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THE RESPONSE OF DIFFERENT INVESTOR TYPES TO MACROECONOMIC NEWS

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Highlights

- We investigate investors' trading responses to macroeconomic surprises in Korea
- Different investor types respond differently to different shocks and to the same news
- Behavior is more complex than previously recognized
- Local individuals are contrarian traders with respect to expected policy responses, not the raw shocks
- Local institutions are momentum traders, also with respect to expected policy responses

Abstract

We provide the first investigation of foreign, local institutional and local individual investors' trading responses to global, regional and local macroeconomic surprises using daily buy-sell volumes for Korea, taking account of endogeneity. Investor types respond differently to different

shocks and differentially to the same news. Responses also differ across market states. However, behavior is more complex than previously recognized. Local individuals' (institutions') responses to local news suggest they are contrarian (momentum) traders with respect to expected policy responses, rather than the raw shocks themselves. The importance of investor type to understanding the impact of macroeconomic news on behavior is highlighted.

JEL code: G10, G14

Keywords: Foreign investors, institutional investors, individual investors, macroeconomic announcements, trading decisions.

1. Introduction

This paper brings together two distinct, but related, strands of literature to examine the behavior of different types of market participants to news. Specifically, we consider the impact of the unexpected component of global (U.S.), regional (Japan) and domestic macroeconomic announcements on the trading behavior of different investor types (foreigners, local institutions and local individuals) in Korea. Considerable attention has been given to the relationship between stock market behavior and the announcement of macroeconomic information, with the latter having been found to impact on various features including stock returns, trading volume,

volatility, Sharpe ratios and herding behavior.^{1,2} In addition to investigating these features, there is a body of literature which has analyzed how macroeconomic information is transmitted between financial markets in different countries, both between developed markets (see, for example, Connolly and Wang, 2003; Kim, 2003) and from developed to emerging markets (see, for example, Wongswan, 2006; Nowak et al., 2011). Important linkages are identified. To illustrate, Wongswan (2006) demonstrates that equity market volatility in Korea and Thailand is significantly affected by news in the United States and Japan, and argues that this confirms the importance of linkages between macroeconomic fundamentals and the behavior of asset prices.³ Furthermore, it is now well established that different investor types behave differently in response to stock market stimuli. For example, Richards (2005) investigates the trading behavior of foreign and domestic investors for six Asian markets and concludes that foreign investors are positive feedback traders, while local individuals appear to be contrarian traders. In relation to the Swedish market, Dahlquist and Robertsson (2004) also find evidence that foreign investors

¹ See, for example, Jain (1988), (who examines the impact of announcements on stock returns and trading volume), McQueen and Roley (1993), (the impact on stock prices and equity discount rate proxies), Flannery and Protopapadakis (2002), (aggregate equity returns), Boyd et al. (2005), (stock prices), Gilbert (2011), (the relationship between announcement revisions and stock returns), Savor and Wilson (2013) (impact on stock market average returns and Sharpe ratios), Scholtus et al. (2014), (returns, volume and volatility), Brogaard et al. (2014) (the correlation between the trades of high frequency traders and macroeconomic news), and Galariotis et al. (2015) (herding and macroeconomic information releases), among others.

² In addition to the impact of macroeconomic announcements there is a voluminous literature on the impact of firm specific information on the stock market.

³ Linkages between markets are not confined to macroeconomic news. For example, Griffin et al. (2004) find that Asian equity flows are significantly impacted by returns in North America.

engage in positive feedback trading. Kim and Wei (2002) investigate trading by different categories of foreign investors in Korea and show that foreigners based outside Korea have a greater tendency to pursue momentum trading strategies and exhibit herding behavior than foreigners living in Korea. Similarly, Grinblatt and Keloharju (2000) find that foreign investors in Finland exhibit momentum behavior, while local investors are characterized by contrarian trading. However, they find that the contrarian behavior of households is much stronger than that of local institutions and argue that there is an inverse relationship between the extent to which investors are contrarian traders and the level of investor sophistication. Specifically, less (more) sophisticated investors appear to pursue contrarian (momentum) investment strategies.

The finding of different behavior by different investor types is not confined to responses to past returns. Lee (1992) shows that institutional and individual investors react differently to the same earnings news, with small traders being net buyers during periods of earnings announcements irrespective of the sign of the news, whereas institutional traders involve in intense buying (selling) subsequent to good (bad) news. Vieru et al. (2006) find that Finnish households who are active investors tend to follow a contrarian strategy, especially selling after good news.

Institutions are less affected by the announcement than active investors, suggesting that institutions have access to a wider information set than individual investors. Similarly, substantial differences are found in the trading reaction of U.S individual and institutional investors to analysts' recommendations by Malmendier and Shanthikumar (2007). Duxbury et al. (2013) examine portfolio composition in China and find that different investor classes choose stocks with different characteristics, while Duxbury et al. (2015) examine the disposition and house money effects and find a significant role for investor type. Thus, there is considerable evidence not only that foreigners and local investors may behave differently, but also that the

sophistication of investors impacts on trading decisions. As Rubinstein (1993, page 473) states “In real life, differences in consumer behavior are often attributed to varying intelligence and ability to process information. Agents reading the same morning newspapers with the same stock price lists will interpret the information differently”. Given the evidence and arguments, it is of interest to investigate whether the momentum/contrarian differences identified in relation to typical trading behavior based on returns also apply in response to specific events, such as macroeconomic news announcements.

However, despite the stylized facts relating to the impact of macroeconomic announcements and of differential trading behavior, to date very few studies have investigated how different investor types trade following macroeconomic news. The first which has, is by Nofsinger (2001), who examines trading by institutional and individual investors around macroeconomic (and firm specific) announcements for NYSE stocks and finds significant differences in the behavior of the two types of investors in response to both good and bad macroeconomic news: both increase purchases following good news announcements, but individuals’ purchase rates are documented as being significantly higher than those of institutions; similarly, following bad news announcements institutions sell significantly more, but individual investors significantly less.⁴ The second study examining this issue, Erenburg et al. (2006), investigates the effect of major macroeconomic announcements on trading in S&P 500 index futures. The study identifies trader types as exchange local traders and off-exchange traders and the authors establish that off-exchange traders are slower to respond to macroeconomic news than are locals. However, while these two studies investigate the trading behavior of different investor types in response to macroeconomic news, they only examine the impact of U.S. macroeconomic news on trading in

⁴ Differences are also found in the trading behavior of institutions and individuals in response to firm-specific news.

U.S. assets. Moreover, no distinction is made in the prior studies between the trades of foreign and domestic investors in relation to macroeconomic announcements or in relation to the role of investor sophistication.

Furthermore, in seeking to understand responses to macroeconomic announcements it is important to recognize that different types of investors may be affected by home bias and may react to different macroeconomic shocks in making their purchase and sale decisions.

Considerable evidence exists to suggest that investors are characterized by home bias (see, for example, Cooper and Kaplanis, 1994; Kang and Stulz, 1997; Chan et al., 2005). In addition, investor recognition arguments (see, for example, the investor recognition hypothesis of Merton, 1987 and developments such as Shapiro, 2002) suggest that investors are better informed about, rely more on, and respond more to, information with which they are familiar, such as domestic assets and domestic news. This would suggest that within a given market, foreign and domestic investors may respond differentially to global, regional and local macroeconomic announcements. For example, in a market such as Korea domestic investors may respond to local macroeconomic announcements differently to the way in which they respond to global or regional market news. Similarly, the investor recognition argument is supported by Roque and Cortez (2014) who find that there are marked differences in the determinants of international investments for institutional and non-institutional investors. Thus, it is necessary not only to consider separately how foreign and domestic investors respond to a specific item of news, but also to recognize that different investors within a market may respond differently to a range of sources of macroeconomic news.

Prior literature suggests that investors respond in different ways to good and bad news.

Typically, higher than expected inflation or unemployment and lower than expected GDP are

viewed as bad news (and their opposites as good news). However, careful consideration needs to be given to possible macroeconomic policy responses to such news and the likely impact of any response on aggregate demand and, hence, expected future corporate earnings. In addition, not only has extant literature identified differential behavior in relation to market state (e.g. recession versus expansion),⁵ but also the state of the economy is likely to impact on expected macroeconomic policy responses to particular announcements. We, therefore, examine investor behavior relating to macroeconomic surprises in different market states.

Finally, the potential endogeneity problem has not been addressed by previous studies. In particular, if investor reactions are endogenously related to same day local returns then it is not possible to obtain unbiased and consistent OLS estimates. The possible existence of endogeneity needs to be examined if reliable conclusions are to be drawn.

To address all the issues identified, we utilize a data set consisting of daily purchases and sales volumes for local individuals, local institutions and foreign investors obtained from the Korea Stock Exchange (KSE).⁶ Korea is of particular interest in studies looking at the cross-border effects of news announcements due to its economic success over recent decades (GDP by PPP ranks 15th in the world and stock market capitalization 12th in the world (CIA, 2016)), the

⁵ For further evidence relating to asymmetric responses to good and bad news, see for example, Lee (1992), Nofsinger (2001), Andersen et al. (2003), Beber and Brandt (2010) and Chen and Ghysels (2011). Evidence in relation to the role of market state includes Cooper et al. (2004), Boyd et al. (2005), Beber and Brandt (2010) and Gavrilidis et al. (2013).

⁶ Buy-sell data is available for each of the three investor types on a daily basis for Korea. In addition, to investigate the impact of macroeconomic announcements on trading behavior using daily data, we require the announcements to be made outside of normal market trading hours. This is possible for Korea for a range of global, regional and local announcements, as discussed in section 2.2.

importance of both international and regional news flows from the US and Japan, and the Korean economy's dependence on exports by large quoted manufacturing firms affiliated with *chaebols*. Exports accounted for 50.3% of GDP in 2014 and these are heavily dominated by machinery, transport equipment and chemicals (OECD, 2016)). For our data set average trading volumes of foreigners, institutions and individuals correspond to 9%, 11% and 80% of total trading volume respectively. Using this data we construct daily order imbalances for each investor type to examine how different groups respond to key macroeconomic announcements, not only relating to the home market, but also announcements for the major regional market (Japan) and the major global market (U.S.). Given that we are concerned about responses to macroeconomic news, we extract from the announcement figures the expected value of the announcement to determine the unanticipated component. For the anticipated portion of these macroeconomic announcements we use survey expectations. As many studies have shown (e.g. Ederington and Lee, 1993; McQueen and Roley, 1993; Li and Hu, 1998), compared to econometric estimates survey expectations contain more recent information and so more accurately reflect contemporary market opinion. Survey forecasts have also been documented to be unbiased and efficient compared to econometric estimates (e.g. Pearce and Roley, 1985; McQueen and Roley, 1993). The data utilized for our analysis relates to a period of over 12 years, allowing us to examine separately both good and bad macroeconomic news and recessionary and expansionary periods. Our paper makes a number of important contributions to the literature. We provide the first examination of the response of investors to not only global (U.S.) macroeconomic news, but also regional (Japan) and domestic (Korea) announcements. Second, unlike previous studies we are able to examine separately the responses of foreign, local institutional and local individual investors to macroeconomic news. This is important given the evidence of differential behavior

of these groups in other areas of financial activity. Third, we perform detailed analysis across a range of characteristics (good/bad news, recessionary/expansionary periods) to allow a more detailed understanding of responses to macroeconomic news, possible policy responses and the role of investor type in these trading decisions. Fourth, unlike previous studies we adopt a methodology which allows us to take account of the fact that investor buy and sell decisions may be endogenously related to same day local returns.

In line with previous studies, the results of the empirical analysis are consistent with the view that less sophisticated local investors (individuals) respond in a manner opposite to their more sophisticated local counterparts (institutions) in relation to domestic macroeconomic shocks. However, the contrarian and momentum behavior associated with announcements is consistent with responses to expected macroeconomic policy responses, rather than simply whether the news is good or bad in the traditional sense. This suggests that even the least sophisticated investor type looks beyond the raw data to consider policy implications. In contrast, foreigners respond much less uniformly to the unexpected component of macroeconomic announcements, consistent with them being more sophisticated and anticipating the announcement more accurately. The findings demonstrate the need to take account of investor type when seeking to understand the impact of macroeconomic shocks on trading behavior.

The remainder of the paper is organized as follows: the next section develops hypotheses, sets out the methodology used in the analysis and provides more detail on the data set; we then present and discuss empirical results; the final section provides a summary and conclusion.

2. Data and Methodology

In this section we set out: the hypotheses to be examined; the macroeconomic data series used for the analysis; how we measure investor responses and macroeconomic announcement surprises; the development of the main model for investigating the reaction of investors to announcement surprises; and some important econometric issues which are taken into account.

2.1. Hypothesis development

The central issue of interest is how different investor types respond to global, regional and domestic macroeconomic surprises. As explained in the introduction, there is considerable evidence to suggest that less (more) sophisticated investors act as contrarian (momentum) traders. Grinblatt and Keloharju (2000) argue that foreign investors are the most sophisticated investors.⁷ They also argue that institutional investors are more sophisticated than individual investors since they have better access to research resources, invest more funds and spend more time on investment decisions. Vieru, Perttunen and Schadewitz (2006) show that active private investors react strongly in a contrarian manner to announcements, while institutions are less affected, suggesting that the institutions use a broader set of information. In light of the above arguments, particularly those concerning momentum and contrarian behavior, our first set of hypotheses are as follows:

Hypothesis (1a): Less sophisticated investors (i.e. local individuals) sell (buy) in response to good (bad) macroeconomic news.

⁷ Despite the claims of Grinblatt and Keloharju (2000), there remains debate as to whether foreign investors are the most sophisticated (see, for example, Kang and Stulz, 1997, Shukla and van Inwegen, 1995 and Chen et al. 2009). Nonetheless, for ease of exposition and given that some of the evidence against this view relates to foreign investors in highly developed markets (for example, Shukla and van Inwegen, 1995) we follow Grinblatt and Keloharju (2000) in referring to foreigners as the most sophisticated investor type.

Hypothesis (1b): More sophisticated investors (i.e. local institutions and foreigners) buy (sell) in response to good (bad) macroeconomic news.

In order to test these hypotheses a definition of good and bad news is required. Consistent with the standard macroeconomic view we treat as bad news higher than expected inflation, higher than expected unemployment and lower than expected GDP and good news as being the opposite of these. However, when considering the impact of macroeconomic announcements on investor behavior it is not sufficient only to consider whether news is good or bad in this sense. Rather, we also need to consider the possible macroeconomic policy responses and the likely impact of those responses on long-run company earnings and, hence, stock prices. For example, consider possible policy responses to bad news (see, for example, Taylor, 2000): in the face of higher than expected inflation (i.e. bad news on inflation), policymakers may seek to *reduce* future aggregate demand (for example, through an increase in interest rates or a tightening of fiscal policy); in contrast, policy responses to either lower than expected GDP figures (i.e. bad news on GDP) or higher than expected unemployment figures (i.e. bad news on unemployment), are likely to lead policymakers to seek to *increase* future aggregate demand (for example, through a reduction in interest rates or expansionary fiscal policy). Since aggregate demand is likely to impact on company earnings in the long-run (see, for example, Fama, 1981 and Boyd et al., 2005), *ceteris paribus* we would expect to see any stock trading response to bad (good) news on inflation, to be opposite to the response to bad (good) news for GDP and unemployment if investors respond to the likely policy response.⁸ Thus, assuming less (more) sophisticated investors are contrarian

⁸ There may be circumstances where this is not the case. For example, Japan was subject to deflation for most of our sample period (see, for example, Nishizaki et al., 2014). In such a period, higher (lower) than expected inflation might

(momentum) traders in relation to macroeconomic policy responses, rather than the news itself, then we have the following alternatives to hypotheses 1a and 1b:

Hypothesis (A1a): Less sophisticated investors (i.e. local individuals) sell (buy) in response to good (bad) news on inflation and bad (good) news on GDP and unemployment.

Hypothesis (A1b): More sophisticated investors (i.e. local institutions and foreigners) buy (sell) in response to good (bad) news on inflation and bad (good) news on GDP and unemployment.

The two sets of hypotheses differ in respect to responses to GDP and unemployment shocks, but are the same in relation to inflation surprises. By considering these two sets of alternative hypotheses, insight will be gained into whether investors of varying degrees of sophistication respond to the raw shock or expected policy responses. These arguments would appear to hold true for domestic investors (institutions and individuals) for the three types of news: global; regional; and local, although given prior evidence on differential behavior there may be different responses from institutions and individuals. For example, institutions may pay more (less) attention to global or regional (local) news than individuals. Furthermore, the impact on buy-sell decisions is likely to vary across the three types of shocks: for example, policies to reduce aggregate demand in Korea may affect future earnings more than policies relating to the regional or global market. For foreign investors consideration also needs to be given to the impact of such

be viewed as good (bad) news. However, higher than expected inflation, even in a deflationary period, brings forward the time when interest rates may rise, impacting negatively on long-run company earnings. Nonetheless, investor responses to lower than expected inflation in Japan may be ambiguous and/or different to those for lower than expected inflation in the U.S., where deflation was not an issue during the sample period.

policy responses on the exchange rate, since the return from their buy-sell decisions will be impacted by currency movements. Thus, foreign investors can be expected to respond differently to domestic investors following announcement surprises.⁹

Finally, for reasons discussed earlier, it is necessary to take account of the state of the market. It is likely that less sophisticated investors will be more strongly influenced by market confidence than will more sophisticated investors.¹⁰ It is, therefore, necessary to consider these features when seeking to gain a full understanding of investor responses to macroeconomic news. This leads to the following hypotheses:

Hypothesis (2a): Investor responses to macroeconomic announcements will vary with the state of the economy (recession or expansion).

Hypothesis (2b): There will be more significant differences in response between recessionary and expansionary periods for less sophisticated investors than for more sophisticated investors.

2.2. *Macroeconomic Announcements*

⁹ Arguments relating to home bias and investor recognition, discussed earlier, would strengthen this tendency to differential behaviour.

¹⁰ We use “market confidence” and “investor sentiment” interchangeably, with consideration given to expansionary and recessionary periods, since such periods are expected to coincide with greater optimism and pessimism. Behavioral theories posit that investors may form erroneous stochastic beliefs, either with excessive optimism or pessimism, and therefore incorrectly evaluate asset values, causing asset prices to deviate from their intrinsic values (see for example De Long et al., 1990, Lee et al., 1991, and Kumar and Lee, 2006). There is a voluminous literature examining the impact of investor confidence on a range of financial issues. See, for example, Baker and Wurgler (2006), Antoniou et al. (2013) and Galariotis et al. (2016).

In order to examine the central issues in this paper, relating to how different investor types respond to global, regional and local macroeconomic surprises, we use announcements from the U.S. (to capture global news), Japan (regional news) and the market under investigation, Korea (domestic news). A number of announcements are considered, to capture a range of features of macroeconomic activity globally, regionally and locally, although given the focus on surprises, we can only include those announcements for which forecasts are available. Furthermore, given the use of daily data for measuring trading responses, we can only include announcements which are made outside of trading hours in Korea¹¹. To determine how investors respond to surprises relating to real economic activity, we include in our analysis unexpected components relating to inflation, GDP and unemployment. For inflation and GDP we have forecast data for all three countries examined. For all announcements we check the time at which the news was released. We only analyze responses to announcements made outside of trading hours in Korea. For inflation in Korea, some announcements were made during trading hours and some outside of trading hours. We only include the latter in our sample. All the unemployment rate announcements for Korea were made within trading hours. Therefore, local unemployment shocks are excluded from our analysis, but global and regional announcements on unemployment are examined. The announcements, which are all on a quarterly or monthly basis are as shown in table 1, together with relevant details (number of announcements in the sample period included in the analysis, start and end dates and sources).

¹¹ For this reason, we are unable to include such announcements as exports, trade balance and industrial production in our analysis, because most of each of these announcements are released when the market is open. China's announcements are also released when the market is open.

Table 1: Macroeconomic announcement data

Announcement	No. of announcements	Monthly or Quarterly	Start date	End date	Source	Positive surprise			Negative surprise		
						Mean	Maximum	Minimum	Mean	Maximum	Minimum
U.S.											
Consumer price index	185	M	14/01/2000	22/05/2015	Bureau of Labor Statistics	0.3420	3.0488	0.0000	-0.3873	0.0000	-3.0488
GDP	185	M	28/01/2000	29/05/2015	Bureau of Economic Analysis	0.3358	3.4858	0.0000	-0.3791	0.0000	-3.4857
Unemployment rate	185	M	01/07/2000	05/08/2015	Bureau of Labor Statistics	0.2767	2.6576	0.0000	-0.4924	0.0000	-3.3245
Japan											
Consumer price index	74	M	31/03/2000	27/03/2015	Bank of Japan	0.3198	1.9724	0.0000	-0.2799	0.0000	-1.9724
Gross domestic product	43	Q	06/08/2000	03/09/2015	Economic Planning Agency	0.3587	1.9283	0.0000	-0.4395	0.0000	-3.4709
Unemployment rate	91	M	29/02/2000	27/03/2015	Statistics Bureau	0.5285	4.2433	0.0000	-1.0103	0.0000	-7.0127
Korea											
Consumer price index	101	M	31/05/2001	05/01/2015	Ministry of Finance and Economy	0.2628	2.7322	0.0000	-0.5488	0.0000	-2.3419
Gross domestic product	46	Q	21/11/2003	23/04/2015	Bank of Korea	0.1868	1.7541	0.0000	-0.2174	0.0000	-6.1393

Note: Standard deviations are not shown because the standard deviation is one for all variables. Announcements were only included if the announcement was made when the Korean stock market was closed. US GDP figures are published quarterly but revised monthly.

2.3. Measuring Investor Responses to Macroeconomic Announcement Surprises

To examine how different types of investors respond to macroeconomic news releases, we need a proxy for investor reaction (IR) as the dependent variable. In line with the literature (see, e.g., Lakonishok, Shleifer, and Vishny, 1992; Chordia and Subrahmanyam, 2004; Li and Wang, 2010), we utilize the buy-sell imbalance of each investor type calculated as follows:

$$IR_{i,t} = \frac{(buy_{i,t} - sell_{i,t})}{(Total\ trading\ volume_t)} \quad (1)$$

$IR_{i,t}$ is the buy-sell imbalance and buy (sell) denotes the total volume of shares purchased (sold) by investor class i during day t . The different investor types, i , are foreigner, local institutions and local individuals. Total trading volume $_t$ is the total of the trading volume across all investor types during day t . The buy-sell imbalance is calculated from data of daily purchases and sales volumes for the three types obtained from the Korea Stock Exchange (KSE).¹² There are six daily series in total: buys and sells of local individual investors, local institutions and foreign investors. The data cover the period from 2000 to 2015.

Note that our dependent variable is not the trading imbalance of total volume, since we already know that there can be no imbalance in the total volume, but rather the imbalance in trading volume for each of the three types of investor. With our data set, it is not possible to know whether trades are buyer initiated or seller initiated, since these transactions are compiled after the market closes each day.

¹² The reactions of different types of investors to macroeconomic announcements are examined on a daily basis. Intraday data would not be consistent with the idea that investors need some time to process news; on the other hand, monthly or quarterly data would make it difficult to differentiate the impact of macroeconomic news from other information.

The central issue of concern is how investors respond to the unexpected component (or surprise) of macroeconomic news announcements at the local, regional and global level. To determine the surprise element of any announcement we must first have a measure of the expected value of the announcement. We obtain this from survey data and use the median of analysts' expectations as our estimate of the market's expectation of that particular announcement. Our expectations data is from the Bloomberg News Service. Bloomberg is a consistent source of data on macroeconomic announcements for various countries, which is widely used by investors, analysts and traders. Bloomberg surveys commercial and investment banks on their expectations for a wide range of macroeconomic announcements. Bloomberg calendars of events are published on a regular basis and are available to a broad investor community. Bloomberg records and preserves the announced value of macroeconomic variables, in addition to the revised values. This is an important distinction, as macroeconomic data is often revised in the months following its initial release. Because we are concerned only with the immediate response of investors to macroeconomic surprises, we need the actually announced data. We calculate the surprises in macroeconomic announcements as the difference between the actual data value at announcement and the median value of the most recent analysts' expectations prior to the announcement. Since many of the economic variables have different units of measurement, we use standardized surprises to compare the responses to different macroeconomic announcements. Standardization is achieved by dividing each announcement surprise by its sample standard deviation, following Balduzzi et al. (2001):

$$S_{k,m,t} = \frac{A_{k,m,t} - F_{k,m,t}}{\sigma_{k,m}} \quad (2)$$

Where $S_{k,m,t}$ denotes the standardized surprise of announcement k in country m on day t ; $A_{k,m,t}$ denotes the actual released value for announcement k in country m on day t ; $F_{k,m,t}$ is the median of the forecast survey for announcement k in country m on day t ; and $\sigma_{k,m}$ is the standard deviation across the sample period of announcement k in country m .¹³ Country m relates to the U.S., Japan and Korea. As stated above, we consider the impact of three global (U.S.) announcements, three regional (Japan) announcements and two local announcements (Korea).¹⁴

2.4. Main model development

To examine the response of investors to macroeconomic surprises we start with the following model:

$$IR_t^i = \alpha + \beta_{k,m}^i \times \Pi_{k,m,t} + \sum \phi_{r,m}^i \times \Pi_{r,m,t} + e_t^i \quad (3)$$

IR_t^i denotes the investor reaction of investor type i during day t ; $\Pi_{k,m,t}$ denotes the news component of announcement k in country m on day t ; and $\Pi_{r,m,t}$ denotes the news component of announcement r in other macroeconomic releases when they coincide with an announcement k of country m .¹⁵

¹³ Standardizing in this way facilitates comparison of the quantitative importance of the estimated responses, since a unit variance is guaranteed for all surprises of the macroeconomic variables.

¹⁴ Recall that as the unemployment announcements for Korea are made during trading hours, these are excluded from our analysis.

¹⁵ The last set of variables, $\Pi_{r,m,t}$, is included because some U.S. macroeconomic data announcements are made on the same day.

Previous studies of emerging markets (see for example Richards, 2005) have found significant correlations between foreigners' purchases and lagged local market returns. These studies have also documented substantial positive autocorrelations in daily net purchases of foreign investors. In line with previous findings, our preliminary analysis shows that the first two lags of net purchases of each investor type and the previous day's local market returns are significant in the equations for all investor types.

Similarly, previous studies have also found that lagged returns in mature markets such as the U.S. are helpful in explaining equity flows into emerging countries (see, for example, Griffin et al., 2004). However, due to the time difference between the United States and Asia, the impact of U.S. announcements appears during the first trading period of the following day. This delay might lead to a problem in differentiating the impact of U.S. macroeconomic announcements from other overnight information. To minimize any problems which this might cause we follow Wongswan (2006) and use the value of the daily net-of-announcement-effect return on the S&P 500 to control for other overnight information that may impact the Korean market. We compute the net-of-announcement-effect return as the return during the U.S. trading day (open to-close) minus the return over the 30 minutes following the announcement. As with lagged net purchases and local market returns, we find that the previous day's net-of-announcement-effect return on the S&P 500 is significant in each equation. Finally, we need to consider that investor sentiment and contemporaneous local market return may be correlated. Previous studies of emerging markets (e.g. Richards, 2005) have found significant correlations between foreign investors' net purchases (a measure of investor sentiment) and the contemporaneous local market return. To control for such correlation between investor sentiment and domestic returns, we include same-

day return as a control variable. We therefore augment Equation (3) with control variables \mathbf{y}_t and LR_t as follows:

$$IR_t^i = \alpha + \beta_{k,m}^i \times \Pi_{k,m,t} + \sum \phi_{r,m}^i \times \Pi_{r,m,t} + \mathbf{c}\mathbf{y}_t + \eta LR_t + e_t^i \quad (4)$$

where \mathbf{y}_t is a 1x4 vector of variables (the first two lags of net purchases of investor group i , the previous day's local market return and the net-of-announcement-effect return on the S&P 500 for the previous trading day), \mathbf{c} is a vector of coefficients, LR_t is local returns on day t and η is the corresponding coefficient.¹⁶

Investor responses to the unexpected component of macroeconomic announcements are likely to be different depending on whether the news is seen as positive or negative, for reasons set out earlier. However, Equation (4) does not take this into account. Indeed, the impact of estimates from Equation (4) cannot be readily interpreted.¹⁷ Therefore, rather than estimating Equation (4), we extend our basic model allowing investor reactions to depend on whether the news surprise is good or bad. Details are set out in Equation (5).

Reaction to economic announcements conditional on the sign of the news:

¹⁶ For local market returns, we use the KOSPI index (obtained from the Korea Stock Exchange) which includes all common stocks listed on the Korea Stock Exchange. Local market returns are computed by taking the first difference of the log of the daily price index that is readjusted for stock dividends.

¹⁷ Specifically, on the basis of Equation (4), a positive (negative) estimate can either mean that a particular investor type buys (sells) after announcements that are higher than forecast or sells (buys) following announcements that are lower than forecast, or both. Such estimates would not provide real insight.

$$\begin{aligned}
IR_t^i &= \alpha_{Bad}^i \times Bad + \alpha_{Good}^i \times Good + \beta_{Bad,k,m}^i \times Bad \times \Pi_{k,m,t} \\
&+ \beta_{Good,k,m}^i \times Good \times \Pi_{k,m,t} + \sum \varphi_{r,m}^i \times \Pi_{r,m,t} + \mathbf{c}y_t + \eta LR_t + e_t^i
\end{aligned}
\tag{5}$$

Bad and Good are zero-one dummy variables for bad news and good news respectively.

Bad = 1 if the surprise at time t is ‘bad’, and zero otherwise;

Good = 1 if the surprise at time t is ‘good’, and zero otherwise.

We categorize each news item as good or bad news as discussed in section 2.1. All other variables are defined as in Equation (4).¹⁸

Investor responses to the unexpected component of macroeconomic announcements are also likely to be different depending on whether the announcements are made during recessions or expansionary periods for reasons set out in the introduction and section 2.1. To take account of the impact of market state Equation (5) is augmented to examine reactions to economic announcements conditional on both the nature of the news (good or bad) and the state of the market:

$$\begin{aligned}
IR_t^i &= \alpha_{Bad,Rec}^i \times Bad \times Rec + \alpha_{Bad,Exp}^i \times Bad \times Exp + \alpha_{Good,Rec}^i \times Good \times Rec \\
&+ \alpha_{Good,Exp}^i \times Good \times Exp + \beta_{Bad,Rec,k,m}^i \times Bad \times Rec \times \Pi_{k,m,t} + \\
&\beta_{Bad,Exp,k,m}^i \times Bad \times Exp \times \Pi_{k,m,t} + \beta_{Good,Rec,k,m}^i \times Good \times Rec \times \Pi_{k,m,t} \\
&+ \beta_{Good,Exp,k,m}^i \times Good \times Exp \times \Pi_{k,m,t} + \sum \varphi_{r,m}^i \times \Pi_{r,m,t} + \mathbf{c}y_t + \eta LR_t + e_t^i
\end{aligned}
\tag{6}$$

¹⁸ We follow an event study approach. Therefore, the regression estimates are based only on data for those days on which a news announcement was made. On this basis, we have 8 announcement types and three different investor groups. Therefore, we have 24 separate equations to estimate.

Where Rec and Exp are zero-one dummy variables for recessionary periods and expansionary periods respectively.

Rec = 1 if the economy is in a recessionary state at time t , and zero otherwise;

Exp = 1 if the economy is in an expansionary state at time t , and zero otherwise.

The recessionary and expansionary periods are different for each country. The state of the market (recession/expansion) is taken from the NBER defined periods for the U.S. and from the OECD defined periods for Japan and Korea.¹⁹ All other variables are defined as in Equation (4).

2.5. *Econometric estimation issues*

Equations (5) and (6) are the basis for our investigation of investor responses to surprises in a range of macroeconomic announcements. However, investor reactions may also be endogenously related to same day local returns.²⁰ If endogeneity is present, unbiased and consistent OLS estimates cannot be obtained due to the regressor-error correlation. In such cases instrumental variables (IV) or the Generalized Method of Moments (GMM) provide general solutions to obtaining consistent estimators. Unfortunately, if the OLS estimator is unbiased and consistent we inevitably lose efficiency when using IV or GMM. It is, therefore, necessary to test for the endogeneity of the same-day local returns to decide whether we need to use IV or GMM. To test

¹⁹ See <http://www.nber.org/cycles.html> and <http://www.oecd.org/std/leading-indicators/oecdcompositeleadingindicatorsreferenceturningpointsandcomponentseries.htm>.

²⁰ The relationship between trading flows and local returns involves a bi-directional interaction with lagged responses. As the contemporaneous correlation can also result from a possible endogeneity relationship between investors' purchases and local return, the vector autoregression (VAR) methodology has been widely used in this line of the literature. Using actual trade-by-trade data, contemporaneous causality is assumed to run from net purchases to prices, but not vice versa (see, for example, Hasbrouck, 1991).

this we need to find a set of instrumental variables. Following Richards (2005) we consider the use of same-day returns of other countries in the same region (Indonesia, Taiwan, Philippines, Hong Kong, Japan, Australia, Singapore, China and Malaysia) as instruments, since the returns in these markets are not expected to be determined by the net purchases of investors in the Korean market. To avoid problems associated with too many over-identifying restrictions we prefer to be parsimonious in the choice of instruments. On this basis, after preliminary tests we choose the two or three markets out of these nine which have the strongest correlations with Korean market returns and which passed the first stage regression with the highest F-statistic.²¹ In the presence of homoscedastic errors IV is preferable to GMM. We, therefore, also check for heteroscedasticity in the IV regression residuals to decide whether to employ IV or GMM. Having completed endogeneity analyses in each equation,²² we would like to go forward and estimate the empirical specification in Equations (5) and (6) for each equation separately, via OLS (in the absence of same day local return endogeneity) or via IV/GMM (if it is present). However, as mentioned previously, how investors react to macroeconomic news is estimated

²¹ In approximately 90% of the estimations the highest F statistic was achieved with two markets. In the remainder of cases three markets were needed to obtain the highest F statistic. The markets were different for each of the 48 separate equations (there are 24 equations for each of the two specifications in Equations (5) and (6)). We do not present the results here for the sake of brevity, but they are available from the authors on request.

²² Classical diagnostic tests for instrument relevance (the underidentification test and the weak identification test) are not valid in the presence of non-i.i.d errors. Robust versions of these tests are employed when the i.i.d assumption is violated: for the underidentification test, the LM version of the Anderson (1951) canonical correlations test is replaced with the LM version of the Kleibergen-Paap (2006) rk statistic; for the weak identification test, an F version of the Cragg-Donald Wald statistic is replaced with the robust Kleibergen-Paap Wald rk F statistic. Since we test 48 separate equations, we do not present the results here for the sake of brevity, but they are available from the authors on request.

only for days on which announcements are released, and we have three separate equations for each announcement. Since these three types of market player trade with each other, correlation is likely to be present between the residuals of the three equations. Therefore, in the absence of endogeneity we employ the Seemingly Unrelated Regressions method (SUR) that estimates the parameters of the system simultaneously. Using SUR we can place constraints on the coefficients across equations, while accounting for correlations in the residuals across equations. However, SUR does not handle equations with endogenous regressors. When some of the equations in the system have endogenous regressors, SUR is inconsistent. In this case we set the system up as a GMM system which allows joint estimation with a different instrument list for each equation. In this set up, it is possible to keep local return in the equation, while excluding instruments from that equation in the absence of endogeneous regressors. It is also possible to exclude local return while including instruments in the presence of endogeneous regressors. As a result, to estimate the parameters of the system we employ SUR estimators when there is no endogeneous regressor in any equation in the system and GMM estimators when there is an endogeneous regressor in at least one equation in the system.²³

3. Investor responses to macroeconomic surprises: empirical results

Analysis begins by estimating Equation (5) for each of the three investor types for the whole sample period, with table 2 presenting the results for CPI announcements and tables 3 and 4 those relating to GDP and unemployment news respectively. In the interests of brevity the table

²³ We employ the GMM Continuously Updated Weight Matrix as a system estimator. This recalculates the weight matrix at each iteration during the estimation.

presents estimated coefficients relating to the responses to announcement surprises only.²⁴ To ease interpretation and discussion of results, in the tables we show estimated coefficients after adjustment of their signs so that a negative value always reflects selling and a positive value buying, irrespective of the type of announcement and whether the news is good or bad.²⁵ The first three columns in the tables report the coefficient for bad news and for good news ($\beta_{k,m}^{BAD}$ and $\beta_{k,m}^{GOOD}$) and the associated standard error for each announcement for each investor type (foreigners, local institutions and local individuals), as well as Wald tests of equality of the two coefficients for each investor type (test statistic and associated probability).^{26,27} The final three columns in each table show results for Wald tests for differences in the estimated coefficients between pairs of each of the three groups, together with the associated probabilities.

²⁴ Results relating to the control variables are available from the authors on request.

²⁵ Without this adjustment interpretation/discussion of the estimated coefficients would be extremely complex. To illustrate, for CPI announcements, bad (good) news occurs if CPI is greater (lower) than expected. As a result an estimated positive (negative) coefficient for CPI bad news indicates investors respond by buying (selling), whereas for good news an estimated positive (negative) coefficient indicates selling (buying). The same argument applies to unemployment announcements where unemployment higher than expected is bad news. However, the opposite holds true for GDP announcements, since bad news arises when GDP is lower than expected. Thus, the estimated coefficients are reported in the table for CPI bad news, unemployment bad news and GDP good news. For the other three categories, each coefficient reported in the table is the estimated coefficient multiplied by minus one. In the text we will refer to signs based on the values reported in the tables.

²⁶ The tests of equality between good and bad news are based on the estimated coefficients, rather than the reported (adjusted) coefficients explained in footnote 24.

²⁷ Our results always relate to the unexpected component of announcements, as described above. We will use the terms surprises, shocks, unexpected component and announcement interchangeably to refer to this measure. Thus, when we refer to an announcement, we actually mean the unexpected component.

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Table 2: Responses of different types of investor on the Korea Composite Index to good and bad CPI news, with tests for differences between good news versus bad news and different responses from different types of investor

Announcement	Investor response by			Equality test II		
	Foreigners	Institutions	Individuals	Foreigners vs Institutions	Foreigners vs Individuals	Institutions vs Individuals
Bad news - US	0.0004 (0.0024)	-0.0015 (0.0030)	0.0006 (0.0031)	0.1943 [0.66]	0.001 [0.97]	0.1356 [0.71]
Good news - US	-0.0003 (0.0014)	0.0009 (0.0023)	-0.0006 (0.0021)	0.1294 [0.72]	0.0185 [0.89]	0.1282 [0.72]
Equality test (bad vs good) – US	0.0019 [0.96]	0.0259 [0.87]	0.0003 [0.98]			
Bad news - Japan	-0.0012 (0.0022)	0.0007 (0.0026)	0.0006 (0.0023)	0.2128 [0.64]	0.279 [0.6]	0.0017 [0.97]
Good news - Japan	-0.0014 (0.0017)	0.0026 (0.0024)	-0.0012 (0.0022)	1.236 [0.27]	0.0022 [0.96]	0.8196 [0.37]
Equality test (bad vs good) – Japan	0.7915 [0.37]	0.6187 [0.43]	0.0370 [0.85]			
Bad news - Korea	0.0014 (0.0022)	-0.0086 (0.0026)***	0.0068 (0.0024)***	5.8824 [0.015]**	1.9252 [0.17]	12.0318 [0.00]***
Good news - Korea	-0.0009 (0.0017)	-0.0016 (0.0022)	0.0033 (0.0020)	0.0439 [0.83]	1.9902 [0.16]	1.6631 [0.2]
Equality test (bad vs good) – Korea	0.0228 [0.88]	5.7669 [0.02]**	6.7535 [0.00]***			

Note: The first three results columns show the coefficients and standard errors in () of the estimated responses of the three types of investor on the Korea Composite Index to good versus bad CPI news, with tests for a difference on response for good versus bad news. Underneath them and in results columns four to six the equality tests show the results of Wald Test coefficient restrictions, i.e. the F-test value and its related Chi-squared probability in []. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. To ease interpretation the reported coefficients for good news are equal to the estimated coefficient multiplied by minus 1, to ensure that in all cases a negative reported coefficient indicates sell and a positive reported coefficient buy.

We first consider responses to inflation announcements. For both global and regional shocks, the results do not offer support for hypotheses 1, 1b, A1a or A1b: examination of the first two rows of table 2 reveals that all three investor types have no significant response to either bad or good U.S. news on inflation. Similarly, there are no significant differences in the responses to bad and good surprises or between the different investor types for either sign of news: the next three rows of table 2 show similar findings for Japanese inflation announcements. Again there are no significant coefficients and no significant differences for either the sign of the news or between investor types. Taken together, these results suggest that global and regional inflation surprises do not lead to identifiable patterns in trading behavior on the part of investors in the Korean market. While these global and regional results do not support hypotheses 1a, 1b, A1a or A1b, this is possibly because such news is not seen as directly relevant. However, results relating to Korean inflation shocks are different. While foreign investors again have no significant response to either bad or good Korean inflation news (also not consistent with our hypotheses 1a, 1b, A1a or A1b), local individuals have a positive response (buy more) when there is bad news about Korean inflation, while the reaction of local institutions is negative.

The final three columns show that there are significant differences in response between local institutions and the other two investor types. The results in relation to Korean inflation are consistent with negative (positive) feedback trading for individuals (institutions) and, thus, with hypotheses 1a and 1b and A1a and A1b in respect of bad news for the two local groups.²⁸

However, this is not the case as far as good news is concerned: there is no significant coefficient for any of the investor types and no significant differences between the three groups.

Nonetheless, for the two local investor types the trading response to bad and good Korean

²⁸ Recall, in relation to inflation the two sets of hypotheses (1a/1b and A1a/A1b) are the same.

inflation news is significantly different. The finding that the most sophisticated investor type (foreigners) has no significant response to inflation news may be due to the news being less of a surprise to this group, given their superior research capabilities. In contrast, while global and regional inflation shocks do not impact on the trading behavior of either local institutions or local individuals, both groups respond to bad local inflation news, but in opposite directions, consistent with the hypothesized relationships for more and less sophisticated investor types.

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Table 3: Responses of different types of investor on the Korea Composite Index to good and bad GDP news, with tests for differences between good news versus bad news and different responses from different types of investor

Announcement	Investor response by			Equality test II		
	Foreigners	Institutions	Individuals	Foreigners vs Institutions	Foreigners vs Individuals	Institutions vs Individuals
Bad news – US	0.0015 (0.0015)	0.0015 (0.0020)	-0.0025 (0.0018)	0 [0.99]	2.5192 [0.11]	1.3886 [0.24]
Good news – US	0.0012 (0.0014)	0.0035 (0.0025)	-0.0050 (0.00204)**	0.4755 [0.49]	6.2803 [0.01]**	4.0617 [0.04]**
Equality test (bad vs good) – US	1.1988 [0.27]	1.9951 [0.16]	6.0717 [0.013]**			
Bad news - Japan	0.0040 (0.0026)	-0.0058 (0.0027)**	0.0015 (0.0021)	4 [0.045]**	0.4253 [0.51]	3.068 [0.08]*
Good news - Japan	-0.0019 (0.0071)	-0.0008 (0.0046)	0.0018 (0.0061)	0.0121 [0.91]	0.0887 [0.77]	0.095 [0.76]
Equality test (bad vs good) – Japan	0.0671 [0.79]	1.1014 [0.29]	0.2279 [0.63]			
Bad news - Korea	-0.0048 (0.00101)***	0.0058 (0.0014)***	-0.0029 (0.00105)***	26.058 [0.00]***	1.5082 [0.22]	16.4401 [0.00]***
Good news - Korea	0.0024 (0.0038)	-0.0010 (0.0093)	0.0001 (0.0083)	0.0802 [0.78]	0.0864 [0.77]	0.0041 [0.95]
Equality test (bad vs good) – Korea	0.3856 [0.53]	0.2363 [0.63]	0.1137 [0.74]			

Note: The first three results columns show the coefficients and standard errors in () of the estimated responses of the three types of investor on the Korea Composite Index to good versus bad GDP news, with tests for a difference on response for good versus bad news. Underneath them and in results columns four to six the equality tests show the results of Wald Test coefficient restrictions, i.e. the F-test value and its related Chi-squared probability in []. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. To ease interpretation the reported coefficients for bad news are equal to the estimated coefficient multiplied by minus 1, to ensure that in all cases a negative reported coefficient indicates sell and a positive reported coefficient buy.

Turning to GDP surprises, the first three rows of table 3 show that only local individuals have a statistically significant response to global shocks, while only local institutions do for regional news, suggesting limited support for our hypotheses. Specifically, all three groups have insignificant trading responses to bad U.S. GDP news, while local individuals respond negatively to global good news (the difference in response between this group and the other two groups is statistically significant, as is the difference in response of local individuals to good and bad news). The sign of the significant coefficient is in line with hypothesis 1a, but contrary to A1a. For Japanese GDP shocks, the only significant trading response is from local institutions to bad news, where the coefficient is negative, again consistent with hypothesis 1b and not A1b. A different picture emerges for Korean GDP shocks: good news on GDP elicits no significant responses, but all three investor types have significant responses to bad news, with the differences between institutions and the other two groups being significant. The responses to Korean GDP bad news are positive for institutions and negative for the other two investor types. These results contrast with the finding that local institutions sold following bad news on inflation, while local individuals bought. Thus, for local news, the findings for the two investor groups are consistent with hypotheses A1a and A1b, suggesting that when it comes to local news, rather than global or regional shocks, local individuals (institutions) trade in a way consistent with being contrarian (momentum) traders in respect of likely macroeconomic policy responses. However, this is not the case for foreign investors, possibly reflecting arguments discussed in section 2.1 that the responses of this investor type are more complex, due to, for example, the impact on exchange rates.

Table 4: Responses of different types of investor on the Korea Composite Index to good and bad unemployment news, with tests for differences between good news versus bad news and different responses from different types of investor

Announcement	Investor response by			Equality test II		
	Foreigners	Institutions	Individuals	Foreigners vs Institutions	Foreigners vs Individuals	Institutions vs Individuals
Bad news - US	-0.0003 (0.0020)	0.0019 (0.0027)	-0.0011 (0.0023)	0.2726 [0.6]	0.0589 [0.81]	0.4163 [0.52]
Good news - US	0.0005 (0.0013)	0.0033 (0.0024)	-0.0030 (0.0024)	0.8285 [0.36]	1.4181 [0.23]	1.8979 [0.17]
Equality test (bad vs good) – US	0.0041 [0.94]	1.6923 [0.19]	1.2041 [0.27]			
Bad news - Japan	-0.0006 (0.0009)	-0.0009 (0.0012)	0.0018 (0.001)*	0.0254 [0.087]	3.0173 [0.08]*	1.7537 [0.19]
Good news - Japan	-0.0015 (0.0008)*	0.0010 (0.0014)	0.0004 (0.0009)	1.4107 [0.23]	4.3014 [0.04]**	0.0872 [0.76]
Equality test (bad vs good) – Japan	2.2905 [0.13]	0.0024 [0.96]	1.8491 [0.17]			

Note: The first three results columns show the coefficients and standard errors in () of the estimated responses of the three types of investor on the Korea Composite Index to good versus bad unemployment news, with tests for a difference on response for good versus bad news. Underneath them and in results columns four to six the equality tests show the results of Wald Test coefficient restrictions, i.e. the F-test value and its related Chi-squared probability in []. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. To ease interpretation the reported coefficients for good news are equal to the estimated coefficient multiplied by minus 1, to ensure that in all cases a negative reported coefficient indicates sell and a positive reported coefficient buy.

Table 4 reports results relating to good and bad unemployment news, although there are no findings for Korea, due to the fact that unemployment announcements in Korea are made within trading hours. Once again global shocks do not lead to significant trading responses from any of the three investor types, thus offering no support for our hypothesized relationships. Japanese unemployment surprises elicit a significantly positive response from local individuals to bad news and a significantly negative response from foreigners to good news. While the results for local individuals are in line with hypothesis 1a, but not for A1a, those for foreigners are consistent with A1b, but not 1b. The differences in response between foreigners and local individuals are statistically significant for both signs, but the differences within a group between good and bad news are not statistically significant.

Overall, the findings from tables 2-4 suggest that the responses of different investor types to macroeconomic shocks are more complex than previous literature has suggested. Specifically, for local investors significant results for global and regional shocks are consistent with hypotheses 1a and 1b, while for Korean surprises they are consistent with hypotheses A1a and A1b. This suggests that local investors ignore possible macroeconomic policy implications and focus only on the news itself when determining whether macroeconomic news is good or bad for global and regional shocks, but take account of likely domestic macroeconomic policy responses when trading following Korean macroeconomic shocks.²⁹ In contrast, the two significant

²⁹ These conclusions concerning which information local investors use when making trading decisions rely on the prior assumption that local individuals are negative feedback traders and local institutions are positive feedback traders. An alternative is to not make this assumption and only consider how different investors respond to the raw surprise, rather than the likely policy responses. On this basis, local individuals (institutions) would be acting as contrarian (momentum) traders in relation to bad news on Korean inflation, but momentum (contrarian) traders in

coefficients for foreign investors are consistent with hypothesis A1b for regional shocks and 1b for domestic surprises. In addition, the evidence suggests that bad news (negative shocks) is of more importance in terms of generating systematic responses, particularly in relation to local news; five of the six coefficients for domestic surprises are significant in relation to bad news, with none of six being significant for good domestic news. The finding that responses are stronger in relation to bad news suggests that sentiment may play a part in decision making. We, therefore, turn to consider how the state of the economy impacts on responses to macroeconomic announcements.

relation to bad news on Korean GDP. Such inconsistent behaviour within each group appears unlikely and would be hard to understand. This is not the case if we consider responses are made on the basis of expected macroeconomic policy responses: in this case, individuals are consistently contrarian traders with respect to local shocks and institutions consistently momentum traders.

Table 5: Responses of different types of investor in South Korea to CPI announcements during recessionary and expansionary periods, with tests for differences between the two periods and for different responses from different types of investor

Announcement	Investor response by			Equality test II		
	Foreigners	Institutions	Individuals	Foreigners vs Institutions	Foreigners vs Individuals	Institutions vs Individuals
Panel A: US						
Bad news – recession	-0.0027 (0.0038)	0.0024 (0.0041)	0.0000 (0.0029)	0.5029 [0.48]	0.2657 [0.6]	0.1562 [0.69]
Bad news – expansion	0.0021 (0.0026)	-0.0040 (0.0034)	0.0011 (0.0043)	2.0129 [0.16]	0.0258 [0.87]	0.4865 [0.49]
Equality test I (recession vs expansion)	1.2297 [0.27]	1.5698 [0.21]	0.0479 [0.83]			
Good news – recession	0.0002 (0.0023)	0.0052 (0.0027)**	-0.0050 (0.0029)*	1.6192 [0.2]	1.3194 [0.25]	4.0249 [0.04]**
Good news – expansion	-0.0001 (0.0015)	-0.0017 (0.0026)	0.0013 (0.0024)	0.1942 [0.66]	0.2020 [0.65]	0.3657 [0.54]
Equality test I (recession vs expansion)	0.0155 [0.9]	4.2933 [0.04]**	3.4698 [0.06]*			
Panel B: Japan						
Bad news – recession	0.0023 (0.0036)	-0.0054 (0.0044)	0.0036 (0.0031)	1.0269 [0.31]	0.1179 [0.73]	1.8155 [0.18]
Bad news – expansion	-0.0024 (0.0026)	0.0023 (0.0032)	-0.0003 (0.0028)	0.8104 [0.37]	0.2219 [0.64]	0.2408 [0.62]
Equality test I (recession vs expansion)	1.1292 [0.29]	2.2851 [0.13]	1.1043 [0.29]			
Good news – recession	-0.0013 (0.0039)	-0.0014 (0.0043)	0.0015 (0.0065)	0.0000 [0.99]	0.0871 [0.77]	0.0811 [0.77]
Good news – expansion	0.0004 (0.0018)	0.0007 (0.0023)	-0.0015 (0.0018)	0.0061 [0.94]	0.4611 [0.5]	0.3305 [0.57]
Equality test I (recession vs expansion)	0.1852 [0.67]	0.2226 [0.64]	0.2189 [0.64]			

Announcement	Investor response by			Equality test II		
	Foreigners	Institutions	Individuals	Foreigners vs Institutions	Foreigners vs Individuals	Institutions vs Individuals
Panel C: Korea						
Bad news – recession	0.0042 (0.0032)	-0.0103 (0.0023)***	0.0069 (0.0034)**	10.5522 [0.00]***	0.1982 [0.65]	12.7131 [0.00]***
Bad news – expansion	-0.0001 (0.0024)	-0.0074 (0.00365)**	0.0065 (0.00267)**	1.8186 [0.18]	2.9156 [0.087]*	5.8147 [0.015]**
Equality test I (recession vs expansion)	0.6093 [0.43]	0.1578 [0.69]	0.0113 [0.91]			
Good news – recession	0.0008 (0.0019)	-0.0031 (0.0026)	0.0037 (0.0025)	0.9951 [0.32]	0.6579 [0.42]	2.0565 [0.15]
Good news – expansion	-0.0013 (0.0019)	-0.0010 (0.0023)	0.0028 (0.0020)	0.0048 [0.94]	1.5865 [0.21]	0.9699 [0.32]
Equality test I (recession vs expansion)	1.0038 [0.32]	1.4416 [0.23]	0.6112 [0.43]			

Note: The first three results columns show the coefficients and standard errors in () of the estimated responses of the three types of investor in South Korea to CPI announcements during recessionary and expansionary periods. Underneath them and in results columns four to six the equality tests show the results of Wald Test coefficient restrictions, i.e. the F-test value and its related Chi-squared probability in []. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. To ease interpretation the reported coefficients for good news are equal to the estimated coefficient multiplied by minus 1, to ensure that in all cases a negative reported coefficient indicates sell and a positive reported coefficient buy.

The final set of tables, 5 and 6, presents results based on Equation 6, i.e. examining separately announcements made during recessionary and expansionary periods. These tables have the same general format as tables 2-4, with the exception that for each announcement type (e.g. U.S. CPI) the first three rows in each set show figures for bad news announced during recessionary periods, bad news during expansionary periods and tests of differences between the two and the next three rows show the equivalent for good news. In addition, given the number of results in these tables, and for ease of reading, we split them into panels. Table 5 presents results for inflation announcements (panel A for U.S., panel B for Japan and panel C for Korea) and table 6 for GDP and unemployment news.³⁰

In table 2 we saw that for the whole period inflation did not have a significant impact on investor trading decisions for either the U.S. or Japan. Results in table 5 show that once market state is taken into account, there are significant responses in relation to global news (panel A), but not regional shocks (panel B). Specifically, during expansionary periods there are no significant responses, but when good news is announced about U.S. inflation during recessionary periods the two local investor types respond significantly and in opposite directions: local institutions respond in a way consistent with momentum trading, while local individuals' behavior is consistent with contrarianism. These results for U.S. good news on inflation during a recession

³⁰ Due to splitting the whole period into recessionary and expansionary sub-periods, the number of observations is too low to allow estimation in all cases. For example, in one case there are only two bad news announcements made during a recessionary period. We, therefore, exclude such periods from the analysis. Also, as we want to compare behavior during the two sub-periods we also exclude the corresponding expansionary period (which are, in any case, extremely similar to the whole period). Taking account of this, we are only able to undertake estimations for the U.S. for GDP and for the U.S. and Japan for the unemployment rate announcements and we show these in one table. Thus, compared to the earlier tables we do not have results for GDP for Japan and Korea.

are consistent with hypotheses 1a/1b and A1a/A1b. The difference in responses during recessions versus expansions is statistically significant for these two groups, as is the difference between institutions and individuals during recessionary periods.

Results for Korean announcements are in line with those in table 2, with no significant differences between expansionary and recessionary periods. For both periods, institutions have a negative response to bad news and local individuals a positive response. The only notable differences from the whole period results is that the difference in response between foreigners and institutions to bad news during expansionary periods is not statistically significant, while the difference between foreigners and individuals is significant for bad news during expansionary periods. Thus, again the results for local investors in relation to inflation announcements in Korea are in line with hypotheses 1a and 1b and A1a and A1b. The results in table 5 also provide some support for hypotheses 2a (investor responses will vary with the state of the economy) and 2b (more significant differences in response between recessionary and expansionary periods for less sophisticated investors than for more sophisticated investors.). In relation to the latter, the difference is between the most sophisticated investor type (foreigners) for which there are no significant differences and the two local groups, for which differences do exist for both the U.S. and Korea.

Table 6: Responses of different types of investor in South Korea to GDP and unemployment announcements during recessionary and expansionary periods, with tests for differences between the two periods and for different responses from different types of investor

Announcement	Investor response by			Equality test II		
	Foreigners	Institutions	Individuals	Foreigners vs Institutions	Foreigners vs Individuals	Institutions vs Individuals
Panel A: GDP						
Bad news – recession – US	0.0014 (0.0045)	-0.0000 (0.0058)	-0.0022 (0.0058)	0.0295 [0.86]	0.1633 [0.69]	0.0442 [0.83]
Bad news – expansion – US	0.0016 (0.0015)	0.0012 (0.0020)	-0.0021 (0.0019)	0.0135 [0.91]	2.1278 [0.14]	0.8894 [0.35]
Equality test I (recession vs expansion) – US	0.0015 [0.97]	0.0432 [0.84]	0.0003 [0.99]			
Good news – recession – US	-0.0020 (0.0020)	0.0100 (0.0036)***	-0.0087 (0.0031)***	6.8330 [0.00]***	2.8589 [0.09]*	8.7296 [0.00]***
Good news – expansion – US	0.0022 (0.0015)	0.0009 (0.0025)	-0.0031 (0.0022)	0.1666 [0.68]	3.4878 [0.06]*	0.8075 [0.37]
Equality test I (recession vs expansion) – US	3.6624 [0.055]*	5.2054 [0.02]**	2.2569 [0.13]			
Panel B: Unemployment						
Bad news – recession – US	-0.0029 (0.0022)	0.0011 (0.0032)	0.0021 (0.0024)	0.6474 [0.42]	2.3455 [0.13]	0.0382 [0.85]
Bad news – expansion – US	0.0037 (0.0025)	0.0016 (0.0041)	-0.0050 (0.0032)	0.1253 [0.72]	4.5537 [0.03]**	0.9074 [0.34]
Equality test I (recession vs expansion) – US	4.7583 [0.03]**	0.0102 [0.92]	3.81 [0.051]*			
Good news – recession – US	0.0004 (0.0046)	-0.0074 (0.0055)	0.0071 (0.0058)	0.8936 [0.34]	0.5588 [0.45]	1.9475 [0.16]
Good news – expansion – US	0.0019 (0.0014)	0.0032 (0.0026)	-0.0042 (0.0024)*	0.1369 [0.71]	4.0371 [0.04]**	2.2979 [0.13]
Equality test I (recession vs expansion) – US	0.1038 [0.75]	3.1986 [0.07]*	3.754 [0.052]*			

Announcement	Investor response by			Equality test II		
	Foreigners	Institutions	Individuals	Foreigners vs Institutions	Foreigners vs Individuals	Institutions vs Individuals
Panel B: Unemployment (continued)						
Bad news – recession – Japan	0.0006 (0.0011)	-0.0030 (0.0013)**	0.0032 (0.00092)***	2.4890 [0.11]	3.6486 [0.056]*	9.2619 [0.00]***
Bad news – expansion – Japan	0.0000 (0.0009)	0.0004 (0.0015)	-0.0005 (0.0013)	0.0553 [0.81]	0.0669 [0.79]	0.1177 [0.73]
Equality test I (recession vs expansion) – Japan	0.2668 [0.61]	3.4568 [0.06]*	5.7673 [0.02]**			
Good news – recession – Japan	-0.0003 (0.0011)	-0.0002 (0.0022)	0.0013 (0.0010)	0.0003 [0.98]	1.9097 [0.17]	0.2179 [0.64]
Good news – expansion – Japan	-0.0018 (0.0011)	0.0025 (0.00095)***	-0.0010 (0.0010)	5.7693 [0.02]**	0.1706 [0.68]	4.7973 [0.03]**
Equality test I (recession vs expansion) – Japan	0.8697 [0.35]	1.5138 [0.22]	3.0159 [0.08]*			

Note: The first three results columns show the coefficients and standard errors in () of the estimated responses of the three types of investor in South Korea to GDP and unemployment announcements during recessionary and expansionary periods. Underneath them and in results columns four to six the equality tests show the results of Wald Test coefficient restrictions, i.e. the F-test value and its related Chi-squared probability in []. *, ** and *** indicate significance at the 10%, 5% and 1% levels respectively. To ease interpretation the reported coefficients for bad (good) news for GDP (unemployment) are equal to the estimated coefficient multiplied by minus 1, to ensure that in all cases a negative reported coefficient indicates sell and a positive reported coefficient buy.

Panel A of table 6 shows results for U.S. GDP shocks and panel B results for the unexpected component of U.S. and Japanese unemployment. When the whole period was considered (table 3) the only significant response to U.S. GDP shocks was by individuals in relation to good news. In contrast, when the sample is split by the state of the economy, both of the local groups have significant responses to good news during recessionary periods, but no significant response during expansionary periods (panel A). Once again there is evidence of behavior consistent with hypotheses 1a and 1b, but not A1a and A1b. There are significant differences between each pair of investor type for good news announcements during recessionary periods and between foreigners and individuals (albeit it at the 10% level) during expansionary periods. Results for U.S. unemployment shocks in panel B of table 6 show almost no responses to such announcements. The only exception relates to good news announced during expansionary periods, where the (negative) coefficient for local individuals is significant at the 10% level, again consistent with hypotheses 1a and 1b, but not A1a and A1b. Despite the paucity of significant coefficients in response to U.S. unemployment, there are significant differences between the two market states for foreigners (bad news), local institutions (good news) and local individuals (bad and good news). There are also significantly different responses between the most sophisticated investor type (foreigners) and the least sophisticated (local individuals). Results in relation to Japanese unemployment again show that foreigners do not have significant trading responses to either good or bad news during either market state. In contrast, local institutions have a negative response to bad news during recessionary periods and a positive response to good news during expansionary periods, while local individuals have a positive trading reaction to bad news during recessionary periods. Once again these results are consistent with hypotheses 1a and 1b, but not A1a and A1b. There are associated statistically significant

differences between recession and expansion for local institutions (bad news) and local individuals (bad and good news) and between individuals and foreigners (bad news during recessions), individuals and institutions (bad news during recessions and good news during expansionary periods) and between foreigners and local institutions (good news during expansionary periods).

The results in tables 5 and 6 are consistent with hypothesis 2a that investor responses will vary with the state of the economy. Hypothesis 2b is also supported by the results in tables 5 and 6, with more significant differences in response during recessionary and expansionary periods for less sophisticated investors than for more sophisticated investors. To illustrate, for foreigners there are only two cases in tables 5 and 6 where there are significantly different responses to announcements in recessionary and expansionary periods. This contrasts with four such cases for local institutions and five for local individuals.

Taken together, the results in tables 2-6 from examining Equations 5 and 6 for the Korean market demonstrate the importance of taking account of the investor type when analyzing responses to unexpected components of economic announcements. Prior studies have examined whether local or foreign investors follow different trading strategies (see, for example, Richards, 2005, Grinblatt and Keloharju, 2000) and whether institutional and individual investors respond to firm specific news (e.g. Lee, 1992, Vieru et al., 2006), and macroeconomic announcements (Nofsinger, 2001) differently. However, ours is the first study to establish differences across three investor groups: local individuals, local institutions and foreign investors, allowing a greater understanding of the responses to macroeconomic announcements and deeper insights into the role of investor sophistication. The evidence suggests that the most sophisticated investor type (foreigners) respond very little to the unexpected component of macroeconomic

announcements, with no significant responses to global news, and only one significant response to regional and one to local surprises for the whole period. Similarly, local institutions have no significant responses to global macroeconomic shocks, one to a regional announcement and two to local news. The least sophisticated group (local individuals) has significant reactions to one global, one regional and two local announcement types. These results are consistent with more sophisticated investors having more accurate expectations of forthcoming announcements, whereas the response of less sophisticated investors suggests they are more surprised by the news. Where there are significant responses to news, results suggest much greater complexity of response to shocks than prior literature has been able to identify. Specifically, the results generally support hypotheses 1a and 1b in relation to global and regional announcements, but A1a and A1b in relation to local announcements. This suggests that more (less) sophisticated local investors in the Korean market are momentum (contrarian) traders with respect to the traditional view of good and bad macroeconomic news when responding to global and regional shocks, but take account of likely macroeconomic policy responses when trading following domestic macroeconomic shocks. Similarly, investor responses to macroeconomic surprises are influenced by the state of the market and sentiment appears to influence the less sophisticated investors to a greater extent, consistent with Nofsinger (2001).³¹ Thus, investor sophistication appears to play a large part in determining the trading behavior of investors following macroeconomic announcements and home bias plays a part for local investor types.

4. Conclusion

³¹ However, unlike Nofsinger (2001), we also consider how sentiment impacts on foreign investors.

Considerable evidence exists to suggest that macroeconomic news announcements impact on stock market behavior and that different investor types respond in diverse ways to economic stimuli, with particular differences having been identified in relation to domestic and foreign investors, and institutional and individual investors. Investor sophistication has been put forward as a possible explanation of differences in trading behavior, with evidence that less sophisticated investors (e.g. individuals) tend to follow negative feedback trading strategies, whereas more sophisticated investors (e.g. foreigners and institutional investors) are positive feedback traders. Despite these well documented features, to date no study has investigated the way in which unexpected components of macroeconomic announcements affect the trading decisions of foreign, local institutional and local individual investors. In this paper we seek to fill this gap in the literature by examining how the buy-sell decisions of these three investor types in the Korean stock market respond to global, regional and local macroeconomic news and examine whether the arguments about contrarian and momentum strategies evident in other areas are relevant to responses to macroeconomic news. This is an important issue, since if different investor types behave in differing ways to such news, then earlier studies which have investigated the role of macroeconomic announcements will have reached conclusions which fail to reflect the diversity of investor responses. Furthermore, if investors are aware of such differences then they may seek to change their own buy-sell decisions to take account of differing responses of other groups. Financial economists and regulatory bodies are also likely to be interested in the findings of this work, since it is the trading of the various market participants that changes share prices and moves them to new equilibria.

To investigate this issue we utilize a data set consisting of daily purchases and sales volumes for local individuals, local institutions and foreign investors in the market under investigation. As

the data covers a period in excess of 12 years, we are also able to investigate the extent to which trading responses to announcements are impacted by the state of the economy (recessionary or expansionary periods) and the nature of the news (good or bad). We also give explicit consideration to likely macroeconomic policy responses to such announcements. A range of macroeconomic announcements (inflation, GDP and unemployment) are considered. Furthermore, unlike previous studies, we take account of potential endogeneity issues in the analysis.

Results provide clear evidence of the three investor types responding differently to the unexpected component of announcements and of their trading decisions responding to different levels of macroeconomic news (global, regional and local). The results highlight the importance of taking account of investor type when seeking to understand how macroeconomic news impacts investor behavior. Further, differences are found between the state of the economy and between good and bad shocks. The findings are consistent with earlier evidence of differences in behavior across investor type, and provide support for the home bias view for local investors, but not for foreigners; there is no clear pattern that foreign investors react more to global or regional surprises.

Overall, there is strong support for our main hypotheses: that less sophisticated investors will follow contrarian strategies, while the more sophisticated will act in a way consistent with momentum trading; and that the less sophisticated investors will be affected more by sentiment (whether announcements are made during recessionary or expansionary periods) than the other investor types. However, results suggest that behavior is more complex than has previously been identified, with the nature of the news (good or bad) determining responses to global and regional news for local investors, but the likely policy response driving responses to domestic

shocks, even for the least sophisticated investor group. These findings largely apply to the two local investor types, with foreign investors responding little to macroeconomic news, possibly since their superior research capabilities means they anticipate the news better than their local, less sophisticated counterparts. The extent to which the results differ more generally between emerging markets of different size and between developed and emerging markets requires further investigation.

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