Does Foreign Trading Destabilize Local Stock Markets?

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Abstract

This paper investigates the impact of foreign trading on short term volatility and the correlation of local with world returns. I find that trading in general is associated with higher volatility, whether it is trading by foreign or domestic investors. However, controlling for total trading volume, foreign trading has no impact on volatility in developed countries, and only a marginally significant impact in developing countries. Thus, in developed markets, foreigners generate as much volatility as domestic investors, while foreigners are able to destabilize emerging markets. (JEL: F36, G15)

Key words: volatility, emerging markets, foreign trading volume

1 Introduction

The share of foreign trading activity in total stock market volume increased tremendously during the last decade. Today, the amount of gross cross border flows in stocks and bonds is spectacular, exceeding 7 times the GDP (IMF(1998) p.186). The internationalization of capital markets is reflected not only in the addition of foreign securities to otherwise domestic portfolios, but also in active trading in foreign markets. There is surprisingly little evidence, however, on the impact of foreign trading activity on local equity markets. The purpose of this paper is to establish the empirical relationship between foreign trading, the volatility of returns and the correlation of local and world returns.

The motivation for this exercise is straightforward. Despite the benefits of free capital mobility, there are growing concerns that international capital flows are destabilizing. The perception is that by opening capital markets, countries expose themselves to the fickle sentiment of foreign investors. In addition, this sentiment is not only volatile but is also highly dependent on returns in other countries. The required rate of return, which is the cost of capital, depends on the variance of returns and the correlation with world returns. If the impact of liberalization is that the variance and the correlation increase, expected returns must increase. When returns increase, the cost of capital also increases. A higher cost of capital reduces investment and growth, and in this case the opening of the capital account may not be a good idea. The effects of capital account liberalization have been the subject of much recent research. However, the existing literature focuses primarily on the effects of the lifting of restrictions, the introduction of country funds, ADRs, and structural breaks in net capital flows. The impact of foreign trading activity on return volatility and co-movement has not been previously studied. This paper tries to fill in the gap.

There are a number of hypotheses which hold that foreigners often pursue noisy or irrational trading strategies such as herding, quick changes in sentiment (Calvo and Mendoza(1999)), positive feedback trading, overreaction to changes in fundamentals(Dornbush and Park(1995)), and financial crisis and contagion (Kodres and Pritskert(1999)). These hypotheses are related to various market imperfections that occur across national borders,

the chief being incomplete or asymmetric information. Some of these theoretical models are supported by empirical work. Kim and Wei(2000) and Choe et al(1999) find evidence that foreign investors in the Korean stock market pursued herding and positive feedback trading strategies. In addition to theoretical reasons and the empirical evidence that foreigners are a noisy kind of investor, there is an overwhelming perception in the popular press that this is the case. For two examples, see Stiglitz's(1998) article in the Financial Times and Krugman's(1997) in Fortune.

It is important to point out that even when foreigners are noisy and irrational, their activity does not necessarily have a destabilizing impact. Domestic investors may be powerful enough and the market as a whole sufficiently liquid to accommodate selling or buying pressures from noisy foreigners. As long as domestic investors are not subject to the same imperfections that give rise to noisy trading strategies, foreigners should have no impact on volatility. In a detailed paper, Choe et al(1999) find strong evidence of positive feedback trading and herding by foreign investors in Korea. However, they find no permanent effects of net foreign order imbalances on prices and volatility. Large sales or purchases by foreigners are quickly accommodated by domestic investors. It can be concluded from this that foreign investors do not destabilize the Korean stock market. Thus, noisy or irrational trading strategies are necessary but not sufficient conditions for foreigners to destabilize local stock markets.

The data I have does not allow me to directly measure herding or positive feedback trading by foreign investors. I consider these strategies on the part of foreign investors to be a possibility, and investigate whether foreign trading has a disproportionate impact on volatility and correlations. I proceed in three steps: First, I look at the relationship between volatility and total trading volume. This relationship has been the subject of much research using U.S. data. I use data for 20 developed and developing countries and compare the results to those for the U.S. Second, I look at the relationship between volatility and the foreign component of trading volume. It is possible that the effect of foreign trading on volatility is different than that of domestic trading. Finally, I look at the effect of foreign

trading on volatility controlling for total trading volume.

It is a well established result that in the U.S. data, trading volume is associated with volatility (Schwert(1989), Jones et al(1994), Gallant et al(1992)). There are two possible sources of this relationship. One is that the relationship between volume and volatility is driven by changes in fundamentals. If investors interpret information differently, new information will cause both price changes and trading. This gives rise to a contemporaneous relationship between volatility and trading as in Wang(1994). Trading is the process through which private information is incorporated into prices. In this case the causality runs from volatility to volume and markets are efficient.

The other possibility is that trading itself generates volatility in prices. There are now many papers that show how destabilizing noise traders can be sustained in equilibrium. Noise trading can take many different forms. In DeLong et al(1990a) noise traders have misperceptions about expected prices. In DeLong et al(1990b) they are positive feedback traders. Traders are over-confident in Odean(1998). In all of the above papers noise trading generates excessive volatility. Furthermore, French and Roll (1987) provide striking evidence that trading generates volatility.[1]

Foreign trading is part of the total trading volume. Given the positive relationship between total volume and volatility, one would expect that foreign trading is also associated with volatility. This relationship can mean two things. First, it can reflect the heterogeneity within the group of foreign investors. This heterogeneity causes information flow about fundamentals to be associated with trading. Second, it can mean that foreigners pursue noisy trading strategies and that their activity is not arbitraged away by domestic investors. If the degree of heterogeneity within groups of foreign and domestic investors is the same,

[1]They compare volatility when markets are closed versus when markets are open. In 1968, the NYSE was closed on Wednesdays due to paper overflow. French and Roll found that the volatility of returns from Tuesdays to Thursdays was roughly halved when the markets were closed on Wednesdays. If price volatility is driven by shocks to fundamentals, then the closing of the market on Wednesdays should have had no effect on volatility between Tuesday and Thursday. The implication of French and Roll's finding is that Wednesday's trading itself generated price volatility.

then the two groups should exhibit proportional amounts of trading based on heterogeneity and fundamentals. Hence, controlling for total trading volume, foreign trading should have no impact on volatility if foreign investors are as noisy as domestic. However, if foreign investors are especially noisy and irrational, then even controlling for total trading volume their activity may have an impact on volatility. [2]

The relationship between trading volume and volatility is of some importance. For example, transaction taxes are often proposed as a mechanism for reducing the effects of speculation on asset prices (Summers and Summers(1989), Niehans(1994)). Such proposals are even more frequent in an international context (Tobin(1984), Eichengreen and Wyplosz(1996)). Daily turnover on foreign exchange markets is in spectacular excess of the needs of international trade in goods and assets. Similarly, the tremendous amount of trading in bonds and equities that takes place across borders is far greater than what is necessary for net redistribution of savings across countries (see Tesar and Werner(1995)). Taxes on cross border transactions are supposed to reduce speculative trading and dampen exchange rate and asset price volatility. In light of these proposals, it is important to understand the relationship between total trading, foreign trading and volatility. The following section briefly summarizes existing work on the effects of capital account liberalization on asset price volatility. Sections 3 and 4 describe the data and empirical results and the last section concludes.

2 Capital Account Liberalization and Volatility

Early papers which look at the effects of foreign investment on volatility compare asset price volatility before and after liberalization. Bakaert and Harvey(1997) look at returns in 20 emerging markets and find that in many countries, equity market volatility decreased after liberalization. At the same time, however, they find that liberalization often increases

[2]It is also possible that controlling for total trading volume, foreign trading has a negative effect on volatility. This may be the case if foreign trading activity supplies liquidity to local markets or that local investors destabilize markets more than foreign ones. In this case, foreign participation is highly beneficial.

the correlation between local market returns and world returns. Kim and Singal(1993) find that volatility following liberalization is not significantly different from volatility prior to liberalization. Richards(1996) examines volatility in emerging markets between 1992-1995, when foreign institutional investors played an especially significant role, and finds this volatility marginally lower than in the remainder of the sample (1975 -1992).

Another group of papers tries to link capital flows to volatility. The IMF(1995), p.156, compares the volatility of returns with the intensity of net capital flows. They divide periods of flows into three categories: periods of low net inflows, high net inflows, and volatile net flows. They find that periods of volatile net flows are not always associated with the most volatile returns. Using Japanese data, Hamao and Mei(1996) investigate the link between volatility and trading by different classes of investors. They find that purchases and sales by foreign investors have as much effect on volatility as purchases and sales by other types of investors. This paper is closest in spirit to my paper. I use a somewhat different methodology and extend their results to a larger set of countries. The cost is that I am able to focus only on sales and purchases by U.S. investors and not all foreign investors.

Beakert and Harvey(2000) explore the impact of foreign speculative activity on returns and price volatility in 20 emerging markets. They measure "increased foreign investment activity" with the introduction of ADRs, country funds, the lifting of legal restrictions, and extent of net capital flows. Using a sophisticated econometric model, they find that their measures of foreign activity have an insignificant effect on volatility.[3] They omit measuring foreign activity using the amount of foreign trading. One could argue that ADRs and country funds serve as vehicles for foreign speculators, but that the actual volume of foreign trading is a more direct measure of foreign speculative activity.

[3]The main focus of Beakert and Harvey's study is the effect of foreign activity on returns - the cost of capital. They find that capital market liberalization decreases the cost of capital by 5 to 75 basis points.

3 Data and Descriptive Statistics

I use data for a sample of 10 developed and 10 developing countries. For local returns I use the log difference of daily observations of Morgan Stanley Capital International(MSCI) stock market indices. For developed countries, daily market indices are available from the mid 1980's, but the coverage for developing countries begins much later. I choose a sample of developing countries for which the daily indices are available from 1990. The list of the countries appears in table A in the appendix. For world returns I use the capitalization weighted MSCI world market equity index. All indices are valued in U.S. dollars. I calculate monthly volatility using a method used by Schwert(1989). I take the square root of the product of the variance of daily returns and the number of trading days in the month. This measure of volatility is equal to the square root of the sum of the squared daily returns after subtracting the average daily return in the month:

$$\widehat{\sigma}_t = \sqrt{var(r_{it})N_t} = \sqrt{\sum_{i=1}^{N_t}(r_{it} - \overline{r_t})^2} \tag{1}$$

where there are N_t daily returns r_{it} in month t.

As a measure of trading volume, I use value traded in U.S. dollars on major stock exchanges. For developed countries the data comes from the International Federation of Stock Exchanges (FIBV); for developing countries it comes from the IFC local markets database.[4] I use value traded as opposed to the number of shares traded for two reasons. First, volume in terms of number of shares is not readily available from the FIBV. Second, value traded corresponds to my series on foreign trading which is also in terms of value traded. Unfortunately, not all foreign trading data is available. I have to limit my attention to trading by U.S. investors. This data, collected by the Department of Treasury, is known as TIC data. It has information on transactions in foreign equity between U.S. investors and those located abroad. It includes monthly information on gross sales and purchases. The sum of the two represents the value traded by U.S. investors. Details of the TIC data

[4]Monthly FIBV data goes back only to 1991. Therefore, my regressions for developed countries are for the period from 1991 - 1999

Table 1: Descriptive Statistics

Volatility is the average of monthly volatility calculated according to equation (1) using daily data. Correlation is the average of correlation coefficients of local and world returns calculated for each month using daily data. The share of U.S. trading is the sum of gross U.S. sales and purchases of foreign stocks divided by local stock market volume.

	Developing Markets		Developed Markets	
	1991-94	1995-99	1991-94	1995-99
Volatility	8.3%	9.9%	4.8%	4.9%
Correlation with World Returns	0.08	0.19	0.53	0.49
Share of U.S. Trading	7.7%	20.8%	6.8%	7.5%

are described in Tesar and Werner (1994).

Table 1 presents a number of descriptive statistics of my data. I compare the data characteristics for 1991 - 1994 and 1995 - 1999. The first line in the table shows the average monthly volatility of the stock market index. The volatility is always roughly twice as high in developing markets as in developed markets. This is consistent with the perception that developing markets are more volatile. Volatility in the second half of the 1990's is only marginally greater than volatility in the first half. This comes as somewhat of a surprise given that the Asian, Russian and Brazilian crises occurred during the second half of the 1990's.

The second line in table 1 shows the average correlation coefficients of local returns with world market returns. The correlations are markedly higher in developed than in developing markets. This is in part by construction since developed markets account for much of the world market capitalization and the world returns index is capitalization weighted. The differences in correlations show that developing countries offer lower systematic risk. While the correlations are still lower in developing than developed markets, they more than doubled during the last 5 years. The equity returns in developing markets move more with world returns than they used to. An increase in co-movement with world returns makes investment in foreign markets more risky; it increases the systematic risk. It is possible that

the increase in the co-movement is due to fundamental reasons such as more international trade between developed and developing countries. Another possibility is that the active participation of foreign traders spreads asset price movements across markets. This paper investigates whether foreign speculative trading is associated with a co-movement in returns, i.e. whether foreign trading propagates itself in higher correlations across markets.

The last line in table 1 shows the average share of U.S. transactions in total trading volume on the stock market. The share of U.S. trading in developing markets more than tripled in the second half of the 1990's. It now accounts for more than 20% of total trading volume, which is markedly higher than the U.S. trading share in developed markets. This indicates that U.S. investors play an important part in developing markets. The share of U.S. transactions in foreign stock markets increased in both developed and developing countries. This is consistent with the international integration of equity markets. The increase in shares of foreign trading coincides with virtually no increase in volatility and a substantial increase in correlations with world returns. Whether these long run associations hold in high frequency data is the subject of the next section.

4 Empirical Model and Results

There is a trend in total trading volume and in trading by foreign investors. Before estimating my regression equations, I take logarithms of these two variables and linearly detrend them. As in the preceding section, I present my results separately for developed and developing countries. I estimate pooled regressions where I restrict the slope coefficients to be the same across each group of countries. Thus, I estimate the following model:

$$y_{i,t} = \alpha_i + x_{i,t}\beta + u_{i,t} \tag{2}$$

where i subscripts countries and t time, $y_{i,t}$ is the dependent variable which will be either the detrended log of monthly volatility or the detrended log of monthly correlation coefficient of local returns with world returns, and $x_{i,t}$ denotes a vector of independent variables which in this paper consists of either detrended log of trading volume, detrended log of foreign

trading, or both. The specification is very simple. It is similar to the model estimated by Schwert(1989) using NYSE data. There are undoubtedly many other variables which influence volatility. Country specific intercepts α_i capture effects of any variables that vary across countries but are constant through time.

As in the existing work on volatility and volume relationship, I pay special attention to the appropriate modeling of the time series properties of volatility. The monthly volatility series is highly persistent which causes autocorrelated residuals in regressions where volatility is the dependent variable. In order to have efficient estimates of the relationship between volatility and volume, all existing work on this topic corrects for autocorrelations. In this paper I allow for a very parsimonious specification of the error term:

$$u_{i,t} = \sum_{j=1}^{n_i} \rho_{i,j} u_{i,t-j} + \varepsilon_{i,t}$$

I let the autocorrelation coefficients and the order of autocorrelation vary across countries. The order of autocorrelation for each country, n_i is chosen using Akaike information criterion (Judge(1985) p.871). The number of lags for each country are in table B in the appendix. In addition, I allow for contemporaneous correlation between the errors in different countries so that

$$\begin{aligned} E(\varepsilon_{i,s}, \varepsilon_{j,t}) &= \sigma_{ij} \qquad for \quad t = s \\ &= 0 \qquad for \quad t \neq s \end{aligned}$$

In summary, I am estimating a seemingly unrelated regression model with autocorrelated errors.[5]

4.1 Impact on volatility

As mentioned in the introduction, I look first at the relationship between total trading volume and volatility, second at the relationship between foreign trading and volatility, and

[5]The method is implemented by first transforming equation (2) for each country to reflect the order of autocorrelation. This gives rise to two sets of 10 nonlinear equations. Each set is then estimated using nonlinear SUR.

finally at the relationship between foreign trading and volatility controlling for total trading volume. The results for all three specifications are reported in table 2. Line (1) shows the effect of total trading volume on volatility. The results indicate that in both developed and developing markets, total trading volume is associated with volatility. The coefficients in both groups of countries are positive and highly significant. This is consistent with findings for the U.S. (Schwert(1989), Jones et al(1994), Gallant et al(1992)). The size of the coefficients indicate that a 1% increase in trading volume results in approximately 1% increase in volatility. A positive relationship between trading volume and volatility does not necessarily mean that trading generates volatility. The causality may run the other way, as in the model of competitive trading volume by Wang(1994) where investors are heterogeneous and react differently to shocks that affect prices. This results in contemporaneous relationship between price changes and trading volume. Thus, the relationship can be a product of perfectly efficient markets and can merely reflect the heterogeneity of investors. Another source of the positive relationship between volatility and trading volume is noise trading. The activity of noise traders is associated with volatility. This paper does not try to distinguish between the two cases, rather it compares the impact of domestic and foreign trading on volatility. The results on line (1) of table 2 are reported to provide a comparison with the studies on the volume/volatility relationship conducted for the U.S., and with the effects of *foreign* trading on volatility.

Line (2) shows results of the effects of U.S. trading on local volatility. There is a positive relationship between foreign trading and volatility. This does not come as a surprise since domestic and foreign trading are likely to be correlated. The coefficients are somewhat lower and less precise than the estimates of the effects of total trading volume. As mentioned before, the fact that foreign trading is associated with volatility does not necessarily mean that foreign trading destabilizes local stock markets. Foreign investors can be heterogeneous and react differently to shocks that affect prices. In order to see the *relative* contribution of foreign trading to volatility, both foreign *and* domestic trading must appear in the regression.

Table 2: Total Trading, U.S. Trading and Volatility

The dependent variable is volatility calculated according to equation (1) for each month using daily data. Restricted seemingly unrelated regression with autocorrelated errors is estimated. The order of autocorrelations varies across countries. The regression is estimated with linearly detrended logarithms of the original series. Standard errors are heteroskedasticity consistent. One, two and three stars indicate significance at the 10%, 5% and 1% levels respectively.

	Developing Markets		Developed Markets	
	Total Trading	U.S. Trading	Total Trading	U.S. Trading
(1)	1.06***		0.90***	
	(0.24)		(0.14)	
(2)		0.41**		0.25**
		(0.18)		(0.11)
(3)	1.02***	0.32*	0.87***	0.13
	(0.25)	(0.19)	(0.15)	(0.11)
No. of observations	1120		1010	

Line (3) provides the results of the regression where both total and foreign trading are independent variables. It is reassuring that the coefficients on total trading are close to those in line (1). This means that the effects of total trading volume on volatility are the same whether or not foreign trading is included in the regression. The interesting question is whether foreign trading has any effect on volatility controlling for total trading volume. The answer may give us a clue as to whether foreign trading can destabilize domestic stock markets. As previously noted, the positive relationship between volume and volatility can be generated by heterogeneous investors and their different response to new information flow. It may by reasonable to assume that the degree of heterogeneity is the same within the groups of foreign and domestic investors. Trading due to information flows should be the same on the part of foreign and local investors. In this case, total trading volume controls for trading due to information flows. It also controls for noise trading by local and foreign investors to the extent that both groups do some noise trading. If foreign and domestic trading have the same impact on volatility, foreign trading should have no explanatory power after controlling for total trading. However, if the impact on volatility

from foreign trades is greater than from local trades, the coefficient on foreign trading should be significant. It should capture whether foreigners can destabilize domestic markets more than domestic investors. In other words, whether foreigners are the villains often portrayed in the popular press.[6]

The results are somewhat different in developed and developing countries. Let me discuss the results for developed markets first. In this group of countries, the marginal effect of U.S. trading on volatility is statistically insignificant. This result indicates that for developed markets, U.S. trading has no effect on volatility once I control for total trading volume. It suggests that the effects of U.S. trading are similar to those of domestic trading and that foreign investors do not destabilize developed stock markets. It is possible that U.S. investors do not pursue noisy strategies towards developed markets, but even if they do, they have no impact on volatility. This may be because developed markets are large enough and liquid enough to absorb noisy trading by foreigners. I also estimate unrestricted regressions where the slope coefficients are allowed to vary across countries. I report the results in table C in the appendix. Many coefficients are insignificant because they are estimated with only about 100 observations. Nonetheless, the results suggest that the effect of U.S. trading is not the same everywhere. In particular, U.S. investors seem to have a significant impact on volatility in France and Switzerland.

In developing markets, the coefficient on U.S. trading is statistically significant only at the 10% level. Moreover, the estimated coefficient is small, holding total volume constant a 1% increase in U.S. trading will increase volatility by 0.13%. Nonetheless, the result does warrant some caution. The unrestricted results are reported in table C. Again, the effect of foreign trading on volatility is not the same everywhere. In Brazil, Malaysia and Thailand, U.S. trading affects volatility even after controlling for total trading volume. This suggests that in these countries, foreign investors may destabilize domestic stock markets.

[6]Daigler and Wiley(1999) use similar strategy to investigate the impact of different types of traders on volatility volume relationships in futures markets.

Table 3: Total Trading, U.S. Trading and Correlations

The dependent variable is the correlation of local and world returns calculated for each month using daily data. Restricted seemingly unrelated regression with autocorrelated errors is estimated. The order of autocorrelations varies across countries. The regressions were estimated with linearly detrended logarithms of the original series. Standard errors are heteroskedasticity consistent.

	Developing Markets		Developed Markets	
	Total Trading	U.S. Trading	Total Trading	U.S. Trading
(1)	−0.91		−2.80	
	(1.24)		(1.90)	
(2)		−1.95		0.68
		(1.16)		(1.76)
(3)	0.10	−1.99	−3.20	1.16
	(1.40)	(1.54)	(2.06)	(1.81)
No. of observations	1120		1010	

4.2 Impact on correlations

Foreign investors are often blamed for spreading asset price movement across borders. It is possible that they pursue strategies that affect not only volatility, but also correlations of local and world returns. In terms of the cost of capital, the correlation of local and world returns is as important as volatility. This is because a high correlation increases riskiness and the required rate of return. Whether foreign trading plays a role in the comovement of returns is the subject of this section.

Table 3 presents results analogous to table 2, only here the dependent variable is a detrended log of monthly correlations of local and world returns. Even a cursory look at table 3 shows that unlike volatility, correlations are not associated with trading. The effect of total trading volume on correlations is statistically insignificant. Similarly, the effect of U.S. trading on correlations is insignificant for both sets of countries. This is contrary to the findings of Beakert and Harvey(1997) who find that liberalizations increase correlations of local and world returns. I find that months when local markets move together with world markets are not associated with large amounts of foreign or local trading. This means that

systemic shocks are not incorporated to prices through trading. This is somewhat surprising given that local shocks seem to be propagated though trading.

Since neither total nor foreign trading are significant in bivariate regressions, it is expected that they will insignificant when both total and foreign trading are on the right hand side. This is shown on line (3) in table 3.

5 Conclusion

The internationalization of world equity markets manifests itself not only in increasing shares of foreign stocks in otherwise domestic portfolios, but also in foreign participation in trading. Shares of foreign trading increased substantially in the second half of the 1990's, and the increase was especially significant in developing countries. This paper investigates the impact of foreign trading on short term volatility and the correlation of local returns with world returns. I find that trading in general is associated with higher volatility whether it is by foreign or domestic investors. However, controlling for total trading volume, foreign trading has no impact on volatility in developed countries and only a marginally significant impact in developing countries. Thus, in developed markets, foreigners generate as much volatility as do domestic investors. However, foreigners are able to destabilize emerging markets. In addition, I find that there is no relationship between trading, whether foreign or domestic, and the correlation between local and world returns.

These results have potential policy implications. Proposals aimed at the reduction in trading of financial assets across borders must be considered with caution. In developed countries, these proposals are unlikely to reduce either volatility or cross market correlations. The empirical evidence that foreign investors destabilize developing stock markets is weak. The size of estimated coefficients suggests that the impact of a reduction of trading on emerging markets' volatility would, if anything, be small. In addition, the difference in results for developed and developing countries suggests that one way to reduce the impact of foreign investors is to increase the liquidity of local markets. In order for irrational trading strategies of foreign investors to have an impact on volatility, the domestic market

must be relatively illiquid. Once an adequate level of liquidity has been attained in emerging markets, panic, herding, or positive feedback trading of foreign investors will have no impact either on volatility or unnecessary cross market correlations.

This paper has a few limitations which deserve attention. Firstly, it does not test for causes of volatility. Rather, it looks at associations between volatility and foreign and domestic trading. I argue that the impact on volatility of foreign trading conditional on total trading would be evidence of destabilizing effect on the part of foreign investors. The identifying assumption is that trading due to information flows is the same on the part of foreign and domestic investors. This may not be the case. For example, if the degree of heterogeneity is higher among foreign investors, information flows would generate more trading among foreign than among domestic investors. As a result, volatility would cause more foreign trading relative to domestic trading. In this case the causality would run from trading to volatility rather than the other way around. [7]

One should also note that this paper focuses on short term volatility only. I calculate volatility by taking a standard deviation of daily returns in a given month. It is possible that foreigners play an important role in longer term volatility. For example, asset price bubbles often last longer than several days. It may take several months, even years, for a price bubble to burst. This paper does not capture the role that foreign investors play in periodic market crashes or crises. Rather, it concentrates on the relationship between short term foreign trading and short term volatility.

[7] What is clearly needed here is a formal model that would link trading to asset pricing. In the existing literature there is a large dichotomy between asset pricing and trading volume. Trading plays no role in standard asset pricing models and prices always adjust instantaneously to information about fundamentals. In addition, we have little understanding of when speculative trading supplies liquidity and when it becomes destabilizing.

Table A: Descriptive Statistics

Volatility is the average of monthly volatility calculated according to equation (1) using daily data. Correlation is the average of correlation coefficients of local and world returns calculated for each month using daily data. The share of U.S. trading is the sum of gross U.S. sales and purchases of foreign stocks divided by local stock market volume.

Country	Volatility		Correlations		Share of U.S. Trading	
	1990-94	1995-99	1990-94	1995-99	1990-94	1995-99
Argentina	14%	8%	0.06	0.35	5%	15%
Brazil	14%	10%	0.08	0.34	23%	139%
Chile	6%	6%	0.09	0.25	12%	15%
Greece	9%	8%	0.16	0.13	2%	3%
Indonesia	5%	14%	-0.04	0.13	4%	5%
Korea	7%	12%	0.04	0.06	0%	2%
Malaysia	5%	10%	0.21	0.16	3%	3%
Mexico	7%	9%	0.22	0.39	17%	23%
Thailand	7%	11%	0.04	0.11	1%	2%
Turkey	15%	12%	0.05	0.01	1%	2%
Belgium	4%	4%	0.45	0.45	12%	15%
Canada	3%	4%	0.43	0.59	12%	15%
Denmark	5%	5%	0.43	0.37	3%	4%
France	5%	5%	0.58	0.54	6%	5%
Germany	5%	5%	0.51	0.53	2%	2%
Italy	7%	6%	036	0.43	5%	4%
Japan	6%	7%	0.74	0.48	4%	7%
Netherlands	4%	5%	0.60	0.52	11%	6%
Switzerland	5%	5%	0.55	0.49	4%	4%
United Kingdom	5%	4%	0.63	0.56	11%	13%

Table B: Order of Autocorrelation

The order of autocorrelation of the error term is determined by Akaiken information criterion. The information criterion was estimated with linearly detrended logarithms of the original series. The order of autocorrelation is the same regardless of the variables on the right hand side.

Country	Regressions with Volatility	Regressions with Correlations
Argentina	2	4
Brazil	1	5
Chile	2	2
Greece	1	4
Indonesia	6	3
Korea	1	4
Malaysia	3	1
Mexico	8	1
Thailand	5	1
Turkey	1	5
Austria	7	2
Belgium	7	5
Denmark	4	1
France	7	5
Germany	2	5
Italy	1	5
Japan	1	4
Netherlands	7	5
Switzerland	2	5
United Kingdom	4	6

Table C: Total Trading, U.S. Trading and Volatility

The dependent variable is volatility calculated according to equation (1) for each month using daily data. Seemingly unrelated regression with autocorrelated errors is estimated. The order of autocorrelations varies across countries. The regression is estimated with linearly detrended logarithms of the original series. Standard errors are heteroskedasticity consistent. One, two and three stars indicate significance at the 10%, 5% and 1% levels respectively.

Country	Total Trading	U.S. Trading	Country	Total Trading	U.S. Trading
Argentina	2.09**	−0.26	Austria	0.50*	−0.21
	(0.96)	(0.93)		(0.29)	(0.19)
Brazil	−0.52	2.03***	Belgium	0.80*	−0.13
	(0.59)	(0.75)		(0.44)	(0.27)
Chile	0.99**	−0.08	Denmark	0.94**	0.29
	(0.43)	(0.28)		(0.47)	(0.26)
Greece	2.44***	−0.08	France	0.05	0.71**
	(0.49)	(0.42)		(0.46)	(0.35)
Indonesia	2.38	−1.67	Germany	0.22	0.42
	(1.65)	(1.05)		(0.56)	(0.50)
Korea	−0.60	−0.21	Italy	1.94***	−0.38
	(1.42)	(0.92)		(0.52)	(0.57)
Malaysia	−0.65	2.22**	Japan	−0.08	0.50
	(0.89)	(1.11)		(0.88)	(1.28)
Mexico	0.60	−0.22	Netherlands	1.96***	0.22
	(0.97)	(0.78)		(0.49)	(0.28)
Thailand	0.19	1.55**	Switzerland	0.91***	0.60**
	(0.73)	(0.60)		(0.25)	(0.31)
Turkey	2.89**	1.04*	United Kingdom	0.12	0.26
	(1.27)	(0.59)		(0.58)	(0.77)

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