OLS)

TABLE 3.9 – Granger Causality and VAR Flow x Local Returns

PANEL A - Flow as Dependent Variable – Equation (3.1)

	Flow		Local Returns		Constant	Adj R2	Granger Causality
	Lag: 1M	Lag: 2M	Lag: 1M	Lag: 2M			
Bulgaria	0.0226	0.0854	0.0038	-0.0446	-0.0001	7.3%	1.6%
Brazil	0.2573	0.0364	0.0072	0.0048	0.0006	17.2%	0.8%
Estonia	0.5390	-0.2407	-0.0197	-0.0619	0.0009	25.2%	14.4%
Hungary	0.0153	0.0993	0.0151	0.0120	0.0003	-0.5%	33.0%
Indonesia	-0.0125	0.3405	0.0091	0.0065	0.0006	8.4%	43.2%
India	0.2823	0.0857	0.0114	0.0013	0.0012	19.6%	0.4%
South Korea	0.4879	0.1388	0.0269	-0.0158	0.0006	47.3%	0.0%
Lithuania	-0.2066	-0.2862	0.0192	-0.0056	-0.0006	10.3%	6.9%
Philippines	0.4716	0.2978	-0.0014	0.0092	0.0003	57.7%	7.2%
Poland	0.3289	-0.0206	0.0158	-0.0068	-0.0001	10.1%	5.7%
Romania	0.0252	0.0528	0.0017	-0.0002	0.0014	-6.1%	97.0%
Turkey	0.2600	0.0330	0.0065	-0.0003	0.0005	18.6%	0.3%
Taiwan	0.2528	-0.0794	0.0244	-0.0062	0.0018	34.2%	0.0%
South Africa	0.1777	0.1471	0.0033	0.0085	0.0004	17.8%	0.8%

PANEL B – Local Returns as Dependent Variable – Equation (3.2)

	Flow		Local Returns		Constant	Adj R2	Granger Causality
	Lag: 1M	Lag: 2M	Lag: 1M	Lag: 2M			
Bulgaria	-0.6665	-0.3701	-0.0346	-0.0286	0.0423	-6.6%	80.4%
Brazil	-8.3113	-7.6021	-0.0025	-0.0558	0.0291	3.8%	5.8%
Estonia	-0.0010	0.0553	0.4770	-0.1859	0.0160	14.1%	98.6%
Hungary	0.9901	-0.2274	-0.0346	-0.2526	0.0004	-1.4%	86.4%
Indonesia	-0.5624	1.9635	0.1712	-0.0402	0.0090	-1.2%	45.0%
India	-4.9376	4.4397	0.1190	0.0466	0.0126	-2.5%	43.4%
South Korea	-5.2550	2.1159	0.0758	0.1328	0.0138	-1.7%	26.4%
Lithuania	0.9760	1.6492	0.4799	0.0111	0.0177	21.7%	73.6%
Philippines	3.1024	-1.5259	0.0647	0.0142	0.0030	-4.8%	66.4%
Poland	-1.1195	-0.4293	0.0511	-0.0193	0.0080	-5.6%	83.9%
Romania	-4.0885	-2.3513	0.0353	-0.1813	0.0545	4.4%	11.5%
Turkey	3.1991	2.0884	-0.2805	-0.1783	0.0271	2.1%	82.5%
Taiwan	1.9230	-2.0828	0.0694	0.1462	-0.0028	-1.4%	71.3%
South Africa	3.2124	6.4633	-0.0247	-0.0372	0.0063	-2.4%	28.7%

Granger Causality: It is shown the p-value of a Wald test with null hypothesis that all coefficients of the exogenous variable are equal to zero.
The coefficients significantly different from zero at 5% are in gray.
Estimation Method: Ordinary Least Squares (OLS)

Another way to analyze is to consider the data as a panel with the estimation of just one set of parameters, instead of one for each market. So we would have equations (3.1) and (3.2) without the *k* subscript, i.e., polled data. Therefore, we obtain a consolidated figure for our set of emerging markets as a whole. Results are on Table 3.10 and are in favor of feedback trading. However, as in the country-by-country case, they are opposed: while the feedback to USD returns

is negative (Panel A), the feedback to local currency is positive (Panel B). So we reinforce the figure in favor of feedback trading, but with different directions for local and USD returns.

There is also strong evidence of flow persistence up to 2 lags on both panels of Table 3.10. On the equations with Return as dependent variable, there is no evidence that flows affect future returns causing a price pressure or that foreigners have some kind of information about future returns. Again, persistence of returns is not present.

Regarding Granger-causality, there is evidence on table 3.10 of Returns Granger-causing Flows, but not the reverse. These results are in line with half of the countries on Panel A of Table 3.8 and with almost all markets of Panel B. So, we may say that overall Granger-causality is present only from Returns to flow and not from flows to Returns.

TABLE 3.10 – Panel Data: Flow x Returns

Panel A: Flow x USD Returns

	Flow		USD Returns		Granger Causality	Adj R^2
Dependent Variable	**Lag: 1M**	**Lag: 2M**	**Lag: 1M**	**Lag: 2M**		
Flow	0.2177	0.0583	-0.0023	-0.0006	5.33%	8.34%
USD Returns	0.4196	-0.0301	0.0141	-0.0643	24.40%	0.46%

Panel B: Flow x Local Returns

	Flow		Local Returns		Granger Causality	Adj R^2
Dependent Variable	**Lag: 1M**	**Lag: 2M**	**Lag: 1M**	**Lag: 2M**		
Flow	0.2053	0.0540	0.0082	-0.0013	0.00%	8.91%
Local Returns	0.0274	0.2699	0.0033	-0.0569	47.60%	0.60%

Granger Causality: It is shown the p-value of a Wald test with null hypothesis that all coefficients of the exogenous variable are equal to zero.
The coefficients significantly different from zero at 5% are in gray
Estimation Method: SUR weighted least squares[10] for each regression, using Fixed Effects.

3.4) Foreign Flow x Returns: Structural VAR

So far the analysis has been restricted to bivariate models. But it may be the case that some external variables have strong influence on our model. These variables may affect our endogenous variables (Flow and Returns), and therefore an analysis considering these factors should be done. For this purpose we use Structural VAR models like:

[10] Feasible GLS specification correcting for both cross-section heteroskedasticity and contemporaneous correlation. Also known as Parks estimator.

$$R_{k,t} = c_{1,k} + \sum_{i=1}^{n} \alpha_{k,i} R_{k,t-i} + \sum_{i=0}^{n} \beta_{k,i} FF_{k,t-i} + \Phi V + \varepsilon_{1,k,t} \quad (3.3)$$

$$FF_{k,t} = c_{1,k} + \sum_{i=1}^{n} \delta_{k,i} FF_{k,t-i} + \sum_{i=0}^{n} \gamma_{k,i} R_{k,t-i} + \Phi V + \varepsilon_{2,k,t} \quad (3.4)$$

where $\boldsymbol{V}$ is a vector with the control variables and $\boldsymbol{\Phi}$ is a vector of its coefficients.

Note that equations (3.3) and (3.4) above include the contemporaneous coefficient of the other endogenous variable. This is due to the presence in the literature (see table 2.1) of many papers that have found a contemporaneous relationship between foreign inflow and returns. Therefore these coefficients are also included as control variables. The above regressions are analyzed with both local and USD returns.

About the control variables to be used, one common choice in the literature is the returns of developed countries stock indices, expecting a positive influence over emerging markets. We use an index from developed countries (the FTSE AW Developed) for all markets. As a robustness check, we tested also a specification using regional indexes considering the developed countries of each region, and results were similar, although slightly weaker.

Control variables representing the risk premium of emerging countries may also be used. One of the most known indicators of emerging market risk premium is the Spread over Treasury of JPMorgan's EMBI+ (Emerging Market Bond Index). This spread is the number of basis points that the USD Sovereign bonds' term structure of the country is above the US Treasury curve, and is seen as a measure of the country's risk. It is expected that the higher this spread, the lower is the value of stocks in the country, since fundamentalist models use this spread when calculating the rate used to discount the future cash flows. As we are using returns and flows (and not prices and stock) as endogenous variables, we have to use the first difference of the EMBI Spread as the control variable. Since not all the countries in our sample are included in the EMBI for this period, we consider a specification with the composite EMBI spread for all countries. As a robustness check, we tested other specifications with the country-specific EMBI when available, or with the composite or regional EMBI, otherwise. Results for both specifications were very similar.

Given the opposite results of the previous section regarding feedback trading for USD or Local returns, the Foreign Exchange (FX) Returns may be used to decipher this puzzle. Therefore, on the Local version of the Structural VAR, the Returns of Foreign Exchange (denominated as Local Currency per USD Dollars) are used as a control variable. In this way, we would have the USD Returns as a composition of FX Returns and Local Stock Returns on equation (3.4). Therefore, we can check if foreign investors care about FX returns in addition to Stock Returns in local currency. Also, by adding FX Returns on equation (3.3), we can assess a possible positive correlation between FX returns and Stock Returns in local currency. Theoretically, on the long run both should have an inflation component, especially in emerging markets, and this component would make higher the companies' earnings, pushing up their returns in local currency. Also, an inflation consistently higher than US inflation would make the local currency to loose value, leading to a negative correlation between the value of local currency and local stock returns.

For the control variables, the contemporaneous coefficient and the first lag are used. Further lags up to the 4th were tested but were not significant.

The specification of equations (3.3) and (3.4) for USD Returns is the following:

$$R_{k,t} = c_{1,k} + \sum_{i=1}^{2} \alpha_{k,i} R_{k,t-i} + \sum_{i=0}^{2} \beta_{k,i} FF_{k,t-i} + \sum_{i=0}^{1} \gamma_{k,i} FTSE_{k,t-i} + \sum_{i=0}^{1} \delta_{k,i} EMBI_{k,t-i} + \varepsilon_{1,k,t} \quad (3.5)$$

$$FF_{k,t} = c_{2,k} + \sum_{i=0}^{2} \phi_{k,i} R_{k,t-i} + \sum_{i=1}^{2} \varphi_{k,i} FF_{k,t-i} + \sum_{i=0}^{1} \mu_{k,i} FTSE_{k,t-i} + \sum_{i=0}^{1} \rho_{k,i} EMBI_{k,t-i} + \varepsilon_{2,k,t} \quad (3.6)$$

Where $FF_{k,t}$ is the Net Foreign Equity Portfolio Investment as a percentage of market capitalization of country k at time t; $R_{k,t}$ is the return in USD of the equity index of country k at time t, FTSE is the USD returns of the FTSE AW Developed index, EMBI is the first difference of the spread of the EMBI+ from JP Morgan[11], and the c's are constants. The time series of the control variables were obtained with DataStream and Bloomberg.

The results are in Table 3.11. The control variables added were responsible for a significant increase on the adjusted R^2 of the Return's Regression (Panel B), but the improvements in Flow's regressions were restricted to approximately half of the markets. The contemporaneous positive relationship between USD returns and flows were present in 8 of the 14 markets, in line with the literature. As expected, the FTSE AW Developed returns were a significant element for explaining USD Returns in most of the markets. Some fraction of this explanation power may be due the fact that we are using USD returns on both emerging and developed markets, and so variations of the US currency itself may cause a spurious correlation.

The developed world index has little influence on the flow for emerging markets, and the direction of the influence is mixed when it exists. The EMBI variation showed a negative influence in USD Returns in four countries, and results for flows are mixed with 2 positive and one negative influence. But in general the influence of EMBI seems to be small on this Structural VAR.

A comparison of Panel A of tables 3.11 and 3.8 shows that the evidence of negative feedback trading for Bulgaria, Estonia and South Korea remains, whether Turkey now has positive feedback coefficients up to 2 lags. Persistence in flows is still present in many markets. The influence of flows on Returns (Panel B) appears now also in Lithuania and South Korea, besides Brazil and Hungary. While in Lithuania foreigners seem to have some forecast ability, in South Korea they appear to have some information disadvantage.

[11] We are using the spread denominated in percentage points and not basis points.

TABLE 3.11 –Structural VAR Flow x USD Returns										
PANEL A - Flow as Dependent Variable – Equation (3.6)										
	USD Returns			**Flow**		**EMBI**		**FTSE**		**Adjusted R^2**
	0 Lag	**1 Lag**	**2 Lags**	**1 Lag**	**2 Lags**	**0 Lag**	**1 Lag**	**0 Lag**	**1 Lag**	
Bulgaria	-0.014	-0.045	0.005	0.013	0.052	-0.003	0.001	-0.009	0.058	3.9%
Brazil	0.008	0.000	0.000	0.275	0.024	0.001	-0.001	0.003	0.004	17.0%
Estonia	0.007	-0.142	0.038	0.514	-0.169	-0.005	0.000	0.002	0.079	26.0%
Hungary	0.036	0.011	0.009	-0.064	0.164	-0.001	0.000	-0.041	-0.009	-13.5%
Indonesia	0.005	0.003	-0.005	0.008	0.347	-0.001	0.000	-0.008	0.009	3.5%
India	0.021	-0.002	0.011	0.276	-0.016	0.000	0.000	-0.013	0.001	20.4%
South Korea	0.043	-0.025	-0.002	0.501	0.227	0.001	0.001	-0.026	0.033	45.2%
Lithuania	0.039	0.001	0.014	-0.341	-0.628	-0.001	0.001	-0.024	-0.030	17.7%
Philippines	0.001	0.006	0.007	0.465	0.258	0.000	0.000	-0.009	0.015	57.9%
Poland	0.028	-0.005	0.005	0.287	0.028	0.001	0.000	-0.009	0.025	1.5%
Romania	0.004	-0.002	0.000	0.045	0.054	0.000	0.000	0.015	-0.016	-12.0%
Turkey	0.013	0.005	0.005	0.129	-0.077	0.001	0.001	-0.013	0.002	9.4%
Taiwan	0.034	-0.004	-0.004	0.189	-0.095	0.002	0.000	0.028	-0.001	39.3%
South Africa	0.002	-0.004	0.002	0.216	0.221	0.000	0.000	-0.002	0.009	10.0%
PANEL B - USD Returns as Dependent Variable – Equation (3.5)										
	Flow			**USD Returns**		**EMBI**		**FTSE**		**Adjusted R^2**
	0 Lag	**1 Lag**	**2 Lags**	**1 Lag**	**2 Lags**	**0 Lag**	**1 Lag**	**0 Lag**	**1 Lag**	
Bulgaria	-1.160	1.050	-1.507	-0.044	0.146	-0.012	-0.012	0.522	0.006	-7.5%
Brazil	12.711	1.708	-9.379	-0.101	0.028	-0.064	0.016	1.403	-0.177	67.6%
Estonia	0.050	0.126	0.305	0.463	-0.214	0.009	-0.014	0.904	-0.179	46.1%
Hungary	4.584	3.327	-1.345	-0.087	-0.278	0.000	-0.010	0.789	-0.047	27.6%
Indonesia	1.262	0.445	-0.902	0.097	0.040	0.001	-0.013	0.638	0.702	15.4%
India	21.466	-6.948	-2.591	0.067	-0.249	0.001	0.011	0.833	0.337	28.8%
South Korea	16.224	-8.163	-4.984	0.435	0.049	-0.015	-0.011	0.863	-0.565	61.2%
Lithuania	12.668	6.337	9.930	0.050	-0.110	0.012	-0.018	0.559	0.507	29.0%
Philippines	0.913	-0.559	3.282	-0.118	-0.064	-0.017	-0.028	0.379	0.144	13.1%
Poland	8.588	-2.141	-1.652	0.021	-0.156	-0.017	-0.006	0.873	-0.389	32.9%
Romania	1.387	-0.341	-4.356	0.145	-0.177	0.007	0.015	0.049	0.793	1.1%
Turkey	30.504	3.771	5.728	-0.456	-0.350	-0.060	-0.051	1.617	0.385	52.5%
Taiwan	19.403	-2.329	2.228	0.061	0.126	-0.045	0.008	-0.358	0.005	46.7%
South Africa	3.557	2.321	-6.726	0.046	-0.001	-0.008	-0.002	0.886	0.077	34.0%
The coefficients significantly different from zero at 5% are in gray Estimation Method: Seemingly Unrelated Regressions (SUR)										

The specification of equations (3.3) and (3.4) for Local Returns is the following:

$$R_{k,t} = c_{1,k} + \sum_{i=1}^{2} \alpha_{k,i} R_{k,t-i} + \sum_{i=0}^{2} \beta_{k,i} FF_{k,t-i} + \sum_{i=0}^{1} \gamma_{k,i} FTSE_{k,t-i} + \sum_{i=0}^{1} \delta_{k,i} EMBI_{k,t-i} + \\ + \sum_{i=0}^{1} \xi_{k,i} FX_{k,t-i} + \varepsilon_{1,k,t} \tag{3.7}$$

$$FF_{k,t} = c_{2,k} + \sum_{i=0}^{2} \phi_{k,i} R_{k,t-i} + \sum_{i=1}^{2} \varphi_{k,i} FF_{k,t-i} + \sum_{i=0}^{1} \mu_{k,i} FTSE_{k,t-i} + \sum_{i=0}^{1} \rho_{k,i} EMBI_{k,t-i} + \\ + \sum_{i=0}^{1} \psi_{k,i} FX_{k,t-i} + \varepsilon_{2,k,t} \tag{3.8}$$

Where $FF_{k,t}$ is the Net Foreign Equity Portfolio Investment as a percentage of market capitalization of country k at time t; $R_{k,t}$ is the return in local currency of the index of country k at time t, FTSE is the return of the FTSE AW Developed index in local currency, EMBI is the first difference of the spread of the EMBI from JP Morgan, FX is the return of the exchange rate denominated in local currency per US Dollar, and the c's are constants. . For the two Baltic Republics, Estonia and Lithuania, the Foreign Exchange Returns were not used, since these countries had their currencies pegged to the Euro during the entire period of our sample.

The results are on Table 3.12. Although the inclusion of control variables did not increase the Adjusted R^2 as much as in the USD Returns' specification, for more than half of the markets the control variables increased the Adjusted R^2. However, the Adjusted R^2 for the Return's regression (Panel B) is in general low. Panel A shows that FTSE AW Developed Returns positively influences the Flows for only two markets, while EMBI and FX returns also exert very residual influence over flows. Panel B shows stronger results for the influence of FTSE AW Developed Returns of USD stock returns of emerging countries. For four countries this influence is significantly positive. The EMBI and FX returns seem to weakly influence local returns.

The contemporaneous positive relationship between returns and flows were present in only 5 of the 14 markets, a weaker result than the USD Return's case. For one country, Brazil, this relationship is negative. This may be explained by a negative feedback trading on a daily or weekly basis.

Panel A of table 3.12 shows that the evidence of positive feedback trading is still strong across countries when compared with table 3.9. Persistence in flows is still present in many markets. The influence of flows on Returns (Panel B of Table 3.12) is also almost inexistent as in Panel B of table 3.9.

TABLE 3.12 –Structural VAR Flow x Local Returns

PANEL A - Flow as Dependent Variable – Equation (3.8)

	Local Returns			Flow		EMBI		FTSE		FX		Adjusted R^2
	0 Lag	1 Lag	2 Lags	1 Lag	2 Lags	0 Lag	1 Lag	0 Lag	1 Lag	0 Lag	1 Lag	
Bulgaria	0.002	0.000	-0.042	0.014	0.015	-0.0023	0.0006	-0.002	0.049	0.093	-0.014	5.1%
Brazil	-0.007	0.010	-0.003	0.235	-0.049	0.0007	-0.0009	0.005	0.004	-0.001	-0.005	18.5%
Estonia	0.100	-0.110	-0.081	0.477	-0.170	-0.0038	-0.0028	0.048	0.062	-	-	25.6%
Hungary	0.058	0.023	0.030	-0.060	0.117	0.0001	-0.0010	-0.019	-0.014	0.012	-0.016	-5.9%
Indonesia	-0.004	0.012	0.007	0.000	0.335	-0.0017	0.0002	-0.024	0.010	0.016	0.004	3.0%
India	-0.003	0.007	-0.004	0.238	0.111	0.0001	-0.0005	0.004	-0.001	-0.110	-0.018	27.5%
South Korea	0.008	0.030	-0.026	0.539	0.131	0.0009	0.0004	-0.007	0.037	-0.018	0.014	49.4%
Lithuania	0.018	0.018	0.004	-0.325	-0.504	-0.0005	0.0009	-0.021	-0.017	-	-	13.5%
Philippines	-0.004	-0.001	0.009	0.509	0.271	0.0003	0.0000	-0.002	0.009	-0.001	0.011	55.0%
Poland	-0.005	0.014	-0.017	0.312	0.006	0.0004	0.0000	0.004	0.022	-0.011	-0.025	11.8%
Romania	0.006	0.003	0.003	0.047	0.048	-0.0003	0.0007	0.012	-0.013	0.011	0.045	-13.6%
Turkey	0.010	0.012	0.000	0.201	0.004	0.0002	0.0004	-0.012	0.003	0.001	-0.019	23.1%
Taiwan	0.010	0.020	-0.007	0.230	-0.081	0.0012	-0.0005	0.038	0.000	-0.018	0.010	45.7%
South Africa	0.000	0.001	0.003	0.186	0.152	-0.0001	-0.0002	0.002	0.006	0.001	0.007	16.6%

PANEL B - Local Returns as Dependent Variable – Equation (3.7)

	Flow			Local Returns		EMBI		FTSE		FX		Adjusted R^2
	0 Lag	1 Lag	2 Lags	1 Lag	2 Lags	0 Lag	1 Lag	0 Lag	1 Lag	0 Lag	1 Lag	
Bulgaria	0.143	-0.470	-0.778	-0.035	-0.018	-0.003	0.037	0.030	1.013	0.542	-0.353	-3.1%
Brazil	-14.226	-4.051	-8.503	0.344	-0.308	0.037	-0.033	0.018	0.145	-0.034	-0.349	9.4%
Estonia	0.975	-0.409	0.217	0.520	-0.041	-0.005	0.006	-0.067	-0.199	-	-	9.6%
Hungary	7.893	0.995	-0.599	-0.166	-0.375	-0.009	0.015	0.004	0.168	-0.214	0.369	0.1%
Indonesia	-0.641	-1.051	2.739	0.075	0.090	-0.020	-0.010	0.493	-0.111	0.222	0.225	13.3%
India	-3.852	-5.357	5.018	0.057	0.086	0.014	-0.022	0.609	-0.351	-0.958	-0.152	-4.2%
South Korea	6.458	-8.983	0.869	-0.209	0.543	0.006	0.002	0.436	-0.629	1.004	0.517	3.0%
Lithuania	5.234	3.968	4.515	0.300	-0.070	-0.002	-0.018	0.311	-0.053	-	-	18.8%
Philippines	-3.341	6.639	-1.845	-0.055	-0.110	-0.027	0.004	0.057	0.411	0.369	0.176	1.2%
Poland	-1.907	-0.219	-0.305	0.129	-0.055	-0.001	0.001	-0.147	0.246	-0.253	0.353	-11.9%
Romania	1.964	-3.799	-2.322	0.013	-0.226	0.012	-0.007	0.547	0.096	-0.293	-0.734	0.4%
Turkey	39.684	-4.945	0.782	-0.712	-0.082	-0.009	-0.008	0.856	0.134	-0.119	1.240	12.7%
Taiwan	10.211	-2.119	-0.974	-0.134	0.292	0.005	0.019	-0.140	0.267	-0.421	0.639	-9.6%
South Africa	-0.284	2.519	5.654	-0.189	0.004	0.007	0.001	0.510	-0.065	0.002	0.228	-1.1%

The coefficients significantly different from zero at 5% are in gray

Estimation Method: Seemingly Unrelated Regressions (SUR)

In general, the analysis country-by-country is not significantly improved by these control variables, except for the case of equation (3.6) where we have USD Returns as dependent variable, where the inclusion of the EMBI and developed countries' index showed to be important, although it did not change results for feedback trading.

However, the analysis with pooled data shows that these variables have significant coefficients, specially the developed countries' index as seen on Table 3.13. While the EMBI is

significant only when USD Return is the dependent variable, the FSTE returns are significantly positive in all regressions.

The coefficient of the 1-month-lag FX returns on the regression with Local Returns as dependent variable is positive and significant, shedding a light on the opposite results for feedback trading for USD and Local Returns as seen on table 3.10 and now also on table 3.13. The variation of local indices tends to be reversed or at least offset by the variation of the foreign exchange, so that the variation of the stock index in USD turns out to be smaller in absolute terms or even has the opposite sign of local returns. Therefore, the hypothesis of positive feedback trading by hedged investors and negative feedback trading by unhedged investors are not incompatible, and may occur at the same time.

Results of table 3.13 reject both information advantage and disadvantage by foreign investors, as flows are not able to predict neither Local Returns nor USD Returns. Recall that this can be seen also as evidence that foreign flows does not create any kind of price pressure over emerging equity markets. The persistence of flows is still present on both panels of Table 3.13, while there is some small evidence of negative serial autocorrelation for returns.

TABLE 3.13 – Panel Data: Flow x Returns with Control Variables

Panel A: Flow x USD Returns

Dependent Variable	USD Returns			Flows			EMBI		FTSE		Adjusted R2
	0 Lag	1 Lag	2 Lags	0 Lag	1 Lag	2 Lags	0 Lag	1 Lag	0 Lag	1 Lag	
Flow	0.0048	-0.0033	-0.0004	-	0.213	0.067	0.000	0.000	0.0053	0.0088	9.0%
USD Returns	-	-0.0173	-0.0480	-0.131	0.497	-0.072	-0.014	-0.013	0.946	0.061	21.5%

Panel B: Flow x Local Returns

Dependent Variable	Local Returns			Flows			EMBI		FTSE		FX		Adjusted R2
	0 Lag	1 Lag	2 Lags	0 Lag	1 Lag	2 Lags	0 Lag	1 Lag	0 Lag	1 Lag	0 Lag	1 Lag	
Flow	0.003	0.008	-0.002	-	0.174	0.107	0.000	0.000	0.005	0.010	0.001	-0.001	7.3%
Local Returns	-	-0.100	-0.089	0.758	-0.855	-0.182	-0.007	0.009	0.260	0.343	0.075	0.149	1.6%

The coefficients significantly different from zero at 5% are in gray
Estimation Method: SUR weighted least squares, using Fixed Effects

3.5) Robustness Checks

This section performs some robustness checks regarding the currency used on Returns. On the previous sections the return on USD and local currency were used. However, it is possible that foreign investors look at the relative return among emerging equity markets, especially hedge funds using long-short strategies. Therefore, this section evaluates the behavior of foreign investors using the return of each market in excess of the average return of the sample, weighted by the market capitalization. The excess return is calculated considering both hedge and unhedged investors, i.e., excess returns in Local Currency and in USD.

The specification is the following:

$$ER_{k,t} = c_{1,k} + \sum_{i=1}^{2} \alpha_{k,i} ER_{k,t-i} + \sum_{i=1}^{2} \beta_{k,i} FF_{k,t-i} + \varepsilon_{1,k,t} \quad (3.9)$$

$$FF_{k,t} = c_{2,k} + \sum_{i=1}^{2} \phi_{k,i} ER_{k,t-i} + \sum_{i=1}^{2} \varphi_{k,i} FF_{k,t-i} + \varepsilon_{2,k,t} \quad (3.10)$$

Where $ER_{k,t}$ is the difference of the country's index return and the return of an index of 14 markets of our sample weighted by market capitalization, for each country k and time t. These equations are used with local currency and USD returns.

Table 3.14 shows the results. As in the previous sections, the persistence of flows is still present for both specifications and past flows do not appear to influence future excess returns. Interestingly, the excess returns have significant negative coefficients, which means that the countries that are above the average in one month tend to be below the average on the following one or two months. This can be explained by liquidity issues: big investors tend to build and unwind their positions on the more liquid markets and then go to smaller markets.

We found evidence of negative feedback trading for USD Excess Returns since both coefficients of Returns on the Flow equation are negative and significant. However, when using Local Excess Returns, no evidence of feedback trading is found. Therefore, this robustness check supports the hypothesis of unhedged foreign investors engaging on negative feedback trading instead of hedged investors engaging on positive feedback trading.

TABLE 3.14 – Panel Data: Flow x Excess Returns

Panel A: Flow x Excess USD Returns

	Flow		Excess USD Returns		Adj R^2
Dependent Variable	**Lag: 1M**	**Lag: 2M**	**Lag: 1M**	**Lag: 2M**	
Flow	0.2186[a]	0.0667[b]	-0.0045[a]	-0.0022[b]	8.68%
Excess USD Returns	-0.0108	-0.0712	-0.0816[b]	-0.1001[a]	1.62%

Panel B: Flow x Excess Local Returns

	Flow		Excess Local Returns		Adj R^2
Dependent Variable	**Lag: 1M**	**Lag: 2M**	**Lag: 1M**	**Lag: 2M**	
Flow	0.1891 [a]	0.0532	-0.0020	0.0001	7.66%
Excess Local Returns	0.0585	0.1540	-0.0870[b]	-0.0713[b]	2.19%

a) Coefficient significant at 1%
b) Coefficient significant at 5%
c) Coefficient significant at 10%
Estimation Method: SUR weighted least squares, using Fixed Effects.

3.6) Conclusion

The empirical evidence regarding feedback trading through this chapter supports two hypotheses: positive feedback trading by hedged investors and negative feedback trading by unhedged investors. The latter has stronger evidence, but we cannot refute the possibility that both occur together, and the behavior of currency returns is responsible for making this possible. When considering only the excess return over the emerging market mean, we found no evidence of feedback trading by hedged but unhedged investors still seem to be negative feedback traders.

Comparison with previous literature should consider whether returns used are in local currency or USD. Our results are in line with the positive feedback trading found in previous studies that use local currency returns (e.g., Richards (2004), Griffin, Nardari and Stulz(2004)). However, results of Froot, O'Connell, Seasholes (2001), that use USD returns, show positive feedback trading up to 40 trading days using daily data. The difference to our negative feedback findings may be attributable to the sample. They used data from 1994 to 1998 and we used data from the 2000 to 2005 period; also they used data from a specific custodian only, whereas we used data from all investors in the market. Another important point is that, in fact, we found negative feedback trading with one-month lag, while the one-month contemporaneous relationship is positive. This one-month positive contemporaneous relationship may be due to positive feedback trading on a daily basis in the first month. As Froot, O'Connell, Seasholes (2001) used 40 trading days – approximately 2 months - it may be the case that a strong daily positive feedback trading in the first month will offset a negative feedback trading on the second month, so that the final effect is positive.

One important issue is how this behavior affects emerging markets. Positive feedback traders are blamed to exacerbate price movements, so they would be prejudicial considering local currency movements. But if foreigners were also negative feedback traders considering USD returns, what would be the effect after all? If we think of USD return as a return that adjusts currency fluctuations caused by inflation[12], then this effect would be beneficial to the long-term stability of emerging stock markets. So a temporary exacerbating effect in local currency stock returns is offset by the exchange rate dynamics, creating an effect that is not prejudicial in the end. Next chapter will go deeper in the effects of foreign investors to emerging markets.

Another issue on the effect of foreign investors is how informed are foreigners. If such investors have superior information about local markets, then they would be beneficial to keep those markets efficient. However, our results show no evidence of informational advantage or disadvantage by foreign investors using polled data. There is just some weak evidence of informational disadvantages for special cases, like South Korea. This hypothesis of informed trading cannot be distinguished from the price pressure hypothesis, i.e., if foreigners have superior information and anticipate price movements or if their trading causes a pressure on prices. So we found no evidence of price pressure. In contrast, the articles of O'Connell, Seasholes (2001) and Richards (2004) found that foreign trading does have an impact on local prices. The differences may be again attributable to the sample.

[12] in this case, we are assuming that inflation of emerging countries is higher that US inflation.

The persistence of foreign flows documented in the literature (e.g. Froot and Donohue (2002,2004)) is corroborated by our empirical findings. The evidence of positive serial autocorrelation in local stock returns, found using traditional autocorrelation tests (see Table 3.4), disappears when control variables are added to the analysis. On the contrary, there is even some small evidence of negative autocorrelation in local returns when the analysis is done with pooled data and control variables.

4) Effects on Local Markets

The presence of foreign portfolio investors in emerging markets is often associated to financial crisis. Differently from the foreign direct investments, the portfolio investments tend to be volatile, entering and exiting emerging markets with a speed sometimes undesirable, causing volatility in equity and foreign exchange markets. Some articles focus on the behavior of foreign equity investors during financial crises, like Choe et al (1999) which investigates the Asian crisis of 1997. This chapter will analyze the effect of foreign investors during the period of 2000 to 2005. This period comprises some events that brought volatility to the equity on developed and emerging markets (e.g. the burst of the internet bubble in 2000 and Iraq's invasion in 2003). Crisis in emerging markets during this period were restricted to South America: Argentina in 2001 and Brazil in 2002. As Argentina is not in our sample (data is not available), a possible event study may be restricted to Brazil. Thus, this chapter analyzes the effects of foreign investors during "normal" up and down swings, and not as an event study of crisis.

The main contribution of this chapter is to assess the effects of foreign trading on volatility in a multi-country setting of emerging markets. Also, we assess the effects on Kurtosis of equity returns and on foreign exchange markets. To my knowledge, this is the first study to do this analysis.

Last chapter already showed that the foreign net flow does not create a price pressure in emerging markets. Next section will assess effects of foreign trading on volatility and Kurtosis of stocks and currencies, while section 4.2 will deal with the effects of foreigners on the currency value. Section 4.3 concludes the chapter.

4.1) Effects on Stock's Volatility and Kurtosis

As seen before, one of the possible negative effects of foreign trading on a domestic equity emerging market is an increase of the volatility. If no restrictions to flows are imposed, the foreign capital may enter and exit the emerging market very fast and with high volume. To analyze the contemporaneous impact of foreign trading on the equity and exchange rate markets volatilities, the following regressions are estimated individually for each country:

$$SV_{k,t} = c_k + \sum_{i=1}^{n} \alpha_{k,i} SV_{k,t-i} + \beta_k FT_{k,t} + \varepsilon_{k,t} \quad (4.1)$$

$$UV_{k,t} = c_k + \sum_{i=1}^{n} \alpha_{k,i} UV_{k,t-i} + \phi_k FT_{k,t} + \varepsilon_{k,t} \quad (4.2)$$

$$XV_{k,t} = c_k + \sum_{i=1}^{n} \alpha_{k,i} XV_{k,t-i} + \gamma_k FT_{k,t} + \varepsilon_{k,t} \quad (4.3)$$

Where $FT_{k,t}$ is the Turnover[13] of Equity Foreign Portfolio Investors of country k at time t as a percentage of the total turnover; $SV_{k,t}$ is the annualized volatility of the daily equity returns in local currency of country k at time t ; $UV_{k,t}$ is the annualized volatility of the daily equity returns in USD of country k at time t ; $XV_{k,t}$ is the annualized volatility of the daily exchange rate's returns of country k at time t, and the c_i's are constants.

The results are on table 4.1, and use specifications with 2 lags for volatility, since further lags were not significant. The control variables used on last chapter were also not relevant. As for 5 European countries data from flow are available only on a net basis, they are not present on this analysis, so we have only 9 markets.

Panel A of Table 4.1 shows the effects on the volatility of local currency returns. There is a strong persistence of volatility for 7 of the 9 markets, as expected and documented in the literature. In fact, models with moving averages are widely used on Risk Management applications to forecast volatility. The coefficient of Foreign Turnover, although negative, is not statically significant for most of the cases.

Results for the volatility of USD Returns are on Panel B of Table 4.1, and also show strong persistence on volatility. Foreign Turnover has a negative contemporaneous relationship on volatility for 7 of 9 markets, but only for two (Indonesia and Taiwan) the impact is statistically significant. So we have some weak evidence that higher Foreign Turnover is associated with lower equity volatility.

The effects of foreign trading on the foreign exchange volatility are also analyzed on Table 4.1, on Panel C. Volatility again shows strong persistence. The Foreign Turnover appears to have no clear impact on volatility, as coefficients are not significant (except Taiwan) and are sometimes positive, sometimes negative.

The above country-by-country analysis is also performed using pooled data (see Table 4.2). Volatility persistence still remains high, and now also for the second lag for all three kinds of volatility (Local Returns, USD Returns and Foreign Exchange Returns). But the effects of Foreign Turnover are now significant for the equity returns' volatility both in Local currency and USD. These coefficients are negative, which means that a higher trading by foreigners is accompanied by a decrease in volatility. Therefore, the effect of foreigner's trading would be beneficial to the local equity market. This beneficial effect is restricted to the equity market, since the coefficient of the volatility of Foreign Exchange Returns is not significant, although it is negative.

[13] The total turnover of foreign equity investors is the sum of purchases and sales.

TABLE 4.1 – Volatile Effects of Foreign trading

PANEL A - Volatility of Local Returns – Equation (4.1)

	Volatility		Foreign Turnover	Constant	Adj R^2
	Lag: 1M	Lag: 2M			
Brazil	0.2640[b]	0.1478[c]	-0.1427	0.1909[a]	6.6%
Indonesia	0.1105	-0.1806[b]	-0.0586	0.2277[a]	1.6%
India	0.3306[a]	0.2081[b]	-0.0949	0.1065[b]	18.8%
South Korea	0.5085[a]	0.0237	-0.3955	0.1871[b]	35.6%
Philippines	-0.0795	-0.0404	-0.0656	0.2227[a]	-3.1%
Romania	0.4551[a]	-0.0411	-0.0335	0.1390[a]	15.8%
Turkey	0.2840[a]	0.3032[b]	-0.6794	0.2360[b]	30.9%
Taiwan	0.3741[a]	-0.0396	-0.912[a]	0.2558[a]	43.4%
South Africa	0.2712[b]	0.0929	0.3109[b]	0.0270	17.7%

PANEL B - Volatility of USD Returns – Equation (4.2)

	Volatility		Foreign Turnover	Constant	Adj R^2
	Lag: 1M	Lag: 2M			
Brazil	0.2993[b]	0.1281	0.1693	0.1370[b]	11.2%
Indonesia	0.2270[a]	-0.0747	-0.0977[c]	0.2017	9.6%
India	0.3420[a]	0.2012[a]	-0.0811	0.1040[b]	19.5%
South Korea	0.4502[b]	0.0397	-0.3799	0.1953[b]	29.9%
Philippines	-0.1177	-0.0090	-0.0950	0.2378[a]	-1.9%
Romania	0.4579[a]	-0.0411	-0.0193	0.1461[a]	15.9%
Turkey	0.2189[a]	0.4329	-0.3732	0.1714	30.6%
Taiwan	0.3685[a]	-0.0325	-0.8663[a]	0.2477[a]	42.5%
South Africa	0.2767[a]	0.1599	0.0665[b]	0.1286[c]	8.3%

PANEL C - Volatility of Foreign Exchange Returns – Equation (4.3)

	Volatility		Foreign Turnover	Constant	Adj R^2
	Lag: 1M	Lag: 2M			
Brazil	0.3774[a]	0.2223[b]	0.4792	-0.0247	41.7%
Indonesia	0.4581[a]	0.1702	-0.0523	0.0521[b]	39.3%
India	0.3815[a]	0.0694	0.0888	0.0062	23.1%
South Korea	0.5477[a]	-0.0940	-0.0286	0.0406[b]	23.7%
Philippines	0.1443[c]	0.4104[c]	-0.0461	0.0365[c]	21.7%
Romania	0.3600[a]	0.4459[b]	0.0047	0.0141	48.6%
Turkey	0.2213[a]	0.2540[a]	-0.1638	0.1071[c]	11.6%
Taiwan	0.4440[a]	0.0039	0.0661[c]	0.0113[b]	23.9%
South Africa	0.4453[a]	0.0833	-0.1045	0.1033[c]	24.9%

Estimation Method: OLS with Newey-West HAC Standard Errors & Covariance

a) Coefficient significant at 1%
b) Coefficient significant at 5%
c) Coefficient significant at 10%

TABLE 4.2 – Panel Data - Volatile Effects of Foreign trading				
Dependent Variable	**Volatility**		**Foreign Turnover**	**Adj R^2**
	Lag: 1M	**Lag: 2M**		
Local Returns' Volatility	0.3246[a]	0.1493[a]	-0.0733[b]	42.5%
USD Returns' Volatility	0.3419[a]	0.1469[a]	-0.0632[c]	32.7%
FX Returns' Volatility	0.3611[a]	0.2256[a]	-0.0020	40.5%

Estimation Method: Seemingly Unrelated Regression, using Fixed Effects.
a) Coefficient significant at 1%
b) Coefficient significant at 5%
c) Coefficient significant at 10%

The volatility can be replaced by the kurtosis as a measure of risk on the set of regressions (4.1) to (4.3). The kurtosis can be viewed as a measure of extreme events of the distribution or how fat are the tails of the distribution. In the risk management literature, it is common to use risk measures that focus on the tail of the distribution such as the Value at Risk and the Expected Short-fall. Therefore, if the foreign trading is increasing the kurtosis, we can say it is a negative effect since it increases the perception of risk and limits the allocation of capital to these markets.

Therefore, we can measure the effects of foreign trading on Kurtosis by running the following regressions:

$$SK_{k,t} = c_k + \sum_{i=1}^{n} \alpha_{k,i} SK_{k,t-i} + \beta_k FT_{k,t} + \varepsilon_{k,t} \quad (4.4)$$

$$UK_{k,t} = c_k + \sum_{i=1}^{n} \alpha_{k,i} UK_{k,t-i} + \phi_k FT_{k,t} + \varepsilon_{k,t} \quad (4.5)$$

$$XK_{k,t} = c_k + \sum_{i=1}^{n} \alpha_{k,i} XK_{k,t-i} + \gamma_k FT_{k,t} + \varepsilon_{k,t} \quad (4.6)$$

Where $FT_{k,t}$ is the Turnover of Equity Foreign Portfolio Investors of country k at time t as a percentage of the total turnover; $SK_{k,t}$ is the excess kurtosis of the daily equity returns in local currency of country k at time t ; $UK_{k,t}$ is the excess kurtosis of the daily equity returns in USD of country k at time t ; $XK_{k,t}$ is the excess kurtosis of the daily exchange rate's returns of country k at time t, and the c_i's are constants.

Results are presented on Table 4.3. For the equity returns (Panels A and B) we identify a strong persistence of Kurtosis for most of the markets, while for the foreign exchange returns the evidence of Kurtosis persistence is not present, except for Taiwan. The Foreign Turnover has a negative coefficient for most of the markets, but it is rarely significant. The result from pooled data (Table 4.4) also corroborates the view of no impact of Foreign Turnover on Kurtosis, however it shows no evidence of Kurtosis persistence contradicting country-by-country results.

TABLE 4.3 – Effects of Foreign Trading on Kurtosis

PANEL A - Kurtosis of Local Returns – Equation (4.4)

	Kurtosis		Foreign Turnover	Constant	Adj R^2
	Lag: 1M	Lag: 2M			
Brazil	0.2640[b]	0.14781[c]	-0.1427	0.1909[a]	6.6%
Indonesia	0.1105	-0.1806[b]	-0.0586	0.2277[a]	1.6%
India	0.3306[a]	0.2080[b]	-0.0949	0.1065[b]	18.8%
South Korea	0.5085[a]	0.0237	-0.3955	0.1871[b]	35.6%
Philippines	-0.0795	-0.0404	-0.0656	0.2227[a]	-3.1%
Romania	0.4551[a]	-0.0411	-0.0335	0.1390[a]	15.8%
Turkey	0.2840[a]	0.3032[b]	-0.6794	0.2359[b]	30.9%
Taiwan	0.3741[a]	-0.0396	-0.9119[a]	0.2558	43.4%
South Africa	0.2712[b]	0.0929	0.3109[b]	0.0270	17.7%

PANEL B - Kurtosis of USD Returns – Equation (4.5)

	Kurtosis		Foreign Turnover	Constant	Adj R^2
	Lag: 1M	Lag: 2M			
Brazil	0.2993[b]	0.1281	0.1693	0.1371[b]	11.2%
Indonesia	0.2270[a]	-0.0747	-0.0977[c]	0.2017[a]	9.6%
India	0.3420[a]	0.2012[b]	-0.0811	0.1040[b]	19.5%
South Korea	0.4502[b]	0.0397	-0.3799	0.1953[b]	29.9%
Philippines	-0.1177	-0.0090	-0.0950	0.2378[a]	-1.9%
Romania	0.4579[a]	-0.0411	-0.0193	0.1461[a]	15.9%
Turkey	0.2189[a]	0.4329	-0.3732	0.1714	30.6%
Taiwan	0.3685[a]	-0.0325	-0.8663[a]	0.2478[a]	42.5%
South Africa	0.2768[a]	0.1599[b]	0.0665	0.1286[c]	8.3%

PANEL C - Kurtosis of Foreign Exchange Returns – Equation (4.6)

	Kurtosis		Foreign Turnover	Constant	Adj R^2
	Lag: 1M	Lag: 2M			
Brazil	-0.0357	0.2389[c]	-0.5608	0.0891	1.5%
Indonesia	-0.0304	-0.1065	-1.2802	2.426[a]	-3.1%
India	-0.1560	-0.2080	16.089[c]	0.5574	5.6%
South Korea	0.1248	0.0370	4.0568	0.4459	-1.8%
Philippines	0.0258	0.2407	-4.8456[c]	2.1218[b]	7.6%
Romania	-0.0214	0.3308	-1.8943	1.4721[a]	7.4%
Turkey	-0.0830	0.1061	-4.9948	1.4097[c]	-2.1%
Taiwan	0.3979[a]	0.0224	-2.3219	1.0131[c]	13.3%
South Africa	-0.1706	-0.1708[c]	12.156[c]	-2.2744	7.4%

Estimation Method: OLS with Newey-West HAC Standard Errors & Covariance

a) Coefficient significant at 1%
b) Coefficient significant at 5%
c) Coefficient significant at 10%

TABLE 4.4 – Panel Data - Effects of Foreign Trading on Kurtosis				
Dependent Variable	**Kurtosis**		**Foreign Turnover**	**Adj R2**
	Lag: 1M	**Lag: 2M**		
Local Returns	-0.0161	0.0092	-0.8023	1.8%
USD Returns	0.0169	-0.0050	-0.1332	0.5%
FX Returns	0.0505	0.1068[a]	-0.0093	4.6%

Estimation Method: Seemingly Unrelated Regression, using Fixed Effects.
a) Coefficient significant at 1%
b) Coefficient significant at 5%
c) Coefficient significant at 10%

4.2) Effects on Foreign Exchange Returns

The flow of foreign investors to emerging equity markets may influence also the local currency spot value, especially when these investors are unhedged. The intuition is that the higher the inflow, the higher will be the value of the local currency. This section will analyze this effect through a regression of the foreign exchange returns as a dependent variable and foreign flow as a percentage of market capitalization[14] as an independent variable. As control variable we use the variation of the Spread over Treasury of JPM's EMBI+. This spread is the number of basis points that the USD Sovereign bonds' term structure of the issuer is above the US Treasury curve, and is seen as a measure of the country risk. It is expected that this spread and the currency value will move in the same direction. As we are using returns and flows (and not prices and stock) as variables, we have to use the first difference of the EMBI Spread as control variable. As not all the countries in our sample are present in the EMBI for this period, we use the country-specific EMBI when available, and the composite or regional EMBI otherwise.

Other control variables from the balance of payments (e.g. debt portfolio investment, direct investment, balance of goods) could be also used, however we did not find monthly data for most of the countries. Therefore, the specification includes only the EMBI as control variable:

$$FX_{k,t} = c_k + \sum_{i=1}^{2} \alpha_{k,i} FX_{k,t-i} + \beta_k FF_{k,t} + \rho_k EMBI_{k,t} + \varepsilon_{k,t} \qquad (4.7)$$

Where $FF_{k,t}$ is the Net Foreign Equity Portfolio Investment as a percentage of market capitalization of country k at time t; EMBI is the first difference of the spread of the EMBI from JP Morgan expressed in percentage points, FX is the return of the exchange rate denominated in local currency per US Dollar, and the c's are constants.

Results are on table 4.5, and include 12 markets of the sample (Estonia and Lithuania are excluded because of their pegged currencies). We see that the effect of foreign flows in appreciating the local currency is significant in only 3 markets. The persistence of foreign

[14] The ideal case is to normalize the flow by the turnover of the foreign exchange market, but we could not find this data.

exchange returns is present in six markets, while the EMBI is a significant factor in only three markets.

Pooled regression is showed in Table 4.6. The FX return is persistent for the first lag. The EMBI influence is significant, and in the expected direction: when local currencies loose value the EMBI increases and vice-versa. The flow coefficient is negative and significant at 5%, which means that foreign flows appreciate the local currency, as expected. Here we have to mention the problem of omitted variables bias, since control variables from the balance of payments may affect the foreign exchange. However, we believe that the EMBI is a reasonable proxy for some of these variables, especially the debt portfolio flows. Therefore, we may conclude that foreign equity flows has some influence on foreign exchange returns in emerging markets, in the way these flows tend to add value to the local currency.

TABLE 4.5 – Effects of Foreign Trading on Exchange Rate Returns

Country by Country Analysis – Equation (4.7)

	FX Returns		Flow	EMBI	Constant	Adj R^2
	Lag: 1M	Lag: 2M				
Bulgaria	0.1702[c]	-0.1127	0.6019b	0.0076	-0.0027	11.6%
Brazil	0.1241[c]	0.1250[b]	-0.7738	0.0247[a]	0.0065	74.3%
Hungary	0.1138	-0.1180	-0.3695	-0.0397	-0.0047	6.0%
Indonesia	0.2542[b]	0.0076	0.0106	0.0447[a]	0.0034	16.5%
India	0.0856	0.0508	-1.7264[b]	-0.0013	0.0039[c]	24.1%
South Korea	0.1826	-0.0239	-0.5623	0.0059	0.0000	4.5%
Philippines	-0.1219	-0.0499	-1.2490[a]	0.0076	0.0075	6.5%
Poland	-0.0386	-0.1173	-0.9444	0.0340[b]	-0.0021	8.5%
Romania	0.1834	0.3261[a]	0.0315	-0.0011	0.0025	17.2%
Turkey	0.1425[a]	0.0594	-2.8665	-0.0117	0.0136	7.2%
Taiwan	0.3002[b]	0.1084	-0.9281[b]	0.0010	0.0027[c]	20.9%
South Africa	-0.0234	0.0936	1.7284	0.0003	-0.0001	1.1%

Estimation Method: OLS with Newey-West HAC Standard Errors & Covariance

a) Coefficient significant at 1%
b) Coefficient significant at 5%
c) Coefficient significant at 10%

TABLE 4.6 – Effects of Foreign Trading on Exchange Rate Returns

Panel Data

	FX Returns		Flow	EMBI	Adj R^2
	Lag: 1M	Lag: 2M			
FX Returns	0.0732[b]	0.0392	-0.3129[b]	0.0096[a]	7.1%

Estimation Method: Seemingly Unrelated Regression, Fixed Effects.

4.3) Conclusion

This chapter analyzed the effects of foreign trading on local emerging markets. We found no evidence that this trading is prejudicial to the emerging equity and foreign exchange markets

in our sample. In some cases, it even brings benefits. The idea that foreign traders increase volatility of emerging markets is refuted. On the contrary, our results suggest that periods of high trading by foreigners have lower volatility on equity markets. This is consistent with the hypothesis that foreign investors enter and exit the emerging markets gradually, building and unwinding their positions through a relatively long period of time. The persistence of foreign flows found on last chapter corroborates this view. This is consistent with the findings of Albuquerque et al (2004), which uses flows of US investors to G7 countries. The articles of Froot and Donohue (2002,2004) and Froot et al (2001) also support the view of strong persistence.

The foreigners' flow tends to increase the value of local currencies. However, the volatility and kurtosis of foreign exchange returns are not affected, which corroborates the view of slow movements of foreigners when trading on emerging markets. Thus, although there is an influence on the local exchange market, this influence does not affect risk indicators like volatility and kurtosis, being smooth enough to avoid problems.

Therefore, results support the view that restrictions to equity capital flows are not necessary. This is in line with the results of Choe, Khoe and Stulz (1998), which find no evidence that foreign equity investors had a destabilizing effect on Korean stock market over the Asian crisis in 1997. However, Richards (2004) supports the view that foreign trading can be destabilizing in emerging markets and that policy makers should ensure that their markets and institutions are sufficiently strong to cope with these inflows and outflows. His conclusions are based on two results: first, there is a price pressure caused by foreigners' trading; second, the foreign flows are substantially influenced by recent returns in global equity markets. The first result is not found in our sample (see last chapter's conclusion), while the second is not, in our view, a big threat to the stability of emerging markets, since developed markets tend to be more stable than emerging markets.

5) Herding Behavior

Foreign investors are often blamed to enter and exit emerging markets in herds. As seen before, this can happen because investors are imitating or following other investors, or can be due to an external common factor. On the first case, we would have the true herding behavior and in the second the spurious herding. As it is very difficult to identify if a herd behavior is spurious or not, on this chapter we concentrate in identifying the herd behavior on foreign investors no matter if it is spurious or genuine. The aim is to measure the degree of Herding by foreign investors on the emerging equity markets of our sample, and try to find the effects of this behavior on the market.

This chapter contributes to the literature by analyzing the herding behavior of all foreign investors of 9 emerging markets, while previous papers either were focused on single countries only (Bowe and Domuta (2004), Kim and Wei (2002)) or use data only from emerging equity funds (Borensztein and Gelos (2003)). Also, we consider the period of time from 2000 to 2005, while previous studies covered the late 1990's, a period of crisis on emerging markets. Our paper obtains evidence of herding during relatively tranquil times, although some negative events like the burst of the Internet bubble in 2000 are present on this time period. Furthermore, we empirically investigate the relationship between herding behavior and fat tails of return's distribution, in order to test models like Bak et al (1997), Lux (1998), and Cont and Bouchaud (2000). As far as we know, this has never been done before.

Next section will describe the sample and the herding measure used. Section 5.2 will show the results in our sample, comparing the mean value of the measure across countries. Section 5.3 will extend the analysis to consider the all herding measure distribution characteristics, and not only the mean. Section 5.4 will investigate the relationship between the herding measure and the kurtosis of stock indices returns, while section 5.5 analyzes the impacts of herding on the volatility of equity indices.

5.1) Herding Measure and Sample Description

Our methodology adapts the herding measure proposed by LSV (1992). A stock in the LSV setting will be a national market in our data. Also, instead of counting the number of funds buying a stock divided by the total number of funds trading that stock, we use the buying volume of a national market divided by the foreign turnover *FT* of the same market. So, using the volume instead of counting the number of buyers, we can account for the buying intensity, resolving one of the drawbacks of the original LSV measure. Our adapted LSV measure is:

$$LSV_{i,t} = \left| p_{i,t} - \mathrm{E}\left[p_{i,t} \right] \right| - \mathrm{E}\left[\left| p_{i,t} - \mathrm{E}\left[p_{i,t} \right] \right| \right] \qquad (5.1)$$

Where in our case:

$$p_{i,t} = FB_{i,t} / FT_{i,t}$$

$$\mathrm{E}\left[p_{i,t}\right] = \sum_i FB_{i,t} \div \sum_i FT_{i,t}$$

and $FT_{i,t}$ is the Turnover in USD of Equity Foreign Portfolio Investors of country k at time t , $FB_{i,t}$ is the USD amount of the foreign purchases of country k at time t.

The term $\mathrm{E}\left[\left|p_{i,t} - \mathrm{E}\left[p_{i,t}\right]\right|\right]$ assumes that $FB_{i,t}$ follows a binomial distribution with mean $E[p_{i,t}]$, i.e., this is the theoretical distribution with a behavior considering independent and random trades for each country. The other parameter of the binomial distribution above is the number of investors trading at that period. This term, also called Adjustment Factor, is used to correct for the mean of the first term of (5.1) so that the herding measure would tend to zero under the hypothesis of no herding (or independent trading). This correction is especially important when the number of investors is small.

The sample is the same described on section 3.1. For 5 countries we do not have the purchases separated from sales, but just the net inflow. Therefore we cannot use these countries, as we need the foreign buying volume to calculate the Herding measure. This leaves us with only 9 markets. The sample period is the same of Table 3.1.

Information regarding the number of investors (which is needed to calculate the adjustment factor) is not available for most of the markets. We have this information on a monthly basis only for India. For South Korea and Brazil we have annual data. While for Brazil and India the information is actually the number of registered investors (not necessarily trading), for South Korea the data is about shareholdings. We believe that both are good proxies for the number of investors trading. For Romania, data is available only for the year of 2005, showing around 600 foreign investors trading each month.

As this adjustment factor has small variations for numbers of investors above 600, it is not a problem to have poor estimates of these numbers. For example, the adjustment factor for 600 and 1,000 investors with $E[p_{i,t}] = 0.50$ is respectively 1,63% and 1,26%. For $E[p_{i,t}]=0.50$ with 4,000 and 6,000 investors the difference is still lower: 0.63% and 0.52%. For India, South Korea and Brazil, we used the actual data – monthly for the first and annual for the others. For the other markets, we choose the number of investors by matching them with a similar market in terms of foreign flow volume. For Taiwan we used 10,000 investors (similar to South Korea), for Turkey and South Africa we used 4,000 (similar to Brazil), for Indonesia we used 1,000 and for Philippines we used 600 (similar to Romania). These numbers of investors may be downward biased. A smaller number of investor lead to a higher adjustment factor and a smaller Herding measure, so that our herding measure may be downward biased if the number of investors is also downward biased. As we will see later, our results support herding measures significantly different from zero, even with this bias.

5.2) Herding Measure Mean Results

For each month and country, we calculate the Herding measure according with equation (5.1). Our first assessment will be to analyze the mean of the Herding measure for each country during the 68 months of the sample. Results are on Table 5.1. For all countries the herding measure is significantly different from zero, corroborating previous studies of foreign trading herding. The values of the two smallest markets (Romania and Philippines) are higher, and this is expected since they have little influence on the $E[p_{i,t}]$. Our overall mean, 4.75, is lower than previous studies with emerging equity markets. Borensztein and Gelos (2003) found an average measure of 7.7 using 400 dedicated emerging equity funds. Bowe and Domuta (2004) found values over 11 using Indonesian data. Kim and Wei (2002), using Korean data, found measures above 8 for individual non-residents, however for institutional investors, the measures were lower: during tranquil periods the measure was 5.8, but interestingly, during the Asian crisis of 1997, the measure was only 2.5.

It is worth to mention that the above studies, using single countries, use data at individual stock level. Borensztein and Gelos (2003) is the most similar to our study, since it uses the country allocation as we do, and not stocks. However, they are restricted to funds, while we use all foreign investors universe (except for India). Also, the previous studies use a time period between 1995 and 2000, while our period starts on 2000. Therefore, it may also be the case that the herding on emerging markets has diminished. In the end, we cannot distinguish between the hypothesis of herding decreasing from 1995-2000 to 2000-2005, and the hypothesis that the funds have a herding intensity higher than the whole universe of foreign investors.

One may think that our downward biased estimate of the number of investors may alter significantly our herding measure so that our conclusions may change. Table 5.1 shows that our adjustment factor is not very significant for most of the markets. Recall that this factor has a minus signal on the formula, and therefore even if we cut them all (by increasing indefinitely the number of investors), our herding measure will still have values around 5.7, which is still lower than previous emerging market studies.

Although the herding measures of Table 5.1 are lower than previous emerging market studies, they are higher than studies with US funds, like the seminal paper of LSV (1992), Grinblatt, Titman and Wermers (1995) and Wermers(1999). These papers use quarterly data at individual stock level from mid 1970's to mid 1990's, finding herding measures from 2.5 and 2.7 (LSV (1992) and Grinblatt, Titman and Wermers(1995)) to 3.5 (Wermers (1999)).

TABLE 5.1 – LSV Herding Measure			
Market	LSV Herding Measure		Adjustment Factor Mean
	Mean	Standard Error	
Brazil	5.34	0.57	0.57
Indonesia	5.62	1.19	1.26
India	1.92	0.36	1.71
South Korea	2.06	0.22	0.33
Philippines	9.90	0.84	1.62
Romania	8.80	1.27	1.63
Turkey	3.63	0.38	0.63
Taiwan	2.57	0.26	0.40
South Africa	2.97	0.36	0.63
All Markets	4.76	0.26	0.98

Mean and standard errors calculated for each country considering the all sample period.
Values in percentage.
All means are significantly different from zero at 1%.

5.3) The Distribution of Herding Measure

The analysis of the previous section is limited to the mean of the herding measure, and no consideration is given to the other moments and to the whole distribution. Although the difference of the means is a good indicator that the distributions are different, the analysis of the whole distribution may bring a better understanding of the magnitude of this difference. Therefore, on this section we follow Wermers (1999) and Borensztein and Gelos (2003) in comparing the actual herding distribution to a distribution generated by a Monte Carlo Simulation considering independent trading decisions by investors (see appendix for details of the Monte Carlo Simulation).

Panels A and B of Table 5.2 show the statistical properties of the actual and simulated distributions respectively. Besides the higher mean, the range and standard deviation of the actual distribution are also larger than the simulated one. On Figure 5.1 we see the histograms of the actual and simulated distributions for the whole sample. The actual distribution has a substantially greater probability mass on the positive herding area, with the simulated distribution being more peaked around zero. These results are similar to those of Borensztein and Gelos (2003). Panel C of Table 5.2 shows two formal statistical tests – Komolgorov-Smirnov and Kuiper - with the null hypothesis that both distributions are equal (see Appendix for details). Results show approximately the difference between the two distributions.

The above analysis refers to the unconditional distribution of the herding measure, but its evolution along the time can also be examined. Table 5.3 shows the autocorrelation coefficients of the herding measure by country and for the whole sample. Overall, there is little evidence of persistence on herding. The correlation coefficients are significantly positive for only three countries (Indonesia, Philippines and Turkey), while for the others and for the whole sample there

is no evidence of autocorrelation. So it is not possible to forecast future herding behavior using past information of herding.

TABLE 5.2 – LSV Herding Measure Distribution Statistics

PANEL A - Actual Distribution

Market	Mean	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis
Brazil	5.34	23.30	-0.46	4.71	1.60	6.19
Indonesia	5.62	44.41	-1.25	9.80	2.60	9.54
India	1.92	10.36	-1.70	2.99	0.87	3.20
South Korea	2.06	7.40	-0.24	1.84	1.23	3.75
Philippines	9.90	36.79	-1.45	6.93	1.19	5.60
Romania	8.80	45.85	-1.42	10.47	1.61	5.61
Turkey	3.63	14.04	-0.30	3.17	1.00	3.57
Taiwan	2.57	10.01	-0.18	2.16	1.04	4.00
South Africa	2.97	13.99	-0.61	2.99	1.02	4.17
All	4.76	45.85	-1.70	6.47	2.92	14.85

PANEL B - Simulated Distribution

Brazil	-0,01	2,19	-0,61	0,43	1,05	4,14
Indonesia	0,00	4,19	-1,26	0,94	0,97	3,71
India	0,00	6,74	-1,79	1,28	0,96	3,84
South Korea	0,00	1,40	-0,37	0,25	1,00	4,05
Philippines	0,02	5,97	-1,62	1,22	0,97	3,85
Romania	0,00	5,52	-2,05	1,23	0,97	3,76
Turkey	0,01	2,53	-0,63	0,48	0,95	3,62
Taiwan	0,00	1,44	-0,40	0,30	1,00	3,81
South Africa	0,01	2,40	-0,63	0,48	1,01	3,87
All	0,00	6,74	-2,05	0,84	1,27	6,96

PANEL C - Kolmogorov and Kuiper Tests

Market	Kolmogorov		Kuiper	
	Distance	p-value	Distance	p-value
Brazil	0,8257	0,0000	0,8257	0,0000
Indonesia	0,5382	0,0000	0,5382	0,0000
India	0,3917	0,0000	0,4094	0,0000
South Korea	0,8174	0,0000	0,8174	0,0000
Philippines	0,8208	0,0000	0,8208	0,0000
Romania	0,6075	0,0000	0,6126	0,0000
Turkey	0,7421	0,0000	0,7421	0,0000
Taiwan	0,7590	0,0000	0,7590	0,0000
South Africa	0,6296	0,0000	0,6296	0,0000
All	0.6429	0,0000	0.6438	0,0000

Figure 5.1 - Actual and Simulated Herding Distributions

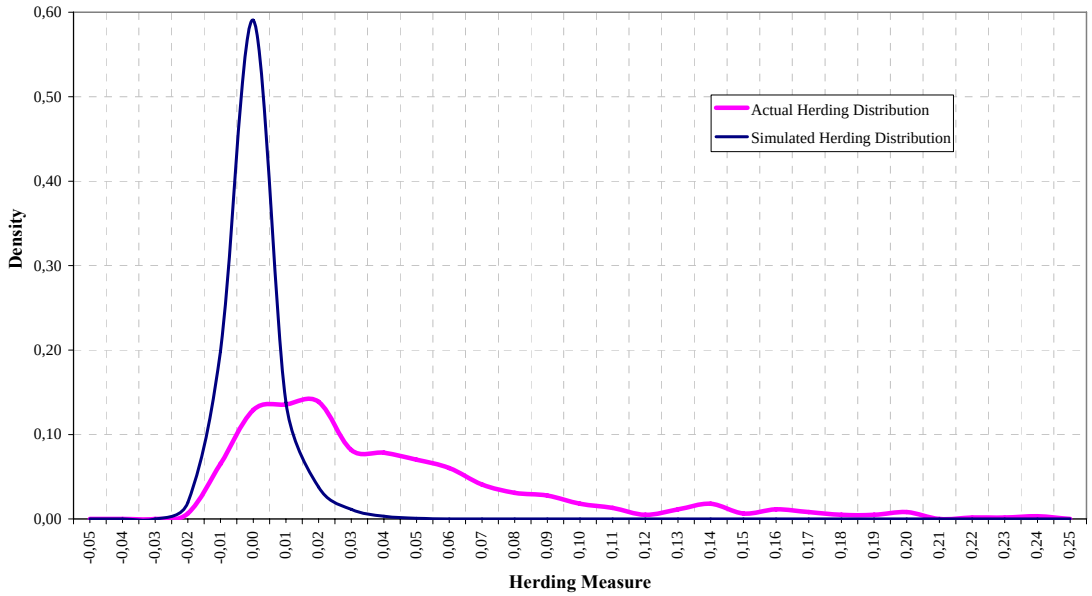

TABLE 5.3 – LSV Herding Measure Autocorrelation

Market	Autocorrelation Coefficients			p-values		
	1 Lag	2 Lags	3 Lags	1 Lag	2 Lags	3 Lags
Brazil	0,149	0,103	0,033	21,0%	31,1%	49,1%
Indonesia	0.363	0.291	0.323	0.2%	0.0%	37.8%
India	-0.017	-0.053	0.022	88.9%	89.6%	96.8%
South Korea	0.192	-0.073	-0.077	10.6%	22.4%	33.0%
Philippines	0.366	0.225	0.276	0.2%	0.1%	0.0%
Romania	-0.048	0.045	0.076	68.6%	85.5%	86.4%
Turkey	0.264	0.174	0.037	2.6%	2.8%	6.5%
Taiwan	-0.071	-0.178	0.104	55.2%	26.6%	32.8%
South Africa	0.076	0.120	-0.057	52.2%	48.5%	64.0%
All Sample	-0.012	0.037	0.199	91.8%	94.6%	39.2%

This table shows Autocorrelation Coefficients up to 1, 2 and 3 lags and p-value for the null hypothesis of no autocorrelation for up to 1, 2 and 3 lags.

5.4) Herding Measure and Kurtosis of Returns

One interesting analysis that can be done with the LSV herding measure is to compare it with the kurtosis of return's distribution on each month, in order to evaluate whether the positive association between excess kurtosis and herding proposed by Cont and Bouchaud (2000) and Bak et al (1997) exists and if it is relevant or not. As seen before on section 2.5, they support this association using theoretical models, and not empirical data. On this section, we aim to test this relationship using empirical data on emerging markets. We are considering that foreign investors are noise traders that use to herd, and this behavior would exacerbate the kurtosis of the equity return's distribution.

We use a regression with the lagged values of Local Return's Kurtosis and the LSV Herding measure as independent variables. We could include the foreign turnover as control variables, but as seen on section 4.1, no effect of the foreign turnover on the Kurtosis of returns (both local currency and USD) could be found. Therefore, we run the following pooled regression:

$$SK_{k,t} = c_k + \sum_{i=1}^{n} \alpha_{k,i} SK_{k,t-i} + \beta_k LSV_{k,t} + \varepsilon_{k,t} \qquad (5.2)$$

Where $LSV_{k,t}$ is the LSV Herding measure of market k at time t, $SK_{k,t}$ is the excess kurtosis of the daily equity returns in local currency of country k at time t.

Results are on Table 5.4. The lagged coefficients of the kurtosis are not significant as in the equation (4.4). But the LSV Herding measure coefficient is positive and significant, which corroborates empirically the models of Cont and Bouchaud (2000) and Bak et al (1997). Although this coefficient is significant, the R^2 of the regression is low, so that the Herding measure explains only a small variation of the Kurtosis.

Some caution should be used to interpret the results of this section due to omitted variables bias. For example, other groups of investors may engage in herding behavior and also affect the kurtosis. But also in this case the above-mentioned models would be supported.

TABLE 5.4 – Panel Data: Kurtosis x Herding

Equation (5.2)

	Kurtosis		LSV Herding	Constant	Adj R^2
	Lag: 1M	Lag: 2M			
Kurtosis	0.0251	0.0505	1.966[b]	0.165[a]	-0.32%

Estimation Method: Seemingly Unrelated Regression, common Effects.
a) Coefficient significant at 1%
b) Coefficient significant at 5%
c) Coefficient significant at 10%

5.5) Herding Measure and Volatility of Returns

The degree of herding behavior may also impact the volatility of returns (or vice-versa). Borensztein and Gelos (2003) studied this issue and obtained mixed evidence on the relationship between herding and volatility. Using a bivariate regression with only the variance of stock returns and the mean of herding measure, they found statistically significant relationship for 40 countries, with the coefficient on the herding variable reaching 0.47. They also estimated a GARCH (1,1) model in which the herding measure entered the variance equation for each country individually. Among 39 countries, the herding variable was significantly positive in 15 cases, and significantly negative in 5.

On this section, we use a pooled regression to investigate the effects of herding on volatility of stock's returns. To account for the volatility persistence, we use two lagged terms together with the contemporaneous herding coefficients, and the foreign flow turnover as the control variable (see equation(5.3)). Therefore the regression used here is the same of Table 4.2, but with the inclusion of the Herding measure. The regression is then performed with pooled data of the 9 countries of our sample.

$$SV_{k,t} = c_k + \sum_{i=1}^{n} \alpha_{k,i} SV_{k,t-i} + \beta_k HM_{k,t} + \sum_{i=1}^{n} \gamma_{k,i} FT_{k,t-i} \varepsilon_{k,t} \qquad (5.3)$$

The results are on Table 5.5, and show no evidence that Herding affects the volatility. As in Table 4.2, the lagged volatilities and Foreign Turnover were significant. Overall, the inclusion of the herding measure did not help at all in explaining the volatility movements.

TABLE 5.5 – Panel Data - Volatility Effects of Foreign trading

Equation (5.3)

Dependent Variable	Volatility		Foreign Turnover	LSV Herding Measure	Adj R^2
	Lag: 1M	Lag: 2M			
Local Equity Returns' Volatility	0.3250[a]	0.1459[a]	-0.0715[b]	0.0406	42.4%

Estimation Method: Seemingly Unrelated Regression, Fixed Effects.

5.6) Conclusion

This chapter addressed the issue of Herding behavior by foreign investors on emerging markets. We used an adaptation of the LSV Herding measure and calculated this measure for a sample of 9 emerging markets over the period 2000-2005. Our overall mean, 4.75, although is lower than previous studies with emerging equity markets, still indicates the presence of herding behavior. Therefore we have evidence to support the hypothesis of herding decreasing from the period 1995-2000 to 2000-2005. However, the difference of the sample characteristics may be the responsible for these results. The two main differences on our sample is that we use

country allocation, instead of stocks and the all universe of foreign investors, instead of only funds as in Borensztein and Gelos (2003). In this way an alterntive hypothesis would be that funds herd in a higher intensity than the other types of investors.

Regarding the effects of Herding on the risk measures, our result are mixed. Our regression analysis showed no effects of the Herding on the volatility, which is one of the main risk measures used by investors. However, the fat tails of equity return's distribution may be due to this herding behavior of foreigners. Further studies should address this issue in more in deep since the fat tails may be due to herding of other types of investors also.

6) Conclusion and Policy Implications

This study of the behavior of foreign investors in emerging markets could find few evidence that these investors have brought problems to local markets. Confirming the previous literature, we identify a strong persistence on the foreign flows. Foreign investors seem to build and unwind their positions on emerging stock markets slowly enough to avoid problems as price pressure or volatility and kurtosis upswings. On the foreign exchange market an effect on the local currency value was found, but it does not affect the risk indicators of the market.

Regarding feedback trading, we support two hypotheses: positive feedback trading by hedged investors and negative feedback trading by unhedged investors. The latter has stronger evidence and is beneficial to the local markets, while the first has weaker evidence and may exacerbate the stock's movements when we consider the local currency. But we cannot refute the possibility that both occur together, and the behavior of currency returns is the responsible to make this possible.

Another potentially dangerous behavior to emerging markets is the herding. Although herding among foreign investors was statistically significant in our sample, it is lower than previous studies with emerging equity markets and our regression analysis showed no effects on the volatility. However, the fat tails of equity return's distribution may be due to this herding behavior of foreigners. Further studies should address this issue more in deep since the fat tails may be due to herding of other types of investors also.

Given this picture of the foreign equity investors, it seems there is no reason to impose long-term restrictions to their flows since they bring benefits such as greater risk sharing and higher market liquidity. For example, regulations like limiting the percentage of foreign ownership of companies, ceiling the foreign investment amount or even closing completely the market for foreigners are not recommended.

However, it is worth to mention that since the periodicity of our data is monthly, some effects on the very short-term may be overlooked by our analysis. Therefore we cannot discard some regulations such as higher capital gains taxes for very short investments or a quarantine period for the inflows. A short-term analysis based on daily data may indicate the use of such controls. Nevertheless, this kind of regulation creates some costs to perform the controls and an additional burocracy that investors will have to bear.

Other kind of policies that do not restrict capital flows, but attenuate its possible shortcomings may be adopted. The International Monetary Fund (IMF 2003a and 2003b) suggests what they call "self-insurance" policies. These are general policies to enhance the investment environment for foreigners. For example, better sovereign external asset and liability management practices together with exchange rate policies adequated to the degree of capital account openness. This would bring more stability to the equity flows since the exchange rate tends to be

easily foreseen. Policies to enhance financial system strength as well as to develop local securities and derivatives markets may smooth the foreign flow in turbulent periods.

7) Appendix

7.1) Monte Carlo Simulation of the Herding Measure Distribution

This appendix describes the Monte Carlo Simulation used on section 5.3 to generate the Herding Measure Distribution, considering independent trading decisions by investors. It follows the methodology of Wermers (1999) and Borensztein and Gelos (2003).

For each month t and country i, we produce N_{it} random draws from a Uniform (0,1) distribution, where Nit is the number of investors trading. The outcomes that are greater than (1– E[$p_{i,t}$]) are summed up, yielding a draw from a binomial distribution with parameters (N_{it}, E[$p_{i,t}$]). As explained in section 5.1, E[$p_{i,t}$] is the actual proportion of investors buying at month t. We then use the draw of this binomial distribution as the number of investors buying for each country and month in order to calculate the herding measure using formula (5.1). This procedure is repeated 100 times for each country-month, yielding a simulated distribution with 61,200 observations.

7.2) Kolmogorov and Kuiper Distances

The Kolmogorov-Smirnov and Kuiper tests have the null hypothesis that an empirical distribution is equal to a theoretical cumulative distribution function.

The Kolmogorov distance (see, for example, Massey[1951]) is defined as the greatest distance between the empirical and the theoretical cumulative distribution, for all possible values:

$$D_{Kol} = \max_{x \in \Re} \left| f_{Emp}(x) - f_{Theo}(x) \right| \qquad (8.1)$$

where f_{Emp} is an empirical cumulative density function and f_{Theo} is a continuous and completely specified theoretical cumulative density function.

The Kuiper distance (see Kuiper[1962]) is similar to the Kolmogorov distance, but it considers the direction of the deviation, adding the greatest distances upwards and downwards:

$$D_{Kui} = \max_{x \in \Re} \left\{ f_{Emp}(x) - f_{Theo}(x) \right\} + \max_{x \in \Re} \left\{ f_{Theo}(x) - f_{Emp}(x) \right\} \qquad (8.2)$$

On our tests, we substitute the theoretical distribution by the simulated distribution, using numerical methods to calculate the distance of the simulated and empirical distributions.

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