The relation between trades of domestic and foreign investors and stock returns in Sri Lanka

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ABSTRACT

This study investigates the relation between equity flows and returns in Sri Lanka using daily trade data categorized by investor classes. The results show that purchases and sales of domestic and foreign investors, both institutional and individual, are positively related with past returns, except during crisis periods, when they are negatively related. Domestic institutional and foreign individual purchases lead to higher future returns whereas domestic individual purchases lead to lower future returns. Foreign institutional purchases do not impact future returns. Sales by domestic investors have no impact on future returns while sales by foreign investors lead to higher future returns.

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1. Introduction

The understanding of the behavior of equity flows in emerging markets has become ever more important for both investors and policy makers alike. Some have argued that trading patterns of foreign speculative investors are responsible for instability in emerging stock markets. This line of attack also implies that domestic investors, being the opposite party to trade with foreign investors, are at the losing side of the emerging market investments. However, there has been very little published work that attempt to distinguish among the trading behavior of foreign and local investors, both institutional

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and individual, in order to obtain a measure of how equity flows of each investor class relate to past and future returns. The paucity of research is understandably due to the lack of long-term high-frequency disaggregated data on emerging market equity flows.

The purpose of this study is to fill this vacuum and shed some light on the important issue of how equity flows among different types of investors are related to returns by employing a unique dataset on the emerging market of Sri Lanka that has never been exploited previously. The data include 13 years of daily equity flows classified by the identity of the buyer and the seller of each trade into four investor classes, namely, foreign institutional investors, foreign individual investors, local institutional investors and local individual investors. The information on the identity of the buyer and seller provides a way to examine the behavior of each investor class in buy and sell trades.

Specifically, this paper examines two main research issues by each investor class. The first issue is whether past returns affect equity flows. The second issue is whether past equity flows affect future returns. These two issues are investigated through vector autoregressive models (VAR) which relate equity flows to past returns, and returns to past equity flows. The estimated coefficients on lagged returns and flows as well as the joint significance of the ability of past returns to predict flows, and the ability of past flows to predict returns provide evidence to answer these two research issues. Further, impulse responses of returns to shocks to flows, and impulse responses of flows to shocks to returns are examined for each investor class in their buy and sell trades to assess the relation between flows and returns.

The main findings of the study are as follows: On the issue of the relation between flows and past returns, this study finds that all investor types exhibit positive feedback trading behavior in buy trades and contrarian behavior in sell trades. Interestingly, this pattern reverses during times of crisis. Investors exhibit contrarian trading in buy trades and positive feedback trading in sell trades during crisis periods. The past returns have the most impact on purchases and sales of domestic investors suggesting that domestic investors exhibit more feedback and more contrarian behavior than foreign investors. On the issue of the relation between returns and past flows, the results show that purchases of domestic institutional and foreign individual investors are strongly positively related with future returns whereas purchases of domestic individual investors are strongly negatively related with future returns. Purchases of foreign institutional investors are not related with future returns in any significant manner. Sales by domestic investors, both institutional and individual, have no discernible impact on future returns while sales by foreign investors, both institutional and individual, are strongly positively related with future returns. The impact of flows on future returns is not different between crisis and non-crisis periods.

The remainder of this paper proceeds as follows. Section 2 discusses previous literature. Section 3 describes the data used in the study. The methodology of the study is presented in Section 4. In Section 5, empirical results are discussed, and Section 6 presents the conclusions.

2. Previous literature

There have been two main inter-related branches of investigations into the behavior of equity flows of investors. The first line of research investigates the positive feedback trading by foreign investors, mostly at the aggregate level. The positive feedback trading is defined as buying after price increases and selling after price declines. Bohn and Tesar (1996) find that monthly foreign purchases of U.S. investors are positively correlated with contemporaneous as well as expected local returns. Brennan and Cao (1997) report a positive relation between U.S. quarterly purchases in developed foreign markets and concurrent local returns, and a positive relation between lagged U.S. purchases in emerging markets and local returns. In a study of the daily flows in the Korean market, Choe et al. (1999) find strong evidence that foreign investors buy following a positive market return and sell following a negative market return before the Korean economic crisis. They find similar evidence of positive feedback trading by Korean individual investors as well. Froot et al. (2001) show that portfolio flows of international investors are strongly influenced by concurrent and lagged returns. Batra (2003) shows that foreign institutional investors act as positive feedback traders on a daily basis in India. Using Swedish data, Dahlquist and Robertsson (2004) find that foreigners increase their net holdings in firms that have recently performed well. Richards (2005) reports that foreign flows show positive feedback trading
with respect to global as well as domestic equity returns. Griffen et al. (2007) show a strong relation between turnover and past returns in many stock markets. Using Korean data, Bae and Min (2007) show that foreign investors tend to buy stocks that have outperformed previously and sell stocks that have underperformed suggesting that foreigners tend to be momentum traders. Chayawadee and Ho (2008) also show that foreign investors become net buyers of equities following increases in market returns and vice versa in Asian emerging markets. Thus, there is a preponderance of evidence on positive feedback trading by foreign investors.¹

There are also studies that report evidence of contrarian behavior by investors. In contrast to their results before the Korean crisis, which show positive feedback trading by foreign investors, Choe et al. (1999) find evidence of contrarian trading by foreign investors in their sell trades during the Korean crisis period. Grinblatt and Keloharju (2000a,b) report contrarian behavior of Finish domestic investors. Using Korean data, Kim and Wei (2002) show that non-resident foreign institutional investors are always positive feedback traders while resident foreign institutional investors are contrarian traders before the Korean crisis and positive feedback traders during the Korean crisis. Hamao and Mei (2001) find evidence of contrarian behavior of foreign investors in Japan. Odean (1998) shows that individual investors tend to sell past winners and hold on to past losers. Barber and Odean (2000) reported that individual investors are anti-momentum investors in the U.S. Griffin et al. (2003) show that individual investors tend to be contrarian traders in that they sell stocks with positive returns in prior trading days. Bae and Min (2007) find that individual investor in Korea exhibit contrarian behavior in that they tend to buy past losers and sell past winners.

The second set of studies examines the returns following equity flows, particularly price momentum. A positive momentum is observed when prices keep rising after purchases or when prices keep falling after sales. A negative momentum occurs when prices keep rising after sales or when prices keep falling after purchases. Choe et al. (1999) find no evidence of price continuations following foreign trades in the Korean stock market, and show that prices adjust quickly to large sales by foreign investors. However, Froot et al. (2001) find that net foreign portfolio flows are correlated positively with future returns in emerging markets.

Positive price momentum has at least two interpretations. Choe et al. (1999) argue that price continuations reflect a permanent effect of equity flows on subsequent prices. Another interpretation is that positive momentum is evidence of an anticipation effect in that foreign investors anticipate local equity returns. This anticipation effect may be a result of foreign investors having better information or due to price pressure (Froot and Ramadori, 2001). The information explanation says that a positive relation between equity flows and future returns are indicative of that particular class of equity investors being less informed about future fundamentals of the market (e.g., Brennan and Cao, 1997). Under the price pressure explanation, any positive association between equity flows and future returns is potentially due to that particular class of investors’ trading being autocorrelated with their past trading, and not necessarily due to information advantages. For example, positive feedback trading would lead to positively autocorrelated equity flows (Froot and Ramadori, 2001).

3. Data

This study uses daily equity flow data for each stock classified by the investor class. The data are from the Colombo Stock Exchange (CSE) in Sri Lanka. Table 1 gives the definitions of the 12 flow variables used. The buyer and seller of each trade is identified as domestic institution (DI), domestic individual (DI), foreign institution (FC), and foreign individual (FI). The daily turnover, which is the value of shares traded, of each stock is classified by the buyside and the sellside investor class. This paper examines the purchases and sales of each of the four investor classes.

The data set covers the 13-year period from January 3, 1992 to December 31, 2004, and contains trades of all 272 stocks listed on the CSE, which amounts to 3,258,744 trades.² However, some stocks

¹ Brennan and Cao (1997), and Brennan et al. (2005) argue asymmetry of information among different investors about the asset prices as a plausible explanation for the trend-following behavior of foreign investors.

² This is excluding the odd-lot trades (trades involving less than 100 shares). The sample of this study excludes all odd-lot trades.
Table 1
Equity flow variables.

<table>
<thead>
<tr>
<th>Investor class</th>
<th>Purchases</th>
<th>Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>DCP</td>
<td>DP</td>
</tr>
<tr>
<td>Domestic institutional investors</td>
<td>DIP</td>
<td>DIS</td>
</tr>
<tr>
<td>Domestic individual investors</td>
<td>DIP</td>
<td>DIS</td>
</tr>
<tr>
<td>Foreign</td>
<td>FCP</td>
<td>FP</td>
</tr>
<tr>
<td>Foreign institutional investors</td>
<td>FIP</td>
<td>FIS</td>
</tr>
<tr>
<td>Foreign individual investors</td>
<td>FIP</td>
<td>FIS</td>
</tr>
<tr>
<td>Total</td>
<td>Turnover</td>
<td>Turnover</td>
</tr>
</tbody>
</table>

The total of domestic institutional purchases (DCP) and domestic individual purchases (DIP) is equal to domestic purchases (DP). The total of foreign institutional purchases (FCP) and foreign individual purchases (FIP) is equal to foreign purchases (FP). The total of domestic institutional sales (DCS) domestic individual sales (DIS) is equal to domestic sales (DS). The total of foreign institutional sales (FCS) and foreign individual sales (FIS) is equal to foreign sales (FS). The column total is equal to the total turnover (value of shares traded).

Table 2
Characteristics of the sample.

<table>
<thead>
<tr>
<th>Average</th>
<th>Standard deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trading frequency (%)</td>
<td>74</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>Average number of trades (per stock per day)</td>
<td>14</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>Average number of shares traded (per stock per day)</td>
<td>57,808</td>
<td>127,681</td>
<td>1,357</td>
</tr>
<tr>
<td>Average value of shares traded (per stock per day, Rs. Mn.)</td>
<td>1,553,273</td>
<td>3,031,282</td>
<td>30,718</td>
</tr>
</tbody>
</table>

Panel A: characteristics of trades (2,902,471 trades for 115 firms)

Panel B: characteristics of daily returns and flows (264,544 observations)

returns (%) | 0.01 | 3.97 | −243.23 | 183.26 |

Domestic purchases (Rs. Mn.) | 741,921 | 10,283,576 | 0 | 4,095,090,000 |
Domestic institutional purchases (Rs. Mn.) | 408,929 | 9,358,461 | 0 | 4,027,850,000 |
Domestic individual purchases (Rs. Mn.) | 332,992 | 3,018,275 | 0 | 717,679,625 |
Domestic sales (Rs. Mn.) | 747,711 | 7,349,279 | 0 | 1,125,400,000 |
Domestic institutional sales (Rs. Mn.) | 393,781 | 6,053,764 | 0 | 1,124,370,000 |
Domestic individual sales (Rs. Mn.) | 353,930 | 2,788,875 | 0 | 401,790,750 |
Foreign purchases (Rs. Mn.) | 317,882 | 5,166,867 | 0 | 749,008,200 |
Foreign institutional purchases (Rs. Mn.) | 282,980 | 4,696,995 | 0 | 749,008,200 |
Foreign individual purchases (Rs. Mn.) | 34,902 | 2,104,160 | 0 | 571,362,875 |
Foreign sales (Rs. Mn.) | 312,092 | 8,559,360 | 0 | 3,865,170,000 |
Foreign institutional sales (Rs. Mn.) | 282,493 | 3,054,855 | 0 | 1,511,370,000 |
Foreign individual sales (Rs. Mn.) | 29,598 | 3,054,855 | 0 | 1,511,370,000 |

are thinly traded, and the use of all the stocks raises questions relating to potential biases due to infrequent trading. As a result, this study excludes those stocks whose daily trading frequency is less than 50%. The daily trading frequency is defined as the ratio of the number of days the stock is traded to the total number of days the stock existed during the sample period. The exclusion of stocks with trading frequency of less than 50% results in a sample of 115 firms containing 2,902,471 trades in total. This sample represents 89% of the total number of trades that took place in the sample period. These trades, when converted into a daily basis, result in 264,544 daily observations of equity flows which are used in the study.

Table 2 presents the salient characteristics of the sample used in the study. Panel A shows the characteristics of the trades. On average, stocks in the sample have traded 74% of the time. The average number of trades is 14 per stock per day. On average a stock traded 57,808 shares per day with a value just over 1.5 million rupees (USD 15,000 approximately). Panel B provides the descriptive statistics of the daily returns and the 12 flow variables used in the study.

3 As a robustness check, the VAR model was also estimated using data for stocks with a trading frequency of 75% or higher. The results are qualitatively similar.
The data set is free of survivorship biases since it uses all the transactions of the 115 stocks in the sample. All equity flows are measured in domestic currency, Sri Lankan Rupee (Rs). The stock returns are continuously compounded daily returns, measured in domestic currency terms. The daily returns are adjusted for dividends, rights, splits and bonus information, and hence represent total daily returns.

4. Methodology

This paper examines whether returns affect flows and flows affect returns by estimating a bivariate vector autoregression (VAR) model on the entire cross-sectional time-series sample of daily equity flows. If equity flows are positively autocorrelated, future flows tend to be higher when past flows are higher. Therefore, it is important to control for information contained in past returns as well as the price pressure effect of concurrent equity flows when trying to predict future equity flows. A VAR system allows for such controls by specifying lagged values of the dependent variable as regressors. The VAR model is specified as follows:

Flow model:

\[ \text{Flow}_t = \alpha_0 + \sum_{j=1}^{3} \alpha_j \text{Flow}_{t-j} + \sum_{j=1}^{3} \alpha_{2j} \text{Ret}_{t-j} + \alpha_3 D_t + \sum_{j=1}^{3} \alpha_{4j} \text{RetD}_{t-j} + \epsilon_{1t} \]  

(1)

Return model:

\[ \text{Ret}_t = \beta_0 + \sum_{j=0}^{3} \beta_{1j} \text{Flow}_{t-j} + \sum_{j=1}^{3} \beta_{2j} \text{Ret}_{t-j} + \beta_3 D_t + \sum_{j=1}^{3} \beta_{4j} \text{FlowD}_{t-j} + \epsilon_{2t} \]  

(2)

where \(\alpha_0, \beta_0 = \) constant terms; Flow\(_t\) = equity flow on day \(t\); Flow\(_{t-j}\) = equity flow on day \(t-j\), where \(j = 1\) to \(3\); Ret\(_t\) = stock return on day \(t\); Ret\(_{t-j}\) = stock return on day \(t-j\), where \(j = 1\) to \(3\); \(D_t\) = crisis dummy; RetD\(_{t-j}\) = crisis-induced flow-sensitivity to return (Ret \(\times D\)) on day \(t\), where \(j = 1\)–\(3\); FlowD\(_{t-j}\) = crisis-induced return-sensitivity to flows (Flow \(\times D\)) on day \(t\), where \(j = 1\)–\(3\); \(\epsilon_{1t}, \epsilon_{2t}\) = error terms.

In the VAR system, equity flows and stock returns are endogenous variables while the crisis dummy is an exogenous variable. Equity flows represent each of the 12 variables defined previously (see Table 1). The above two-equation VAR system is estimated for each flow variable separately. The crisis dummy, \(D_t\), is expected to capture any spillover effects of external economic and financial crisis on equity flows and domestic returns. It is equal to one during crisis and zero during non-crisis periods. This crisis dummy variable is specified with respect to the Mexican crisis (12/94–06/95), the Asian crisis (07/97–03/98), and the Russian crisis (08/98–10/98). In addition, this study specifies RetD\(_{t-j}\), defined as stock returns times the crisis dummy, to capture any crisis-induced flow-sensitivity to returns in Eq. (1), and FlowD\(_{t-j}\), defined as flow times the crisis dummy, to capture any crisis-induced return-sensitivity to flows in Eq. (2).4

Eq. (1) in the VAR system (flow model) provides evidence as to whether past returns affect flows. The primary interest in the flow model is on the coefficients on Ret\(_{t-j}\), where \(j = 1\) to \(3\), which would indicate whether equity flows are correlated with past returns. The lagged equity flows, Flow\(_{t-j}\), where \(j = 1\) to \(3\), control for information about future equity flows contained in past equity flows. The \(\chi^2\)-test of the joint significance of the slope coefficients of the lagged return variables is used to assess whether past returns affect future equity flows.

Eq. (2) in the VAR system (return model) helps us understand whether flows affect future returns. To control for the potential price pressure effect of the concurrent equity flows on returns, the concurrent equity flow, Flow\(_t\), is included as a regressor in the model. The tests also control for information contained in lagged returns up to three lags. The joint significance of lagged equity flows, Flow\(_{t-j}\), where \(t = 1\) to \(3\), would indicate the ability of past equity flows to predict future returns after controlling for

4 I thank the referee for the suggestion to include these interaction terms.
concurrent equity flows and past returns. The number of lags on the VAR equations is determined after examining the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC). Overall, the results are extremely robust to the inclusion of additional lags.

This study also estimates the impulse response function of returns and flows in response to a one rupee shock to flows and a 100 basis-point shock to returns. Before the VAR specification, the variables that enter the VAR system are tested to ensure that they are stationary. The results of the augmented Dickey–Fuller unit root tests reject the null hypothesis of unit root reliably for all the return and flow series, suggesting that returns and flows appear to be stationary. The VAR system is estimated using the Ordinary Least Squares and standard errors are adjusted for both heteroskedasticity and autocorrelation using the Newey–West technique.

5. Empirical results

5.1. Do past returns affect flows?

Table 3 presents the coefficient estimates in regressions of equity flows of investor types on past stock returns. The objective of this model is to assess the ability of past returns to predict future flows, after controlling for the effects of past flows and external economic shocks which are captured through the crisis dummy.

The results for purchases of domestic investors (DP) are given in Panel A. The past returns at the first two lags are significantly positively related with purchases of both domestic institutional (DCP) and domestic individual investors (DIP). The largest coefficient is associated with the most recent lagged return, Ret$\text{t-1}$, and they tend to decline with longer lags. Panel B reports the results relating to the regressions on purchases of foreign investors. Similar to domestic investor types, purchases of foreign institutional (FCP) and foreign individual investors (FIP) are also significantly positively related with past returns. Thus, there is strong evidence that domestic and foreign investors, both institutional and individual, act as positive feedback traders when they purchase. Panels C and D provide the coefficient estimates relating to the sales of domestic and foreign investors. Accordingly, equity sales and past returns are also strongly positively related across all investor classes. Thus, higher returns lead to larger sales suggesting that both domestic and foreign investors act as contrarian investors in their sell trades.

The purchases and sales of domestic investors, both institutional and individual, and foreign individual investors are significantly negatively related with the crisis dummy variable. This suggests that, on average, during periods of external economic crisis such as the Asian or the Mexican crises, domestic investors and foreign individual investors trade less than during the non-crisis periods. In contrast, the crisis dummy is insignificantly related with both purchases and sales of foreign institutional investors implying that the average value of trades of foreign institutional investors is not different between crisis and non-crisis period periods.

The interaction of returns and the crisis dummy, Ret$D_{t-j}$, which measures the crisis-induced flow sensitivity to returns, is strongly negatively related to purchases across all investor types. What this means is that, during periods of crisis, returns affect purchases negatively – higher returns lead to lower purchases and lower returns lead to higher purchases. This suggests that all investor types exhibit contrarian behavior in their purchases in times of crisis. The crisis-induced flow sensitivity to return is negatively related with sales across all investor types as well. This indicates that higher returns lead to lower sales and lower returns lead to higher sales suggesting positive feedback trading in sell trades during crisis periods. Choe et al. (1999) find similar behavior of foreign investors during the Korean crisis. Different from the period before the Korean crisis, they find that large foreign purchases and sales are preceded by negative abnormal returns during the crisis.

The $p$-values of $\chi^2$-tests of joint significance of the lagged returns in predicting future flows are given in the last column of the table. Consistent with the findings of previous research (e.g., Froot et al., 2001), the $\chi^2$-tests show that lagged returns are strongly significant in predicting purchases as well as sales of all major investor types, after controlling for the impact of past flows. The significance level is less than 1% in almost all the flow series, except domestic individual sales (DIS) series, which is significant at 5%.
Table 3
Flow model: regression of equity flows of investor classes on past returns.

<table>
<thead>
<tr>
<th>Investor class</th>
<th>Constant</th>
<th>Flow_{t-1}</th>
<th>Flow_{t-3}</th>
<th>Ret_{t-1}</th>
<th>Ret_{t-2}</th>
<th>Ret_{t-3}</th>
<th>D_t</th>
<th>RetD_{t-1}</th>
<th>RetD_{t-2}</th>
<th>RetD_{t-3}</th>
<th>DW</th>
<th>$\chi^2$ (p-values)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: purchases of domestic investors</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DP</td>
<td>0.5631***</td>
<td>0.0953***</td>
<td>0.1164***</td>
<td>0.0631***</td>
<td>0.0616***</td>
<td>0.0275***</td>
<td>0.0167***</td>
<td>-0.2489***</td>
<td>-0.0493***</td>
<td>-0.0194***</td>
<td>-0.0013***</td>
<td>2.01</td>
</tr>
<tr>
<td>DCP</td>
<td>0.3485***</td>
<td>0.0500***</td>
<td>0.0886***</td>
<td>0.0377***</td>
<td>0.0295***</td>
<td>0.0142***</td>
<td>0.0101***</td>
<td>-0.1165***</td>
<td>-0.0221***</td>
<td>-0.0093***</td>
<td>-0.0085***</td>
<td>2.00</td>
</tr>
<tr>
<td>DIP</td>
<td>0.1741***</td>
<td>0.2599***</td>
<td>0.1205***</td>
<td>0.0227***</td>
<td>0.0088***</td>
<td>0.0028***</td>
<td>-0.0997***</td>
<td>-0.0228***</td>
<td>-0.0060***</td>
<td>-0.0011***</td>
<td>2.03</td>
<td>0.0000</td>
</tr>
<tr>
<td><strong>Panel B: purchases of foreign investors</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>FP</td>
<td>0.2537***</td>
<td>0.1045***</td>
<td>0.0372***</td>
<td>0.0710***</td>
<td>0.0091***</td>
<td>0.0075***</td>
<td>0.0062***</td>
<td>-0.0387***</td>
<td>-0.0090***</td>
<td>0.0068***</td>
<td>-0.0043***</td>
<td>2.01</td>
</tr>
<tr>
<td>FCP</td>
<td>0.2329***</td>
<td>0.0768***</td>
<td>0.0504***</td>
<td>0.0087***</td>
<td>0.0061***</td>
<td>0.0057***</td>
<td>-0.0194***</td>
<td>-0.0083***</td>
<td>0.0079***</td>
<td>-0.0033***</td>
<td>2.01</td>
<td>0.0000</td>
</tr>
<tr>
<td>FIP</td>
<td>0.0333***</td>
<td>0.0089***</td>
<td>0.0058***</td>
<td>0.0935***</td>
<td>0.0014***</td>
<td>0.0011***</td>
<td>-0.0225***</td>
<td>-0.0010***</td>
<td>0.0016***</td>
<td>-0.0009***</td>
<td>2.00</td>
<td>0.0000</td>
</tr>
<tr>
<td><strong>Panel C: sales of domestic investors</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>DS</td>
<td>0.4929***</td>
<td>0.1804***</td>
<td>0.0999***</td>
<td>0.0968***</td>
<td>0.0531***</td>
<td>0.0238***</td>
<td>0.0141***</td>
<td>-0.2618***</td>
<td>-0.0414***</td>
<td>-0.0131***</td>
<td>-0.0013***</td>
<td>2.00</td>
</tr>
<tr>
<td>DCS</td>
<td>0.3205***</td>
<td>0.1210***</td>
<td>0.0583***</td>
<td>0.0503***</td>
<td>0.0275***</td>
<td>0.0161***</td>
<td>0.0131***</td>
<td>-0.1566***</td>
<td>-0.0202***</td>
<td>-0.0084***</td>
<td>-0.0125***</td>
<td>2.00</td>
</tr>
<tr>
<td>DIS</td>
<td>0.1842***</td>
<td>0.2421***</td>
<td>0.1366***</td>
<td>0.0263***</td>
<td>0.0082***</td>
<td>0.0025***</td>
<td>-0.1065***</td>
<td>-0.0211***</td>
<td>-0.0045***</td>
<td>-0.0009***</td>
<td>2.02</td>
<td>0.0242</td>
</tr>
<tr>
<td><strong>Panel D: sales of foreign investors</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>FS</td>
<td>0.2841***</td>
<td>0.0306***</td>
<td>0.0180***</td>
<td>0.0269***</td>
<td>0.0115***</td>
<td>0.0082***</td>
<td>0.0043***</td>
<td>0.0253***</td>
<td>-0.0123***</td>
<td>0.0020***</td>
<td>-0.0012***</td>
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<td>FCS</td>
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<td>0.0314***</td>
<td>0.0402***</td>
<td>0.0078***</td>
<td>0.0056***</td>
<td>0.0039***</td>
<td>0.0401***</td>
<td>-0.0091***</td>
<td>0.0045***</td>
<td>-0.0012***</td>
<td>2.00</td>
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<td>FIS</td>
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<td>0.0047***</td>
<td>0.0014***</td>
<td>0.0050***</td>
<td>0.0034***</td>
<td>0.0023***</td>
<td>0.0002***</td>
<td>-0.0184***</td>
<td>-0.0030***</td>
<td>-0.0022***</td>
<td>0.0000***</td>
<td>2.00</td>
</tr>
</tbody>
</table>

***, ** and * indicate statistical significance at the 0.01, 0.05, and 0.10 level, respectively. Flow model:

$$\text{Flow}_t = a_0 + \sum_{j=1}^{3} a_{1j}\text{Flow}_{t-j} + \sum_{j=1}^{3} a_{2j}\text{Ret}_{t-j} + \sum_{j=1}^{3} a_{3j}\text{D}_t + \sum_{j=1}^{3} a_{4j}\text{RetD}_{t-j} + \epsilon_t$$

Ret is the stock return, Flow is the equity flow, $D$ is the crisis dummy, and RetD is the interaction term ($\text{Ret} \times D$). The model is estimated for 115 stocks listed on the Colombo Stock Exchange during the 1992–2004 period. This table shows the results for 12 series of equity flows of major investor types: domestic purchases (DP), domestic institutional purchases (DCP), domestic individual purchases (DIP), foreign purchases (FP), foreign institutional purchases (FCP), foreign individual purchases (FIP), domestic sales (DS), domestic institutional sales (DCS), domestic individual sales (DIS), foreign sales (FS), foreign institutional sales (FCS), and foreign individual sales (FIS). The table shows the estimated coefficients, t-statistics (in parentheses), the Durbin–Watson (DW) statistic, and the p-values of the $\chi^2$-test of joint significance of lagged returns. All the variables are daily observations and measured in local currency terms. The number of observations is 264,199.
It is also possible to obtain an excellent perspective on the impact of past returns on flows by examining the impulse response functions. Fig. 1 shows the cumulative impulse responses of purchases up to 20 days resulting from a 100 basis-point shock to returns. Very clearly, a return shock has the greatest influence on domestic purchases (DP). A 100 basis-point return shock increases domestic purchases by 13 basis points. The same return shock increases purchases of domestic institutional and domestic individual purchases by about six and seven basis points, respectively. The impact of the return shock is complete in about 3 days in domestic institutional purchases and in about 10 days in domestic individual purchases. Foreign institutional purchases increase by about two basis points in response to a 100 basis-point return shock, and such response is complete in about 3 days. The response of foreign individual investor purchases is very small. Fig. 2 shows the impulse responses of sales, which display patterns almost identical to those relating to purchases.

Fig. 1. Cumulative impulse responses of purchases to a return shock. These plots show, up to 20 days, the cumulative impulse response of purchases of major investor types to a 1% shock to returns. The parameters are from the VAR results reported in Table 3.

Fig. 2. Cumulative impulse responses of sales to a return shock. These plots show, up to 20 days, the cumulative impulse response of sales of major investor types to a 1% shock to returns. The parameters are from the VAR results reported in Table 3.
These impulse response functions relating to the predictability of flows from past returns suggest several important points about the relation between past returns and flows. First, although returns strongly predict domestic and foreign purchases and sales, returns have the most impact on purchases and sales of domestic investors. This finding implies that domestic investors exhibit more feedback trading than foreign investors in their purchases, and that domestic investors exhibit more contrarian trading than foreign investors in their sales. Second, the impact of lagged returns is fully absorbed into prices in about 5 days and there is no persistence of the response beyond that. Third, such impact does not show evidence of reversing in the 20-day period, suggesting that the impact of returns on purchases and sales, when such impact exists, appears to be permanent.

5.2. Do past flows affect returns?

Table 4 presents evidence on the relation between past equity flows and returns for the four investor classes. In the return model, the coefficients on the lagged flows indicate whether flows influence future returns after controlling for past returns, the concurrent flows, and external economic shocks. The results show that concurrent flows, Flow\(_t\), are significantly positively related with returns in regressions of purchases and sales across all investor types, except for purchases of foreign individual investors (FIP). The concurrent flows capture the price pressure exerted by current trading activity, and appear to have a positive impact regardless of whether the trade is a buy or a sell.

Turning to the regression of purchases of domestic investors (Panel A), Flow\(_{t-1}\) is positively related with returns in purchases of domestic investors in the aggregate, and domestic institutional investors in particular. In contrast, the coefficient Flow\(_{t-2}\) indicates that domestic individual investor purchases are reliably negatively related with future returns. Thus, while purchases by domestic institutional investors lead to higher future returns, purchases by domestic individual investors lead to lower future returns. The purchases of foreign institutional investors (Panel B) do not affect future returns, whereas purchases of foreign individual investors are strongly positively related with returns as indicated by the significant Flow\(_{t-2}\). The \(\chi^2\)-tests of joint significance of lagged flows suggest that lagged purchases of domestic institutional, domestic individual and foreign individual investors are strongly related with returns at the 5% significant level. In contrast, purchases of foreign institutional investors do not have a significant impact on future returns.

With regard to the sales of domestic investors in the return model, the results (Panel C) show a negative relation between Flow\(_{t-3}\) and returns. This is driven by sales of domestic individual investors. First two lags of flows are not significant for domestic institutional or individual investors. The lagged sales of foreign investors (Panel D), both institutional and individual, are strongly positively related with returns at the first lag. The \(\chi^2\)-tests of joint significance of lagged flows confirm these findings. Sales of domestic investors do not predict returns. In contrast, foreign investor sales are strongly positively related to future returns. These results imply that sales by foreign investors lead to subsequent higher returns, while sales by domestic investors have no impact on future returns. The interaction of flows and the crisis dummy, which captures any crisis-induced return-sensitivity to flows, is not statistically significant for both domestic and foreign investor purchases and sales. This can be interpreted as evidence that the impact of flows on future returns is not different between crisis and non-crisis periods.

Fig. 3 displays the impulse responses of returns resulting from a one rupee shock to purchases. The returns increase the most in response to a shock to domestic individual purchases. In response to a one rupee shock to domestic individual purchases, the subsequent returns increase by about 10 basis points within the first 5 days. The response of returns to shocks to purchases of all other investor classes leads to a maximum of about two basis points increase in returns. The impulse responses of returns due to a similar shock to sales are shown in Fig. 4. Here, the largest response of about 12 basis points is also associated with shocks to domestic individual sales. The impact of purchases and sales of domestic individual investors on returns persists for less than 5 days only. Also, such impact does not reverse in the 20-day period, signaling domestic individual purchases and sales have a permanent effect on stock prices. There appears to be a slightly greater increase in returns from a sales shock than
**Table 4**

Return model: regression of returns on past equity flows of investor classes.

<table>
<thead>
<tr>
<th>Investor class</th>
<th>Constant</th>
<th>Flowt</th>
<th>Flowt−1</th>
<th>Flowt−2</th>
<th>Flowt−3</th>
<th>Rett−1</th>
<th>Rett−2</th>
<th>Rett−3</th>
<th>Dt</th>
<th>FlowD−1</th>
<th>FlowD−2</th>
<th>FlowD−3</th>
<th>DW</th>
<th>χ² (p-values)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Panel A: purchases of domestic investors</strong></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>DP</td>
<td>0.0318</td>
<td>0.0160</td>
<td>0.0019</td>
<td>−0.0011</td>
<td>−0.0010</td>
<td>−0.0714</td>
<td>−0.0529</td>
<td>−0.0375</td>
<td>−0.2909</td>
<td>0.0026</td>
<td>−0.0034</td>
<td>−0.0018</td>
<td>2.00</td>
<td>0.0042</td>
</tr>
<tr>
<td>DCP</td>
<td>0.0387</td>
<td>0.0116</td>
<td>0.0015</td>
<td>−0.0003</td>
<td>−0.0002</td>
<td>−0.0706</td>
<td>−0.0525</td>
<td>−0.0373</td>
<td>−0.2944</td>
<td>0.0008</td>
<td>−0.0027</td>
<td>−0.0012</td>
<td>2.00</td>
<td>0.0249</td>
</tr>
<tr>
<td>DIP</td>
<td>0.0240</td>
<td>0.0806</td>
<td>0.0007</td>
<td>−0.0118</td>
<td>−0.0128</td>
<td>−0.0731</td>
<td>−0.0536</td>
<td>−0.0377</td>
<td>−0.2865</td>
<td>0.0310</td>
<td>−0.0254</td>
<td>−0.0049</td>
<td>2.00</td>
<td>0.0432</td>
</tr>
<tr>
<td><strong>Panel B: purchases of foreign investors</strong></td>
<td></td>
<td></td>
<td></td>
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<td>FP</td>
<td>0.0386</td>
<td>0.0622</td>
<td>−0.0004</td>
<td>0.0014</td>
<td>−0.0003</td>
<td>−0.0703</td>
<td>−0.0524</td>
<td>−0.0372</td>
<td>−0.2940</td>
<td>0.0013</td>
<td>0.0022</td>
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</tr>
<tr>
<td>FCP</td>
<td>0.0386</td>
<td>0.0179</td>
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<td>0.0008</td>
<td>0.0001</td>
<td>−0.0703</td>
<td>−0.0524</td>
<td>−0.0372</td>
<td>−0.2942</td>
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<td>0.0028</td>
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<td>0.6637</td>
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<tr>
<td>FIP</td>
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<td>0.0039</td>
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<td>−0.0522</td>
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<tr>
<td><strong>Panel C: sales of domestic investors</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>DS</td>
<td>0.0237</td>
<td>0.0311</td>
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<td>−0.0018</td>
<td>−0.0029</td>
<td>−0.0721</td>
<td>−0.0534</td>
<td>−0.0378</td>
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<td>−0.0093</td>
<td>−0.0000</td>
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<tr>
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<td>0.0007</td>
<td>−0.0710</td>
<td>−0.0527</td>
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<td>−0.0540</td>
<td>−0.0376</td>
<td>−0.2665</td>
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<td>−0.0859</td>
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<td>0.1817</td>
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<tr>
<td><strong>Panel D: sales of foreign investors</strong></td>
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<tr>
<td>FS</td>
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<td>0.0607</td>
<td>0.0015</td>
<td>0.0005</td>
<td>0.0001</td>
<td>−0.0703</td>
<td>−0.0523</td>
<td>−0.0372</td>
<td>−0.2977</td>
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<td>−0.0006</td>
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<td>0.0007</td>
<td>−0.0702</td>
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<td>−0.2969</td>
<td>0.0369</td>
<td>0.0117</td>
<td>0.0544</td>
<td>2.00</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

***, ** and * indicate statistical significance at the 0.01, 0.05, and 0.10 level, respectively. Return model:

\[
\text{Ret}_t = \beta_0 + \sum_{j=0}^{3} \beta_{1j} \text{Flow}_{t-j} + \sum_{j=1}^{3} \beta_{2j} \text{Ret}_{t-j} + \sum_{j=1}^{3} \beta_{3j} \text{D}_{t-j} + \beta_4 \text{FlowD}_{t-j} + \epsilon_{2t}
\]

Ret is the stock return, Flow is the equity flow, D is the crisis dummy, and FlowD is the interaction term (Flow × D). The model is estimated for 115 stocks listed on the Colombo Stock Exchange during the 1992–2004 period. This table shows the results for 12 series of equity flows of major investor types: domestic purchases (DP), domestic institutional purchases (DCP), domestic individual purchases (DIP), foreign purchases (FP), foreign institutional purchases (FCP), foreign individual purchases (FIP), domestic sales (DS), domestic institutional sales (DCS), domestic individual sales (DIS), foreign sales (FS), foreign institutional sales (FCS), and foreign individual sales (FIS). The table shows the estimated coefficients, t-statistics (in parentheses), the Durbin–Watson (DW) statistic, and the p-values of the χ²-test of joint significance of lagged flows. All the variables are daily observations and measured in local currency terms. The number of observations is 264,199.
Fig. 3. Cumulative impulse responses of returns to shock to purchases. These plots show, up to 20 days, the cumulative impulse response of returns to a one rupee shock to purchases of each major investor type. The parameters are from the VAR reported in Table 4.

from a purchase shock relating to domestic investors. As with purchases, shocks to sales of foreign investors seem to have a negligible impact on returns. This evidence of foreign purchases and sales having an insignificant impact on subsequent returns is consistent with the findings of Choe et al. (1999) who show that foreign purchases and sales do not have a permanent impact on subsequent prices in Korea.

Fig. 4. Cumulative impulse responses of returns to shock to sales. These plots show, up to 20 days, the cumulative impulse response of returns to a one rupee shock to sales of each major investor type. The parameters are from the VAR reported in Table 4.
6. Conclusions

This paper investigates whether past flows affect returns, and whether past returns affect flows using 13 years of daily equity flow data in the Sri Lankan stock market. The equity flow data are unique in that they are categorized by the buying and selling investor class as domestic institutional investors, domestic individual investors, foreign institutional investors, and foreign individual investors. The study uses a bivariate VAR model to test the influence of past returns on future equity flows, and past flows on future returns.

On the issue of the relation between flows and past returns, this study finds that purchases as well as sales of domestic and foreign investors, both institutional and individual, are strongly positively related with past returns suggesting that all classes of investors exhibit positive feedback trading in buy trades and contrarian trading behavior in sell trades. However, this pattern reverses during times of crisis in that investors exhibit contrarian trading in buy trades and positive feedback trading in sell trades. The past returns have the most impact on purchases and sales of domestic investors suggesting that domestic investors exhibit more feedback and more contrarian behavior than foreign investors.

On the issue of the relation between returns and past flows, the results show that purchases of domestic institutional and foreign individual investors lead to higher future returns while purchases of domestic individual investors lead to lower future returns. Purchases of foreign institutional investors are not related with future returns. Sales by domestic investors have no discernible impact on future returns while sales by foreign investors result in higher future returns. The impact of flows on future returns is not different between crisis and non-crisis periods.

References