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Macroeconomic News Announcements and the Role of Expectations: Evidence for US Bond, Stock and Foreign Exchange Markets

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Abstract

We investigate the impact of scheduled government announcements relating to six different macroeconomic variables on the risk and return of three major US financial markets. Our results suggest that these markets do not respond in any meaningful way, to the act of releasing information by the government. Rather, it is the 'news' content of these announcements which cause the market to react. For the three markets tested, unexpected balance of trade news was found to have the greatest impact on the mean return in the foreign exchange market. In the bond market, news related to the internal economy was found to be important. For the US stock market, consumer and producer price information was found to be important. Finally, financial market volatility was found to have increased in response to some classes of announcement and fallen for others. In part, this result can be explained by differential 'policy feedback' effects.

Key Words: Macroeconomic News; Expectations; Financial Markets; GARCH.

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1 Introduction

There now exists an extensive literature aimed at assessing the market impact of 'scheduled' news announcements. In this context, three of the most commonly studied financial markets are the stock market (see *inter alia* Pearce and Roley, 1983, 1985, French and Roll, 1986, McQueen and Roley, 1993, Sun and Tong, 2000), the foreign exchange rate market (see *inter alia* Ito and Roley, 1987, Hardouvelis, 1988, Ederington and Lee, 1994, DeGennaro and Shreives, 1997, Almeida, Goodhart and Payne, 1998), and the bond market (see *inter alia* Becker, Finnerty and Kopecky, 1996, Jones, Lamont and Lumsdaine, 1998, Fleming and Remolona, 1999a). For each of these markets, the impact of macroeconomic news announcements on returns and volatility is most frequently examined, although other market trading dimensions such as volume and bid/ask spreads have also been tested.

Much of the work in this field has considered the announcement event only – without regard for the actual information revealed to the market by that announcement (see Stone, 1990, Fleming and Remolona, 1997, 1999b, Jones, Lamont and Lumsdaine, 1998, Andersen and Bollerslev, 1998). One key feature of scheduled news arrivals however, is that the market (and those that participate in it) formulate expectations regarding the upcoming scheduled information release. To the extent that traders take positions based on their expectations of future events, the anticipated estimate for the upcoming scheduled news announcement will be important in determining the reaction of the market. Thus, it may not be the act of releasing information to the market which is important, nor the (gross) information embodied in the estimate itself. Rather, it is the extent to which the actual announcement differs from the expected which determines the response of the market to the new information. A number of studies have considered the impact of the unexpected component of scheduled news released on individual markets (see Singh, 1993, 1995, Kim, 1998, 1999, Li and Hu, 1998, Balduzzi, Elton and Green, 1999).

More recently, a literature is beginning to emerge which considers the impact of such macroeconomic announcements across financial markets rather than for individual markets in isolation. Given such scheduled news releases typically relate to macroeconomic indicators whose impact is economy wide, such an approach is of great interest. For example, Aggarwal and Schirm (1998) document an asymmetric impact of unexpected trade balance announcements on bond, exchange rate and equity mean returns.

The purpose of this paper is to consolidate these advances in the literature by conducting an intensive examination of the impact of six of the most important macroeconomic news announcements on the mean and volatility of returns in US equity, bond and foreign exchange markets. Not only will the impact of the announcement itself be considered, but also the role of expectations is to be examined. Thus, the key contributions of this paper are threefold. First, the paper provides evidence on the response of financial markets to macroeconomic news announcements. The focus on US markets is justified given its dominant position in the global arena. Second, it aims to identify the role of market expectations in determining the markets response to macroeconomic announcements. The testing of both the release of information to the market as well as the news content of that information will provide important insights into what drives market responses to the release of macroeconomic news. Third, in contrast to the piecemeal approach which has typically been adopted previously in the literature, this paper will consider a wide range of announcements across a number of financial markets. As such, comparative conclusions will be possible that allow greater insight into the differential dynamics of various markets and into the complex way in which different financial markets interact.

The major findings of our analysis can be summarized as follows. First, we found that financial markets do not seem to respond in any meaningful way, to the very act of releasing information by the government. Rather, it is the 'news' content of these announcements

which cause the market to react. For the three markets tested, unexpected balance of trade news was found to have the greatest impact on the mean return in the foreign exchange market. In the bond market, news related to the internal economy was found to be important. For the US stock market, consumer and producer price information was found to be important. Finally, contrary to previous studies, financial market volatility was found to have significantly increased in response to some classes of announcement and fallen for others. In part, this result can be explained by differential 'policy feedback' effects across the various macroeconomic indicators.

The remainder of this paper is organized as follows. In Section two we provide general background to US macroeconomic announcements and market expectations. Section three outlines the empirical framework, while results are presented in section four. Finally, in section five we present our conclusions.

2 US Macroeconomic News Announcements and Market Expectations

2.1 Macroeconomic Announcements

Information relating to US macroeconomic variables is released to the market by various agencies of the federal government. In this study, market announcements are considered for six US macroeconomic variables which have been found in the previous literature (Anderson and Bollerslev, 1998[1]) to be important and details of which are presented in Table 1. The six macroeconomic announcements are (a) nominal foreign international trade balance (BOT); (b) gross domestic product (GDP); (c) unemployment rate (UE); (d) retail sales growth (RET); (e) consumer price index (CPI); and (f) producer price index (PPI).[2]

[1] Merchandise Trade (or BOT), GDP, Employment report (both employment numbers and unemployment rate were included in the report), UE, RET and PPI news were identified as important announcement news events by Andersen and Bollerslev (1998) while CPI was classified as less important.

[2] Instead of considering all macroeconomic announcements made, a decision has been taken to concentrate on these six as a reasonable representation of the 'influential' announcements (as identified in Anderson and Bollerslev, 1998) in both economic activity and inflation related variables. Importantly, this helps to keep the modelling process to a manageable level. We acknowledge, however, the existence of a possible bias resulting

The monthly nominal foreign international trade balance (BOT) is released by the U.S. Department of Commerce, Economics & Statistics Administration. This report is released about six weeks after month-end at 08:30 (EST) and measures the difference between exports and imports of both goods and services in US billions of current dollars.

Announcements relating to quarterly gross domestic product (GDP) estimates are released by the US Department of Commerce, Bureau of Economic Analysis. This announcement is released in stages beginning with an 'advance' estimate which is furnished near the end of the month following the quarter for which the figure is being reported. A 'preliminary' estimate is then released near the end of the second month following the end of the quarter for which the figures is being reported. Near the end of the third month, the 'final' GDP estimate is released. These three announcements are considered to represent important information events and as such are to be included in this study which means that even though the actual GDP figure is released quarterly, there are effectively three news items relating to each release or 12 per year.

Announcements relating to the whole economy unemployment rate (UE) are compiled by the Bureau of Labor Statistics and released at 8:30 A.M. (EST) in the first week after month-end.[3] Nominal retail sales (RET) announcements, sourced from the U.S. Department of Commerce, Economics & Statistics Administration, are released approximately two weeks after month-end at 8:30 (EST). This series measures sales of retail establishments, adjusted for normal seasonal variation, holidays, and trading-day differences. National consumer price index (CPI) data (U.S. city averages) are released each month by the Bureau of Labor Statistics at 08:30 (EST), approximately 2 weeks after the reference period. Finally,

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from the omission of some announcements made (in particular, monthly payroll employment rate which may have become influential) usually on the same days as those included in our study. We thank an anonymous referee for bringing this issue to our attention.

[3] The unemployment rate data were announced along with other employment statistics such as employment numbers, changes in the labour force, number of hours worked, in a document entitled Employment Situations (labelled 'Employment Report' in Anderson and Bollerslev, 1998) released by the Bureau of Labor Statistics.

information relating to the producer price index (PPI), also compiled by the Bureau of Labor Statistics, is released at 08:30 (EST) on or near the day preceding the release of the CPI figures.

With regard to the day of the week on which announcements are made, it can be seen in Panel A of Table 1 that no announcements were made on Mondays and the majority of announcements were made on Fridays (an average of 45% across all categories). Moreover, unemployment (95%) and producer price (62%) announcements are particularly heavily concentrated on Fridays.

2.2 Market Expectations

Any 'news' contained in a given announcement is reflected by the deviation of the observed value of the macroeconomic statistic to its counterpart market expectation value. A unique measure of this news component does not exist however and in this study it is defined as the percent deviation of actual (released) figures from a market expectation estimate (which is the median survey expectations estimate provided by Money Market Services International (MMS)). Thus, with the exception of BOT, which is the actual balance estimate, all of the announcements are reported as percentages and so in these cases the measure of news is simply the difference between the actual and the median survey estimate. In the case of BOT, news is calculated as = ln (actual/MMS expectation)*100. Each of these news items may be classified as either a positively signed news event ('positive' hereafter) or negatively signed news event ('negative' hereafter) depending on the actual value relative to the expected value. [4] For example, a negative unemployment news event occurs where actual

[4] It should be noted that the use of the terms 'positive' and 'negative' refer solely to the sign of the news estimate and do not infer the likely impact of the news on the financial markets. This is because a news announcement, such as actual unemployment being less than expected unemployment, while 'good' news for the economy, may constitute 'bad' news for financial markets.

unemployment < expected unemployment and vice versa for a positive news event. Similarly, positive and negative news may be defined for each of the macroeconomic indicators.

Some summary statistics of these news estimates for each of the six announcements is presented in Panel B of Table 1. The key features of this panel are as follows. First, with regard to the average absolute size of news, it can be seen that the smallest value was found for the consumer price index series (0.085%) which suggests that market expectations and the actual CPI figure are typically very close on average. Reinforcing this observation, the expected and actual CPI values coincided for 32% of the sample which means that this price series exhibits the highest rate of 'no surprise' announcement days across our six categories. In those cases where the CPI expected and actual do differ, 42% of the time the news is positive (actual CPI < expected CPI) and for 26% of the observations, the news was negative. Second, the average BOT absolute news value was the highest observed (13.57%) and the actual and expected estimates only coincided on 2 occasions (1%). It is interesting to note that the number of positive news (54%) and negative news (45%) occasions is fairly evenly distributed for this class of announcement. Third, in the case of the retail sales, unemployment and prices, negative news was received by the market more often than positive news. In contrast, positive news was released more frequently for the BOT and GDP.[5]

3 Empirical Model

Daily returns data for the US stock market represented by the Dow Jones index, exchange rate market represented by the JPY/USD and DEM/USD, and bond market were gathered over the sample period beginning January 2, 1986 to December 31, 1998. All data were sourced from Datastream except for the bond market data which was obtained from the Fed's statistical data

[5] While the focus of this paper is not on the rationality of expectations formation, the authors did perform the regression of actual announcements against expectations estimates and hypothesis tests of a zero intercept and a unit slope coefficient could not be rejected. Thus, the expectations data would appear to contain real information with respect to future values of each variable under consideration.

repository. Following Jones *et al.* (1998), who show significantly higher daily bond return volatility on the days of announcements of unemployment and PPI data, bond market returns were estimated as the daily continuously compounded excess return of the US 10-year bond over the 3-month Treasury bill multiplied by 100.

Table 2 presents a summary of these returns data and while for the stock market the mean return was positive, for the other series considered the mean return was negative. These stock market data also exhibited the greatest variance, while the second moment of the bond market returns was the lowest. Interestingly, the variance of the JPY/USD exchange rate series was noticeably higher than that of the USD/DEM. Turning to the higher moments of these data, they exhibit the usual array of characteristics which one would expect of higher frequency data insomuch as the tests indicate skewness and positive excess kurtosis. The Box-Ljung test of white noise for linear and non-linear returns was significant in every case except the USD/DEM returns. Where this test is applied to the squared returns, it is significant in every case. As a final diagnostic test of the returns data, the Engle and Ng joint sign bias test was performed and found to be highly significant in every case.

These stock, bond and foreign exchange returns may be modelled as a GARCH process which takes the following form:

$$R_t = \mu_0 + \sum_{i=MON}^{THU} \mu_i D_i + \sum_{j=BOT}^{PPI} \mu_j D_j + \varepsilon_t \qquad (1)$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon^2_{t-1} + \beta_1 h_{t-1} + \sum_{i=MON}^{THU} \alpha_i D_i + \sum_{j=BOT}^{PPI} \alpha_j D_j$$

where R_t represents the returns to the market under consideration, D_i are dummy variables included to capture daily seasonalities,[6] D_j represents dummy variables which takes the value of unity on those days in which a scheduled news announcement occurs for each of the six

economic variables and zero otherwise and ε is the error term which is assumed ~$(0,h_t)$. The μ terms in the mean equation as well as the α and β terms in the variance equation are parameters to be estimated. Specifically, in the mean equation, the intercept term μ_0 measures the mean return on all 'no-news' Fridays in the sample. The other mean equation coefficients measure the average increment in return for each designated case.

Similarly, in the variance equation, the intercept term α_0 measures the time-invariant component of volatility associated with 'no-news' Fridays. The other α coefficients measure the average volatility increment for each designated case. For example, α_{PPI} measures the increment in the time-invariant component of volatility related to PPI news announcements. Under the hypothesis that the release of news matters, the μ_{NEWS} and α_{NEWS} terms should be statistically significant indicating that mean returns and volatility are different on announcement days. Moreover, since the arrival of news is hypothesised to increase volatility, a positive sign is expected for the α_{NEWS} coefficient.

A feature of this model is that it does not account for market expectations. To test the hypothesis regarding the role of expectations in the market, Equation (1) may be estimated where the news dummy variable, D_j (D_k), takes the value of unity if positive (negative) news occurs. In terms of the variance equation, higher than normal market volatility is expected in response to both positive and negative news announcements (ie. a positive response in the variance equation) as the market readjusts itself to this new information irrespective as to the nature of that information.[7] Thus, the model to be tested takes the form:

$$R_t = \mu_0 + \sum_{i=MON}^{THU} \mu_i D_i + \sum_{j=PBOT}^{PPPI} \mu_j D_j + \sum_{k=NBOT}^{NPPI} \mu_k D_k + \varepsilon_t \qquad (2)$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} + \sum_{i=MON}^{THU} \alpha_i D_i + \sum_{j=PBOT}^{PPPI} \alpha_j D_j + \sum_{k=NBOT}^{NPPI} \alpha_k D_k$$

[6] We define separate day-of-the-week dummy variables D_{MON}, D_{TUE}, D_{WED}, and D_{THU} which each take on a value of unity on the day-of-the-week to which they are assigned and zero otherwise.

4 Results

4.1 The Impact of Scheduled Macroeconomic News Announcements on Financial Markets – News Dummies

Table 3 reports the estimation of model (1) for stock, bond and foreign exchange markets.[8]

4.1.1 Foreign Exchange Rate Market

Panel A of Table 3 provides the estimated results for the mean equation in each financial market. In the case of the two exchange rate series, for the day-of-the-week variables, only the Thursday effect remains significant. Of the individual news announcements, GDP and retail sales were significant in the JPY/USD exchange rate returns and the negative coefficient suggests that the release of news in these two indicators causes lower than average returns for the dollar. Thus, these results for the foreign exchange market would suggest individual macroeconomic indicator news items may be significant. In the variance equation (Panel B), with regard to the DEM/USD the balance of payments announcement is found to be important as the BOT dummy variable attracts a estimated coefficient that is significant and positive. Bos and Fetherston (1993) and Kim (1998 and 1999) report a similar result for the AUD/USD as BOP announcements were found to increase volatility. With regard to the variance equation for the JPY/USD model, retail sales is found to be associated with significantly increased volatility.

[7] We also conducted analysis taking into account the magnitude of the news (ie the size of the deviation between actual and expected) as well as the 'sign' of the news. The outcome of such work largely confirmed results from simpler formulations and so is not discussed in detail.

[8] The model was estimated using a quasi-maximum likelihood function assuming normally distributed errors. Each of the models estimated in this paper was specified with an MA error term whose lag structure was set at a level so as to capture serial correlation in the standardised residuals. Details of the MA coefficients estimated in each model are omitted to conserve space.

4.1.2 Bond Market

For the bond market mean equation, with the exception of CPI, each of the news variables has a positive coefficient estimate and retail sales is significant at the 10% level. In the variance equation for the bond market (Panel B), strong evidence of daily seasonality is revealed but none of the news releases are individually significant.

4.1.3 Stock Market

The stock market mean equation results (Panel A of Table 3) reveal that a Thursday and Friday effect are in evidence and none of the news coefficients are significant. In terms of the variance equation, the GARCH model is robust and strong evidence of daily seasonality is present. As for the individual news items, while none of the estimated coefficients are significant at the 5 % level, there is however, some weak evidence of a volatility impact at the 10% level in the case of the unemployment and GDP announcements.

In general, these results suggest that the stock market appears to exhibit little interest in the actual release of news regarding the state of the economy. For the bond and foreign exchange markets however, some evidence of an impact of the release of news is found .

4.2 Market Expectations and Macroeconomic News Announcements

The results presented in Section 4.1 follow the testing method of much of the previous literature in considering the impact of the act of releasing macroeconomic news on financial markets *per se* and ignores the role which market expectations play in determining the response of the market to such news releases. To incorporate information about expectations into the estimation procedure, Equation (2) may be estimated where a positive and negative news dummy variable is included in both the mean and variance equation.

4.2.1 Foreign Exchange Rate Market

The results of this estimation procedure are presented in Table 4 and the impact of the arrival of positive news to the market is considered initially. The mean equation results (Panel A) indicate that for the foreign exchange market, positive BOT news causes below average returns for both exchange rate series. In addition, for the JPY/USD series, positive GDP (at the 10% level) and retail sales news are associated with below average exchange rate returns. One possible interpretation of this latter result is the argument that higher income (GDP) or spending in the economy may lead to higher consumption of Japanese imports and so put downward pressure on the value of the US dollar.

Where the arrival of 'negative' news to the market in each of these six macroeconomic news variables is considered, the BOT and unemployment dummy variables are significant for both exchange rate series and the positive sign on these coefficients suggests above average returns. Interestingly, this outcome for the BOT variable is the converse of the significant negative impact of 'positive' news discussed earlier. Taken together, these results suggest FX market participants do systematically monitor BOT announcements and adjust their portfolios in response to the implied 'news' content of these announcements relative to their expectations. For the JPY/USD series, negative GDP news is significant and is found to cause a weakening of returns to the US dollar which is consistent with expectations.

For both of the exchange rate variance equations, all of the ARCH and GARCH coefficients were highly significant and for the DEM/USD series, strong day-of-the-week effects were in evidence. Both positive and negative news in each of the macroeconomic news announcements had surprisingly little impact on the market variance. Positive news in the producer price index had a negative and significant estimated coefficient for the DEM/USD series and negative news in producer prices caused a significant and positive rise

in market volatility. Beyond these two cases, none of the other news dummy variables were significant for these two exchange rate series.

4.2.2 Bond Market

The bond market mean returns exhibited a negative and significant response to positive consumer price information. Negative consumer and producer price as well as retail sale information elicited a positive response in all cases. This result may suggest stock and bonds are considered substitutes. To the extent that lower than expected retail sales (negative news) signals poor prospects for some stocks dependent on the consumer economy, the shift of investors may be away from stocks in which case this could lead to an increase in the demand for bonds.

In a similar fashion to the foreign exchange market, all of the ARCH, GARCH and day-of-the-week coefficients are significant for the bond market variance equation. Only the retail sales dummy variable is significant and the negative coefficient suggests lower bond market volatility in response to the arrival of retail sales news which is less than the market expectation. That none of the news dummy variables were significant in the positive news case and only one in the negative news case, forms an interesting contrast to Jones, Lamont and Lumsdaine (1998) who find a significant positive relationship between employment, PPI and daily US bond price volatility.[9]

4.2.3 Stock Market

Finally, for the stock market, weak evidence is found which suggests that where producer and consumer price inflation are below expectations, a significant positive response in mean

[9] We replicated the bond market investigation of Jones, Lamont and Lumsdaine (1998) which focused on the announcement only and found similar results which suggests the differences in results in the current paper are not a function of the data used. As such, this serves to highlight the importance of distinguishing information releases from the news content of those releases.

returns was found. This result is reinforced when negative inflation news is released to the market in which case significantly below average returns result. This latter result was robust to the exclusion of the 1987 crash and suggests the stock market values price information, and in particular negative price news, quite highly. None of the other macroeconomic news announcements were significant in the mean equation.

In terms of the variance equation, consistent with the foreign exchange and bond markets, with the exception of the Monday and Tuesday coefficients, all of the ARCH, GARCH and daily seasonality terms are significant. The variance equation mirrors the mean equation insomuch as prices are again an important influence in this markets volatility. Negative producer price news was found to have a diminishing effect on stock market volatility while positive inflation news was found to increase stock market volatility. This suggests higher than expected inflation (positive news) causes greater uncertainty in the market possibly as a result of some flow on effects such as the Fed's monetary policy response to the unexpected inflation. Lower than expected inflation on the other hand, was found to create a more stable trading environment which may be attributed to allaying the fears of an official interest rate hike.

In addition to this price impact in the variance equation, unemployment and retail sales news was also found to heighten stock market volatility irrespective as to the sign. That both positive and negative news were found to increase volatility in this way would seem to support the hypothesis that in general, where expectations and actual do not accord, portfolio adjustments by traders to this new information causes heightened market volatility. The apparent exception to this is the possible market calming effect of favourable price news and its signal relating to interest rate policy by the Fed. Generally, the exclusion of the stock

market crash does not alter the estimated signs on these discussed coefficients although their significance is reduced on occasion.[10, 11]

4.3 Discussion

In general, a number of important conclusions can be drawn from the above results and Table 5 provides a compact summary of the analysis to help guide this discussion.[12] First, none of the three financial markets considered in this study responds in any consistent fashion to the release of scheduled macroeconomic information by the US government. Second, markets respond to the implied news content of macroeconomic news announcements, which is defined as the difference between the actual estimate and the (median survey) expected announcement. Third, in terms of what type of news each market responds to, for the foreign exchange market, balance of trade news is, not surprisingly, found to be important in terms of the mean return. In addition, there appears to be a strong role for lower than expected

[10] The impact of the arrival of news to the market was also tested using a variable which takes on the actual magnitude of the news rather than the value of unity. These results were broadly consistent with those reported here and are not presented to conserve space. Further, attempts were also made to test the impact of the arrival of large (above average) and small (below average) positive and negative news items. While suffering somewhat from a lack of data, the results did not add significantly to the insights reported in detail here and so are omitted for the sake of brevity.

[11] The discussion presented in this section suggests that the arrival of news to the market in general causes heightened stock market volatility irrespective as to whether that news was positive or negative. This fact is most succinctly captured by the fact that of the ten significant variance equation coefficients across the four markets considered, eight were positive. This would seem to suggest that the specification of Equation (2) may be improved insomuch as the variance equation should not distinguish between positive and negative news, as news itself heightens volatility, irrespective as to its nature. Additional analysis of this nature was conducted, however it suggested that the differential positive/negative news model of equation (2) is necessary. As such, the results did not add significantly to the insights reported in detail here and so are omitted for the sake of brevity.

[12] A robustness test of the stability of the estimated news coefficients was undertaken by splitting the sample using a break point of 2 March 1991. This date was chosen as it was identified by the Economic Cycle Research Institute (www.businesscycle.com) as the beginning of an expansionary phase for the US business cycle which continued until the end of the sample. After this date, the Fed is arguably less inclined to provide an immediate policy response (monetary and foreign exchange) to the release of news which did not meet expectations compared to a situation where the economy is in general decline. To test this proposition, models (3), (4) and (5) were re-estimated in each of these two sub-periods and the news coefficients from each sub-sample compared. Consistent with our hypothesis, there was general evidence of stronger news effects in the first sub-period for most of the announcements. Specifically, BOT news (both positive and negative news, in dummy or magnitude news form) had a significantly greater impact on the returns and volatility of each market tested in this first sub-period. To a lesser extent, UE news also follows this pattern (in particular the estimation of Model 5). Recall that the first sub-period includes the 1987 stock market crash as well as the recession of 1990-91, either of which may have increased the need for government intervention to boost the economy. Thus, the higher sensitivity to the announcement of news in this first sub-period may be attributable to markets factoring in policy feedback effects from the arrival of news.

unemployment information and to a lesser extent GDP and retail sales news. Fourth, for the bond market, information relating to the external economy was not found to be significant which is consistent with Stone (1990). Negative news relating to the internal economy was found to be important primarily for the mean. Only retail sales news had a role in volatility of bond yields – and then only for the 'negative' news case. Fifth, in terms of the stock market, information relating to prices, appears to be the primary source of news to which the mean market return responds which is consistent with the previous research of DeGennaro and Zhao (1998). Compared to the foreign exchange and bond markets, the stock market exhibits a much richer volatility response to news which not only includes a role for prices but also for unemployment and retail sales. Sixth, a scan of Table 5 suggests that the stock market was generally found to be the most responsive to news (across both mean and volatility). Seventh, PPI news had the most wide-ranging impact across all three markets.

In sum, this research serves to highlight the importance of simultaneously testing across financial markets when considering the impact of news announcements. Only by adopting a unified methodology can a clear distinction between the type of news to which each markets responds be made.

5 Conclusion

General macroeconomic information is important to investors as it has an obvious and fundamental role to play in influencing the path of asset prices. This paper considers the impact of the release of news in six of the most important macroeconomic indicators on US stock, bond and foreign exchange markets. Unlike previous studies in this area which have included only a few indicators and typically one market, the current paper takes a more holistic approach to the task. Further, an attempt is made to assess the level of information released to the market by incorporating market expectations into the analysis. The relationship

between announcement news and market volatility, as well as the news effects on the market returns is also investigated.

The quantitative results presented in this paper suggest that it is not the act of releasing macroeconomic information which the market considers to be important, but rather the 'news' component of each release – ie, the difference between the markets expectation and the actual figure. Balance of trade news was found to have the greatest impact on the foreign exchange market. In the bond market, news related to the internal economy was generally found to be important while for the US stock market, consumer and producer price information was significant. This latter result is most interesting given that economic conditions have an important role to play in determining a company's prospects for future growth. The fact that little evidence could be found of returns responding to non-price news about the state of the economy may indicate that trading in these markets is dominated by short term (liquidity) traders with little interest in a company's real value. One interesting but largely unexplained aspect of the current research was that the arrival of positively signed and negatively signed news did not necessarily increase volatility as is often hypothesised. For some markets, evidence was found of a volatility dampening effect on the arrival of certain types of news.

Future research in this field may consider the cross-country impact of macroeconomic announcements. Events in the US economy, for example, are frequently taken as a leading indicator of future events in other economies. As such it is possible that US macroeconomic announcements may impact on other economies. This issue is currently the subject of ongoing research.

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TABLE 1
Summary of US Macroeconomic Announcement Data and the Associated News Component

This table provides details of the six macroeconomic announcements which are released to the market at 08:30 EST (GMT –5) as well as the 'news' component measured for each of these six announcements sampled over the period January, 1986 to December, 1998. The GDP announcements include not only the actual announcement itself, but also the preliminary as well as the advance announcement which completely precede the announcement event.

Announcement	Balance of Payment (BOT)	Gross Domestic Product (GDP)	Unemployment Rate (UE)	Retail Sales Growth (RET)	Consumer Price Index (CPI)	Producer Price Index (PPI)
Panel A: Features of US Macroeconomic Announcements						
Frequency of Announcements	Monthly	Quarterly	Monthly	Monthly	Monthly	Monthly
Unit of Measurement	$ US billion	% change in GDP from previous quarter	Unemployment Rate, %	% change of gross retail sales from previous month	% change in CPI from previous month	% change in PPI from previous month
Total Number of Announcements	155	149	156	139	154	137
Announcements made on Monday	0	0	0	0	0	0
Tuesday	24	21	0	34	45	14
Wednesday	39	38	1	21	40	12
Thursday	51	44	6	45	27	26
Friday	41	46	149	39	42	85
Panel B: Measuring 'News' for the US Macroeconomic Announcements						
Definition of News	$\text{Ln}\left(\frac{Actual}{Expected}\right)$	(Actual figure less MMS Median Survey Expectations Estimate)				
Average size of News (% deviation)	13.57	0.45	0.13	0.43	0.085	0.23
No. (% of total) of Positive (>0) news obs.	84 (54%)	77 (52%)	38 (24%)	54 (39%)	40 (26%)	47 (34%)
No. (% of total) of Negative (<0) news obs.	69 (45%)	66 (44%)	78 (50%)	73 (52%)	64 (42%)	68 (50%)
No. (% of total) of no surprise (=0) news obs.	2 (1%)	6 (4%)	40 (26%)	12 (9%)	50 (32%)	22 (16%)

TABLE 2
Summary Statistics of Daily Returns

This table presents summary statistical information for the data included in this study. P-values are provided parentheses.

	DEM/USD	JPY/USD	Bonds	Dow Jones	Dow Jones (ex - 1987)
Mean	-0.0110	-0.0165	-0.0128	0.0454	0.0520
Variance	0.4745	0.5434	0.1861	0.9434	0.7936
Skewness	0.0354	-0.8272	0.05633	-4.03778	-0.4812
Excess Kurtosis	2.3432	7.7210	5.99208	91.19744	9.23687
$Q(20)^{(a)}$: $\chi^2(20)$	18.5657	42.5369 *	51.057 *	48.2588 *	45.6704 *
	(0.55)	(0.00)	(0.00)	(0.00)	(0.00)
$Q^2(20)^{(b)}$: $\chi^2(20)$	254.2073 *	185.2072 *	187.0188 *	169.8874 *	873.7363 *
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
$E\text{-}N^{(c)}$: $\chi^2(3)$	17.4877 *	59.5449 *	2.4391 *	55.3467 *	34.7411 *
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: '*' denotes statistical significance at the 5% level.

(a) (b) Box-Ljung test of white noise for linear and non-linear (squared) returns.

(c) Engle and Ng's joint sign bias test.

TABLE 3

The Impact of Individual Scheduled Macroeconomic Announcements on US Financial Markets

This table presents the estimated mean and variance equation coefficients for Equation (3) applied to US foreign exchange, bond and stock market returns data.

$$R_t = \mu_0 + \sum_{i=MON}^{THU} \mu_i D_i + \sum_{j=BOT}^{PPI} \mu_j D_j + \varepsilon_t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon^2_{t-1} + \beta_1 h_{t-1} + \sum_{i=MON}^{THU} \alpha_i D_i + \sum_{j=BOT}^{PPI} \alpha_j D_j$$

Individual dummy variables are included in the mean and variance equation for BOT, GDP, unemployment, retail sales, CPI and PPP announcements.

	DEM/USD	JPY/USD	Bond	Dow Jones	Dow Jones (ex - 1987)
Panel A : Mean Equation					
μ_0	0.0357	0.0347	-0.0185	0.0867 *	0.0781 *
	(1.28)	(1.13)	(0.90)	(4.60)	(5.54)
μ_{MON}	-0.0605	-0.0713 **	-0.049**	-0.0073	-0.0036
	(1.42)	(1.75)	(1.69)	(0.20)	(0.11)
μ_{TUE}	-0.0404	-0.0269	0.0292	-0.0035	0.0022
	(1.10)	(0.67)	(1.03)	(0.10)	(0.06)
μ_{WED}	-0.0292	-0.0121	0.0168	-0.0010	0.0049
	(0.82)	(0.30)	(0.64)	(0.03)	(0.16)
μ_{THU}	-0.0879 *	-0.0889 *	0.0165	-0.0793 *	-0.0654 **
	(2.26)	(2.22)	(0.60)	(2.62)	(1.84)
μ_{BOT}	0.0683	0.0113	0.0078	0.0410	0.0064
	(1.30)	(0.21)	(0.22)	(0.55)	(0.08)
μ_{GDP}	-0.0209	-0.1340 *	0.0751	0.0294	0.0462
	(0.37)	(2.11)	(1.60)	(0.45)	(0.61)
μ_{UE}	0.0703	0.0781	0.0297	-0.0146	-0.0250
	(1.21)	(1.37)	(0.28)	(0.27)	(0.37)
μ_{RET}	-0.0640	-0.1245 *	0.0832 **	0.0529	0.0420
	(1.02)	(1.99)	(1.86)	(0.89)	(0.60)
μ_{CPI}	-0.0407	-0.0096	-0.0024	0.0241	0.0342
	(0.61)	(0.17)	(0.06)	(0.48)	(0.38)
μ_{PPI}	0.0304	0.0359	0.0604	0.0353	-0.0265
	(0.44)	(0.58)	(1.08)	(0.89)	(0.33)

TABLE 3 (Continued)

The Impact of Individual Scheduled Macroeconomic Announcements on US Financial Markets

	DEM/USD	JPY/USD	Bond	Dow Jones	Dow Jones (ex - 1987)
Panel B : Variance Equation					
α_0	0.0404 *	-0.0134	0.0565 *	0.0865	0.0432 *
	(5.64)	(0.27)	(41.8)	(1.23)	(3.51)
α_1	0.0439 *	0.0455 *	0.0392 *	0.1073 *	0.0582 *
	(4.48)	(2.71)	(2.58)	(2.90)	(2.70)
β_1	0.9374 *	0.9280 *	0.9357 *	0.8584 *	0.9172 *
	(62.9)	(35.3)	(33.4)	(21.8)	(33.1)
α_{MON}	0.0020	0.0163	-0.1330 *	-0.0818	-0.0345
	(0.10)	(0.19)	(15.6)	(0.72)	(1.27)
α_{TUE}	-0.0608 *	0.1284	-0.0250 *	-0.0910	-0.0572 **
	(3.86)	(1.83)	(2.42)	(1.22)	(1.65)
α_{WED}	-0.0902 *	-0.0543	-0.0820 *	-0.1670 **	-0.1136 *
	(4.40)	(1.15)	(10.5)	(1.96)	(4.68)
α_{THU}	-0.0358 **	0.0253	-0.0190 *	0.0442	0.0973 *
	(1.80)	(0.32)	(2.30)	(0.48)	(2.59)
α_{BOT}	0.1082 *	0.0025	0.0125	0.0045	-0.0217
	(2.55)	(0.04)	(0.51)	(0.06)	(0.21)
α_{GDP}	0.0374	0.0371	-0.0214	-0.0748	-0.1270 **
	(0.59)	(0.55)	(0.64)	(1.61)	(1.78)
α_{UE}	0.0178	-0.0171	0.0438	0.0933 **	0.0772 **
	(0.33)	(0.26)	(1.57)	(1.74)	(1.76)
α_{RET}	0.0545	0.1234 *	-0.0386	0.0298	-0.0020
	(0.98)	(2.09)	(1.28)	(0.27)	(0.02)
α_{CPI}	-0.0182	0.0163	0.0028	-0.0376	-0.0596
	(0.39)	(0.22)	(0.09)	(0.50)	(0.64)
α_{PPI}	-0.0812 **	-0.0515	0.0015	0.1018	0.0653
	(1.65)	(0.72)	(0.04)	(1.01)	(0.96)
Panel C: Model Diagnostics					
$Q(20)^{(a)}$: $\chi^2(20)$	19.8298	14.5911	16.7125	18.4585	13.8195
	(0.468)	(0.799)	(0.671)	(0.557)	(0.839)
$Q^2(20)^{(b)}$: $\chi^2(20)$	16.7467	22.1959	26.5870	8.2115	10.3841
	(0.669)	(0.329)	(0.147)	(0.990)	(0.960)
$E\text{-}N^{(c)}$: $\chi^2(3)$	2.5483	2.7764	4.7246	28.4361*	5.2069
	(0.466)	(0.427)	(0.193)	(0.000)	(0.157)

Note: Absolute values of t-statistics (P-values) are presented in parentheses in Panels A and B (C).
'*' denotes statistical significance at the 5% level.
'**' denotes statistical significance at the 10% level.
(a), (b) Box-Ljung test of white noise for linear and non-linear (squared) standardised residuals.
(c) Engle and Ng's joint sign bias test applied to the standardised residuals.

TABLE 4
The Impact of 'Positive' and 'Negative' News Macroeconomic Announcements on US Financial Markets

This table presents the estimated mean (Panel A) and variance equation (Panel B) coefficients for Equation (4) applied to US foreign exchange, bond and stock market returns data.

$$R_t = \mu_0 + \sum_{i=MON}^{THU} \mu_i D_i + \sum_{j=PBOT}^{PPPI} \mu_j D_j + \sum_{k=NBOT}^{NPPI} \mu_k D_k + \varepsilon_t$$

$$h_t = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} + \sum_{i=MON}^{THU} \alpha_i D_i + \sum_{j=PBOT}^{PPPI} \alpha_j D_j + \sum_{k=NBOT}^{NPPI} \alpha_k D_k$$

Individual dummy variables are included in the mean and variance equation to indicate the release of positive and negative news in BOT, GDP, unemployment, retail sales, CPI and PPP announcements.

	DEM/USD	JPY/USD	Bond	Dow Jones	Dow Jones (ex - 1987)
Panel A : Mean Equation					
μ_0	0.0235 *	0.0296	-0.0144	0.0776 *	0.0627 *
	(2.54)	(0.93)	(0.79)	(4.66)	(6.00)
μ_{MON}	-0.0466 **	-0.0711 **	-0.0559 *	0.0109	0.0228
	(1.76)	(1.87)	(2.25)	(0.36)	(0.94)
μ_{TUE}	-0.0317	-0.0207	0.0263	0.0104	0.0190
	(1.11)	(0.50)	(1.05)	(0.38)	(0.65)
μ_{WED}	-0.0207	-0.0113	0.0169	0.0136	0.0217
	(0.83)	(0.28)	(0.78)	(0.49)	(0.80)
μ_{THU}	-0.0655 *	-0.0829 *	0.0159	-0.0646 *	-0.0494 *
	(2.49)	(2.10)	(0.71)	(2.85)	(2.02)
μ_{PBOT}	-0.2521 *	-0.1910 *	-0.0192	-0.0117	-0.0544
	(2.90)	(2.30)	(0.37)	(0.17)	(0.66)
μ_{PGDP}	-0.0568	-0.1108 **	0.1067	0.0028	0.0200
	(0.97)	(1.78)	(1.39)	(0.04)	(0.18)
μ_{PUE}	-0.0607	0.0083	0.2690	-0.0875	-0.0788
	(1.32)	(0.08)	(1.57)	(0.94)	(0.76)
μ_{PRET}	-0.0591	-0.1573 *	-0.0069	-0.0087	-0.0687
	(0.61)	(2.26)	(0.12)	(0.12)	(0.94)
μ_{PCPI}	0.0296	-0.0115	-0.2782 *	-0.3733 *	-0.3177 *
	(0.18)	(0.17)	(4.81)	(5.25)	(2.52)
μ_{PPPI}	0.0961	0.0930	-0.0686	-0.3063 *	-0.2870 *
	(1.15)	(1.45)	(0.59)	(4.51)	(2.23)
μ_{NBOT}	0.4216 *	0.2442 *	0.0250	0.1187	0.1149 **
	(2.55)	(2.62)	(0.52)	(1.17)	(1.94)
μ_{NGDP}	-0.0156	-0.1800 *	0.0287	0.0749	0.0779
	(0.14)	(2.02)	(0.35)	(0.74)	(1.02)
μ_{NUE}	0.1790 *	0.2107 *	-0.0770	0.0806	0.0750
	(2.31)	(2.72)	(1.52)	(1.03)	(0.55)
μ_{NRET}	-0.0563	0.0273	0.1005 *	0.0453	0.0402
	(0.77)	(0.33)	(2.56)	(0.58)	(0.45)
μ_{NCPI}	-0.1216	-0.0722	0.1111 *	0.1810	0.1646 **
	(0.89)	(0.71)	(2.40)	(1.53)	(1.79)
μ_{NPPI}	0.0308	-0.0401	0.1277 *	0.1532 **	0.1420
	(0.27)	(0.30)	(2.31)	(1.73)	(1.48)

TABLE 4 (Continued)
The Impact of 'Positive' and 'Negative' News Macroeconomic Announcements on US Financial Markets

	DEM/USD	JPY/USD	Bond	Dow Jones	Dow Jones (ex - 1987)
Panel B : Variance Equation					
α_0	0.0993 *	-0.0014	0.0838 *	-0.0104 *	0.0235 *
	(42.0)	(0.03)	(87.7)	(5.27)	(13.7)
α_1	0.0400 *	0.0562 **	0.0453 **	0.1201 *	0.0681 *
	(2.22)	(1.88)	(1.85)	(53.7)	(2.45)
β_1	0.9320 *	0.9053 *	0.9273 *	0.8406 *	0.9014 *
	(31.1)	(16.5)	(27.8)	(388.0)	(23.9)
α_{MON}	-0.0887 *	0.0114	-0.1777 *	0.0710	-0.0087
	(5.08)	(0.17)	(19.6)	(8.02)	(0.40)
α_{TUE}	-0.1303 *	0.0902 *	-0.0526 *	0.0146	-0.0200
	(6.74)	(2.07)	(4.86)	(1.22)	(0.85)
α_{WED}	-0.1619 *	-0.0236	-0.1068 *	-0.0729 *	-0.1132 *
	(14.2)	(0.52)	(13.7)	(5.17)	(4.20)
α_{THU}	-0.0973 *	-0.0023	-0.0518 *	0.1532 *	0.1053 *
	(6.72)	(0.04)	(11.1)	(5.30)	(3.28)
α_{PBOT}	0.1126	0.0643	0.0130	0.0379	-0.0144
	(1.55)	(0.83)	(0.60)	(0.98)	(0.22)
α_{PGDP}	0.0742	0.0903	-0.0124	0.0117	-0.0366
	(1.19)	(1.30)	(0.60)	(0.49)	(0.62)
α_{PUE}	0.1355	-0.0030	0.0344	0.1754 *	0.1689 *
	(1.40)	(0.02)	(0.85)	(3.98)	(1.97)
α_{PRET}	0.0885	-0.0661	-0.0249	0.2049 *	0.1817 *
	(0.67)	(0.87)	(1.01)	(2.21)	(3.07)
α_{PCPI}	0.0143	0.0283	0.0277	0.1225 *	0.0999
	(0.07)	(0.32)	(0.71)	(2.59)	(0.84)
α_{PPPI}	-0.1537 *	-0.0204	-0.0255	0.3035 *	0.1637
	(2.55)	(0.22)	(0.86)	(3.13)	(0.94)
α_{NBOT}	0.0310	-0.0232	-0.0000	-0.0424	-0.0663
	(0.40)	(0.39)	(0.00)	(0.73)	(1.44)
α_{NGDP}	0.0962	0.0137	-0.0151	-0.0252	-0.0454
	(0.64)	(0.18)	(0.77)	(0.71)	(0.77)
α_{NUE}	-0.0437	-0.0300	0.0137	0.1538 *	0.0968
	(0.67)	(0.42)	(0.48)	(4.93)	(0.90)
α_{NRET}	0.0461	0.0030	-0.0339 **	0.0996 *	0.0709 **
	(0.95)	(0.03)	(1.81)	(3.50)	(1.64)
α_{NCPI}	0.0664	0.0368	0.0063	-0.0147	0.0268
	(0.29)	(0.48)	(0.25)	(0.57)	(0.60)
α_{NPPI}	0.0229	0.1928 **	-0.0191	-0.1150 *	-0.1264 **
	(0.23)	(1.71)	(0.55)	(2.58)	(1.88)
Panel C : Model Diagnostics					
$Q(20)^{(a)}$: $\chi^2(20)$	18.3601	15.7587	16.2587	20.0305	16.5037
	(0.563)	(0.731)	(0.700)	(0.456)	(0.684)
$Q^2(20)^{(b)}$: $\chi^2(20)$	17.5623	23.0167	24.9094	8.7086	12.7767
	(0.616)	(0.287)	(0.204)	(0.986)	(0.886)
$E\text{-}N^{(c)}$: $\chi^2(3)$	2.8864	6.1740	7.3542	19.0079*	8.2824*
	(0.409)	(0.103)	(0.061)	(0.000)	(0.040)

Note: Absolute values of t-statistics (P-values) are presented in parentheses in Panels A and B (C).
'*' denotes statistical significance at the 5% level.
'**' denotes statistical significance at the 10% level.
(a), (b) Box-Ljung test of white noise for linear and non-linear (squared) standardised residuals.
(c) Engle and Ng's joint sign bias test applied to the standardised residuals.

TABLE 5
Summary of the Mean and Volatility Impact of 'Positive' and 'Negative' News Macroeconomic Announcements on US Financial Markets

This table reports a summary of the general pattern of significant impacts (down to 10 % level of significance) observed in Table 4 - (a) across three financial markets – foreign exchange, bond and stock markets; (b) across six different types of scheduled macroeconomic announcement - nominal foreign international trade balance (BOT), gross domestic product (GDP), unemployment rate (UE), retail sales growth (RET), consumer price index (CPI), and producer price index (PPI); (c) distinguishing mean and volatility effects; and (d) across 'positive' and 'negative' news announcements (actual versus median survey expectation).

	Foreign Exchange Market				Bond Market				Stock Market			
	Mean		Volatility		Mean		Volatility		Mean		Volatility	
Announcement Type	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg
BOT	-	+								+		
GDP	-	-										
UE		+									+	+
RET	-					+		-			+	+
CPI					-	+			-	+	+	-
PPI			-	+		+			-	+	+	-