LTA 2/00 • P. 209–232

JARI JÄRVINEN

Industry Portfolios, Economic News and Business Conditions: Evidence from the Finnish Stock Market*

ABSTRACT

This paper compares monthly stock price reactions across industries to macroeconomic news (residuals from VAR models) conditional on the state of the economy over the period 1987:01–1995:06. Business conditions are defined relative to trend industrial production. The results suggest that stock price responses to news are not constant, but vary depending on business conditions. For example, industrial production, real money supply, and interest rate news may sometimes cause a positive reaction to stock prices and at other times a negative reaction. When the economy is strong, higher than expected industrial production and real money supply decreases stock prices while in weak conditions the responses are positive. For interest rate news, the signs are reversed. Furthermore, the results show that when the estimations are made conditional on the state of the economy, stock prices respond to a larger set of economic news. The results are in line with McQueen and Roley's (1993) study. Therefore, Finnish stock markets do not behave differently than their counterparts in the United States despite the use of empirical expectation proxies and one-month event windows.

KEY WORDS: *Industry portfolios, macroeconomic news, VAR model, and business conditions*

* I thank Tom Berglund, Hannu Kahra, Eva Liljeblom, Markku Rahiala, Jouko Ylä-Liedenpohja, and seminar participants at the Capital Markets and Financial Economics (FPPE) and at the University of Tampere for their comments and suggestions. Furthermore, the helpful comments by an unknown referee of the Finnish Journal of Business Economics are gratefully acknowledged.

JARI JÄRVINEN, D. Sc. (Econ.)

Sampo asset management LTD • e-mail: jari.jarvinen@sampo.com

1. INTRODUCTION

In seeking to understand movements in the absolute level of aggregate stock markets, there are two dominant approaches in the financial literature. The first approach is based on an efficient market view, which is a direct application of rational expectations to financial markets. The efficient market hypothesis states that stock prices fully and instantaneously reflect all publicly available information, which implies that stocks are expected to respond only to the external news. The second reference point is based on "fads", "noise", or "bubbles" approach in which asset prices reflect for the most part something other than news about fundamental values (e.g., West 1988; LeRoy 1989; and Cochrane 1991). In this study, the efficient market approach is followed.

A strand of empirical studies has sought to test the relevance of macroeconomic news for the stock price movements. Voluminous evidence (e.g., Pearce & Roley 1985; Hardouvelis 1987; Wasserfallen 1989; Bailey 1990; Aggarwal & Schirm 1992; Sadeghi 1992; Ajayi & Mehdian 1995; and Siklos & Anusiewicz 1998) shows that stock prices respond to economic news as predicted by the efficient market theory. However, only a small fraction of observed variations in equity returns can be explained by news (e.g., Roll 1988 and Cutler, Poterba, and Summers 1989). The overall conclusion appears to be that monetary news (e.g., money supply or interest rate) affects stocks while non-monetary news (e.g., industrial production or unemployment rate) has weaker effects.

Each of these studies implicitly assumes that the investor's reactions to economy-wide news is constant over different stages of the business cycle, although a more realistic model allows the investor's responses to news to vary depending on business conditions[1]. It might be a reasonable assumption that a higher than expected industrial production during the depression is good news for the stock market since it might be a sign of the end of the depression. On the other hand, if the economy is booming, a positive "surprise" in industrial production is likely to be bad news for the stocks since it might result in fears of an overheating economy. This might possibly induce policy makers to increase interest rates. The implication of this potential asymmetry is straightforward: if the same type of news is considered good in some states and bad in others states, the estimated news effects in previous studies will be biased towards zero.

1 For example, Fama and French (1989) and Jensen, Mercer, and Johnson (1996) argue that expected stock returns may vary depending on business conditions and monetary environment. Moreover, risk premium could also be time varying depending on whether the economy is in up or down states. This would be consistent with the idea of whether the income or substitution effect dominates in different states (e.g., Abel 1988 and Löflund & Nummelin 1997).

Few studies have sought to test for the asymmetry with respect to the level of the economic activity. For example, McQueen and Roley (1993) show that when the estimations are made conditional on the different stages of the business cycle, a stronger announcement effect between stock prices and economic news is evident. They found that higher than expected industrial production is good news for the stock market during a low state of economic activity, but bad news during a high state of economic activity. Similar asymmetry (with signs reversed) holds true for unemployment rate news as well. Furthermore, this business-condition asymmetry is mainly related to cash flow effect rather than a discount rate effect.

Orphanides (1992) finds also asymmetric responses to economic news despite using a different methodology. His results confirm the conventional view (the so-called overheating hypothesis) that an unexpected increase in unemployment is bad news for the stock market during recessions, but good news when the economy is overheated. Furthermore, in the Finnish stock market data, Löflund and Nummelin (1997) tested for the potential asymmetry in the link between stock prices and industrial production during different business conditions. According to their results, forecasted industrial production growth seems to affect Finnish stock returns differently depending on the level of the current industrial production. Specifically, higher conditional production growth increases expected stock returns only when the economy is weak.

The previous studies are almost exclusively concerned with the relation between the aggregate market and economic news, and very little is known about the cross-sectional variation in this relation across industry-sorted stocks. Specifically, some industries may be less affected by economy-wide changes that occur during different stages of the business cycle, while others may be more affected. For instance, export-oriented industries may be more affected in the price competitive position of the domestic economy than the financial sectors. Therefore, it is interesting to explore whether the industry-specific responses to economic news in up and down states differ from the aggregate market.

The purpose of this paper is to investigate whether the stock price reactions to economic news are different depending on business conditions. Previous studies from all share price index to stock price indexes for various industries are extended. Industry grouped data is especially important in the Helsinki Stock Exchange since the aggregate market index can give biased results due to the fact that Nokia Corporation (a large telecommunications firm) dominates it. Stock returns may vary across industries based on the sensitivity of the industry to general macroeconomic conditions. Furthermore, publication lags in economic statistics and the latest time series available are used.

The results show that a stronger relationship between economic news and stock prices is evident when the market reactions are allowed to vary with business conditions. It is found

that stock prices show asymmetric responses to industrial production, real money supply, and interest rate news in up and down states. A higher than expected industrial production and a real money supply is bad news for the stock market in the high state, but good news in the low state. The reverse holds true with interest rate news. Overall, the results are parallel to McQueen and Roley's (1993) study, showing that the Finnish stock market does not behave differently than its counterpart in the U.S. despite the use of empirical expectation proxies and one-month event windows.

The remainder of this paper is organized as follows: Section 2 outlines the theoretical background. In the next section, data and methods are described. In section 4, empirical results are reported, and in the last section, conclusions are drawn.

2. THEORETICAL BACKGROUND

Efficiency in the stock market is based on the assumption that agents form their expectations rationally, and that stock prices reflect all publicly available information instantaneously; that is, stock prices reflect their fundamental values (e.g., Summers 1986). In an efficient and well-informed stock markets (under Fama's 1970 semi-strong form definition), prices should already embed (or "discount") the expected part of any movement in fundamental, and only the news or unexpected changes should have an effect on stocks.

A common theoretical model that relates stock prices to information posits that stock prices equal the present value of rationally forecasted future cash flows discounted by expected risk-adjusted interest rates. Following McQueen and Roley's (1993) notations, this model can be illustrated

$$(1) \qquad p_t = E\left[\sum_{j=1}^{\infty} \frac{D_{t+j}}{(1+{}_t r_{t+j})} \mid \Omega_t\right],$$

where p_t is the price of the stock at time t, E represents the mathematical expectations conditional on information set Ω_t available to market participants at time t, D_{t+j} is the dividend paid at time $t + j$ and ${}_t r_{t+j}$ is the time varying risk-adjusted discount rate for dividends that occur at time $t + j$, determined in the market based on information known at time t.

According to model (1), news affects stock prices both through an impact on expected future cash flows and an impact on required rates of return used to discount these futures cash flows to the present values. However, we need not to expect that news will affect future cash flows and discount rates in the same way during different stages of the business cycle. For example, when the economy is depressing, a higher than expected industrial production could result in a larger increase in cash flows than discount rates (i.e., the possibility of time varying

risk premium). This causes stock prices to increase because, in this case, there is no need for monetary tightening since the economy is operating below capacity.

Similar reasoning applies also to other news (see subchapter 3.4). Therefore, the ultimate impact of news on stock prices depends on whether the "cash flow effect" or the "discount rate effect" dominates over different stages of the business cycle. In other words, in this paper, the assumption of constant size and sign responses is relaxed, and the responses are allowed to vary depending on business conditions.

3. DATA, METHODS AND HYPOTHESES

3.1. Statistical procedure

The theoretical framework discussed in the last section implies that unexpected changes in fundamentals are the relevant explanatory variables to be included in the empirical work. News in this context is taken to mean any new information that is of relevance to the stock prices that were unexpected in the previous period. One major obstacle in this field is our inability to accurately measure investors' expectations. Studies conducted for the U.S data benefit from the rich menu of available survey data to overcome obvious measurement problems in fundamentals. Specifically, regularly published survey data can be taken to measure expectations, so that direct measures of the news can be constructed. Such information does generally not exist in Finland. Therefore, a statistical procedure must be chosen to separate news from expected changes in an observed time series.

The empirical analysis is carried out in three stages. First, as in Cutler et al. (1989), Lahti and Pylkkönen (1989), Orphanides (1992), and Viskari (1992), among others, a vector autoregression (VAR) model is used to generate the unexpected component of each macroeconomic variable. Second, following McQueen and Roley (1993), different levels of economic activity are separated depending on the growth of industrial production relative to its mean. Finally, monthly stock returns across industries are regressed on residuals from VARs in order to test for the possible asymmetric stock market responses in the high and low states of economic activity.

However, this statistical procedure might be problematic due to measurement problems concerning exactly how the different variables are measured, and how well news can be identified from expected changes in these fundamental economic indicators. Nevertheless, in this study it is assumed that investors respond to the measured news rather than the true news, implying that the original estimating equation should be specified in measured rather than the true values of the news. This eliminates the potential errors-in-variables problem. Furthermore, Pearce and Roley (1985) argue that survey data is more efficient (smaller root-mean-square

error) than time-series models in generating expectations. Despite this "inefficiency", McQueen and Roley (1993) show that the estimated news coefficients using VARs are consistent with the survey data.

3.2. Stock return and macroeconomic data

The data set consists of 102 monthly observations during the period of 1987:01–1995:06. Stock returns in real terms are measured as follows:

1) The first logarithmic differences of the stock price indices (end-of-month values) measured by the HEX-industry stock price indices[2] deflated by the consumer price index. The HEX-industry indices are as follows: (1) banks and finance, (2) insurance and investment, (3) other services, (4) metal and engineering, (5) forest industries, (6) multi-business industry, and (7) other industries. R_{it} denotes industry stock returns at time *t*. In order to compare the industry-level results to aggregate market, we also include the HEX all share price index in this analysis. Source: The Helsinki Stock Exchange.

Without a precise economic theory which explains the link between the economic fundamental's and industry stock returns, the decision about which variables are to be included in information set is somewhat arbitrary. Since this paper deals with a small open economy, the following representative set of macroeconomic indicators is included to describe both real and financial conditions of the Finnish economy. In addition, professional investors closely watch these key economic variables:[3]

2) The logarithm of seasonally adjusted industrial production (*ip*). Source: Statistics Finland.
3) The logarithm of the nominal money supply deflated by the consumer price index (*m*1). Sources: The Bank of Finland and Statistics Finland.
4) Nominal short term interest rate measured by the three-month helibor rate (H3). Source: The Bank of Finland.
5) The logarithm of the consumer price index (*p*). Source: Statistics Finland.
6) The logarithm of the real exchange rate calculated by the Bank of Finland (*s*). Source: The Bank of Finland.

2 See Hernesniemi (1990) for details in HEX-industry price indices (without dividends). Of course, a more appropriate means of measuring stock returns would have been to use Hex yield indices since these capture both capital gains and dividends, but these HEX yield indices are not available prior to 1991. Furthermore, as will be shown later (see footnote 11), the results were close to those including dividends. This is expected since for the early 1990s, the average dividend yield has been relatively low (i.e., some 1–2 percent). In addition, the movements of price and yield indices are strongly correlated ($r = .986$) over the period 1987:09–1995:06. Therefore, price indices are good proxies for yield indices for the chosen sample.

3 Since this paper deals with industry-level data, some industry-specific news should not be forgotten, but these issues shall be dealt at the future stages of this research.

Real exchange rate is a nominal trade-weighted exchange rate deflated by the foreign and domestic consumer prices. Real exchange rate is measured as the number of domestic currency needed to buy one unit of foreign currency at time *t*. Defined in this way; an increase (decrease) in real exchange rate denotes depreciation (appreciation).

3.3. The estimated models

To isolate the news component from expected changes of these five macroeconomic series, an unconstrained *p* dimensional VAR(*p*) system in levels is fitted to the data[4]

$$\mathbf{x}_t = A_1\mathbf{x}_{t-1} + A_2\mathbf{x}_{t-2} + \ldots + A_p\mathbf{x}_{t-p} + \mu + \mathbf{e}_t, \tag{2}$$

where *A* is a (5 x 5) matrix of coefficients, $\mathbf{x}_t$ is a (5 x 1) column vector of macroeconomic variables $\mathbf{x}_t = (ip_{t-2}, m1_{t-1}, H3_t, p_{t-1}, s_{t-1})'$, μ is (5 x 1) column vector of constants, $\mathbf{e}_t$ is a (5 x 1) column vector of error terms $\mathbf{e}_t = (e_t^{ip}, e_t^{m1}, e_t^{H3}, e_t^{p}, e_t^{s})'$ and $\mathbf{e}_t \sim$ i.i.d$(0,\sigma^2)$. The lag length of VARs, based on sequential LM tests, was chosen to be six[5] in this study.

Because of lags in the publication of economic statistics, the values for industrial production in period *t* were assumed to be the published values for month *t*–2. In addition, the values for the consumer price index, the real money supply, and the real exchange rate in period *t* were assumed to be the published values for month *t*–1. Therefore, the first eight observations of each series were lost because of lags in the VAR model (2) and delays in the publication of certain monthly series[6]. This VAR model relates to the current value of each series to the lagged values of the series itself and to those of the other four series. The VAR model is estimated equation-by-equation by using ordinary least squares (OLS) method. The residuals $\hat{\mathbf{e}}_t$ from Equation (2) are treated as unexpected changes and used as independent variables in the second stage regressions.

4 Before estimating the VAR model, it is important to difference the individual series the correct number of times to obtain stationary variables. According to Augmented Dickey – Fuller (ADF) tests, the null hypothesis of a unit root in first differences is rejected for all variables (not shown), and all series achieve stationary after differencing them once. The possibility of cointegration within the framework established by Johansen (1988) is also tested. Likelihood Ratio tests suggests that there may be as many as 2–4 cointegrating vectors presence in the data (not shown) at the 5 percent level. Therefore, the VAR in first differences would be misspecified since it removes the long-run information contained in the levels of the variables. The implication of the cointegration tests is that the VAR model is estimated in levels since the linear combinations of the non-stationary *I*(1) variables are stationary *I*(0) variables, which are suitable for the statistical analysis in the second stage regressions.

5 For shorter lag lengths, the residuals turned out to be serial correlated. This violates our assumption of news being white noise (i.e., news $\hat{\mathbf{e}}_t$ represents white noise if $E(\hat{\mathbf{e}}_t) = 0$ and $E(\hat{\mathbf{e}}_t\,\hat{\mathbf{e}}_{t-j}) = 0$ for $j \neq 0$). Furthermore, examination of the off-diagonal elements of the variance-covariance matrix of the residuals revealed them to be very close to zero (not shown). Only two cross-correlation coefficient out of ten turn out to be significant at the 5 percent level. Therefore, the multicollinearity is not a severe problem, either.

6 However, if the publication lags are ignored, then the residuals $\hat{\mathbf{e}}_t$ are improper estimates of news since the VAR model utilizes information that is not yet available to the market participants.

The empirical analysis is carried out by first testing the impact of economic news on industry portfolios without conditioning on the state of the economy. To contrast results from the business condition model with those from the traditional model, a benchmark model is required. As a starting point, a simple linear regression model is used where news and possibly some later-defined exogenous variables are added. The benchmark model used to test the effects of news on industry stock returns without conditioning the state of the economy is as follows:

$$(3) \qquad R_{it} = a_i + \hat{\mathbf{e}}_t \mathbf{b}_i + \mathbf{d}_i + u_{it},$$

where R_{it}, ($i = 1,..., 7$), is the real return of the industry i from month t–1 to month t, a_i is the mean return for industry i, $\hat{\mathbf{e}}_t$ is a (1×5) vector of economic news calculated as the residuals from the VAR(6) model, $\mathbf{b}_i$ is a (5×1) vector of unknown regression coefficients measuring the effects of news on industry stock returns, $\mathbf{d}_i$ is a vector of dummy variables,[7] and u_{it} are industry-specific error terms, which are assumed to be independently and identically distributed with zero mean and constant variance. This model specification is widely used in previous empirical studies (e.g., Siklos & Anusiewicz 1998).

In order to test the main hypothesis that stock price responses to macroeconomic news vary over business conditions, some kind of classification of different levels of economic activity must be done. Following McQueen and Roley (1993), the level of seasonally adjusted monthly industrial production (1990 = 100) index relative to trend to define three discrete economic states is used. The classification of economic states is as follows: First, the logarithm of seasonally adjusted industrial production on a constant and a time trend from September 1987 to June 1995 is regressed

$$(4) \qquad ip = constant + time\ trend + \eta.$$

Second, in order to create upper and lower bounds in economic activity, a constant from a time trend is added and subtracted[8]. The constant is chosen in such a way that about 25 percent of the actual values of the logarithm of industrial production are above and below the

7 Vector of dummies consists of 11 monthly seasonal dummies, a time trend, and a "crash" dummy ($D87 = 1$ if t = 1987:10 and otherwise zero), which captures the impact of the October 1987 stock market crash. Furthermore, dummy vector includes an exchange rate dummy ($D92 = 1$ if t = 1992:09–1995:06 and otherwise zero) to account for the change in exchange rate regime from fixed to floating exchange rate. Finally, a dummy ($D929 = 1$ if t = 1992:09 and otherwise zero) is included to account for floating decision.

8 The bounds for the industrial production are not constructed symmetrically. Instead, the deviations from the trend industrial production are +0.035 and –0.051. This classification puts about 26 percent of the observations in the high state and about 25 percent in the low state.

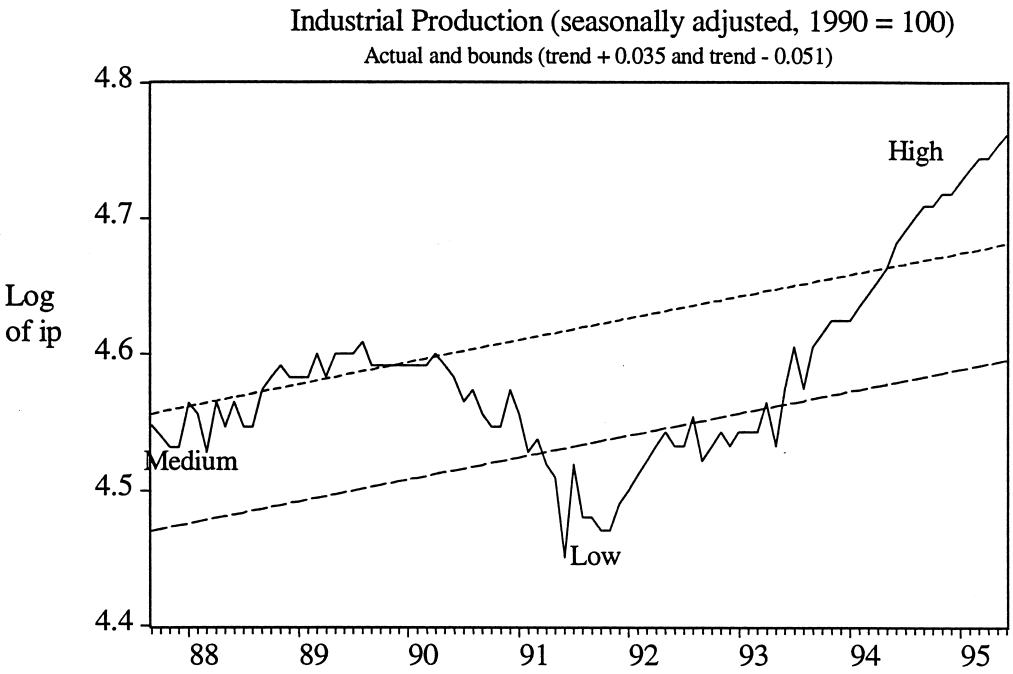

FIGURE 1. The Classification of Economic States

created upper and lower bounds, respectively. The classification of economic states is presented in Figure 1. The economic activity is denoted as "*HIGH*" and "*LOW*" when the logarithm of observed industrial production is above the upper bound and below the lower bound, respectively. The remaining 50 percent of observations between the upper and lower bounds represent the "*MEDIUM*" economic activity.

Equation (2) is unnecessarily restrictive since it assumes that the response of stock prices to news are constant (size and sign) and independent of business conditions. However, if the responses are different depending on the level of the economic activity, then accounting for these asymmetric responses should improve the estimates of news effects on stocks. In order to test whether the industry portfolio responses to macroeconomic news vary across business conditions, the following linear model specification is used:

$$(5) \qquad R_{it} = a_i + HIGH_t \cdot \hat{\mathbf{e}}_t \mathbf{b}_i^H + MEDIUM_t \cdot \hat{\mathbf{e}}_t \mathbf{b}_i^M + LOW_t \cdot \hat{\mathbf{e}}_t \mathbf{b}_i^L + \mathbf{d}_i + u_{it}$$

where $HIGH_t = 1$ if economic activity is in the high state at time t, and otherwise zero, $MEDIUM_t = 1$ if economic activity is in the medium state, and otherwise zero, and $LOW_t = 1$ if

economic activity is in the low state, and otherwise zero. The other variables are defined as in the basic model (3).

3.4. Mapping from news to stock prices and statistical tests

Following the studies by Pearce and Roley (1985), McQueen and Roley (1993), and Amihud (1996), a negative relationship between the unexpected inflation and stock returns is expected. This is surprising since according to the Fisherian view, stocks should provide a hedge against expected inflation. One channel by which inflation news may have a negative impact on stock prices occurs if investors believe that monetary authority reacts to unexpected inflation by monetary tightening. Given that inflation is negatively related to future economic activity, a higher (lower) than expected inflation may lead to decrease (increase) in stock prices (Boudough, Richardson, and Whitelaw 1994). This negative relation applies to all economic states since the central bank is assumed to conduct monetary policy that aims for a low inflation in all states of the economic activity.

It is also expected to see a negative relationship between the interest rate news and stock returns (e.g., Chen, Mohan, and Steiner 1999). Higher interest rates mean lower present value of equity prices. A higher interest rate *ceteris paribus* makes the rate of return on debt instruments relatively more attractive compared with stocks to the investors. In the low state, higher than expected interest rates is more bad news (i.e., negative) since at the same time, cash flows are also diminishing. However, in the high state, the effect is smaller or even positive if investors consider that the monetary authority responds in time to economic prospects to avoid overheating economy in the future. McQueen and Roley (1993) find that in the high state, higher than expected Federal Reserve discount rate have a positive, although insignificant, impact on stock prices.

Weaker than expected real exchange rate is positive news for the stocks since it improves the price competitiveness of domestic industries by making their products cheaper to foreigners (e.g., Chow, Lee, and Solt 1997). This increases firms' profits and the value of their shares. However, in the high state, weaker than expected currency is negative news since the monetary authority may raise interest rates to avoid inflation due to the foreign commodity and product markets. Instead, in the low state, it is expected that this piece of news would be positive news since the probability that the central bank increase its tender rate is smaller. Namely, if the expected cash flow dominates the expected discount rate effect, the response coefficients might even change into positive.

Several studies (e.g., Pearce & Roley 1985, Hardouvelis 1987, Prag 1994, and Siklos & Anusiewicz 1998) have examined the impact of the money stock news on security returns. The consensus findings are that unexpectedly high money growth is associated with higher

TABLE 1. The Expected Signs of the Response Coefficients

	News				
Business conditions	ip^u	$m1^u$	$H3^u$	p^u	s^u
High	***lower***	***higher***	***lower***	***higher***	***lower***
Medium	**(+)**	**(–)**	**(–)**	**(–)**	**(+)**
Low	***higher***	***lower***	***higher***	***lower***	***higher***

Notes: **The news variables are industrial production (ip^u), real money supply ($m1^u$), three-month helibor rate ($H3^u$), consumer prices index (p^u), and real exchange rate (s^u). In the medium state, plus (+) and minus (–) signs denote positive and negative news for the stocks, respectively. *Higher* and *lower* denote the magnitude of the response coefficients in up and down states compared to medium state.**

interest rates and lower stock prices. One interpretation of this result is that investors may expect that the monetary authority will react to a higher than expected money growth by quickly moving to a more restrictive monetary policy. However, in the high state, it is expected that unexpectedly high money growth depress stocks even more due to increase inflation expectations. In the low state, the liquidity effect dominates the expected real interest rate and the expected inflation hypotheses (detailed discussion can be found in, e.g., Cornell 1983). Therefore, the effect is smaller and if the liquidity effect is strong enough, the price response to money supply news could result in opposite sign[9].

Finally, higher than expected real activity is good news for the stocks since it may increase investors' expectations of future growth and expected future profits of firms. Good news about the economy in the low state should make stock investments more attractive and thus increase share prices even more since it might be a sign of the end of a depression. On the other hand, when the economy is in the high state, output surprises may cause investors to forecast more restrictive monetary policy in the future if such surprises are correlated with future inflation or money growth. Therefore, the likely impact of real activity surprises on stock prices at the high state is smaller or even negative. McQueen and Roley (1993) provide evidence for these asymmetric stock price responses to real activity news.

In order to summarize the mapping from news about the economy to industry portfolios, the expected signs concerning the stock price responses to news conditional on the state of the economy are presented in Table 1. Furthermore, due to possibly time varying risk premi-

9 In the Finnish data, the empirical evidence is mixed, however. Lahti and Pylkkönen (1989) report a negative relationship between unexpected real money supply and stock prices while Viskari (1992) finds a positive relation between these variables. However, both of these studies ignore publication lags in economic statistics, which, in fact, have an effect on the results.

um, the response coefficients could be lower in some states and higher in other states depending on whether the cash flow or discount rate effect dominates.

Finally, the statistical significance of individual coefficients is examined by *t*-tests. The significance of various subsets of coefficients is also examined by using *F*-tests of coefficient restrictions. H_1 tests the hypothesis that news jointly has no impact on stock prices across industries. H_2 and H_3 test the significance of the news related to monetary policy and the other three news coefficients as a group, respectively.

Also tested was whether the news coefficients in the low and in the high state are the same. H_4 tests whether news jointly has a similar impact on industry portfolios both in the high and in the low state of the economy. Hypotheses from H_5 to H_6 test one by one whether the response coefficients in the low state are significantly different from the same coefficients in the high state.

4. ESTIMATION RESULTS

4.1. The response of stock prices to economic news: unconditional results

First, Equation (3) is estimated separately for each industry and the HEX all share price index without considering any business conditions. Following Pagan (1984), OLS results in consistent parameter estimates and standard errors of the response coefficients only when contemporaneous residuals are present in the second stage estimations. Due to the usual serial correlation of stock returns, a systematic pattern in residuals is seen because if returns are serial correlated, then Equation (3) would exhibit serial correlated residuals.[10] Furthermore, heteroscedasticity (e.g., Schwert 1989) might also be present in residuals. These problems can be corrected via the Newey-West (1987) procedure to obtain correct standard errors and test statistics.

The estimation results of the Equation (3) are reported in Appendix 1. These results show that the data supports the efficient market theory that stock prices respond to economic news[11].

10 See Amihud and Mendelson (1989) for an analysis of serial correlation in stock index returns. In the Finnish data, for example, Vaihekoski (1999) reported serial correlation in monthly returns. In principle, there are two ways to deal with this problem: include lagged return(s) or use the Newey-West (1987) method. When taking a closer look at the serial correlation in returns, it turns out that the serial correlation diminished in the floating exchange rate period. This might be considered as an increased liquidity, which cause smaller problems with infrequent trading.

11 To check the possible bias that excluding dividends would produce, the regression model (3) is estimated by using dividend adjusted monthly aggregate returns as a dependent variable (calculated by using the WI-index (87–90) and HEX yield-index (91–95)). For further details, see Berglund et al. (1983) and Hernesniemi (1990). The results are

$$R_t = 0.386\ ip^u - 0.569\ m1^u - 0.023\ H3^u + 0.359\ p^u + 0.633\ s^u \qquad R^2C = 0.086\ DW = 1.742$$
$$(1.229)\quad (-1.568)\quad (-2.108)\quad (0.155)\quad (1.562) \qquad (\ .\ ) = t\text{-values}$$

The results (a constant and dummies are not reported) are close to those without dividends. Therefore, it can be argued that excluding dividends would not bias our results, at least in the chosen sample period.

The data rejects the hypothesis (H_1) that news jointly has no impact on stocks at less than 5 percent level on every industry, excluding insurance and investment and forest industries. Furthermore, the hypothesis (H_2) that news related to monetary policy (i.e. real money supply and interest rate) has no impact on stocks is rejected at the 10 percent level in all industries, but forest industries and in the multi-business industry. On the other hand, the hypothesis (H_3) that the other news jointly has no impact on stocks is rejected at the 10 percent level only in the multi-business industry and other industries[12].

The explanatory power (without dummies) of economic news is rather low: news explains only some 8 percent of the aggregate stock return variation[13]. This finding is in line with previous studies conducted on the Finnish stock market (e.g., Lahti & Pylkkönen 1989 and Viskari 1992). Across industries, the explanatory power varies between zero to 16 percent. Most of the statistically significant response coefficients affect industry stock returns with their predicted signs. For example, an unexpected one-percentage point increase in interest rate lowers share prices for most industries by 2.9–6.1 percent, the financial sectors being the most interest rate sensitive.

A real exchange rate has significant impact on banks and finance, multi-business, and the all share price index. An unexpected one percent depreciation increases share prices for these stocks by 0.8–1.5 percent. Furthermore, higher than expected depreciation is negative news for domestic-oriented industries. In addition, an unexpected one percent increase in the real money supply decreases stocks in the financial sectors by 0.7 percent. Higher than expected industrial production increases stocks in the metal and engineering and other industries also by 0.7 percent. News about price levels appears to have less significant effect on stocks, and the positive values of response coefficients are in contrast with prior expectations, although the large standard errors also permit a wide range of negative values[14].

12 This paper also tests whether the stock prices respond to past information. Adding news lagged by one month into the model (3) produced only a few significant coefficients for some industries (not reported). This might be a sign of inefficiency due to the slow dissemination of information. However, it also might be a consequence of the estimation problems or timing issues associated with the release of new information and the reflection of the information into the variables in question. Moreover, the coefficients for contemporaneous news coefficients remained practically unchanged in magnitude, although the *t*-values became systematically lower. It is also test whether the lagged news jointly has significant impacts on stock returns (H_1). This hypothesis can be rejected at the 1 percent level only in insurance and investment, while the hypothesis H_2 and H_3 cannot be rejected at conventional levels for any industries.

13 When referring to adjusted coefficient of determination, the R^2-measures without the dummies are meant (denoted in brackets). This makes it possible to compare the results with the previous studies.

14 It should be noted that the results with respect to price level news were sensitive to the inclusion of *D*929-dummy (September 1992). Without it, price level news has negative (insignificant) impact on stocks.

4.2. The response of stock prices to economic news: conditional results

The results in Appendix 1 are based on the implicit assumption that the response of stock prices to macroeconomic news is symmetric irrespective of business conditions. In this subchapter, this assumption is relaxed, and it is important to investigate further how robust or sensitive the unconditional results are by considering the responses conditional on the level of economic activity[15,16]. Again, the Newey-West (1987) estimator of the covariance matrix is employed to obtain correct standard errors and test statistics.

We begin with the summary of the signs of the response coefficients as well as their statistical significance (as reported in Appendix 2). From a quick glance of Appendix 2, the results support the hypothesis of asymmetric reaction depending on the business conditions. For example, at the aggregate market level, the asymmetry with respect to industrial production and real money supply is as severe as it results in opposite signs for the slope coefficients in up and down states. Across industries, similar sign reversals can also be found with the rest of the news, but overall, this business conditions asymmetry is mainly related to industrial production, real money supply, and interest rate news.

The detailed results from Equation (5) are reported in Appendix 3. In contrast to Appendix 1, there is now a stronger relationship between news and industry portfolios since the adjusted coefficients of determination are systematically higher than those in the unconditional model (2) ignoring potential business cycle asymmetries. For example, news jointly explains now about 11.5 percent of the aggregate market variation, and across industries, the R^2C-measures vary from 2.9 to 13.6 percent. Furthermore, when the estimations are made conditional on the level of the economic activity, stocks respond significantly to a larger set of economic news[17].

15 The results are based on the assumption of i.i.d. residuals. According to diagnostic tests, residuals are not serial correlated in most industries, and the second-order ARCH effect is clearly observed only in banks and finance. Still, although some minor residual problems are detected, the standard errors and test statistics across industries are based on the Newey-West (1987) procedure. Furthermore, residuals from almost every industry pass the Jarque-Bera normality-test. Specifically, only metal and engineering industry exhibits non-normal residuals. However, decomposition of the statistic into tests using separate measures of skewness and kurtosis shows that deviation from normality is due to asymmetric distribution, which is probably more serious than excess kurtosis (too many large residuals).

16 The structural stability of the models is also examined (not shown). CUSUM tests suggest that there has occurred at least one structural break, which is located in September 1992. CHOW tests confirmed that this break was significant at the 5 percent levels in every industry, except metal and engineering and forest industry. There are also some problems with the model misspecification with some industries. In total, while there are some signs of deviations from OLS-assumptions, the diagnostics are interpreted (after correction) as suggesting that our models across industries have statistical properties that are passable.

17 An interesting observation is that average returns in most industries increase when business conditions improve from low to normal. The same results hold also when business conditions become weaker from high to normal. However, when business conditions improve from normal to high, average returns decrease six industries out of seven. Therefore, it appears that the "best time" to buy equities is when the level of economic activity is revised up in a weak economy, or when the level of economic activity is revised down in an already strong economy. This finding is in line with the results by Löflund and Nummelin (1997).

When considering individual coefficients, good news about the economic activity in the high state is bad news for the stock market. When the economic activity is low; good news about the economy is also generally good news for the stocks, although the response coefficients fail to reach any significance at conventional significance levels. Furthermore, a higher than expected real money supply in the high state is negative news for the stocks, but it changes into positive news for most of the cases when the economic activity is low. In the medium state, a higher than expected real money supply causes stock prices for most industries to decrease by 0.4–1.2 percent and metal and engineering and multi-business industry respond to real money supply news more than the market.

An interesting result is the positive relationship between stock prices and higher than expected interest rates in the high states, although this relationship is not significant. Furthermore, the negative impact is even stronger when the state is low compared with results when the state is medium. In the low state, a higher than expected interest rate decreases shares prices across all industries but financial sectors at 10 percent levels by 5.1–9.8 percent. Among all industries, financial sectors show the strongest reaction to interest rate news in the medium state.

The inflation news has a negative impact on stocks in the high and in the low state for most cases, although these estimates are not significant. In addition, inflation news decreases stocks more in the low state than in the high state. For example, higher than expected inflation decreases stocks for the multi-business industry by 10 percent in the high state as compared to the low state, where the same kind of news decreases stocks twice as much. Overall, inflation news produces mixed results in the medium state. Real exchange rate news has a negative impact on share prices for about half of the cases when the state is low or high. Nevertheless, the same kind of news is good for the stock market in the medium state. None of the response coefficients reaches significance at conventional levels.

Finally, the joint hypothesis of the business cycle asymmetry is tested. First, the hypothesis that all response coefficients in the high and in the low state are the same (H_4) can be rejected less than 10 percent levels only in other services and metal and engineering, among all industries. Second, when testing whether the individual coefficients in the high and low states are the same (H_5–H_9), the null can be rejected at 10 percent levels all but inflation and real exchange rate news for some of these industries[18].

18 This paper also investigates how sensitive or robust the reported results are by considering alternative ways to produce market expectations, news, and economic states. First, news is generated by using ARIMA-models, but the results were in line with the reported results, although the test statistics were systematically lower. News is also generated with residuals from the VAR in first differences and error correction form, which produces somewhat higher test statistics in the second stage of the regressions.

5. CONCLUSIONS

The purpose of this paper was to investigate whether the stock price reactions to fundamental macroeconomic news depend upon business conditions. It is found that the reactions are not constant, but vary with the state of the economy. In particular, higher than expected industrial production or real money supply when the economy is already strong results in lower stock prices, whereas the same surprise in a weak economy is associated with higher prices. For interest rate news, the signs are reversed. Overall, these results suggest that previous estimates obtained without any allowances for business cycle effects be biased towards zero partly for this reason, contributing to the insignificant responses estimated in earlier studies.

Without conditioning on the state of the economy, the statistically significant response coefficients affect stocks mainly with their predicted signs. Consistent with the evidence of Pearce and Roley (1985), stocks respond primarily to monetary news while responses to non-monetary news is weaker. Across industries, parallel to Hardouvelis (1987) among others, the financial sectors show the strongest reactions to interest rate news, apparently because monetary development directly affects the cash flows of financial companies. Moreover, stocks for domestic-oriented sectors respond to news about the domestic fundamentals stronger when compared to stocks for export-oriented sectors, whose prices might instead reflect global business conditions or changes in economic growth in export markets. Surprisingly, metal and engineering and forest industries show no response to the real exchange rate.

When the estimations are conducted conditional on the level of the economic activity, stocks respond to a larger set of news, and a stronger relationship between news and stock price changes is evident. According to the results, several asymmetric response coefficients were found. The different response coefficients in up and down states could well be due to changes in risk premium in up and down states. For example, good news about the economic

Second, several alternative lag structures in the VAR-model is tried, and it appears that the fewer lags are included in the VAR model the stronger the asymmetry especially with respect to industrial production (H_5). When considering alternative width of the bounds around the fitted trend used to define business conditions, the changes concern mainly industrial production news. These results suggest that the more observations are classified in normal state the stronger the data rejects the hypothesis (H_5).

Third, seasonally adjusted unemployment rate is used to classify economic states. The results support the hypothesis of asymmetric responses with respect to industrial production news in up and down states, although the evidence is now weaker. Furthermore, economic states were also classified by using the graph of the general stock market index (e.g., Borio and McCauley, 1996, 94–95) into bull and bear markets. The effects of industrial production and real money supply news change signs in bull market, but in total, the results are difficult to summarize here.

Finally, the economic states were classified by using survey data on firms expectations of future business conditions. The results with this ex ante criteria produce similar results as classification with bull and bear market conditions. Therefore, future studies might focus on investigating the news effects using ex ante criteria instead of ex post classification scheme.

activity when the economy is booming is bad news for the stock market. On the other hand, when the economy is in a recession, good news about the economy is generally good news for the stocks. This implies that the cash flow (discount rate) effect is more likely to dominate in down (up) states.

Similarly, a higher than expected real money supply in the high state is negative news for the stocks while in the low state, the same piece of news is positive news for the stock market. The response of stock prices to real money supply news in low state is dissimilar to what the other researchers have found in US data. Therefore, it seems that in recessions the liquidity effect dominates the expected real interest rate and the expected inflation hypotheses (discussed in Cornell 1983). Moreover, when considering the magnitudes of the parameter estimates, stock prices fall most when the business conditions are normal indicating that market's expectations of inflation and fear of monetary tightening influence stocks stronger in the normal states than other states.

Another interesting observation is the positive (although statistically insignificant) relation between stocks and higher than expected interest rate in the high states. This finding is parallel to McQueen and Roley's (1993) result in U.S. data. Interestingly, the results show that the negative relationship between interest rate news and stock prices is stronger when the state is low. In other words, the weaker the business conditions the more stocks decrease after unanticipated increase in interest rates. This implies that as the business conditions become stronger, agents might put more weight on improved future cash flows expectations than return requirements. Finally, the results support the common finding that financial companies are the most interest rate sensitive, but this conclusion is valid only in normal state.

As also noted in Cutler et al. (1989), the use of estimated VAR residuals, as proxies for news might be problematic for several reasons. First, if the VARs are misspecified, residuals do not accurately reflect the value of news to agents. If market participants operate with an information set larger than the one we have considered here, residuals may overstate the importance of news. Second, VAR does not capture new information about future macroeconomic conditions, revealed in period *t* but is not directly reflected in that period variable. According to Fama (1990), stock price changes may largely reflect changes in expectations about future movements in macroeconomic fundamentals, which may not always be reflected in news about their current values. Third, there are some timing issues associated with the release of new information about fundamentals and the reflection of the information into the variables in question.

In total, the results presented in this paper suggest that monetary news have the main effect on stock prices. These results are parallel to McQueen and Roleys (1993) study and based on these results, Finnish stock markets do not behave differently than their counterparts

in the U.S. despite the use of empirical expectations proxies and one-month event windows. It appears that mainly domestic-oriented industries respond monetary news stronger than industrial industries. This might indicate that export-oriented industrial industries respond to news about the export market and international business conditions. Future research might focus on studying the response of export industries to global economic news for example, concerning monetary policy conducted by the Federal Reserve or to study the effects of unexpected changes in US future economic activities.

Another topic for the future research would be to use different econometric methodology. For example, the expectations generating process might be improved into a direction that is more realistic by using recursive least square estimation method when producing news. This statistical procedure allows economic agents to update their expectations continuously when new information becomes available. Furthermore, due to possible cointegration properties of macroeconomic data, vector error-correction (VEC) models could also be used as a description of news generating process. In such a modeling strategy, both short-term expectations (differences) as well as revisions in expectations (error-correction term) could be modeled at one pass.

Finally, business conditions could be alternatively classified in up and down states by using Smooth Transition Regression (STR) models, or alternatively by using some ex ante measures (e.g. consumer confidence index) as a criterion for classification. This could give us valuable information about how stocks in the Helsinki Stock Exchange are priced with respect to fundamental macroeconomic information during different states. ■

REFERENCES

ABEL, A. (1988). Stock Prices under Time-Varying Dividend Risk – An Exact Solution in an Infinite-Horizon General Equilibrium Model. *Journal of Monetary Economics*. 22. 375–93.

AGGARWAL, R. & SCHIRM, D. C. (1992). Balance of Trade Announcements and Asset Prices: Influence on Equity Prices, Exchange Rates, and Interest Rates. *Journal of International Money and Finance*. 11. 80–95.

AJAYI, R. A. & MEHDIAN, S. M. (1995). Global Reactions of Security Prices to Major US-induced Surprises: An empirical Investigation. *Applied Financial Economics*. 5. 203–218.

AMIHUD, Y. & MENDELSON, H. (1989). Index and Index-Futures Returns. *Journal of Accounting, Auditing, and Finance*. 4. 415–31.

AMIHUD, Y. (1996). Unexpected Inflation and Stock Returns Revisited – Evidence from Israel. *Journal of Money, Credit and Banking*. Vol. 28. No. 1. 22–33.

BAILEY, W. (1990). US Money Supply Announcements and Pacific Rim Stock Markets: Evidence and Implications. *Journal of International Money and Finance*. 9. 344–356.

BERGLUND, T. & WAHLROOS, B. & GRANDELL, L. (1983). The KOP and the UNITAS indexes for the Helsinki Stock Exchange in the light of a New Value Weighted Index. *Finnish Journal of Business Economics*. 32. 30–41.

BORIO, C. E. V. & MCCAULEY, R. N. (1996). The Economics of Recent Bond Yield Volatility. *BIS Economic Papers*. Monetary and Economic Department. Basle. No. 45.

BOUDOUGH, J. & RICHARDSON, M. & WHITELAW, R. F. (1994). Industry Returns and the Fisher Effect. *Journal of Finance.* 49. 1595–1616.

CHEN, C. R. & MOHAN, N. J. & STEINER, T. L. (1999). Discount Rate Changes, Stock Market Returns, Volatility, and Trading Volume: Evidence from Intraday Data and Implications for Market Efficiency. *Journal of Banking & Finance.* 23. 897–924.

CHOW, W. H. & LEE, W. Y. & SOLT, M. E. (1997). The Exchange-Rate Risk Exposure of Asset Returns. *Journal of Business.* Vol. 70. No. 1. 105–123.

COCHRANE, J. H. (1991). Volatility Tests and Efficient Markets. *Journal of Monetary Economics.* 27. 463–485.

CORNELL, B. (1983). The Money Supply Announcement Puzzle. *American Economic Review.* 83. 644–657.

CUTLER, D. M. & J. M. POTERBA & L. H. SUMMERS (1989). What Moves Stock Prices? *Journal of Portfolio Management.* 15. 4–12.

FAMA, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance.* 35. 383–423.

FAMA, E. F. (1990). Stock Returns, Expected Returns, and Real Activity. *Journal of Finance.* VOL. XLV. 1089–1128.

FAMA, E. F. & FRENCH, K. R. (1989). Business conditions and Expected Returns on Stocks and Bonds. *Journal of Financial Economics.* Vol. 25. No. 2. 23–50.

HARDOUVELIS, G. A. (1987). Macroeconomic Information and Stock Prices. *Journal of Economics and Business.* 39. 131–140.

HERNESNIEMI, H. (1990). *Hex-indeksi.* Elinkeinoelämän Tutkimuslaitos (ETLA). B 68.

JENSEN, G. R. & MERCER, J. M. & JOHNSON, R. R. (1996). Business Conditions, Monetary Policy and Expected Security Returns. *Journal of Financial Economics.* Vol. 40. 213–38.

JOHANSEN, S. (1988). Statistical Analysis of Cointegrating Vectors. *Journal of Economic Dynamics and Control.* 12. 231–54.

LEROY, S. F. (1989). Efficient Capital Markets and Martingales. *Journal of Economic Literature.* 27. 1583–1621.

LAHTI, A. & PYLKKÖNEN, P. (1989). News and Stock Prices. *Finnish Journal of Business and Economics.* 3. 184–193.

LÖFLUND, A. & NUMMELIN, K. (1997). On Stocks, Bonds and Business Conditions. *Applied Financial Economics.* 7. 137–146.

MCQUEEN, G. & V. V. ROLEY (1993). Stock Prices, News and Business Conditions. *The Review of Financial Studies.* Vol. 6. Number 3. 683–707.

NEWEY, W. & WEST, K. (1987). A Simple Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica.* VOL. 55. 703–708.

ORPHANIDES, A. (1992). When Good News is Bad News: Macroeconomic News and the Stock Market. *Board of Governors of the Federal Reserve System.* Paper presented at the 1992 Winter Meeting of the Econometric Society New Orleans, Lousiana.

PAGAN, A. (1984). Econometric Issues in the Analysis of Regressions with Generated Regressors. *International Economic Review.* 25. 221–247.

PEARCE, D. K. & V. V. ROLEY (1985). Stock Prices and Economic News. *The Journal of Business.* 58. 49–67.

PRAG, J. (1994). Money Supply Announcements and Interest Sensitive Stocks. *Review of Financial Studies.* Volume III. Numbers 1 and 2. Fall 1993: Spring 1994. 130–139.

ROLL, R. (1988). R^2. *Journal of Finance.* 43. 541–566.

SADEGHI, M. (1992). Stock Market Response to Unexpected Macroeconomic News: The Australian Evidence. *International Monetary Fund Working Paper.* 92/61.

SCHWERT, G. W. (1989). Why Does Stock Market Volatility Change Over Time? *Journal of Finance.* 44. 1115–1153.

SIKLOS, P. L. & ANUSIEWICZ, J. (1998). The Effect of Canadian and U.S. M1 announcements on Canadian Financial Markets: The Crow Years. *Journal of Economics and Business.* 50. 49–65.

SUMMERS, L. H. (1986). Does the Stock Market Rationally Reflect Fundamental Values? *The Journal of Finance.* VOL. XLL. 591–602.

VAIHEKOSKI, M. (1999). Essays on International Asset Pricing Models and Finnish Stock Returns. *Ekonomi and Samhälle.* 80. Swedish School of Economics and Business Administration.

VISKARI, J. (1992). News and Stock Prices: Some Further Results. *Finnish Journal of Business and Economics.* 3. 371–376.

WASSERFALLEN, W. (1989). Macroeconomic News and the Stock Market: Evidence from Europe. *Journal of Banking and Finance.* 13. 613–626.

WEST, K. D. (1988). Bubbles, Fads and Stock Price Volatility Tests: A Partial Evaluation. *The Journal of Finance.* XLIII. 639–60.

APPENDIX 1. The response of industry portfolios to macroeconomic news (1987:09–1995:06, n = 94)

Model (3): $R_{it} = a_i + \hat{e}_t b_i + d_i + u_{it}$

Industry portfolios	ip^u	$m1^u$	$H3^u$	p^u	s^u	R^2C	SEE/DW	H_1: $b_i = 0$	H_2: $b_i = 0$	H_3: $b_i = 0$
Banks and finance	–0.223	–0.723*	–0.042**	–1.551	1.351*	0.376	0.087	3.67***	4.35**	1.29
	(–0.446)	(–1.948)	(–2.324)	(–0.534)	(1.729)	{0.151}	1.99	[0.005]	[0.016]	[0.286]
Insurance and investments	0.478	–0.680*	–0.061**	–1.204	0.194	0.344	0.082	1.82	3.61**	0.36
	(0.776)	(–1.850)	(–2.285)	(–0.346)	(0.284)	{0.160}	1.99	[0.120]	[0.032]	[0.785]
Other services	0.538	–0.289	–0.035***	3.545	–0.359	0.352	0.057	5.14***	6.28***	1.11
	(1.317)	(–0.939)	(–3.368)	(1.520)	(–0.741)	{0.070}	1.88	[0.000]	[0.003]	[0.350]
Metal and engineering	0.676*	–0.701	–0.029*	–0.154	0.047	0.125	0.075	2.50**	2.84*	1.00
	(1.677)	(–1.373)	(–1.687)	(–0.053)	(0.077)	{0.007}	1.96	[0.038]	[0.065]	[0.398]
Forest industries	0.429	–0.406	–0.014	1.463	0.562	0.139	0.077	1.41	1.01	0.56
	(0.995)	(–0.800)	(–0.882)	(0.459)	(0.767)	{0.000}	1.86	[0.232]	[0.368]	[0.643]
Multi–business industry	0.538	–0.863	–0.019	0.271	1.450***	0.346	0.076	5.01***	1.87	4.00**
	(1.150)	(–1.458)	(–0.983)	(0.082)	(2.845)	{0.090}	1.73	[0.001]	[0.162]	[0.011]
Other industries	0.763**	–0.335	–0.039***	0.087	–0.064	0.326	0.055	4.85***	4.74**	2.38*
	(2.596)	(–1.135)	(–3.079)	(0.034)	(–0.134)	{0.090}	2.10	[0.001]	[0.012]	[0.076]
HEX all share index	0.410	–0.635	–0.023*	0.018	0.778*	0.381	0.058	4.31***	2.99*	2.00
	(1.217)	(–1.606)	(–1.722)	(0.007)	(1.780)	{0.082}	1.74	[0.002]	[0.057]	[0.121]

Notes: News variables are the industrial production (ip^u), the real money supply ($m1^u$), the three-month helibor rate ($H3^u$), the consumer price index (p^u), the real exchange rate (s^u), and are proxied by the VAR(6) residuals. All variables are logarithms except the helibor rate. T-statistics are in a parenthesis, and are corrected for heteroscedasticity and autocorrelation by using Newey-West (1987) procedure. R^2C is the coefficient of determination adjusted for degrees of the freedom. Round brackets denote R^2C measures estimated without dummies (i.e., $d_i = 0$). H_1 is the null hypothesis that all news coefficients are jointly zero; H_2 is similar for $m1^u$ and $H3^u$; and H_3 is similar for the other three coefficients. Numbers in square brackets are *p*-values. *, ** and *** denotes significance at the 10%, 5%, and 1% level, respectively.

APPENDIX 2. Summary of the signs of the response coefficients and their statistical significances

Industry		ip^u	$m1^u$	$H3^u$	p^u	s^u
Banks and finance	*H*	–	–	+	–	+
	M	–	–**	–	–	+
	L	–	–	–	–	+
Insurance and inv.	*H*	–	–	–	–	–
	M	+	–*	–	+	–
	L	–	–	–	–*	+
Other services	*H*	–***	–	+	+	–
	M	+*	–*	–*	+*	+
	L	+	+	–***	–	–
Metal and engin.	*H*	–*	–	+	–	–
	M	+	–***	–	+	+
	L	+	+**	–***	–*	–
Forest industries	*H*	–**	+	+	–	–
	M	+	–***	–	+	+
	L	+	+**	–*	–	–
Multi-business ind.	*H*	–	–	–	–*	+
	M	+	–***	–	+	+
	L	–	+	–**	–*	+
Other industries	*H*	+	–	–	–	+
	M	+*	–	–*	+	+
	L	+	–	–*	–	–
HEX all share index	*H*	–	–	–	–	+
	M	+	–***	–	+	+
	L	+	+	–**	–	+

Notes: Variables are: the industrial production (ip^u), the real money supply ($m1^u$), the three-month Helibor rate ($H3^u$), the price level (p^u), and the real exchange rate (s^u). *H*, *M* and *L* denote high, medium, and low state of economic activity, respectively. Plus and minus signs denote relationship between stock prices and macroeconomic news. *, ** ja *** denote significance at the 10%, 5% or 1% level, respectively.

APPENDIX 3. The Response of industry portfolios to macroeconomic news during different states of the economy, (1987:09–1995:06)

Model (5): $R_{it} = a_i + HIGH_t \cdot \hat{e}_t b^H_i + MEDIUM_t \cdot \hat{e}_t b^M_i + LOW_t \cdot \hat{e}_t b^L_i + d_i + u_{it}$

Industry		ip^u	$m1^u$	H3^u	p^u	s^u	R^2C	Null hypothesis	*F*-statistics	[*p*-value]
Banks and finance	*HIGH*	–0.371	–0.174	0.020	–4.324	0.484	0.303	H_4: $b^H = b^L$ for all news	0.58	[0.715]
		(–0.306)	(–0.106)	(0.336)	(–0.693)	(0.360)	[0.091]	H_5: $b^H = b^L$ for ip^u	0.08	[0.784]
	MEDIUM	–0.080	–0.888**	–0.051	–1.815	1.033		H_6: $b^H = b^L$ for $m1^u$	0.03	[0.868]
		(–0.092)	(–2.118)	(–1.631)	(–0.389)	(0.566)		H_7: $b^H = b^L$ for H3^u	0.84	[0.363]
	LOW	–0.883	–0.498	–0.056	–4.681	1.275		H_8: $b^H = b^L$ for p^u	0.00	[0.983]
		(–0.700)	(–0.535)	(–1.103)	(–0.288)	(0.670)		H_9: $b^H = b^L$ for s^u	0.11	[0.738]
Insurance and investment	*HIGH*	–1.113	–0.803	–0.033	–5.203	–0.746	0.276	H_4: $b^H = b^L$ for all news	0.67	[0.646]
		(–0.737)	(–0.506)	(–0.620)	(–0.654)	(–0.405)	[0.133]	H_5: $b^H = b^L$ for ip^u	0.18	[0.675]
	MEDIUM	0.849	–0.659*	–0.060	0.562	–0.366		H_6: $b^H = b^L$ for $m1^u$	0.01	[0.937]
		(1.099)	(–1.679)	(–1.382)	(0.103)	(–0.257)		H_7: $b^H = b^L$ for H3^u	0.08	[0.779]
	LOW	–0.207	–0.956	–0.053	–15.614*	1.745		H_8: $b^H = b^L$ for p^u	1.03	[0.315]
		(–0.161)	(–0.884)	(–1.070)	(–1.761)	(1.086)		H_9: $b^H = b^L$ for s^u	0.86	[0.358]
Other services	*HIGH*	–2.118***	–0.596	0.030	1.681	–0.612	0.368	H_4: $b^H = b^L$ for all news	2.53**	[0.038]
		(–3.080)	(–0.634)	(1.064)	(0.262)	(–0.558)	[0.094]	H_5: $b^H = b^L$ for ip^u	6.84**	[0.011]
	MEDIUM	1.133*	–0.395*	–0.042*	7.030*	0.428		H_6: $b^H = b^L$ for $m1^u$	0.58	[0.449]
		(1.885)	(–1.762)	(–1.843)	(1.842)	(0.350)		H_7: $b^H = b^L$ for H3^u	8.79***	[0.004]
	LOW	0.321	0.175	–0.071***	–12.196	–0.865		H_8: $b^H = b^L$ for p^u	2.49	[0.119]
		(0.621)	(0.324)	(–3.780)	(–1.551)	(–1.080)		H_9: $b^H = b^L$ for s^u	0.03	[0.866]
HEX all share index	*HIGH*	–1.209	–0.268	–0.002	–5.544	0.249	0.387	H_4: $b^H = b^L$ for all news	0.62	[0.688]
		(–1.400)	(–0.323)	(–0.073)	(–1.117)	(0.214)	[0.115]	H_5: $b^H = b^L$ for ip^u	1.44	[0.235]
	MEDIUM	0.740	–0.886***	–0.026	3.473	1.197		H_6: $b^H = b^L$ for $m1^u$	0.99	[0.325]
		(1.576)	(–3.365)	(–1.054)	(0.993)	(1.125)		H_7: $b^H = b^L$ for H3^u	1.53	[0.221]
	LOW	0.119	0.797	–0.051**	–14.161	0.692		H_8: $b^H = b^L$ for p^u	0.78	[0.381]
		(0.183)	(0.933)	(–2.281)	(–1.522)	(0.667)		H_9: $b^H = b^L$ for s^u	0.07	[0.790]

Notes: News variables are the industrial production (ip^u), the real money supply ($m1^u$), the three-month helibor rate (H3^u), the consumer price index (p^u), the real exchange rate (s^u), and are proxied by the VAR(6) residuals. All variables are logarithms except the helibor rate. T-statistics are in a parenthesis, and are corrected for heteroscedasticity and autocorrelation by using Newey-West (1987) procedure. R^2C is the coefficient of determination adjusted for degrees of the freedom. Round brackets denote R^2C measures estimated without dummies (i.e., $d_i = 0$). H_4 is the null hypothesis that all news coefficients in the high and in the low states are the same; hypotheses from H_5 to H_9 are similar for individual news coefficients. Numbers in square brackets are *p*-values. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.

APPENDIX 3. (...continued)

Model (5): $R_{it} = a_i + HIGH_t \cdot \hat{e}_t b^H_i + MEDIUM_t \cdot \hat{e}_t b^M_i + LOW_t \cdot \hat{e}_t b^L_i + d_i + u_{it}$

Industry		ip^u	$m1^u$	$H3^u$	p^u	s^u	R^2C	Null hypothesis	*F*-statistics	[*p*-value]
Metal and engineering	*HIGH*	–1.619*	–0.236	0.014	–2.776	–1.232	0.203	H_4: $b^H = b^L$ for all news	2.27*	[0.058]
		(–1.877)	(–0.222)	(0.445)	(–0.578)	(–0.835)	[0.097]	H_5: $b^H = b^L$ for ip^u	4.96**	[0.029]
	MEDIUM	0.947	–1.213***	–0.029	3.421	1.350		H_6: $b^H = b^L$ for $m1^u$	2.93*	[0.092]
		(1.561)	(–3.478)	(–1.037)	(0.802)	(0.976)		H_7: $b^H = b^L$ for $H3^u$	6.67**	[0.012]
	LOW	1.090	2.279**	–0.098***	–16.107*	–1.321		H_8: $b^H = b^L$ for p^u	1.86	[0.178]
		(1.593)	(2.198)	(–3.802)	(–1.671)	(–0.552)		H_9: $b^H = b^L$ for s^u	0.00	[0.965]
Forest industries	*HIGH*	–1.861**	0.896	0.008	–4.974	–0.905	0.158	H_4: $b^H = b^L$ for all news	1.22	[0.311]
		(–2.044)	(0.635)	(0.193)	(–0.735)	(–0.562)	[0.029]	H_5: $b^H = b^L$ for ip^u	4.72**	[0.034]
	MEDIUM	0.621	–0.884***	–0.021	5.051	1.249		H_6: $b^H = b^L$ for $m1^u$	0.36	[0.549]
		(0.939)	(–2.862)	(–1.022)	(1.175)	(0.849)		H_7: $b^H = b^L$ for $H3^u$	1.37	[0.246]
	LOW	0.979	1.831**	–0.051*	–8.109	–0.067		H_8: $b^H = b^L$ for p^u	0.03	[0.863]
		(1.038)	(2.129)	(–1.709)	(–0.450)	(–0.051)		H_9: $b^H = b^L$ for s^u	0.14	[0.712]
Multi-business industry	*HIGH*	–1.139	–0.088	–0.025	–10.255*	1.350	0.378	H_4: $b^H = b^L$ for all news	0.44	[0.821]
		(–0.952)	(–0.092)	(–0.533)	(–1.705)	(0.843)	[0.136]	H_5: $b^H = b^L$ for ip^u	0.41	[0.527]
	MEDIUM	1.047	–1.176***	–0.018	5.767	1.879		H_6: $b^H = b^L$ for $m1^u$	0.54	[0.465]
		(1.528)	(–3.199)	(–0.493)	(1.358)	(1.491)		H_7: $b^H = b^L$ for $H3^u$	0.32	[0.572]
	LOW	–1.254	0.997	–0.055**	–22.032*	1.482		H_8: $b^H = b^L$ for p^u	0.99	[0.325]
		(–0.314)	(0.789)	(–2.081)	(–1.962)	(1.250)		H_9: $b^H = b^L$ for s^u	0.00	[0.949]
Other industries	*HIGH*	0.008	–0.567	–0.034	–0.368	0.025	0.275	H_4: $b^H = b^L$ for all news	0.28	[0.925]
		(0.001)	(–0.488)	(–1.045)	(–0.110)	(0.029)	[0.073]	H_5: $b^H = b^L$ for ip^u	0.16	[0.686]
	MEDIUM	1.112*	–0.288	–0.040*	3.185	1.703		H_6: $b^H = b^L$ for $m1^u$	0.02	[0.878]
		(1.960)	(–0.827)	(–1.584)	(0.846)	(1.629)		H_7: $b^H = b^L$ for $H3^u$	0.38	[0.540]
	LOW	0.440	–0.355	–0.060*	–7.405	–1.007		H_8: $b^H = b^L$ for p^u	0.81	[0.370]
		(0.722)	(–0.432)	(–1.953)	(–1.120)	(–0.904)		H_9: $b^H = b^L$ for s^u	0.57	[0.454]

Notes: News variables are the industrial production (ip^u), the real money supply ($m1^u$), the three-month helibor rate ($H3^u$), the consumer price index (p^u), the real exchange rate (s^u), and are proxied by the VAR(6) residuals. All variables are logarithms except the helibor rate. T-statistics are in a parenthesis, and are corrected for heteroscedasticity and autocorrelation by using Newey-West (1987) procedure. R^2C is the coefficient of determination adjusted for degrees of the freedom. Round brackets denote R^2C measures estimated without dummies (i.e., $d_i = 0$). H_4 is the null hypothesis that all news coefficients in the high and in the low states are the same; hypotheses from H_5 to H_9 are similar for individual news coefficients. Numbers in square brackets are *p*-values. *, ** and *** denote significance at the 10%, 5%, and 1% level, respectively.