The Changing Dynamics of Foreign Equity Investment in the United States

Abstract
This paper analyzes the dynamics of foreign equity investment in the U.S. prior to and during its three major financial crises, e.g., 1987 stock market crash, collapse of internet bubble and the recent mortgage meltdown. Theory would presuppose that foreign investors should anticipate any upcoming crisis and respond before the crisis erodes equity value; a competing theory, on the other hand, would suggest that as the U.S. equities become relatively cheap foreign investors would increase their allocation to the U.S. We find that for the period 1977 to June 2008, returns on the S&P 500 forecast higher foreign investment in the U.S. An interesting finding of our research is that in times of uncertainty and financial crisis in the U.S., the responsiveness of foreign equity flows to returns increases significantly, with the exception of the internet bubble.

Keywords: Equity flows; International investment; Investor behavior
JEL classification: F21; G15; G11:014:016

1. Introduction

The research in international finance proposes mainly two reasons for capital inflow into a specific country: country specific pull factors, e.g. favorable economic (both fiscal and monetary) policies, macroeconomic performance, degree of market liberalization, high returns on investment, and global push factors, favorable interest rate and exchange rates.

Capital flows are generally broken into foreign direct investment flows, bond flows, and equity flows. The U.S. Equity flows represent cross-border portfolio flows of investors living abroad. These flows comprise inflows, the flows originating in a 'foreign' country and flowing into a 'home' country, and outflows, the flows originating in the 'home' country and flowing to the 'foreign'. The net flow is the total volume of inflows minus the total volume of outflows. The motivations behind international equity flows have been a subject of academic research for about 20 years. Early models of capital flows generally assume perfect mobility of capital. According to the neoclassical paradigm, given free mobility of capital, capital flows across borders if its marginal product is higher outside the domestic country. Implication of this theory is that in the absence of regulation in international financial markets, savings of a country will flow to countries with the most productive investment opportunities, as such domestic saving rates should be uncorrelated with domestic investment rates. However, one of the major puzzles of international finance, the "equity home bias" puzzle, documented first by French and Poterba (1991), and Tesar and Werner (1995), contends that despite substantial benefits from international diversification, investors in most countries hold modest amounts of foreign equity. U.S. is a good example of home bias; over the past two decades the share of foreign equities in the aggregate U.S. portfolio has increased only moderately indicating substantial home bias.

There are few established results on the determinants of equity flows between nations or the exact nature of the relationship between equity flows and financial markets (Portes and Rey, 2005 and Stulz, 1999). Empirical agreement on the motivation of international capital flow has been difficult to reach because of lack of data and also as different researchers focus on different time-periods and different sets of countries. Equity flow literature more broadly, have evolved along two major lines. The first line, sometimes referred to as the 'traditional' approach, explores the determinants of equity flows. The traditional approach has usually focused on large cross-sectional regressions, in an attempt to determine the long-run motivating factors of equity flows. The second line of research has evolved around understanding the dynamic relationship between equity flows and financial market returns. This research is often referred to as the 'portfolio' approach. The primary methodologies in the 'portfolio' approach are dynamic autoregressive models.

Existing evidence indicates a strong positive relationship between net flows of foreign capital and market returns, mainly in developing nations. Griffin, Nardari, and Stulz (2004) recently confirmed this result in their study of emerging Asian equity markets. There are several competing hypotheses to explain this relationship. One hypothesis is that the participation of foreign investors in the market brings about a demand shift and hence a permanent price change. This broadening of investor base increases risk sharing opportunities and hence lowers the required rate of return. Theoretical arguments for this mechanism are provided by Merton (1987), and empirical work on the effect of liberalization on emerging markets is reported by Bekaert and Harvey (2000) and Henry (2000). As the above discussion illustrates, the role of foreign investors in emerging market is also much debated, as they are alternately described as trend chasers (Cho, Kho, and Stulz, 1999, Bohn and Tesar, 1996), informed traders (Seasholes, 2004, Grinblatt and Keloharju, 2000), or investors with information disadvantage (Brennan and Cao 1997, Brennan, Cao, Stong, and Xu, 2005).

Research on international capital flow has mainly focused on the flows into developing and emerging markets. With the globalization of financial market foreign ownership of the U.S. assets has increased significantly. The tremendous increase in the volume and variability of gross equity flows in the U.S. as shown in Graph 1 and the scant research on the dynamics of capital flows into the U.S. provides the motivation of this research. The first objective of this paper is to garner an understanding of the time-series nature of the relationship between equity flows and equity returns in the U.S. This research is the first to our knowledge to analyze the nature of the relationship between equity returns and flows to the U.S. from abroad. Issues this paper addresses include the response of equity markets to equity flows and the response of flows to changes in stock market performance. Several theoretical arguments made for the dynamic relationship between equity flows and returns in other countries may be relevant in the U.S. The first compelling theory is commonly called, portfolio rebalancing, which implies, investors sell equities from countries that are the best performers in their portfolio since they have become overweighed in these securities. The portfolio rebalancing effect predicts that high U.S returns are accompanied by flows toward foreign countries (i.e. net flows will be negative). Alternatively, from a U.S. perspective, a high return in the U.S equity market would imply flows toward foreign (non-U.S.) markets. Recently, Rey and Hau (2006) modeled this relationship with an intuitive relationship called the uncovered equity parity condition, assuming incomplete risk trading. The risk-rebalancing channel of capital flows in their model works as follows: any excess performance by foreign equity market leads to an increase in relative exchange rate exposure of the home investor and therefore alters the tradeoff between diversification benefits and exchange rate risk. One would therefore expect following a positive return shock to the U.S. market for the foreign investor to decrease her investment in U.S equities to rebalance her portfolio. This is what Rey and Hau call the 'risk rebalancing' channel for portfolio flows. According to the logic of their model, after a period of good returns international investors are exposed to more risk so they repatriate some funds, this causes foreign currency to depreciate. Rey and Hau (2006) derive a negative correlation between foreign equity excess returns and the corresponding exchange rates. Their model also implies a negative relationship between net equity flows and returns of the U.S. market.

A second compelling set of theories that may explain the relationship between returns and net flows into the U.S. is often termed 'return chasing', 'trend chasing' or 'positive feedback trading'. Bohn and Tesar (1996) document that when the returns are expected to be high in a market, the U.S. investor's move into that market and retreat from that market when predicted returns are low. Dahlquist and Robertsson (2004) document a similar feedback trading behavior in the Swedish market. Choe, Kho and Stulz (1999) evidence positive feedback trading in Korea before the Asian financial crisis. However, the return chasing hypothesis is not without challenge, for example Portes and Rey (2005) in a large panel study fail to find evidence of return chasing. Brennan and Cao (1997), Brennan, Cao, Strong and Xu (2005) tend to favor the information asymmetry as an explanation for the observed relationship between equity flows and market returns.

Asymmetric information theory proposes that as foreign investors are less well-informed about returns on foreign investment, they tend to be more sensitive to new public information than the domestic investors. Following good news in a given national market, the foreign investors' assessment of the expected returns increase faster than that of the domestic investors. As such the demand for domestic assets by the foreign investors goes up causing an increase the asset price in the domestic market. Bad news in a given national market, on the other hand, causes a reduction in asset prices in the domestic market. The net effect is that capital inflow tends to be positively correlated with the returns on the domestic portfolio. Consistent with the asymmetric information theory, Brennan and Cao (1997), Tesar and Werner (1994, 1995) find evidence of positive, contemporaneous correlation between expected returns and international portfolio flows. While information asymmetry theory predicts a contemporaneous relation between flows and returns, it is likely that information disadvantaged foreign investors might trade on new information with a lag. Brennan et al. (2005) analyzes how international investors adjust their expectations of asset returns in a given country in response to information. They find that relative to the domestic investors, foreign investors become more bullish about the stock market of a country as the returns of that country's market portfolio increase. This "trend-chasing" behavior of the foreign investors which results in positive correlation between lagged domestic market returns and contemporaneous and lagged expected returns is also evidenced by Griffin et al. (2003), Bohn and Tesar (1996) and Brennan and Cao (1997).

A few studies have focused on the behavior of capital inflows during the financial crisis of a nation. H. Choe et al. (1999) study the nature of capital inflow and its relationship with stock returns in Korea from November 30, 1996 to the end of 1997. Korea faced intense economic crisis during the last few months of 1997. The authors find that before the Korean crisis foreign investors bought more Korean stocks on days following an increase in the market and bought Korean shares that outperformed the market over the previous day. This finding clearly evidences positive feedback trading by the foreign investors. However, the evidence of positive feedback trading is found to be much weaker during the crisis period. Froot et al. (2001) explores daily international portfolio flows into and out of 44 countries using high frequency data. Consistent with positive feedback trading by international investors, they find that flows are strongly influenced by past returns. An interesting finding of their study is that even during the financial crisis in emerging markets and in Asian markets, there were inflows of foreign capital. They report that daily inflows during the crisis period (July 1997-July 1998) averaged 40% into all emerging markets and 30% into Asian markets of their pre-crisis levels.

We find that even with the recent mortgage meltdown, waning consumer confidence, the free fall off the U.S. dollar along with concerns of forecasted recession in the beginning of 2008 the equity market outperformed the average global index by almost 3%. A change in capital flow dynamics in other countries during a period of financial uncertainty and performance of the U.S. equity market during the financial upheaval in the U.S. raise the following interesting research questions: what motivates the foreign investors invest in the large U.S. capital market especially during the downturn in the U.S. market? How quickly do they respond to the financial crisis in the U.S. market and how quickly do they return to the U.S. market following a crisis? These questions are particularly interesting in the context of today's well integrated capital market. The second objective of our paper is to answer the above questions. We uncover the dynamics between U.S. market returns and foreign equity portfolio investment during times of financial uncertainty. In particular we analyze the dynamics between returns on the S & P 500 and net purchases of equity around three major financial events: The 1987 stock market crash, the internet bubble of the early 2000's and the ongoing housing bubble. We select these crisis period as they are considered the major crisis and as they are different in terms of cause, level of impact and also degree of global contagion. While theory would presuppose that foreign investors should anticipate crisis and respond in a way that would erode value of the U.S. equity, it is also likely that investors may increase their allocation to the U.S. as U.S. equities become relatively inexpensive.

We address our research questions in the following manner; first we examine the correlations between stock market returns and portfolio flows; second we decompose flows into expected and unexpected components to analyze how returns are influenced by different flow components, and third we explore the dynamic relationships among flows, returns, and related variables. The primary empirical methods employed are VAR and

VARX. The attractive feature of VAR analysis is that since the relationship between flows and returns is not well established and neither variable is known to be exogenous, VAR allows for each variable in the system to be treated symmetrically. For example, in a bivariate case, VAR allows the time path of returns to be affected by current and past realizations of the return sequence and allows the time path of the return sequence to be affected by current and past realizations of the flow sequence. The time path of the flow sequence is also affected by current and past realizations of both the return and flow sequences. Another attractive feature of VAR is that the structure of the system incorporates feedback because the variables in the system are allowed to affect each other (Enders, 2004).

2. Methodology

In order to understand the dynamic relationship between net flows and returns we estimate several vector autoregressive models. A VAR model is a composed system of regressions in which the dependent variables are expressed as functions of their own and each other's lagged values (Enders, 2004). For example, consider the following bivariate VAR with a one period lag:

$$\begin{aligned} R_{it} &= b_{10} - b_{12} f_{it} + \beta_{11} R_{it-1} + \beta_{12} f_{it-1} + \varepsilon_{rt} \\ f_{it} &= b_{20} - b_{21} R_{it} + \beta_{21} f_{it-1} + \beta_{22} R_{it-1} + \varepsilon_{ft} \end{aligned} \qquad (1)$$

where R_{it} and f_{it} are returns of the U.S. market and net flows from abroad to the U.S. VAR is useful especially for forecasting systems of interrelated time-series variables and is the common in modeling equity flows (Hoti, 2005). Due to the feedback inherent in the VAR process, the primitive equation (1) cannot be estimated directly. The reason is that R_{it} is correlated with the error term ε_{ft} and f_{it} is correlated with the error term ε_{rt}. Standard estimation techniques require that all repressors be uncorrelated with the error term. In order to deal with this problem of estimating equation (1) one must use matrix algebra to transform the system of equations into the following form:

$$\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix} \begin{bmatrix} R_{it} \\ f_{it} \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{21} \end{bmatrix} + \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix} \begin{bmatrix} R_{it-1} \\ f_{it-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{rt} \\ \varepsilon_{ft} \end{bmatrix} \qquad (2)$$

This can be written in a reduced form:

$$Bz_t = \Gamma_0 + \Gamma_1 z_{t-1} + \varepsilon_t$$

where:

$$B = \begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix},\ z_t = \begin{bmatrix} R_{it} \\ f_{it} \end{bmatrix},\ \Gamma_0 = \begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix},\ \Gamma_1 = \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix},\ \varepsilon_t = \begin{bmatrix} \varepsilon_{rt} \\ \varepsilon_{ft} \end{bmatrix}$$

Then one can simply premultiply by the inverse of the B matrix giving the standard form of a VAR model as:

$$z_t = A_0 + A_1 z_{t-1} + e_t \qquad (3)$$

where: $A_0 = B^{-1}\Gamma_0$, $A_1 = B^{-1}\Gamma_1$, $e_t = B^{-1}\varepsilon_t$

Now e_t is a vector of uncorrelated structural shocks $[\varepsilon_t \sim N(0,\Omega]$. In a bivariate framework of only equity flows and returns, the diagonal coefficients represent conditional momentum in flows and returns, while the off-diagonal coefficients represent flows following returns and returns following flows. The off-diagonal elements of Ω capture the price-impact effects of flows on returns. It is important to note that the error terms in equation (3) are composites of two shocks ε_{rt} and ε_{ft}. Arranging our primitive VAR into the reduced form allows U.S. to estimate the two elements of A_0 and the four elements (in the case of a first order auto regressive problem) of A_1. Moreover, after obtaining the residuals from the two regressions, it is possible to calculate estimates of the variance and covariance of the elements in e_t.

The issue with VAR is whether it is possible to obtain the information present in the primitive system (1) using equation (3). This is not possible unless one is willing to impose restrictions on the primitive system. In a bivariate system, one must restrict one parameter and more generally, $(n^2 - n)/2$ parameters must be restricted to achieve identification of the primitive system.

It has become standard in VAR to restrict parameters assuming that one variable has no contemporaneous effect on the other; this is known as Choleski decomposition. Identification of the primitive model is achieved as follows, because the reduced form covariance matrix Ω has three distinct elements, three restrictions are already imposed on the four parameters in A_0 matrix by assuming as above that z_t has a moving average representation ($z_t = A(L)\varepsilon_t$ where $E[\varepsilon_{rt}\varepsilon_{ft}] = I$) imply $A_0 A_0^{'} = \Omega$. To just identify the primitive equation, one extra restriction is needed. This extra identifying restriction often takes the form of a zero restriction on one of the off-diagonal elements of A_0. For example, if one assumes that returns respond to a net flow innovations with a one-period lag or that net flows respond to innovations in returns with a one period lag, identification is achieved. This sort of identification mechanism can sometimes lead to sensitivity of the results to the ordering of variables. This can be illustrated by the following examples: If we order net flows first, our identifying assumption is to let current net flows affect contemporaneous returns as well as future returns and flows, on the other hand if we order returns first then returns are allowed to affect flows contemporaneous and influence both future returns and flows. However, our results do not appear to be influenced substantially by various ordering of variables, likely due to the nature of our data (i.e. monthly observations).

This exact identification scheme was used by Froot et al (2001), Bekarert et al (2002), and Dahlquist and Robertsson (2004). Additionally, the finding that the major results of a VAR of flows and returns are not influenced by the ordering of the variables is consistent with Bekarert et al (2002) and Dahlquist and Robertsson (2004). The lag length for the VAR is chosen using Akaike information criterion (AIC). We will also estimate impulse response functions, which provide the time path of the short-run dynamic relationships from a shock to the variables in the system. Additionally, granger causality tests will be conducted in the bivariate VAR, to test if lags of one variable are significant in forecasting the other variable. In higher order VARs the equivalent of granger causality is the F-test for block exogeneity.

VARs models can be modified to include exogenous (control) variables; these models are referred to as VARX. We will only include one exogenous variable, to control for changes in foreign exchange rates. Our reduced form VARX model is estimated as follows:

$$z_t = A_0 + A_1 z_{t-1} + Bx_t + e_t \qquad (4)$$

where x_t is a vector of change in exchange rates. We use the estimated VARXs to examine the response of the system to random shocks. These impulse response functions describe the responses of flows on returns to an unexpected shock to flows or returns. F-tests for block exogeneity are also estimated to test if lagged values of other endogenous variables have forecasting power for other variables in the system.

3. The dynamics of capital flows and breaks

Understanding the dynamics of capital inflow into the U.S. market over the full sample period of our study is important for two reasons. First, results of our analysis for the full sample period help us to select appropriate breaks for our subsequent analysis. We then link the statistical breaks with the financial events reported in financial media. Secondly, a comparison between the dynamics of inflow over a long time horizon with those over our selected sub periods allows us to see how perception of the foreign investors change during the turbulence in the U.S. financial market. We analyze the dynamics of capital inflow in the U.S. around three major crisis periods, e.g., around the stock market crash in 1987, internet bubble in 2000 and around the recent housing bubble. While the climax of the crises is precisely detectable from the S and P 500 and NASDAQ indices, existence of market volatility pre- and post- the climax of crises makes it hard to assess the exact time line of these crises. For statistical purposes we choose sub sample periods in a way that the number of observations remains the same across sub sample periods.

On the “Black Monday”, October 19, 1987 Dow Jones Industrial Average (DJIA) declined by more than 20%, which is the largest one day percentage decline in the stock prices to date. Causes of the 1987 crash are manifold and debated. Trading strategies, e.g. program trading, portfolio insurance, overvaluation, market psychology as well as macroeconomic causes, e.g. concerns about weak U.S. dollar, possible inflation and high interest rate and fears of a global recession built up to the stock market crash of 1987. Going into 1987, the major economies of the World were doing well and were into the fifth year of recovery from the 1981-82 recession. However, as 1987 progressed some macroeconomic problems in the major OECD countries became apparent. The 1987 stock market crash in the U.S. triggered declines in markets around the world; by the end of October, stock markets in Hong Kong, Australia, Spain, the United Kingdom, Canada and New Zealand fell significantly. However, in response to the Federal Reserve’s timely pledge to support the economic and financial system, financial panic was averted and market bounced back quickly. The 1987 crash therefore, was severe but short-lived.

Our data shows that the Standard and Poor's 500 index dropped 21.8% during the month of October 1987. We also note this tumultuous time for U.S. equity markets resulted in the withdrawal of almost 9.7 billion dollars of foreign investment in U.S. corporate stock the two months following the 1987 crash. To analyze the dynamics between returns and net flows during this period we look at three subsamples. The first subsample is October 1983 to October 1987, which we refer to as the per-Black Monday period, our second subsample is from November 1987 to November 1991, which we call the post-Black Monday period, and finally our concurrent Black Monday period ranges from October 1985 to October 1989.

The early 1990's were the time of extreme optimism in U.S. equity markets. Since 1995 internet based companies started flourishing; by February 2000, the internet sector equaled 6% of the market capitalization of all the U.S. public companies and 20% of all publicly traded equity volume. These companies opted to grow rapidly hoping that a broad customer base would increase their profit. Fundamentals of many of these companies were poor; however the stock market soared on these companies. Finally, the market got overvalued and crashed in 2001. The internet bubble, also known as "dot-com" bubble occurred during the periods 1995-2001. Rapidly increasing stock prices of internet and related companies and individual speculation in internet stocks caused the internet bubble. Throughout 1990s and early 2000, the Unites States experienced a few major macroeconomic changes. In the second half of 1990s the U.S. productivity was high relative to the rest of the world which started declining in 2000. Since early 1990s the current account deficit started increasing; while the budget deficit was declining throughout the 1990s it started increasing since the beginning of 2000. Over 1999 and early 2000, The Federal Reserve had increased interest rate six times. Therefore the interest rate was high in the 1990; however it was reduced in early 2000. The effects of internet bubble were felt across the World however was less severe than the 1987 crash. To analyze the dynamics of capital flow, during the dot com bubble we consider the following sub sample periods: August 1996 – August 2000; September 2000 – September 2004 and August 1998 – August 2002.

The timeline and effects of the "housing bubble" on the U.S. and on the global economy are yet to unfold. The causes behind the recent housing bubble are manifold and complex. Generally, bursting of the housing bubble and high default rates on subprime and adjustable mortgages are blamed for the recent credit crunch. Some argue that the housing bubble is an outcome of the dot com bubbles in 2000. After the internet bubble many people lost confidence on the stock market, took their money out of the market and purchased houses assuming that real estate is a more reliable investment. In addition, to stimulate a falling economy caused by the internet bubble, the Fed cut interest rate to historically low levels. The lower interest rates in early 2000, rising house prices, increase in liquidity caused by lax lending standard led borrowers to undertake difficult mortgages on the assumption that they would be able to quickly refinance their loan at more favorable terms. Housing prices in the U.S. peaked in 2005, however, the booming housing market started slowing down and home prices as well as sales started declining since March 2007. It is predicted that home prices are yet to hit the bottom. A large number of home owners were unable to pay the mortgage as the subprime mortgages reverted to regular interest rates and this triggered a full-scale credit crunch throughout the U.S financial system. In the mid of 2008, major financial institutions around the world reported huge losses. This credit crunch drove central banks around the world to take action to encourage lending to worthy borrowers and to restore faith in the financial system. Since the housing crisis is linked to the internet bubble and continue to exist till date, our first sub-sample period ranges from October 2001 to October 2005; the other sub sample periods are November 2003 – November 2007 and November 2005 – June 2006.

4. Data and Summary Statistics

Portfolio flows are distinguished from other international capital flows by the degree the flows can be reversed. Some clarification and definitions may be useful at this point. Capital flows are generally broken into three flows: Direct Foreign Investment (FDI), bond flows, and equity flows. FDI is typically defined as the direct or indirect ownership or control by a single domestic entity of at least ten percent of the voting securities of an incorporated foreign business firm or the equivalent in an unincorporated enterprise. Bond flows represent flows from the U.S. to foreign bond markets for portfolio reasons. Similarly, equity flows represent flows from foreign investors to the

U.S. equity markets for portfolio reasons. In particular, component of equity flows we use in our study are foreign purchases and sales of U.S. corporate stocks. The source for the equity flows used in this study is from U.S Department of the Treasury (TIC).

Data from the U.S Department of Treasury is the most comprehensive source of publicly available data for cross-border equity flows (Tesar and Warner, 1994). TIC is the appropriate data set to test the longer term influences of equity market returns. The data contained in the TIC database is taken from mandatory reports filed by banks, securities dealers, investors, and other entities in the U.S., who deal directly with foreign residents in purchases and sales of long-term securities (equities and debt issues with an original maturity of more than one year) issued by U.S. or foreign-based firms. The data reflect only those transactions between U.S. residents and counterparties located outside the United States. Flows in the TIC database are calculated from a foreign perspective (i.e. non-U.S resident). Hence, inflows to country *i* would be from the U.S. minus outflows from country *i* to the U.S. Market returns used in this study are obtained from Bloomberg. We control for average movement in foreign exchange rates using the New York Federal Reserve's monthly trade weighted foreign exchange series.

The sample period for this study is January 1977 to June 2008. Summary statistics of major variables used in this study are reported in Table 1. Table 1 shows that net equity flows has a positive mean of 3.188 billion over the sample period. This indicates that over our sample period, the foreign investor have increased their portfolio weights in the U.S. market. The S&P 500's average performance over the entire sample period is 0.8% per month. Additionally, over our sample period the change in the trade weighted foreign exchange index is approximately unchanged, though demonstrates major fluctuations over the sample period.

The results of the contemporaneous correlations between variables used in this study are reported in Table 2. There is a small positive correlation between net equity flows and returns on S & P 500, while inflows and outflows are almost perfectly positively correlated. Tesar and Werner first pointed out that international capital markets are characterized by large turnovers. They show that turnover of foreign equity holdings is roughly twice that of domestic holdings. The size of total flows compared to net flows, suggests that turnover is high, demonstrating that large foreign investors are constantly changing positions based on changing environments.

5. Results

We estimate a baseline VARX for the entire sample and also for all the sub sample periods to understand the long-run relationship between returns and net flows controlling for exchange rate fluctuations. All variables of our model are tested for unit roots using standard augmented Dickey –Fuller (ADF) test statistics. We find that percentage change in the S & P 500 and foreign exchange are stationary as expected and that net flows are difference stationary. To choose the lag length we rely on AIC and test each VARX system for up to 8 lags, choosing the lag length based on the minimum AIC. For each VARX system, we apply an F-test for the exclusion of the lags on one variable from the VARX.

a. Full Sample (January 1977 – June 2008)

The causality tests are reported in Table 3. Technically, granger causality is a measure of the marginal contribution of a variable to the forecasting of some other variable. For our baseline VARX, returns granger cause net flows at the 1% significance level. These results show that lagged returns are strongly significant in predicting future net flows. These causality results are supported by the impulse response functions; as graph 3 indicates a shock to returns causes a statistically significant increase in net flows over the next month and quickly tapers out. Included in the figures is the 90% confidence interval. These results are economically significant and indicate that on average in the month following an excess return shock approximately 1.273 billion additional net flows will enter the U.S. from abroad. In the context of existing literature, the return chasing hypothesis appears to explain the observed relationship between net flows and returns best for the entire sample period. The evidence for the predictability of returns by net flows is, however, more ambiguous and appears not to be significant for our sample period. The insignificant impulse response functions and granger causality results indicate that foreign investors' do not have the ability to time the market and their behavior does not appear to be influencing U.S. returns.

5. b. Black Monday

Summary statistics and correlations between variables are reported respectively in Tables 1 and 2. As the correlations show, in the pre-crisis period flows and returns are correlated negatively at 4.5%, but during and after the crisis this correlation is close to zero.

Granger causality results are reported for all three sub-periods in Table 3. Interestingly, we find that in all three sub periods that returns on the S & P 500 cause net flows beyond what could have been predicted by lagged flows. Turning to the impulse response functions in graphs 4A-C we find in all three sub periods a positive shock to flows causes a statistically significant increase in net flows beyond what would be predicted from lagged flows, consistent with our granger results. We observe however, that the response is much greater in dollar terms during the crisis. In the periods before and after the crisis a shock to returns tends to increase flows by about a half a billion (beyond what could be predicted by lagged flows) in the 2-3 month period following the shock. However, during the crisis period a positive shock to returns causes an increase in net flows of almost 1.2 billion. These results appear to indicate an increasing responsiveness of foreign investors during the chaotic times during the crisis. This result can also be interpreted in terms of the information asymmetry hypothesis. We reason that during time of financial upheaval information asymmetry is greater. We hypothesize that stronger response of equity flows to returns shocks during this crisis period is due to foreign investors relying more on past realizations of the return sequence to forecast future returns on the S &P.

5b. Internet Bubble

Tables 1 reports summary statistics for the periods we define as pre, post and during the internet bubble. As our summary statistics show during the pre crisis period the average monthly returns on the S & P 500 were 1.88%, which when annualized approaches a 25% annualized return. During this time the average net foreign equity flows was 7.3 billion dollars per month. Our summary statistics for the post internet bubble period shows a significant decline in average net flows to just over 5 billion per month and the average returns on the S & P 500 turned negative. These finding appear to indicate a significant change in the behavior of foreign investors prior to, during and after the internet bubble. This changing relationship is reflected in our granger causality test and impulse response functions. For the per-internet bubble period we find no granger casualty in either direction. This appears to be a be a break from our full sample finding of returns forecasting flows and indicates that returns were a much less important factor influencing returns during the per-crisis period. Additionally, in the concurrent crisis period AIC indicates that no additional information on the forecastability for flows or returns is contained in lagged flows or returns; this finding indicates that during the crisis period net flows and returns were unrelated. Strikingly different results are uncovered for the post bubble period where lagged returns do granger cause net flows and also net flows appear to cause returns showing a long-run joint dynamics of returns and net flows.

The impulse response function in Figure 5A and B indicate that a one unit positive shock to returns generates an over 2 billion dollar increase in net investment in the U.S. and while not statistically significant a positive shock to net flows appears to have a slightly negative influence on returns of the S & P 500. These results appear to indicate that in the post bubble period dynamic interaction between net investment in the U.S. and returns strengthened significantly.

5c. The Mortgage Meltdown

The housing bubble is an ongoing crisis. However, to stay consistent with our previous analysis we break up our sub sample into three periods: pre housing bubble (October 2001 to October 2005), post housing bubble (November 2005 to June 2008) and concurrent crisis (November 2003 to November 2007). Summary statics and correlations for the three periods are reported in Tables 1 and 2. Net flows have increased significantly on an average basis in the concurrent and post periods; the mean net flows were approximately 4.3 billion the pre housing bubble period increasing on an average basis to over 9 billion during the crisis and up to over 12 billion in the post bubble period. A possible reason for this increase might be the global nature of the housing crisis and that U.S. equities are still considered a safe haven for foreign investors. Correlation structure also changed in our sub samples. With net flows and returns being positively correlated in the pre-bubble period, negatively correlated during the bubble period and relatively no correlation after the peak of housing prices in 2005. This changing correlation structure appears to indicate that the dynamics of net equity flows and returns may also change during this most recent crisis.

Granger causality results reported in Table 3 indicate that during the housing price run up (pre crisis) period there was no causality between net flow and returns. Whereas in our concurrent and post housing bubble period returns on the S & P 500 granger cause net equity flows at the 1% significance level. The strong relationship between flows and returns in during these periods are further evidenced by the impulse response functions in Figures 6A and B. Figure 6B reports that in the post bubble period a positive one unit shock in returns of the S & P 500 leads to over 11 billion dollars in net investment in the U.S. over what could be predicted in by lagged flows in the next 10 month period. Figure 6A indicates a similar increase in net flows in response to a one unit shock to returns in the concurrent period. These results indicate an increasing sensitivity of large foreign investors to returns shocks after the peak of housing prices. This might be a possible consequence of the global nature of the housing crisis and any positive shock to returns leads the foreign investors significantly increase their exposure to U.S. equities. These results also support the notion that investors are currently relying heavily on past realizations of the returns sequence after the housing bubble as information asymmetries have increased, this results is consistent with French and Naka (2008) finding in India.

6. Conclusion

The initial results of this study have uncovered several important facts about the dynamics between foreign equity flows and returns on the S&P 500. Over the past over 30 years we find that on average returns on the S&P 500 forecast future statistically significant increases in foreign investment in the US. To understand the changing nature of the dynamics of returns and equity flows we analyses three crisis periods. We find that in times of heightened information asymmetry that returns tend to forecast increases in net flows to a greater extent than in times before major times of uncertainty. This conclusion is supported by the finding of a greater response of net investment to returns shocks during the 1987 crisis and after the peak of the housing bubble. The internet bubble results are less conclusive.

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Table 1: Summary Statistics

statistics	inflow (million dollars)	Outflow (million dollars)	net inflow (million dollars)	returns (%)	exchange rate
Panel A: Sample period: 1977:m01-2008:m06, no. of observation = 377					
Mean	143,336	140,148	3,188	0.01	0.000
Median	23,351	22,227	825	0.01	0.001
Maximum	1,278,771	1,319,388	42,044	0.13	0.054
Minimum	826	752	-40,617	-0.22	-0.052
Std. dev.	234106	230890	7,174	0.04	0.017
Panel B: Subsample period: 1987 stock market crash					
1983:m10-1987:m10; No. of observation = 49					
Mean	10,779	9,817	961.83	0.01	-0.004
Median	7406	7,168	419	0.01	-0.004
Maximum	30,244	27,784	5,054	0.13	0.034
Minimum	3,384	4,007	-1,321	-0.21	-0.052
Std. dev.	6,769	5,778	1452.27	0.05	0.019
1987:m11-1991:m11; No. of observation = 49					
Mean	16,169	16,232	-62.67	0.01	-0.001
Median	16,351	16,278	-50	0.01	-0.001
Maximum	24,430	22,227	3,759	0.09	0.051
Minimum	8,809	11,065	-6,698	-0.09	-0.042
Std. dev.	3,668	2864.71	1,895.14	0.04	0.019
1985:m10-1989:m10; No. of observation = 49					
Mean	16,123	15,114	1,008	0.01	-0.005
Median	15,107	15,415	1,250	0.02	-0.004
Maximum	30,244	27,784	5,054	0.13	0.032
Minimum	7,406	6,741	-6,698	-0.21	-0.052
Std. dev.	4,927	4,556	1,964	0.05	0.020
Panel C: Subsample period: Internet bubble in 2000					
1996:m08-2000:m08; No. of observation = 49					
Mean	1,48,969	156,369	7,399	0.02	0.004
Median	1,33,855	136,184	6,346	0.02	0.006
Maximum	3,78,141	402,373	27,745	0.09	0.032
Minimum	39,731	39,634	-10,477	-0.14	-0.038
Std. dev.	77,999	82,416	7,055		0.015
2000:m09-2004:m09; No. of observation = 49					
Mean	2,73,558	2,68,451	5,107	-0.00	-0.002
Median	2,67,128	2,66,951	6,650	0.00	-0.001
Maximum	3,58,378	3,68,130	23,778	0.08	0.024
Minimum	1,93,492	2,03,875	-11,532	-0.11	-0.047
Std. dev.	37,268	36,823	7,365	0.04	0.017
1998:m08 - 2002:m08; No. of observation = 49					
Mean	242,721	233,618	9,103	-0.00	0.001
Median	2,56,414	2,48,783	8,517	-0.00	0.005
Maximum	4,02,373	3,78,141	27,745	0.09	0.031
Minimum	1,26,268	1,19,169	-11,532	-0.14	-0.038
Std. dev.	6,0231	564,82	7,661	0.05	0.016

Panel D: Subsample period: Housing bubble in 2005

2001:m10 -2005:m10; No. of observation = 49					
Mean	3,02,092	2,97,745	4,347	0.00	-0.003
Median	2,93,998	2,87,126	4,019	0.00	-0.003
Maximum	4,62,722	4,54,339	23,033	0.08	0.023
Minimum	2,01,798	2,03,875	-9,752	-0.11	-0.047
Std. dev.	60,834	59,747	6,531	0.03	0.018
2003:m11- 2007:m11; No. of observation = 49					
Mean	5,24,460	515385.2	9,075	0.00	-0.002
Median	4,45,019	421986	8,084	0.01	-0.003
Maximum	127,8771	1319388	42,044	0.05	0.023
Minimum	2,57,717	248935	-40,617	-0.04	-0.040
Std. dev.	2,37,685	236428.5	13,116	0.02	0.015
2005:m11 - 2008:m06; No. of observation = 32					
Mean	774690.6	762370.2	12320.47	0.00	-0.004
Median	687250.5	666439	13250.5	0.01	-0.003
Maximum	1278771	1319388	42044	0.04	0.019
Minimum	419618	411562	-40617	-0.08	-0.036
Std. dev.	249095.1	252875.8	15725.25	0.030	0.013

Table 2: Correlation Coefficient

	icstock	**ocstock**	**ncstock**	**rsp**	**rforex**
Sample period: 1977:m01-2008:m06, no. of observation = 377					
icstock	1				
ocstock	0.99	1			
ncstock	0.46	0.43	1		
rsp	-0.08	-0.09	0.05	1	
rforex	-0.06	-0.06	0.01	-0.07	1
Subsample period: 1987 stock market crash					
1983:m10-1987:m10; No. of observation = 49					
icstock	1				
ocstock	0.98	1			
ncstock	0.73	0.61	1		
rsp	-0.12	-0.13	-0.04	1	
rforex	-0.19	-0.12	-0.44	-0.13	1
1987:m11-1991:m11; No. of observation = 49					
icstock	1				
ocstock	0.86	1			
ncstock	0.63	0.15	1		
rsp	-.011	-0.02	0.01	1	
rforex	0.29	0.06	0.46	0.14	1
1985:m10-1989:m10; No. of observation = 49					
icstock	1				
ocstock	0.91	1			
ncstock	0.38	-0.01	1		
rsp	-0.03	-0.03	0.00	1	
rforex	0.30	0.29	0.08	-0.05	1

Subsample period: Internet bubble in 2000

1996:m08-2000:m08; No. of observation = 49

icstock	1				
ocstock	0.99	1			
ncstock	0.65	0.59	1		
rsp	-0.05	-0.07	0.14	1	
rforex	0.00	0.00	0.02	-0.31	1

2000:m09-2004:m09; No. of observation = 49

icstock	1				
ocstock	0.98	1			
ncstock	0.16	-0.04	1		
rsp	0.14	0.11	0.17	1	
rforex	0.08	0.01	-0.00	-0.09	1

1998:m08 - 2002:m08; No. of observation = 49

icstock	1				
ocstock	0.99	1			
ncstock	0.53	0.43	1		
rsp	-0.07	-0.11	0.25	1	
rforex	0.01	0.01	0.02	-0.10	1

Subsample period: Housing bubble in 2005

2001:m10 -2005:m10; No. of observation = 49

icstock	1				
ocstock	0.99	1			
ncstock	0.21	0.11	1		
rsp	0.03	0.01	0.21	1	
rforex	0.02	0.02	0.01	-0.05	1

2003:m11- 2007:m11; No. of observation = 49

icstock	1				
ocstock	0.99	1			
ncstock	0.12	0.06	1		
rsp	-0.13	-0.13	0.12	1	
rforex	-0.02	-0.02	-0.02	-0.11	1

2005:m11 - 2008:m06; No. of observation = 32

icstock	1				
ocstock	0.99	1			
ncstock	-0.21	-0.27	1		
rsp	-0.04	-0.04	0.00	1	
rforex	-0.16	-0.15	-0.01	0.07	1

Table 3: Granger Causality Test

Model	Sample Period									
	total	1987 stock market crash			Internet bubble			Housing bubble		
	1977:m01-2008:m06	1983:m10-1987:m10	1987:m11-1991:m11	1985:m10-1989:m10	1996:m08-2000:m08	2000:m09-2004:m09	1998:m08-2002:m08	2001:m10-2005:m10	2003:m11-2007:m11	2005:m11-2008:m06
NF causes returns	3.80	14.46*	1.42	12.73	0.04	8.26**	-	-	3.03*	14.06*
Returns cause NF	20.51***	27.08***	40.05***	106.67***	0.43	8.26**	-	-	6.82***	21.69***

**** Significance at 1%, ** significance at 5% and *significance at 10%*

Figure 1: Net capital inflow: January 1977 – June 2008

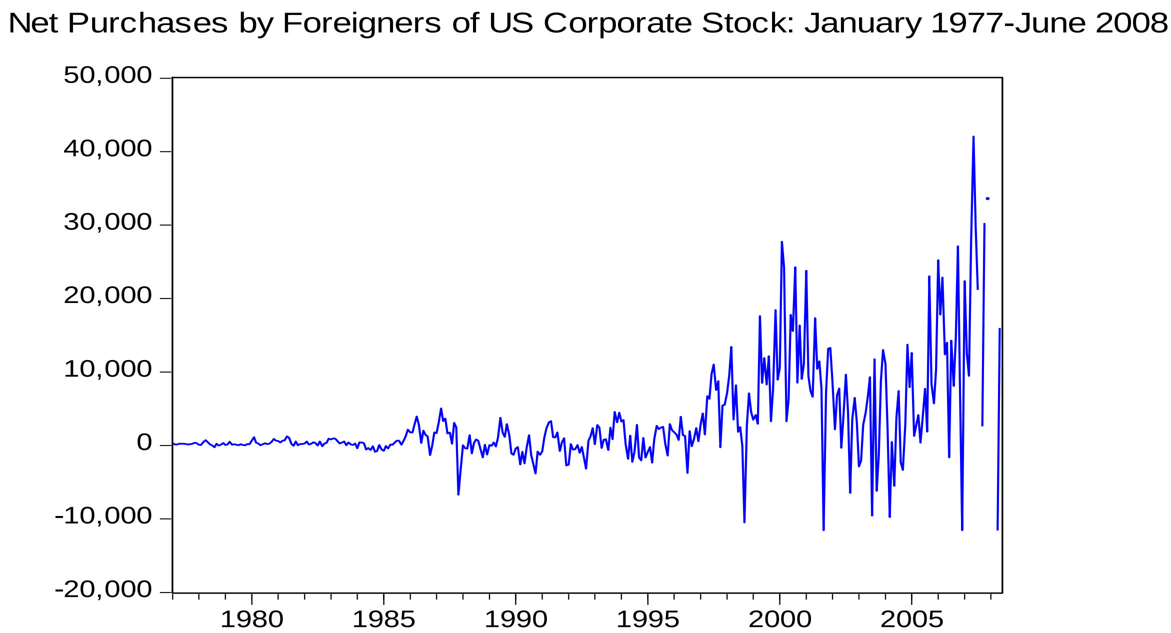

Figure 2: Returns on S & P 500: January 1977 – June 2008

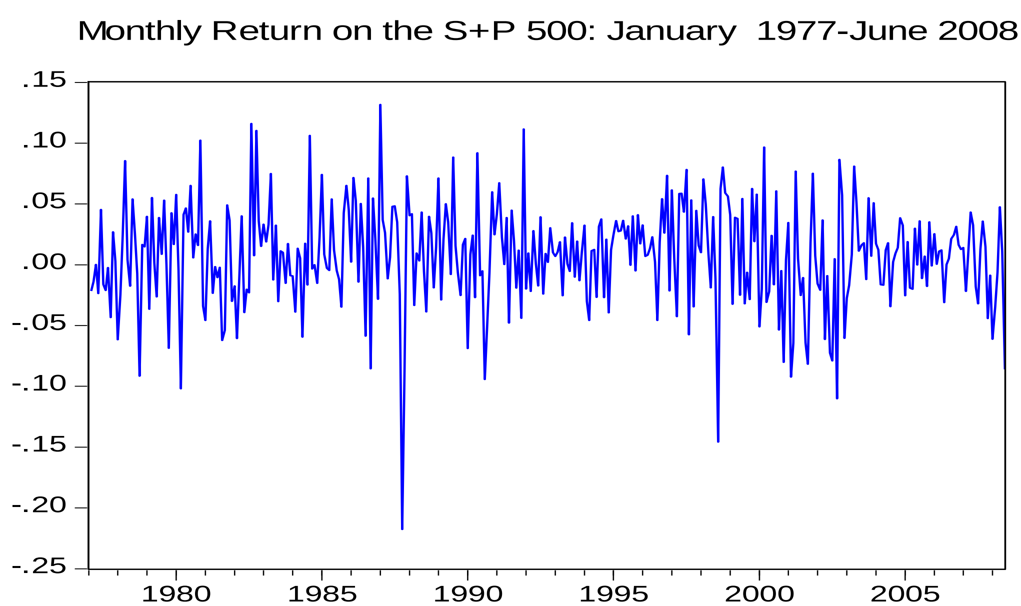

Figure 3: Impulse Response Function (Sample: 1977:m01-2008:m06)

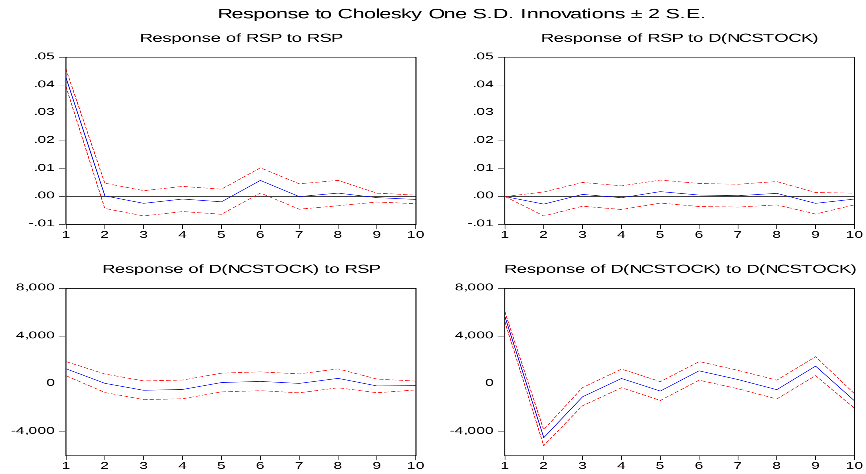

Figure 4A: Impulse Response Function (Sample: 1983:m10-1987:m10)

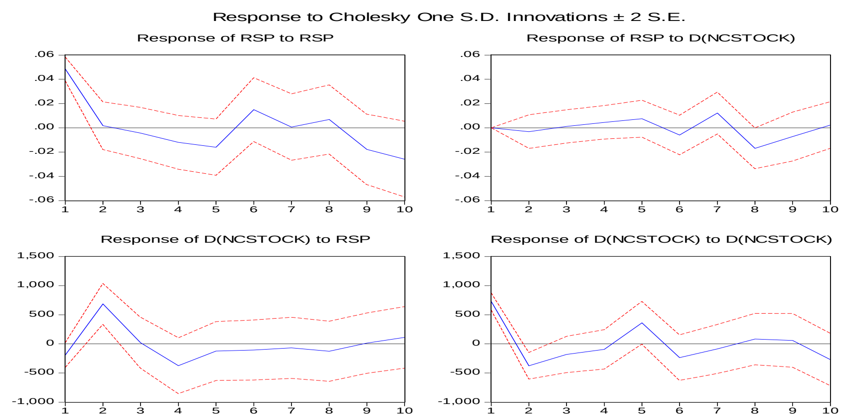

Figure 4B: Impulse Response Function (Sample: 1987:m11-1991:m11)

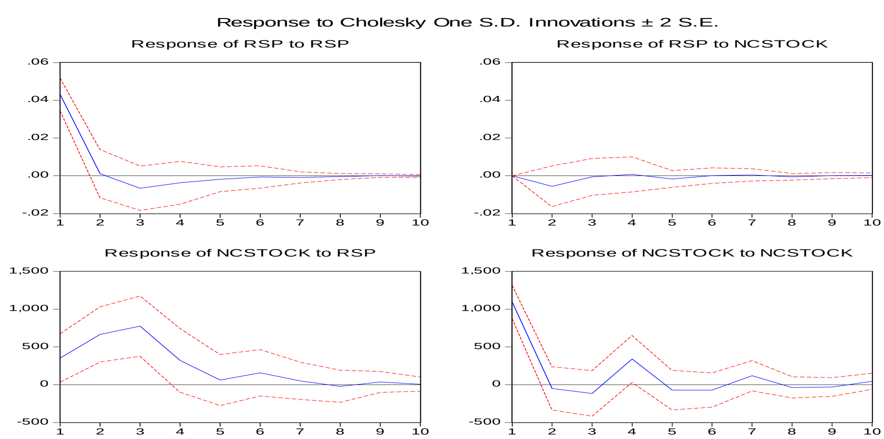

Figure 4C: Impulse Response Function (Sample: 1985:m10-1989:m10)

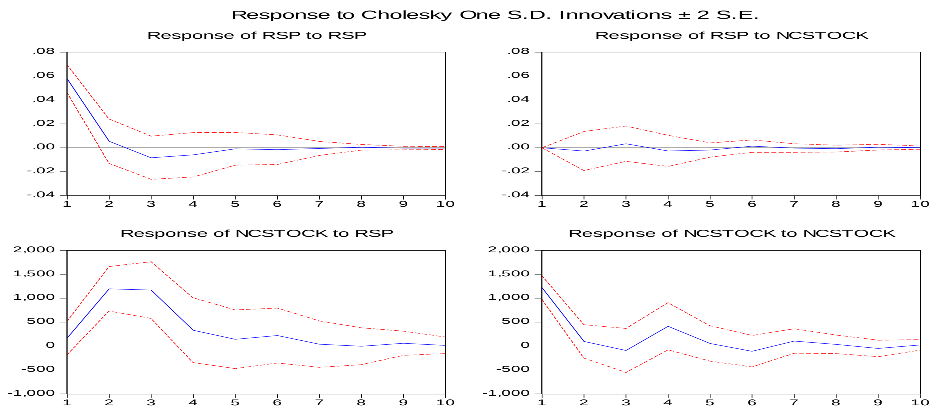

Figure 5A: Impulse Response Function (Sample: 1996:m08-2000:m08)

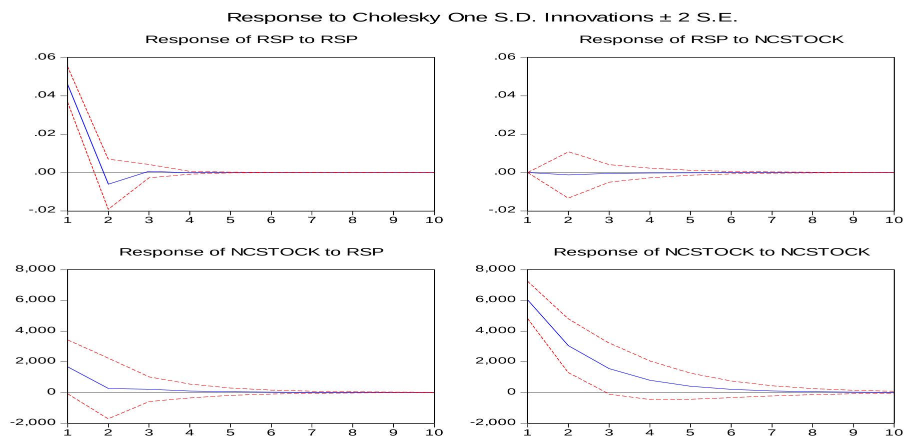

Figure 5B: Impulse Response Function (Sample: 2000:m09-2004:m09)

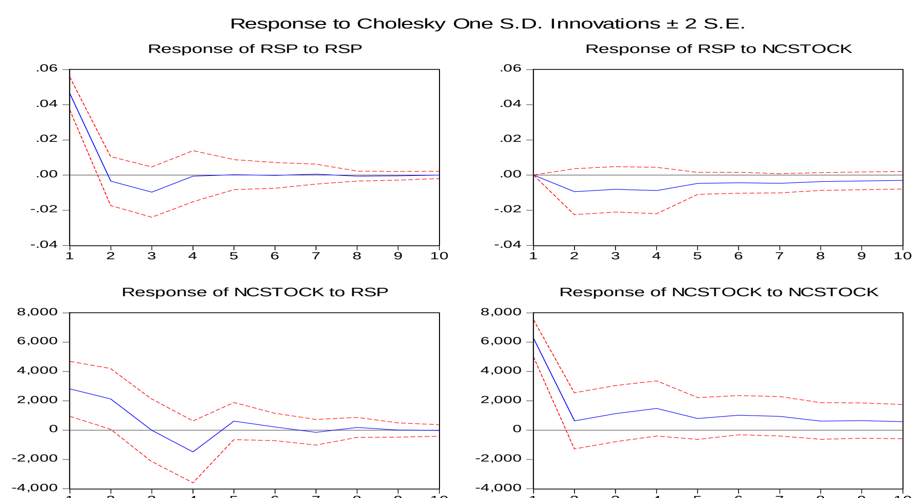

Figure 6A: Impulse Response Function (Sample: 2003:m11-2007:m11)

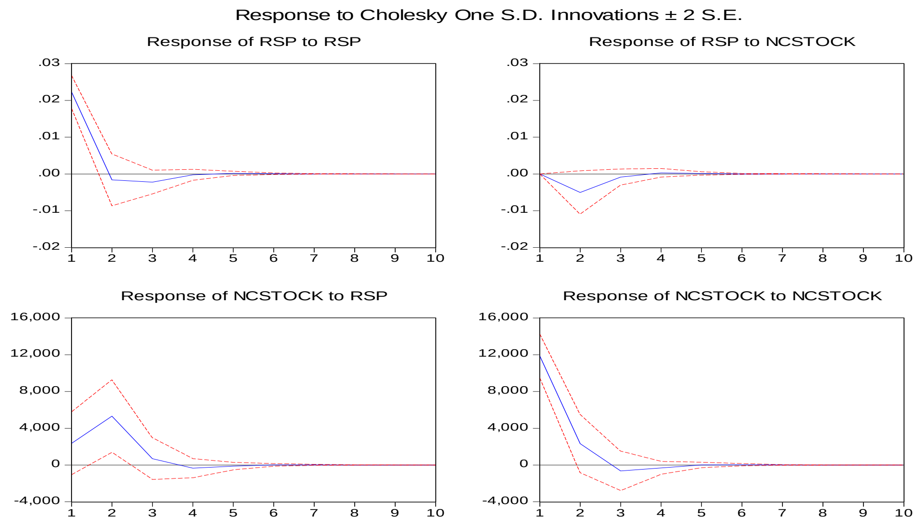

Figure 6B: Impulse Response Function (Sample: 2005:m11-2008:m06)