The Stock Market's Reaction to Unemployment News:

"Why Bad News Is Usually Good For Stocks"[1]

John H. Boyd
Department of Finance
University of Minnesota
Tel: (612)624-1834
Email: Jboyd@csom.umn.edu

Jian Hu
Ratings Research & Analysis
Moody's Investors Service
99 Church Street
New York, NY 10007
Tel: 212.553.7855
Jian.Hu@moodys.com

Ravi Jagannathan
Department of Finance
Kellogg Graduate School of Management
Northwestern University
National Bureau of Economic Research
Tel: (847)491-8338
Email: rjaganna@nwu.edu

This version, December 2002

ABSTRACT

We find that on average an announcement of rising unemployment is "good news" for stocks during economic expansions and "bad news" during economic contractions. Unemployment news bundles three types of primitive information relevant for valuing stocks: information about future interest rates, equity risk premium, and corporate earnings and dividends. The nature of the information bundle — and hence the relative importance of the three effects — changes over time depending on the state of the economy. For stocks as a group, information about interest rates dominates during expansions and information about future corporate dividends and/or the equity risk premium dominates during contractions.

1. Introduction

This study investigates the short run response of stock prices to the arrival of macroeconomic news. The particular news event we consider is the Bureau of Labor Statistic (BLS)'s monthly announcement of the unemployment rate. We establish that the stock market's response to unemployment news arrival depends on whether the economy is expanding or contracting. On average, the stock market responds positively to news of rising unemployment in expansions, and negatively in contractions. Since the economy is *usually* in an expansion phase, it follows that the stock market *usually* rises on bad news from the labor market.[2]

We next provide an explanation for this seemingly odd pattern of stock price responses. Campbell and Mei (1993) point out that, conceptually, three primitive factors determine stock prices: the risk-free rate of interest, the expected rate of growth of corporate earnings and dividends (hereafter, "growth expectations"), and the equity risk premium. Thus, if unemployment news has an effect on stock prices — which it clearly does — that must be because it conveys information about one or more of these primitives.

We begin our explanation by determining whether the pattern of stock price responses can be explained solely by information about future interest rates. If this were the case, stock and bond prices would respond in the same way -- save, possibly, for differences that arise due to differences in their durations. They don't. During contractions stock prices react significantly and negatively to rising unemployment, but bond prices do not react in any significant way. Since bond prices don't respond significantly during contractions, it must be the case that unemployment news contains little information about future interest rates in that business cycle phase. Since stock prices do respond significantly during contractions, it must also be the case that the unemployment news contains information about growth expectations and/or the equity risk premium.

During expansions, both bond and stock prices rise significantly on news of rising unemployment. Given the bond response, it must be the case that during expansions, bad labor market news causes expected future interest rates to decline. This could also be what causes stock prices to rise during expansions, but needn't -- since growth expectations and the equity risk premium could be changing also.

The next step to understanding the pattern of stock price responses over the business cycle is to examine the effect of news arrival on the other two primitive factors: the equity risk premium and growth expectations. We must use proxy measures for both variables since neither is directly observable. In brief, we find some evidence that the equity risk premium is affected by unemployment news arrival, but the results are rather weak. On average, the equity risk premium always increases with unemployment news arrival, during both business cycle phases. However, the expansion and contraction responses are not significantly different at usual confidence levels.

The evidence is stronger that growth expectations change in response to the unemployment news. Specifically, we find that unemployment news is helpful in predicting the actual growth rate of the Index of Industrial Production (IIP), one proxy measure for growth expectations. Rising unemployment is always followed by slower growth. But this relationship is much stronger during contractions than it is during expansions. Thus, if equity investors study the real sector data, they would be expected to revise their growth expectations more significantly during contractions than during expansions.

Finally, we construct a portfolio of public utilities with earnings that are less sensitive to fluctuations in macroeconomic growth than is the average stock. The price effect that arises due to revisions in the growth expectations should be *small* for utility stocks when compared to stocks in general. This is exactly what we find: for utility stocks, growth revisions are relatively unimportant compared to the average stock. Therefore, interest rate effects dominate and the utilities respond in much the same manner as do government bonds.

Related literature

Blanchard (1981) showed that in equilibrium the same news can sometimes be good and some times bad for financial assets, depending on the state of the economy. This study can be viewed as providing the necessary theoretical motivation for our work. Orphanides (1992) gave empirical support for this view by showing that stock price responses to macroeconomic news may depend on the state of the economy. In particular he showed that the stock price response to unemployment news depends on the average unemployment rate during the previous year.

McQueen and Roley (1993) also found a strong relationship between stock prices and macroeconomic news, such as news about inflation, industrial production, and the unemployment rate based on their own definition of business conditions. However their purpose was to demonstrate the state dependence of stock price responses to all macroeconomic news. Krueger (1996) studied the market rationality of bond price responses to labor market news. His focus was on the market reaction to the availability of more reliable information, as the unemployment data were revised. His study found (as we do) that market prices were strongly affected by the unemployment announcements. Fleming and Remolona (1999) analyzed the response of U.S. Treasury yields across the maturity spectrum to different types of macro-economic announcements using high frequency data over four-and-a-quarter years. They found that the yields on intermediate term bonds were most sensitive to unemployment news.

Veronesi (1999), based on theoretical arguments, showed that bad news in good times and good news in bad times would generally be associated with increased uncertainty and hence an increase in the equity risk premium investors require for investing in stocks. Jagannathan and Wang (1993) found that monthly stock returns are negatively correlated with the per capita labor income growth rate. Jagannathan, Kubota and Takehara (1998) report similar findings using Japanese data. Since most of the variation in per capita labor income arises from variation in hours worked and not the wage rate, these findings are consistent with the unconditional positive correlation between the growth rate in unemployment and stock returns that we find in our data set.

The Rest of the Study

Briefly, the rest of the study proceeds as follows. Section 2 describes the data set, and the empirical methods for forecasting unemployment rates. Section 3. examines the effect of unemployment news on the S&P 500 stock index portfolio returns and on government bond returns. Section 4 examines how unemployment news affects growth expectations and the equity risk premium. Finally, Section 5 summarizes and concludes.

2. Data and Methodology

Unemployment Announcements

Although there are a variety of macroeconomic information releases we could have considered, we chose the unemployment rate because it is viewed as newsworthy. It has frequently been the reference point of Federal Reserve policy and the target of wide speculation on Wall Street. In addition, and important for our purposes, this release has a long and accurately dated time series.

The monthly unemployment announcements used in this paper cover the period from February 1948 through December 2000.[3] The announcements were usually made at 8:30 am on a Friday, although during earlier years some announcements were made on other days. All announcement dates, Friday or not, are included in our study. On announcement days, the Department of Labor releases other information besides the most recent unemployment rate. This includes the total number of employed and its distribution across regions and industries. It also releases revisions of past unemployment announcements for the previous three months, after which the announcement is considered final. It also releases employment totals, weekly and hourly earnings and weekly hours worked. This study focuses on unemployment rate announcements only.

Measuring Unemployment News

The focus of this paper is to examine how stocks respond to unemployment news. That requires a model to measure the anticipated and the unanticipated (news) component of the unemployment figures that are announced every month.[4] We use the following statistical model to forecast the unemployment rate change on announcement dates:

$$DUMP_t = b_0 + b_1 \cdot IPGRATE_{t-1} + b_2 \cdot IPGRATE_{t-2} + b_3 \cdot IPGRATE_{t-4} + b_4 \cdot DUMP_{t-1} + b_5 \cdot DTB3_t + b_6 \cdot DBA_t + e_t, \qquad (1)$$

where, $DUMP_t$ is the change in the unemployment rate, $IPGRATE_t$ is the growth rate of monthly industrial production, $DTB3_t$ is the change in the 3-month T-bill rate and DBA_t is the change in the default yield spread between Baa and Aaa corporate bonds, all for the period t-1 and t. The unemployment rate is very persistent so our forecasts are based on the first differences.[5]

Note that for these (and most of the other) regressions presented in this paper, both heteroscedasticity and autocorrelation are present in the residuals. We therefore compute hetereoscedasticity and autocorrelation consistent (HAC) standard errors and t-statistics with the Bartlett kernel. The bandwidth parameter is chosen to match the degree of autocorrelation in the residuals, where the length of autocorrelation is first estimated by the Yule-Walker method. For many regressions -- especially daily stock returns -- autocorrelation is not an important factor, thus only White t-statistics are reported.

Forecasts for the change in the unemployment rate from month t-1 to month t were constructed by first estimating equation (1) using monthly observations up to month t-1. Adding back the unemployment rate at month t-1 to this forecast gives us the predicted unemployment rate in month t.

Actually, equation (1) was estimated in three different ways. The first estimation method is the “best”, in the sense of achieving the smallest out-of-sample forecast errors. In this case, we used final release numbers for unemployment and industrial production and we also included a dummy variable which took on the value 1.0 during contractions, and 0.0 during expansions. This procedure could be criticized on two grounds. First, it takes account of the information conveyed by the state of the economy. However, it can be argued that agents do not necessarily know the state of the economy at the time a forecast is made — since the NBER's announcement of an official turning point typically comes several months after the date. To address this criticism, our second estimation method omits the business cycle dummy variable that allows the intercept for contractions to be different than that for expansions. As shown in Table 1 (method two) this results in a small but significant bias in the forecasts — the average forecast error during expansions and contractions for the model is different from zero — which is not present with method one.

A second criticism of our forecasting procedure relates to the use of final release data for both the unemployment rate and the IIP. Since the final release numbers come out about 3 months after the initial release, forecasts made in this way could not have been made in real-time. In view of this criticism, our third forecasting method uses final release figures for the unemployment rate and the IIP, but only employs data available up to one year before the estimation date. Then we employ the estimated parameters and the initial release numbers of the unemployment rate data and originally published and subsequently revised IIP to construct our estimate of the unemployment surprise. With this very conservative method, we can be sure we are using only information that was available to investors at the time the forecast was made. As can be seen from Table 1 (method three) this method also has a small but significant bias in the forecasts.

As shown in Table 1, the three forecasting methods have the expected properties: method one results in smaller forecast errors than method two; and method two results in smaller errors than method three. We feel that these three estimating methods span the space of "reasonable" real-time unemployment forecasts. That is, estimates by the first method are undoubtedly better than market participants could actually have made, and estimates by the third method are clearly worse. What is most important for present purposes is that none of the results that follow are particularly sensitive to the choice of estimation methods.

Properties of Unemployment News

We classified every sample month as an expansion or contraction month, using the National Bureau of Economic Research (NBER)'s reference dating. The properties of the unemployment rate forecasts for each method are in Table 1. During the 468 month period January 1962 to December 2000, the US economy was in an expansion during 411 months and in a contraction during 57 months.[6] There were 5 contractions and 6 expansions. The average duration of a contraction was 11 months and the average duration of an expansion was 69 months. Unemployment was higher at 6.8% during contractions and lower at 5.8% during expansions. On average the unemployment rate increased by 0.2% per month during contractions and declined 0.04% per month during expansions. The forecasted changes in unemployment rates are smaller in expansions than in contractions. For Method 1 the forecast errors are not statistically significantly different from zero. The average unanticipated change in the unemployment rate (forecast error) was –2 basis points during contractions and –0.2 basis points during expansions. However, there is a small but statistically significant bias in the forecasts made using Models two and three — the forecasts are biased downward during contractions and upward during expansions. The average forecast error was 8 basis points during contractions and –3 basis points during expansions for Model 2. The corresponding numbers for Model 3 were 6 basis points and –4 basis points.

Table 2 shows the distribution of unemployment surprises, when classified according to whether unemployment increased by less or more than forecast. When Model 1 forecasts are used, out of a total of 468 months, there are 236 negative surprises (good news) and 232 positive surprises (bad news). Given the bias in the forecasts using Models 2 and 3, it is not surprising that, the split is much less even for these two models.[7]

Daily Returns on Stocks and Bonds

We ignore dividends when computing stock returns — daily stock returns are defined as the percentage change in the S&P 500 stock index. Daily bond returns are constructed from daily yields. Daily government bond price data were not available to us, so we converted the daily yields into bond prices. (See Appendix A.)

Table 3 reports average daily returns on announcement days and non-announcement days during contractions and expansions. Bond returns are on average higher in contractions than expansions, and stock returns are higher in expansions than in contractions. In Table 4 we partition the sample further, computing average daily returns for both Thursday (day before announcement) and Friday (day of announcement), when the data are sorted into "good news" and "bad news" unemployment surprises. For brevity, we only report results with unemployment forecasts made using Method One. With the finer sort, a pattern seems to emerge in the response of stock prices. In contractions, average stock returns are positive on good news and negative on bad news. In contrast, during expansions average stock returns are positive both on good news and bad news, (but stock prices rise very slightly on good news). Bond price responses are much smaller than stock price responses, and show no obvious state-dependency.

3. Regression Results: Stock And Bond Price Responses to Unemployment News

S&P 500 Responses to the Unemployment News

In this section, we further investigate the response of the S&P 500 stock price index to unemployment news arrival using the linear model given in equation (2).

$$SPRTRN_t = b_0 + b_1 \cdot D_t \cdot ERRUMP_t + b_2 \cdot (1 - D_t) \cdot ERRUMP_t + u_t \,. \qquad (2)$$

$SPRTRN_t$ denotes the return on day t on the S&P 500 index ignoring dividends; D_t denotes the dummy variable that takes on the value one in contractions and zero otherwise; $ERRUMP_t$ denotes the proxy for unemployment news – the surprise component of the unemployment rate announcement, b_0 denotes the intercept, b_1 and b_2 denote slope coefficients, and u_t is the error term.[8]

We estimate equation (2) using data for the period January 1962 to December 2000. Table 5 presents the estimates when the dependent variables are: the stock index return on the day prior to the announcement day (Thursday), on the announcement day (Friday) and on Thursday and Friday taken together. For all of the three event windows, and for all three estimation methods, a consistent pattern emerges. The coefficients are negative in contractions and positive in expansions, and are usually statistically significant. Moreover, in all cases the difference between the expansion and contraction coefficients is statistically significant at (at least) the 95% confidence level. Also in all cases, the announcement effect is much larger (in absolute value) in contractions than it is in expansions.

Bond Price Responses to the Unemployment News

We next turn our attention to the bond market response to unemployment news. The analogue of equation (2) for the bond market is given by equation (2a) below:

$$BRTRN_t = b_0 + b_1 \cdot D_t \cdot ERRUMP_t + b_2 \cdot (1 - D_t) \cdot ERRUMP_t + u_t, \qquad \text{(2a)}$$

where $BRTRN_t$ is the return on the bond of interest on date t, and other variables in (2a) are defined in the previous section. In the regressions that follow, the dependent variables are the return on a hypothetical 1-year government bond, the three-month T-bill, and the 10-year government bond. (See appendix A for a discussion of how we constructed these returns.) Table 6 shows the bond price responses for all event windows, and forecasting methods. Notice that under all three estimation methods, unemployment news has no significant effect on bond prices in contractions over the two-day event window. In expansions, it has a positive and significant effect for the one-year and ten year bonds, but not for the three month T-bill. The difference in responses across the two states is only statistically significant for the one-year bond, on Thursday.

To summarize results, government bond price responses to the unemployment news arrival are different from stock prices; therefore the former cannot possibly "explain" the latter. Moreover, the unemployment news must be conveying information about the other two primitive factors — growth rate expectations and the equity risk premium. These two factors affect stock prices but not bond prices, and therefore account for the differences in their responses. In the next section, we examine the role of growth expectations and the equity risk premium in determining how stock prices respond to unemployment news. Before doing that, however, we first investigate a potentially important source of bias in the results we have just presented.

"Look-Ahead Bias"

There is a subtle possible form of bias in all our results employing NBER reference cycle dating. It is that National Bureau economists might employ stock prices as one of the variables used to call business cycle turning points. Suppose, for example, that the National Bureau defined "an expansion" as a period of rising output, employment *and stock prices*. Then, during expansions, the econometrician would on average observe bad employment news accompanied by rising stock prices. Similarly, if the definition of "a contraction" were falling employment, output *and stock prices* the econometrician would on average observe bad employment news accompanied by falling stock prices. These relationships observed in the data would, of course, be induced by the definition of expansions and contractions. There are other simple-minded stories that could be told, all with the implication that the NBER cycle dates would not be proper right-hand-side variables in our regressions.

We consulted NBER publications and even discussed this matter with one of the economists on the business cycle dating panel at the National Bureau. According to him asset market data were not used in determining business cycle turning points. Still, it is possible that some panel members might be inadvertently taking asset prices into account. As a matter of abundant caution we employed an alternative procedure: we re-estimated all our equations employing the Stock and Watson Experimental Coincident

Regression Index. This index gives an estimate of the probability that the economy was in recession at a given point in time. Unlike NBER dating, the index is constructed using only information available at a particular point in time, and cannot be subject to "look-ahead bias." The construction of the index, and how we employ it here are discussed in Appendix C.

Briefly, all relevant tables in this paper, from Table 5 onward, are reproduced in Appendix C using the Stock-Watson Index instead of NBER cycle dating. As the reader can confirm, the results are qualitatively similar and in most cases quantitatively similar.

4. Unemployment News, Growth Expectations, and The Equity Risk Premium

To see how the three primitive factors influence stock prices, it is convenient to consider the Gordon constant growth model used for security valuation. Let *r* be the interest rate on long term risk free claims, P the price of a security or portfolio, D the last period dividend, g the expected (constant) rate of growth in D, and π the risk premium investors require to invest in stocks. Then according to the Gordon model,

$$P = D(1+g) / (r + \pi - g).$$

Jagannathan, McGrattan and Scherbina (2000) show that when growth rates, interest rates, and risk premiums change over time the Gordon model will continue to hold — only now the long run growth rate, g, is to be interpreted as a weighted average of expected future growth rate.

Let u denote the unanticipated surprise in the unemployment rate (ERRUMP), so that (dP/P)/du represents the percentage change in the price of a security in response to an unemployment rate surprise. Then from the Gordon Model it follows that,

$$(dP/P) / du = - \{P/D\}\{1/(1+g)\}\times\{dr/du + d\pi/du - (1 + D/P)\times dg/du \}$$

$$\approx - \{P/D\}\{ dr/du + d\pi/du - dg/du\}. \qquad (3)$$

It will be useful to estimate that part of the change in stock prices that is due strictly to the change in the interest rate factor *r*. Letting P_s denote stock index price and P_b denote bond price, we define that component of stock price response that is strictly due to a change in the interest rate factor as $(dP_s/P_s)/du\,|_{dg = d\pi = 0.0}$. From inspection of (3) it is clear that $(dP_s/P_s)/du\,|_{dg = d\pi = 0.0} = -(P_s/D)*(dr/du)$. Here P_s/D is the inverse of the dividend yield (which we calculate on average from the CRSP tapes (1962 – 2000) to be 30.1 in expansions and 21.1 in contractions).

The results presented in Table 6 suggest that for bonds $(dP_b/P_b)/du > 0$ during expansions, which of course implies that $dr/du < 0$. During contractions, the estimates of $(dP_b/P_b)/du$ are never statistically significant and frequently change signs depending on the estimation method. Thus it seems reasonable to assume that during contractions, $(dP_b/P_b)/du \approx dr/du \approx 0.0$.

We must next estimate dr/du during expansions. To a first order, $dr/du = -(1/Duration) * (dP_b/P_b)/du$. Assuming a duration of 7.4 for the 10 year government bond, and using the results from Table (6) we obtain dr/du = - .10, - .11, and - .13, respectively, according to the first, second and third forecasting models, during expansions. Columns 3 and 4 of Table 7 shows estimates of the effect on stock returns due to interest rates alone, $(dP_s/P_s)/du\,|_{d\pi = dg = 0.0}$, as well as estimates of the total stock price response to unemployment news, $(dP_s/P_s)/du$ (from Table 5). In contractions there is obviously no predicted stock price change due to news-induced interest rate changes; e.g. $(dP_s/P_s)/du\,|_{d\pi = dg = 0.0} = 0.0$. However, the estimated total effect of unemployment news on stock prices, $(dP_s/P_s)/du$ is negative. The implication is that either the risk premium π must be rising, the expected future growth rate g must be falling, or both.

During economic expansions, on the other hand, the sensitivity of stock returns to unemployment news due to its effect on the interest rate alone is about 3 to 4. However, the total effect of unemployment news on stock prices is estimated to be a little more than 1. That is, the predicted effect on stock prices through the interest rate factor is much larger than the actual combined effect of all the three factors. The logical implication is thus that, during expansions, either the equity risk premium must be rising, growth expectations must be falling, or both.

Column 5 of Table 7 takes this exercise a bit further and back-solves for the values of $[(-P/D)(d\pi/du - dg/du)]$ which are implied by the Gordon equation and the estimated values of the bond and stock price responses to unemployment news. This provides an answer to the question, "How large would the combined risk-premium and growth rate effect have to be, in order to jointly explain the observed responses in stock and bond prices?" Obviously, at this stage we cannot separate the effects of $d\pi/du$ and dg/du and for convenience we define $d\phi/du = [(-P/D)(d\pi/du - dg/du)]$. Separate estimates of $d\phi/du$ are provided for expansions and contractions, and for each of the three forecasting methods. The main feature to note from Column 5 in Table 7 is that all estimates of $d\phi/du$ are negative, meaning that a bad unemployment shock causes the risk premium to increase, growth expectations to decline, or both. They are also larger during contractions than during expansions.

Suppose, hypothetically, unemployment news has no effect on the equity risk premium — i.e., $d\pi/du = 0$. Then according to the first estimate, dg/du, the effect of unemployment news on growth expectations, should be 2.4 times as large during contractions as during expansions; according to the second method, about 2.4 times as large, and according to the third method about 1.7 times as large.

These findings — based solely on the stock and bond price responses to unemployment news — make predictions for other primitive variables' news responses. And these are empirically testable. In the next sections we separately examine the response of the equity risk premium, π, and the dividend growth expectation, g, to unemployment surprises.

The Equity Risk Premium: Its Response to Unemployment News

The equity risk premium is not directly observable and therefore we employ an interest rate spread as a proxy for it, as has been done elsewhere in the literature. This is a "default-risk spread" between Baa and Aaa corporate bonds. As shown in Table 8, the coefficient of news arrival is never significantly different from zero during contractions; however it is positive and marginally significant during expansions with all three estimation methods. Note, however, that the news coefficient is larger during contractions than during expansions by a factor of about two. Therefore, the signs and relative magnitudes of the coefficients are consistent with the predictions in Table 7. What is lacking is consistent statistical significance. These conclusions did not change when we used the slope of the term structure and future stock price volatility as proxies for the unobserved equity premium.

Growth Expectations: Their Response to Unemployment News

We began by examining the earnings growth forecasts of securities analysts to see how these were affected by employment news arrival. These results presented in Table

D1 suggest that there is no statistically significant effect during either expansions or contractions. However, the time-series of analysts' forecasts is only available for eighteen years and this is a period that which includes very few observations in economic contractions. Thus, the insignificant results may just reflect a lack of statistical power.

Our next approach was to construct indirect measures of growth expectations, and we proceeded in two different ways. The first approach assumed that equity investors are good econometricians, who study the data and make forecasts. On that basis, we estimated the *true* relationship between the announced unemployment rate (the actual rate, not the surprise component) and subsequent dividend growth, using the Index of Industrial Production (IIP) as a monthly proxy for corporate dividends.[9] The idea was to see if this actual real sector relationship is significantly different in contractions than in expansions. If that is true, then that fact should be reflected in the expectations formation of investors.

Since each month the announcement of the IIP is made around the 15th (about one week after the announcement of unemployment rate), we studied the relation between IIP in the "same month" and one to four months following the reference month of the unemployment announcement. We estimated the following equation:

$$IPGRATE_s = a_0 + a_1 \cdot D_t \cdot DUMP_t + a_2 \cdot (1 - D_t) \cdot DUMP_t + v_t, \qquad (4)$$

where IPGRATE is the change in the IIP, s is the number of leads before announcement dates ($s = t, t+1, t+2, t+3, t+4$) and v_t is an error term. The results with (4) are shown in Table 9. The coefficients a_1, a_2 in (4) are consistently negative in sign at all five forecast horizons, and most of the coefficients are significantly different from zero. For expansion periods, however, the coefficients are much smaller in absolute value than they are during contractions. It is useful to compare coefficients in contractions and in expansions, dividing the former by the latter. Going from the "same month" to four-month-ahead forecasts, this ratio is: 4.1, 10.1, 8.8, 2.3 and 1.5. This suggests that equity investors should be revising their growth expectations much more strongly in contractions than in expansions; and, this finding is consistent with the predictions from the previous section based on back-solving the Gordon model.[10]

Growth Expectation Tests With A Different Class of Stocks: Public Utilities

As a second test, we examined the unemployment news responses of a specific class of common stocks that are relatively less affected by economic conditions, public utilities. For such companies revisions in growth expectations should be relatively less important than for the average stock. For this class of stocks we chose a sample of 89 public utility companies. In our sample utility stocks had a beta of less than 0.8 on average, which is consistent with our view that they are less sensitive to changes in expectations about future economic conditions.

Table 10 shows the results with two-day (Thursday-Friday) returns for utility stocks and, for purposes of comparison, for the S&P 500 and for the 1-year government bond. We see that like bonds, the utility stocks respond positively and significantly to the unemployment announcement during expansions, but exhibit no significant relationship during contractions. Hence the utility price responses look much more like those of bonds, responding positively to unemployment surprises in expansions and insignificantly during contractions. This finding is also consistent with the predictions of the preceding section.

5. Summary and Conclusions

We have documented that on average stock prices rise on bad labor market news during expansions, and fall during contractions. This pattern cannot be explained based solely on bond price reactions. On average, bond prices rise on bad unemployment news during expansions, but do not respond significantly during contractions. Stock price responses during contractions are therefore unexplained.

Logically, there are two factors that affect the price of stocks but do not affect the price of risk-free government bonds. One is the equity risk premium and the other is the expected future growth rate of dividends. Since stock prices respond differently from bond prices, it seems that unemployment news must contain information about one or both these factors.

We cannot observe the equity risk premium and therefore we used a default risk interest rate spread as a proxy measure for it. To "explain" the documented pattern in stock price and bond price responses, risk premium revisions would have to exhibit a particular pattern: they would have to respond positively to unemployment shocks, and be larger during contractions than during expansions. In fact, we find that the equity risk premium responds positively to unemployment news, during both expansions and contractions, and with larger effect during contractions. The signs and magnitudes or the coefficients are consistent with the theory, but coefficients are insignificant during contractions and only marginally significant during expansions.

Next, we investigated changes in growth expectations. Again, to explain the documented pattern in stock price and bond price responses, growth expectations revisions would have to exhibit a particular pattern: they would have to be negative in sign and be much larger during contractions than during expansions. We found evidence that this is true, based on tests in which unemployment rate announcements were used to forecast the actual growth rate in the Index of Industrial production, (a proxy for growth in corporate dividends). On average, rising unemployment is followed by a much greater reduction in IIP growth during contractions than during expansions. If shareholders are good forecasters, their expectations revisions should reflect the same state-contingent pattern revealed in the real sector data.

Finally, employing data for public utility stocks, we obtained inferential evidence that unemployment news contains relatively more information about growth expectations during contractions than during expansions. We found that utilities stocks (whose dividend growth has been relatively independent of the state of the economy) are priced much like bonds. That is, their price responses to the unemployment news are largely driven by changes in interest rate expectations.

In sum, both growth expectations and the equity risk premium seem to respond to unemployment news arrival in a way that could "explain" the observed response of stock and bond prices. Our measure of the equity risk premium always increases in response to bad unemployment news and the coefficient is much larger in contractions than in expansions. However, these coefficients are only marginally significant at best. Our proxy measure for growth expectations always declines in response to bad unemployment news, and again the effect is much larger in contractions than in expansions. Thus both effects seem to have the right signs and magnitudes relative to the phase of the business cycle. Actually determining if one effect actually dominates the other will require better proxy measures and more powerful tests than those we have employed.

Future Research

The facts we have reported raise two fundamental questions that are not addressed here. First, "Why is the response of bond prices to unemployment news so dependent on the state of the economy?" And second, "Why do changes in the rate of unemployment have a much larger (lagged) effect on real activity during contractions than during expansions?" There is a large literature on state contingencies in macroeconomic relationships (for example, Hamilton (1989) or Neftci (1984)), but such issues are beyond the limited scope of this study.

The facts we have reported also have interesting and potentially important implications for asset pricing factor models that need to be further investigated, too. "Factor models" are widely used in security valuation and risk management, and "factor betas", (i.e. the sensitivity of stock price changes to macro-economic news), play a central role in such models. In several of these models factor betas vary over time in a systematic and stochastic fashion.[11] Hence it is natural to seek an explanation for this time variation, especially the systematic component of it. Campbell and Mei (1993) have shown that it is convenient to decompose the information in a given macroeconomic factor into the three primitive types of news that are relevant for valuing any stock. We have shown that the amount of the different primitive types of news in an unemployment rate announcement (which is, itself, a specific macroeconomic factor) depends on the state of the economy. This would lead the corresponding factor beta of a stock also to depend on the state of the economy. Clearly then, the sensitivity of stock returns to the same type of macroeconomic news will change over time. This is because other things such as the state of the economy are not the same.   Whether “other things” can best be captured in the linear factor model by introducing other factors (such as the past growth rate in output) — or alternatively by modeling the stochastic process governing time variation in factor sensitivity — is an issue for future research.

Appendix A: Data

Unemployment rate announcements

The unemployment rate report along with wage earnings, weekly hours and employment is the first indicator of economic trends announced in each month. They are often used to construct other macroeconomic variables such as personal income, industrial production and productivity, that are announced late in the month.

We obtained unemployment announcement dates for the period from 1957 to 2000 from the Bureau of Labor Statistics. These announcements were usually made at 8:30am on the first Friday of the following month. Fridays were chosen as the usual announcement days after 1970.

Index of industrial Production (IIP)

Each month the announcement of the IIP is made around the 15th (about one week after the announcement of unemployment rate). We obtained IIP from the Federal Reserve Board. For method 1 and 2, we use final release data of IIP to estimate equation (1) and also use them to construct the unemployment surprise. Our third forecasting method also uses final release figures for the unemployment rate and the IIP, but only employs data available up to one year before the estimation date. Then we employ the estimated parameters and the initial release numbers of the unemployment rate data and originally published and subsequently revised IIP to construct our estimate of the unemployment surprise. The initial release data begin in January 1972, thus we have less sample size for method 3.

Computing growth rates using originally published and subsequently revised IIP requires some care. For example, one should divide the initial estimate of February 1972 (published in mid-March 1972) by the first revision of January 1972 IP (also published in mid-March 1972) to get the initial estimate of growth in February 1972. Use the following formulas to calculate the published growth rates for a series:

Initial growth rate:	100 * ((init[t] / rev1[t-1]) - 1)
First revision of growth rate:	100 * ((rev1[t] / rev2[t-1]) - 1)
Second revision of growth rate:	100 * ((rev2[t] / rev3[t-1]) - 1)
Third revision of growth rate:	100 * ((rev3[t] / rev4[t-1]) - 1)

The S&P 500 index returns

Data for the daily S&P 500 Index after July 2, 1962 and for the monthly S&P 500 Index are from CRSP. Data for the daily Index before July 2, 1962 are from G. William Schwert and Robert Stambaugh. The S&P 500 Index return is constructed from these indices. Stock prices for the sampled utility stocks are from CRSP.

Business cycle definitions

We use the National Bureau of Economic Research's (NBER's) dating of business cycles, which is published on their web site. For our sample period, from 1962 to 2000, there were 411 expansion months and 57 contraction months. Table A.1 provides a summary. The

NBER states that a recession is a recurring period of decline in total output, income, employment, and trade, usually lasting from six months to a year, and marked by widespread contractions in many sectors of the economy.

The 3-month T-Bill, 1-year and 10-year Treasury bond with constant maturity

Data for historical yields on the 3-month T-Bill traded on the secondary market, and 1-year, 10-year Treasury bond yields with constant maturity are from the Federal Reserve Board. The daily changes of yields are used to construct the 1-year and 10-year government bond returns. The yield on the 10-year Treasury bond with constant maturity is interpolated by the U.S. Treasury from the daily yield curve. Such a yield can be found even if there is no outstanding security that has exactly 10 years remaining to maturity. The returns for the 10-year government bond are constructed from a duration model.

Returns for the 3-month T-bill and 1-year government bond are constructed by converting yields to prices. For the one-year government bond, the following formula for the bond equivalent yield: $r_{bey} = \frac{10{,}000 - p}{p} \times \frac{365}{n}$ is used. For the 10-year government bond, we compute daily returns from daily yield changes, using the approximate relation between the change in yield and the price: $\frac{dp}{p} = -D \cdot \frac{dy}{1+y}$. The duration of the 10-year government bond is assumed to be 7.4. For the 3-month T-bill, we convert quoted yields to prices using the discount yield formula: $r_{bd} = \frac{10{,}000 - p}{10{,}000} \times \frac{360}{n}$.

Table A.1: Business Cycle Timing

Period	**State of the economy / Number of months**
1961.02 – 1969.12	expansion/106
1970.01 – 1970.11	*contraction/11*
1970.12 – 1973.11	expansion/36
1973.12 – 1975.03	*contraction/16*
1975.04 – 1980.01	expansion/58
1980.02 – 1980.07	*contraction/ 6*
1980.08 – 1981.07	expansion/12
1981.08 – 1982.11	*contraction/16*
1982.12 – 1990.07	expansion/92
1990.08 – 1991.03	*contraction/8*
1991.04 – 2000.12	expansion/117

Appendix B: Forecasting unemployment rates

To get the surprise component in the announcement of unemployment rate, we required forecasts of the change in the unemployment rate. The variables used to forecast unemployment rates include the growth rate of industrial production, the past unemployment rate, inflation, stock and bond returns. We found that past changes of the unemployment rate, the growth rate of industrial production, and bond market variables are good predictors of unemployment rates. However, the inflation rate and stock market returns are not. We followed the Box and Jenkins (1976) method, and used the SAS ARIMA procedure to pick the best ARMAX model. The criteria include the AIC (Akaike's Information Criterion), SBC (Schwarz's Bayesian Criterion), and the t-statistics for those coefficient estimates. Specifically, we looked for a model that had the lowest AIC and SBC values, with all regression coefficients being statistically significant. The final model we used to forecast the unemployment rate is presented in the paper. We selected the forecasting model using data prior to January 1962.

To obtain the forecasts, we first estimated coefficients month by month as more observations were added (Our forecasts started in 1962.01 using all the previous monthly data available). The monthly forecasts of the change in the unemployment rate (called $DUMPF_t$) are the fitted values of $DUMP_t$ in the above model.

Appendix C: Stock-Watson Experimental Coincident Recession Index[1]

In this appendix we use the Experimental Coincident Recession Index taken from Stock-Watson Indicator Report (XRIC) as the summary statistic characterizing the state of the economy. This index is constructed using only information that is available at a particular point in time, unlike NBER dating of contractions and expansions which makes use of information that becomes available later. This Recession Index provides an estimate of the probability that the economy was in a recession. It is computed using four monthly series in the Experimental Coincident Index (XCI). The four series in the Experimental Coincident Index are:

1. Industrial Production
2. Real personal Income, total, less transfer payments
3. Real manufacturing and trade sales, total
4. Total employee-hours in nonagricultural establishments

Using this index to characterize the state of the economy we examine the state dependent response of security returns to unemployment news using the following linear model:

$$RN_t = \alpha + \beta \cdot ERRUMP_t + u_t,\ with\ \beta \equiv a + b \cdot XRIC_t,$$

where $XRIC_t$ denotes the probability that month t was a recession month and RN_t denotes the announcement day return on a security. For stocks RN_t = $SPRTRN_t$ and for bonds RN_t = $BRTRN_t$.

This gives: $RN_t = \alpha + b \cdot XRIC \cdot ERRUMP_t + a \cdot ERRUMP_t + u_t$.

This equation is the analogue of equation (2) in the text. Note that when $XRIC_t$ is the binary variable D_t this equation is the same as equation (2) in the text which is reproduced here below for convenience.

$$SPRTRN_t = b_0 + b_1 \cdot D_t \cdot ERRUMP_t + b_2 \cdot (1 - D_t) \cdot ERRUMP_t + u_t$$
$$= b_0 + (b_1 - b_2) \cdot D_t \cdot ERRUMP_t + b_2 \cdot ERRUMP_t + u_t$$

Therefore, the slope coefficient b can be interpreted in the same way as b_1-b_2 in equation (2) in the text.

[1] Stock, James H. and Mark W. Watson, "New Indexes of Coincident and Leading Economic Indicators," NBER Macroeconomics Annual 1989, pp. 351-394

Table 5c

Change in the S&P 500 Index in Response to Unemployment News*

.

	Method 1			Method 2			Method 3		
	Thursday	Friday	Thursday + Friday	Thursday	Friday	Thursday + Friday	Thursday	Friday	Thursday + Friday
b_2	0.4062 (1.40)	0.7684 (2.30)	1.1746 (2.40)	0.3714 (1.30)	0.6891 (2.15)	1.0605 (2.19)	0.5626 (1.69)	0.6568 (1.64)	1.2194 (2.07)
$b_1 - b_2$	-1.924 (-1.70)	-2.19 (-2.27)	-4.114 (-2.17)	-1.829 (-1.83)	-2.269 (-2.80)	-4.098 (-2.48)	-1.553 (-1.39)	-2.131 (-2.41)	-3.685 (-2.01)

* The table reports the estimated values of the slope coefficients in the equation,

$$SPRTRN_t = b_0 + (b_1 - b_2) \cdot XRIC_t \cdot ERRUMP_t + b_2 \cdot ERRUMP_t + u_t \, .$$

$SPRTRN_t$ denotes the return on day t on the S&P 500 index ignoring dividends; $XRIC_t$ is the Experimental Coincident Recession Index that indicates the probability that the economy was in a recession. This index is taken from Stock and Watson Indicator Report. $ERRUMP_t$ is the surprise component of the unemployment rate announcement. White t-statistics are reported in parentheses. The sample period is from 1962.01 to 2000.12.

Table 6c

T-Bill and Bond Price Responses to Unemployment News*

	Method 1					Method 2					Method 3				
	Thursday (1-year bond)	Friday (1-year bond)	Th +Fr (1-year bond)	Th + Fr (3-month T-bill)	Th + Fr (10-year bond)	Thursday (1-year bond)	Friday (1-year bond)	Th +Fr (1-year bond)	Th + Fr (3-month T-bill)	Th + Fr (10-year bond)	Thursday (1-year bond)	Friday (1-year bond)	Th +Fr (1-year bond)	Th + Fr (3-month T-bill)	Th + Fr (10-year bond)
b_2	0.0244 (1.17)	0.1104 (3.23)	0.1355 (3.16)	0.0207 (1.27)	0.815 (2.91)	0.0226 (1.01)	0.1048 (3.19)	0.1281 (3.03)	0.0155 (0.92)	0.8325 (3.10)	0.0294 (0.98)	0.1258 (2.67)	0.1559 (2.63)	0.0117 (0.48)	0.991 (2.87)
$b_1 - b_2$	-0.186 (-1.85)	-0.089 (-0.58)	-0.276 (-1.32)	-0.049 (-0.91)	-1.412 (-1.41)	-0.056 (-0.48)	0.0019 (0.01)	-0.055 (-0.26)	0.0004 (0.01)	-0.454 (-0.41)	-0.079 (-0.65)	-0.153 (-0.96)	-0.233 (-0.97)	-0.041 (-0.64)	-1.435 (-1.37)

- This table reports the slope coefficients in equation $BRTRN_t = b_0 + (b_1 - b_2) \cdot XRIC_t \cdot ERRUMP_t + b_2 \cdot ERRUMP_t + u_t$ for T-Bills and Bonds. $XRIC_t$ is the Experimental Coincident Recession Index that indicates the probability that the economy was in a recession. This index is taken from Stock and Watson Indicator Report. $ERRUMP_t$ is the surprise component of the unemployment rate announcement. White t-statistics are reported in parentheses. The sample period is from 1962.01 to 2000.12. The dependent variables, from left to right, are the Thursday return of 1-year bond, Friday return of 1-year bond, Thursday plus Friday return of 1-year bond, Thursday plus Friday return of 3-month T-bill, Thursday plus Friday return of 10-year government. The sample period is from 1962.01 to 2000.12.

Table 7C
(Stock and Watson Index)
Stock Price Response to Unemployment News Arrival:
Predicted Response due *to Interest Rate Effects Only*
And Predicted *Total Response*

Forecasting method	Col(1) 10 Year bond price change	Col(2) 10 year interest rate change	Col (3) Implied stock price change due to interest rate effects only	Col (4) Actual total stock price change	Col(5) Implied stock price change due to changes in growth expectations and risk premium	Col(6) Implied change in growth, no change in risk premium	Col(7) Ratio of contractions to expansions from Col 6	Col(8) Average price / dividend ratio
Contractions								
Method 1*	0	0	0	-2.94	-2.94	-0.14	1.96	21.1
Method 2	0	0	0	-3.04	-3.04	-0.14	1.86	21.1
Method 3	0	0	0	-2.47	-2.47	-0.12	1.25	21.1
Expansions								
Method 1	0.82	-0.11	3.31	1.17	-2.14	-0.07		30.1
Method 2	0.83	-0.11	3.39	1.06	-2.33	-0.08		30.1
Method 3	0.99	-0.13	4.03	1.22	-2.81	-0.09		30.1

* Refers to the method employed in forecasting the unemployment rate. See footnote to Table 1.

Column 1. Change in 10 year government bond price due to news. In expansions, from Table 6; in contractions assumed to be 0.

Column 2. Change in 10 year government bond rate, computed from column 1, using duration. (e.g. (Column 1.) / 7.4). Formally dr/du.

Column 3. Change in stock price due to interest rate effects only. Formally, $(dP_s/ P_s)/du \,|_{dg = d\pi = 0.}$

Column 4. Actual total stock price change due to unemployment news. Formally, $(dP_s/ P_s)/du$. Entries are from Table 5.

Column 5. Total stock price change - stock price change predicted by interest rates. (Col. 4. - Col. 3.) Formally, $d\phi/du$.

Column 6. Implied change in growth , dg/du, assuming no change in risk premium. (Col. 5. / Col. 8).

Column 7. (Column 6, contractions) /(Column 6, expansions).

Column 9. Price/dividend ratio from CRSP. Average over period 1962-2000.

Table 8C

The reaction of the risk premium to the unemployment surprise*

	Method 1 †	Method 2 †	Method 3 †
Constant (contraction, XIRC)	0.016 (0.51)	0.0045 (0.12)	0.0032 (0.08)
Constant (expansion, (1-XIRC))	-0.0034 (-0.76)	-0.0014 (-0.30)	-0.0012 (-0.19)
Coefficient (contraction, XIRC)	0.1361 (0.84)	0.1547 (0.97)	0.1487 (1.01)
Coefficient (expansion, (1-XIRC))	0.0513 (1.44)	0.0728 (2.09)	0.0901 (1.87)

Note: The sample period is from 1962.1 to 2000.12. This table reports the slope coefficient in the of the regression of the risk premium on the unemployment surprises. The dependent variable is the change of monthly corporate bond yield spread between Baa and Aaa bonds. XRIC is the Experimental Coincident Recession Index that indicates the probability that the economy was in a recession. This index is taken from Stock and Watson Indicator Report.

† "Method" refers to the forecasting procedure for unemployment, (see notes to Table 1).

Table 9c

Linear Relation Between Unemployment Rates and
Growth Rates of Industrial Production

	Same Month*	One Month Ahead	Two Months Ahead	Three Months Ahead	Four Months Ahead
Expansion	-0.88	-0.385	-0.502	-0.86	-0.834
	(-3.95)	(-1.83)	(-2.14)	(-3.63)	(-2.87)
$XRIC \cdot DUMP$	-3.672	-2.956	-1.898	0.0689	0.6264
	(-7.06)	(-3.80)	(-3.58)	(0.09)	(0.98)

Note: This table reports the slope coefficient in the regression of the growth rates in industrial production on the changes in the unemployment rate,

$IPGRATE_s = a_0 + a_1 \cdot XRIC_t \cdot DUMP_t + a_2 \cdot DUMP_t + v_t$. The t-statistics reported in parenthesis were computed as described in the text. The sample period is from 1962.01 to 2000.12. XRIC is the Experimental Coincident Recession Index that indicates the probability that the economy was in a recession. This index is taken from Stock and Watson Indicator Report.

Table 10c

Response of U.S. Government Bonds, Public Utility Stocks,

The S&P 500 Index and Cyclical Stocks to Unemployment News* (The dependent variables are two-day returns, in %)

	Method 1†		Method 2†		Method 3†	
	b_2	$b_1 - b_2$	b_2	$b_1 - b_2$	b_2	$b_1 - b_2$
One-year Govt. Bond	0.1355 (3.16)	-0.276 (-1.32)	0.1281 (3.03)	-0.055 (-0.26)	0.1559 (2.63)	-0.233 (-0.97)
Utility stocks (equally weighted)	0.518 (1.96)	-0.234 (-0.12)	0.4269 (1.62)	-0.25 (-0.14)	0.5658 (1.74)	-0.018 (-0.01)
Utility stocks (value weighted)	0.912 (2.65)	-0.497 (-0.19)	0.8244 (2.40)	-0.507 (-0.21)	1.0647 (2.48)	-0.188 (-0.07)
S&P500 stocks	1.1746 (2.40)	-4.114 (-2.17)	1.0605 (2.19)	-4.098 (-2.48)	1.2194 (2.07)	-3.685 (-2.01)

- This table reports the slope coefficient in equation $RN_t = b_0 + (b_1 - b_2) \cdot XRIC_t \cdot ERRUMP_t + b_2 \cdot ERRUMP_t + u_t$ for each type of security. $XRIC_t$ is the Experimental Coincident Recession Index that indicates the probability that the economy was in a recession. This index is taken from Stock and Watson Indicator Report. $ERRUMP_t$ is the surprise component of the unemployment rate announcement. RN_t denotes the announcement day return (two day window) on the security. The t-statistics reported in parenthesis were computed as described in the text, allowing for both serial correlation and conditional heteroscedasticity

† "Method" refers to the forecasting procedure for unemployment (see note to Table 1).

References:

Backus, D. and A. Gregory, 1993, "Theoretical Relations Between Risk Premiums and Conditional Variances", *Journal of Business Economics and Statistics*, 11, 177-185.

Blanchard, Olivier J., 1981, “Output, the Stock Market, and Interest Rates”, *The American Economic Review*, Vol. 71, No. 1, 132-143.

Bodurtha, James, N., Jr., and Nelson C. Mark, 1991, “Testing the CAPM with time-varying risks and returns”, *Journal of Finance*, 46, 1485-1505.

Bollerslev, Tim, Robert F. Engle, and Jeffrey M. Wooldridge, 1988, “A capital asset pricing model with time varying covariances,”, “*Journal of Political Economy*, 96, 116-131.

Breen, William J., Larry R. Glosten, and Ravi Jagannathan, 1989, “Economic significance of predictable variations in stock index returns”, Journal of Finance 44, 1177-1190.

Campbell, John Y., 1993, “Intertemporal asset pricing without consumption data”, *American Economic Review*, 83, 487-512.

Campbell, John Y. and Ludger Hentschel, 1992, “No news is good news: An asymmetric model of changing volatility in stock returns”, *Journal of Financial Economics*, 31, 281-318.

Campbell, John Y., and Jianping Mei, 1993, “Where do betas come from? Asset price dynamics and the sources of systematic risk”, *Review of Financial Studies*, Vol. 6, No. 3, 567-592.

Chan, K.C., and Nai-fu Chen, 1988, An unconditional asset-pricing test and the role of firm size as an instrumental variable for risk”, *Journal of Finance*, 43, 309-325.

Chen, Nai-fu, Richard Roll, and Stephen A. Ross, “Economic forces and the stock market”, *Journal of Business*, 46, 529-554.

Cochrane, John, 1999, "Asset Pricing", Manuscript, Graduate School of Business, University of Chicago.

Fama, Eugene F. and Kenneth French, 1989, “Business conditions and the expected returns on bonds and stocks”, *Journal of Financial Economics*, 25, 23-50.

Fama, E.F. (1990), "Stock Returns, Expected Returns, and Real Activity", *Journal of Finance 40*, 1089-1109.

Fama, E.F., French, K.R. (1989), “Business Conditions and Expected returns on Stocks and Bonds”, *Journal of Financial Economics* 23, 23-49.

Ferson, Wayne E., and Campbell Harvey, 1993, The risk and predictability of international equity returns”, *Review of Financial Studies*, 6(3), 527-526.

Ferson, Wayne E and Robert Korajczyk, 1993, “Do arbitrage pricing models explain the predictability of stock returns?”, working paper, Kellogg Graduate School of Management, Northwestern University.

Ferson, Wayne E. and Campbell R. Harvey, 1999, "Conditioning variables and the cross-section of stock returns", *Journal of Finance*, August 1999.

Fleming, M.J., Remolona, E.M.(1998), "The Term Struture of Announcement Effects", Working Paper, Federal Reserve Bank of New York.

French, Kenneth R., G. William Schwert and Robert F. Stambaugh, 1987, "Expected stock returns and volatility", Journal of Financial Economics, 19, 3-29.

Gertler, M., Grinols, E.L. (1982), "Unemployment, Inflation, and Common Stock Returns*", Journal of Money, Credit and Banking 14*, 216-233.

Glosten, Lawrence R., Ravi Jagannathan, and David Runkle, 1993, "On the relation between the Expected Value and the Volatility of the Nominal Excess Return on Stocks", *Journal of Finance*, Vol 48, No. 5, 1779-1801.

Hamilton, J. (1989), "A New Approach to the Economic Analysis of Nonstationary time Series and the Business Cycle", *Econometrica 57*, 357-384.

Harvey, Campbell R., 1989, "Time-varying conditional covariances in tests of asset pricing models", *Journal of Financial Economics*, 24, 289-318.

Jagannathan, Ravi, Ellen R. McGrattan, and Anna Scherbina, 2000, "The Declining U.S. Equity Premium", *Quarterly Review*, Federal Reserve Bank of Minneapolis, Vol 24, No. 4,

Jagannathan, Ravi and Zhenyu Wang (1993), "The CAPM is Alive and Well", Staff Report #165, Federal Reserve Bank of Minneapolis.

Jagannathan, Ravi, Keiichi Kubota, and Hitoshi Takehara (1998), "Relationship between Labor-Income Risk and Average Return: Empirical Evidence from the Japanese Stock Market", *Journal of Business*, Number 3, Volume 71, 319-347.

Keim, Donald B. and Robert F. Stambaugh, 1986, "Predicting returns in the stock and bond markets", *Journal of Financial Economics*, 17, 357-390.

Krueger, A.B. (1996), "Do Markets respond More to More Reliable Labor Market Data? A Test of Market Rationality", NBER Working Paper 5769.

McQueen, G., Roley, V.V. (1993), "Stock Prices, News, and Business Condition*", Review of Financial Studies 6*, 683-707.

Neftci, S.N. (1984), "Are Economic Time Series Asymmetric over the Business Cycle?", *Journal of Political Economy 92*, 307-328.

Orphanides, Athanasios, 1992, "When Good News Is Bad News: Macroeconomic News and the Stock Market", Working paper, Board of Governors of the Federal Reserve System.

Veronesi, Pietro (1999), "Stock Market Overreaction to Bad New in Good Times: A Rational Expectations Equilibrium Model", *Review of Financial Studies*, Vol. 12, No. 5, 975-1007.

Whitelaw, Robert F., 1999, "Stock Market Risk And Return: An Equilibrium Approach", Forthcoming, *Review of Financial Studies*.

Table 1

Properties of the forecasted unemployment rate

		Method 1**			Method 2			Method 3		
	Unemployment rate	DUMP	DUMPF	ERRUMP	DUMP	DUMPF	ERRUMP	DUMP	DUMPF	ERRUMP
whole sample	5.952	-0.0043	0.00007	-0.0043	-0.0043	0.0095	-0.0138	-0.0052	0.0220*	-0.0270*
	(0.0713)	(0.0082)	(0.0054)	(0.0068)	(0.0082)	(0.0050)	(0.0073)	(0.0100)	(0.0066)	(0.0090)
contractions	6.819	0.221*	0.2432*	-0.0222	0.221*	0.144*	0.077*	0.222*	0.1612*	0.0605*
	(0.2397)	(0.0253)	(0.0163)	(0.0219)	(0.0253)	(0.0220)	(0.0230)	(0.0306)	(0.0291)	(0.0293)
expansions	5.832	-0.0355*	-0.0337*	-0.0019	-0.0355*	-0.0091*	-0.0264*	-0.0399*	0.00046	-0.0405*
	(0.0723)	(0.0074)	(0.0031)	(0.0072)	(0.0074)	(0.0040)	(0.0075)	(0.0090)	(0.0051)	(0.0091)

* Means and Standard errors for the means (in parenthesis) are reported. ”*” denotes significance at the 5% level. DUMP is the change of unemployment rate. DUMPF is the predicted value for the change of unemployment rate. ERRUMP is the unanticipated component of unemployment rate, i.e., DUMP – DUMPF.

** In this table and in many of the tables that follow, the unemployment rate surprise is estimated in three different ways (which are discussed in more detail in the main body of the draft.) With “Method One”, final release data are employed for both the Index of Industrial Production and the unemployment rate announcement for the purposes of estimating the equation used to predict unemployment. This equation also contains a dummy variable for the state of the economy so that, in effect, these estimates are state-dependent. With “Method 2”, the data are exactly the same as with method one, but the state-of-the-economy dummy variable is omitted. With “Method 3”, no state dummy variable is included in the estimation and different data are employed. The forecasting equation uses only final release data which were, as of the announcement date, at least one year old. This forecast of the unemployment rate is then combined with the current period preliminary unemployment rate release to compute the surprise component. As discussed in the draft of the paper, the first two estimates are probably “too good” in the sense that actual forecasters could not have done as well in historical real time. The third estimating is clearly “too bad” in the sense that historical forecasts could have made more precise forecasts employing only those data which were available. As will become clear, choice of the forecasting method has limited quantitative effect on our results and no qualitative effect on our conclusions.

Table 2

Properties of the Computed Unemployment Rate Surprises

(Period: 1962.01 - 2000.12. Units: %/year)

	Method 1*				Method 2				Method 3			
	"Good News" (Actual unemployment less than predicted)		"Bad News" (Actual unemployment greater than predicted)		"Good News" (Actual unemployment less than predicted)		"Bad News" (Actual unemployment greater than predicted)		"Good News" (Actual unemployment less than predicted)		"Bad News" (Actual unemployment greater than predicted)	
	Number of observations	Mean [Standard Deviation]	Number of observations	Mean [Standard Deviation]	Number of observations	Mean [Standard Deviation]	Number of observations	Mean [Standard Deviation]	Number of observations	Mean [Standard Deviation]	Number of observations	Mean [Standard Deviation]
Contractions	32	-0.1308 (0.1141)	25	0.1168 (0.1055)	19	-0.1088 [0.1297]	38	0.170 [0.1043]	18	-0.1255 (0.1201)	28	0.1801 (0.1321)
Expansions	204	-0.1156 (0.0933)	207	0.1102 (0.0899)	236	-0.1272 [0.0992]	175	0.1095 [0.0905]	184	-0.1336 (0.1042)	113	0.1110 (0.1010)

* "Method" refers to the forecasting procedure for unemployment. (See notes to Table 1.)

Table 3

Returns on Announcement Days and Other Days During

Expansions and Contractions (Period: 1962.01 - 2000.12, in %)

Panel A: **All Days**

		mean	standard deviation
Announcement days	S&P 500 Index	0.1045	0.9505
	1-year government bond	0.0138	0.1164
Non-announcement days	S&P 500 index	0.0370	0.9029
	1-year government bond	-0.00028	0.0837

Panel B: **Only announcement days**

		mean	standard deviation
Contractions	S&P 500 index	0.0092	0.9519
	1-year government bond	0.0697	0.1874
Expansions	S&P 500 index	0.1183	0.9507
	1-year government bond	0.0059	0.1004

Table 4

Announcement Day (Friday) and Pre-Announcement Day (Thursday) Returns
(period: 1962.01 - 2000.12, figures in %)

S&P 500 Stocks:

Mean (Standard Deviation), Conditional on the state of economy+		
	good news*	bad news
Thursday(expansion)	0.0013 (0.6958)	0.0740 (0.7910)
Thursday(contraction)	0.3518 (1.1363)	-0.4289 (1.0435)
Friday(expansion)	0.0026 (0.9770)	0.2357 (0.9110)
Friday(contraction)	0.0622 (1.0091)	-0.0592 (0.8891)

One-year Government Bond:

Mean (Standard Deviation), Conditional on the state of economy+		
	Good news*	Bad news
Thursday(expansion)	-0.0068 (0.0543)	-0.0008 (0.0491)
Thursday(contraction)	0.0541 (0.1381)	0.0006 (0.1443)
Friday(expansion)	-0.0100 (0.1011)	0.0215 (0.0975)
Friday(contraction)	0.0785 (0.2324)	0.0587 (0.1131)

* News is Good (Bad) when the announced unemployment rate is less (more) than forecasted using the model.
+ These computations rely on unemployment forecasts using method one (see notes to Table 1.)

Table 5

Change in the S&P 500 Index in Response to Unemployment News*

.

	Method 1			Method 2			Method 3		
	Thursday	Friday	Thursday + Friday	Thursday	Friday	Thursday + Friday	Thursday	Friday	Thursday + Friday
Contraction (b_1)	-2.175 (-2.31)	-1.135 (-1.37)	-3.309 (-2.10)	-1.973 (-2.44)	-1.572 (-2.49)	-3.544 (-2.70)	-1.524 (-1.61)	-1.544 (-2.32)	-3.067 (-2.04)
Expansions (b_2)	0.5029 (1.86)	0.6891 (2.14)	1.192 (2.56)	0.4973 (1.92)	0.6996 (2.26)	1.197 (2.65)	0.7017 (2.33)	0.6746 (1.77)	1.3763 (2.52)
The difference (b_1-b_2)	-2.678 (-2.74)	-1.824 (-2.06)	-4.501 (-2.74)	-2.47 (-2.90)	-2.271 (-3.19)	-4.741 (-3.39)	-2.225 (-2.24)	-2.218 (-2.85)	-4.444 (-2.77)

* The table reports the estimated values of the slope coefficients in the equation, $SPRTRN_t = b_0 + b_1 \cdot D_t \cdot ERRUMP_t + b_2 \cdot (1 - D_t) \cdot ERRUMP_t + u_t$.
$SPRTRN_t$ denotes the return on day t on the S&P 500 index ignoring dividends; D_t is a dummy variable that takes on the value one in contractions and zero otherwise; $ERRUMP_t$ is the surprise component of the unemployment rate announcement. White t-statistics are reported in parentheses. The sample period is from 1962.01 to 2000.12.

Table 6

T-Bill and Bond Price Responses to Unemployment News*

	Method 1					Method 2					Method 3				
	Thursday (1-year bond)	Friday (1-year bond)	Th +Fr (1-year bond)	Th + Fr (3-month T-bill)	Th + Fr (10-year bond)	Thursday (1-year bond)	Friday (1-year bond)	Th +Fr (1-year bond)	Th + Fr (3-month T-bill)	Th + Fr (10-year bond)	Thursday (1-year bond)	Friday (1-year bond)	Th +Fr (1-year bond)	Th + Fr (3-month T-bill)	Th + Fr (10-year bond)
Contraction	-0.156 (-1.85)	0.0214 (0.18)	-0.135 (-0.78)	-0.015 (-0.33)	-0.475 (-0.59)	-0.052 (-0.55)	0.1143 (1.14)	0.062 (0.38)	0.0184 (0.40)	0.4594 (0.54)	-0.079 (-0.79)	-0.003 (-0.02)	-0.082 (-0.43)	-0.02 (-0.40)	-0.332 (-0.40)
Expansions	0.0215 (1.07)	0.1096 (3.28)	0.1317 (3.17)	0.0179 (1.15)	0.7774 (2.82)	0.0274 (1.35)	0.103 (3.15)	0.1312 (3.21)	0.015 (0.93)	0.818 (3.11)	0.0377 (1.31)	0.1197 (2.57)	0.158 (2.71)	0.0096 (0.41)	0.9642 (2.83)
Difference	-0.178 (-2.04)	-0.088 (-0.70)	-0.267 (-1.50)	-0.033 (-0.69)	-1.253 (-1.47)	-0.08 (-0.82)	0.0113 (0.11)	-0.069 (-0.41)	0.0034 (0.07)	-0.359 (-0.40)	-0.117 (-1.14)	-0.122 (-0.90)	-0.24 (-1.19)	-0.03 (-0.53)	-1.296 (-1.44)

* This table reports the slope coefficients in equation (2a) for T-Bills and Bonds. The t-statistics given in parenthesis were computed as described in the text, allowing for both serial correlation and conditional heteroscedasticity. The dependent variables, from left to right, are the Thursday return of 1-year bond, Friday return of 1-year bond, Thursday plus Friday return of 1-year bond, Thursday plus Friday return of 3-month T-bill, Thursday plus Friday return of 10-year government. The sample period is from 1962.01 to 2000.12.

Table 7

Stock Price Response to Unemployment News Arrival:
Predicted Response due *to Interest Rate Effects Only*
And Predicted *Total Response*

Forecasting method	Col(1) 10 Year bond price change	Col(2) 10 year interest rate change	Col (3) Implied stock price change due to interest rate effects only	Col (4) Actual total stock price change	Col(5) Implied stock price change due to changes in growth expectations and risk premium	Col(6) Implied change in growth, no change in risk premium	Col(7) Ratio of contractions to expansions from Col 6	Col(8) Average price / dividend ratio
Contractions								
Method 1*	0	0	0	-3.31	-3.31	-0.16	2.40	21.1
Method 2	0	0	0	-3.54	-3.54	-0.17	2.38	21.1
Method 3	0	0	0	-3.07	-3.07	-0.15	1.72	21.1
Expansions								
Method 1	0.78	-0.10	3.16	1.19	-1.97	-0.07		30.1
Method 2	0.82	-0.11	3.32	1.20	-2.13	-0.07		30.1
Method 3	0.96	-0.13	3.92	1.38	-2.54	-0.08		30.1

* Refers to the method employed in forecasting the unemployment rate. See footnote to Table 1.

Column 1. Change in 10 year government bond price due to news. In expansions, from Table 6; in contractions assumed to be 0.

Column 2. Change in 10 year government bond rate, computed from column 1, using duration. (e.g. (Column 1.) / (- 7.4)). Formally dr/du.

Column 3. Change in stock price due to interest rate effects only. Formally, $(dP_s/ P_s)/du \,\big|_{dg = d\pi = 0.}$

Column 4. Actual total stock price change due to unemployment news. Formally, $(dP_s/ P_s)/du$. Entries are from Table 5.

Column 5. Total stock price change - stock price change predicted by interest rates. (Col. 4. - Col. 3.) Formally, $d\phi/du$.

Column 6. Implied change in growth , dg/du, assuming no change in risk premium. (Col. 5. / Col. 8).

Column 7. (Column 6, contractions) /(Column 6, expansions).

Column 9. Price/dividend ratio from CRSP. Average over period 1962-2000.

Table 8

The reaction of the risk premium to the unemployment surprise.*

	Method 1 †	Method 2 †	Method 3 †
Constant term (contractions)	0.03704 (1.44)	0.02501 (0.77)	0.02315 (0.65)
Constant term (expansions)	-0.00605 (-1.50)	-0.0045 (-1.09)	-0.0049 (-0.84)
Coefficient (contractions)	0.1012 (0.68)	0.12788 (0.82)	0.14246 (0.97)
Coefficient (expansions)	0.0622 (1.79)	0.06362 (1.84)	0.07825 (1.58)

* The sample period is from 1962.1 to 2000.12. The dependent variable is the change of monthly corporate bond yield spread between Baa and Aaa bonds.

† "Method" refers to the forecasting procedure for unemployment, (see notes to Table 1).

Table 9

Linear Relation Between Unemployment Rates and
Growth Rates of Industrial Production

	Same Month*	One Month Ahead	Two Months Ahead	Three Months Ahead	Four Months Ahead
Contraction	-4.091 (-9.34)	-3.296 (-5.63)	-2.689 (-6.03)	-1.358 (-1.94)	-0.808 (-1.53)
Expansion	-1.009 (-4.75)	-0.326 (-1.60)	-0.305 (-1.39)	-0.579 (-2.72)	-0.55 (-1.98)
The Difference	-3.082 (-6.27)	-2.97 (-4.69)	-2.384 (-4.76)	-0.779 (-1.05)	-0.258 (-0.42)

Note: This table reports the slope coefficient in the regression of the growth rates in industrial production on the actual changes in the unemployment rates, $IPGRATE_s = a_0 + a_1 \cdot D_t \cdot DUMP_t + a_2 \cdot (1 - D_t) \cdot DUMP_t + v_t$. The t-statistics reported in parenthesis were computed as described in the text. The sample period is from 1962.01 to 2000.12.

Table 10

Response of U.S. Government Bonds, Public Utility Stocks,

The S&P 500 Index and Cyclical Stocks to Unemployment News*

(The dependent variables are two-day returns, in %)

	Method 1†			Method 2†			Method 3†		
	Contraction	Expansion	Difference	Contraction	Expansion	Difference	Contraction	Expansion	Difference
One-year Govt. Bond	-0.135 (-0.78)	0.1317 (3.17)	-0.267 (-1.50)	0.062 (0.38)	0.1312 (3.21)	-0.069 (-0.41)	-0.082 (-0.43)	0.158 (2.71)	-0.24 (-1.19)
Utility stocks (equally weighted)	-0.274 (-0.17)	0.6194 (2.58)	-0.894 (-0.55)	-0.415 (-0.30)	0.5655 (2.46)	-0.981 (-0.70)	-0.024 (-0.01)	0.7178 (2.48)	-0.742 (-0.45)
Utility stocks (value weighted)	-0.166 (-0.08)	1.0149 (3.20)	-1.181 (-0.56)	-0.327 (-0.19)	0.9778 (3.20)	-1.305 (-0.73)	0.188 (0.09)	1.2485 (3.21)	-1.06 (-0.50)
S&P500 stocks	-3.309 (-2.10)	1.192 (2.56)	-4.501 (-2.74)	-3.544 (-2.70)	1.197 (2.65)	-4.741 (-3.39)	-3.067 (-2.04)	1.3763 (2.52)	-4.444 (-2.77)

* This table reports the slope coefficient in equation (2) for each type of security. The t-statistics reported in parenthesis were computed as described in the text, allowing for both serial correlation and conditional heteroscedasticity

† "Method" refers to the forecasting procedure for unemployment (see note to Table 1).

Endnotes

[1] The authors benefited from comments from workshop participants at the June 2001 European Financial Management Meetings at Lugano, Federal Reserve Bank of New York, Federal Reserve Bank of Atlanta, McGill University, University of Akron, University of Vienna, and Olivier Blanchard, Jacob Boudoukh , Frank Diebolt, Wayne Ferson, Narayana Kockerlakota, Ross Levine, and Roberto Rigobon. We particularly benefited from discussions with Gordon Alexander. Any views expressed in the paper are those of the authors and not necessarily those of the institutions they are in.

[2] For example, on December 6, 1974, the Labor Department released substantial bad news: the unemployment rate had risen from 6.0% to 6.6%. Around the announcement, the S&P 500 index declined by about 3.6 percent. However, it is just as easy to find cases in which the stock market *rose* sharply in response to bad unemployment news. On August 3, 1984, the Labor Department announced that the unemployment rate had increased from 7.2% to 7.5%, and around that announcement the S&P 500 index gained 5.4 percent. It is no coincidence that the first case occurred during a contraction and the second during an expansion.

As discussed in Appendix A, the empirical results presented here employ a somewhat shorter time series, provided to us by the Bureau of Labor Statistics that begins in 1957.

[4] McQueen and Roley (1993) and Kreuger(1996), used forecasts made by Money Market Services International (MMS) to identify the surprise element of the unemployment rate announcement. We do not follow this procedure since MMS forecasts have only been available since November 1977, whereas our data set goes back to January 1962. Seeking to employ as much data as possible, we used our own time-series models to forecast the unemployment rate announcement and its unanticipated component.

[5] Regression model (1) can be expanded to include Friday and day of the week dummy variables to account for the fact that announcements were not always made on Fridays. We do not report these results since inclusion of these variables did not affect our results in any substantial way.

Our data set actually begins in January, 1957 (see Appendix A), but the first five years of data are "used up" in obtaining the initial forecasts.

[7] To see how our forecasts compared to the predictions of experts, we studied the period February 1992 to August 1994 during which Fleming and Remolona (1998) reported statistics for unemployment rate surprises, based on consensus forecasts published in the Wall Street Journal. Their mean was –6.3 basis points with a standard deviation of 17.1 basis points. The forecast errors for the three models we use have comparable properties.

[8] Note that unemployment news is not observed. Hence we use a forecasting model to construct a proxy for it. The use of a proxy gives rise to the well known "errors in variables" problem, meaning that the estimated slope coefficients will be biased towards zero. The classical solution for the errors in variables problem is to use an instrumental variable that is correlated with the proxy but uncorrelated with that part of the stock index return that is orthogonal to the proxy. We have not been able to identify such an instrument and thus this bias is to some degree present in our estimates.

[9] The correlation between the annual rate of growth in dividends and the IIP is only.247. However, it is well known that dividend payments are intentionally smoothed, even at annual frequencies. The correlation between quarterly earnings growth and IIP growth is a more respectable .464. Unfortunately, we know of no better proxy variable for dividends which is observable at monthly intervals.

[10] The computations in Table 7 suggest that the effect of unemployment news on growth expectations should (only) be about twice as large during contractions as during expansions. However, these revisions are enough in the permanent (expected) rate of growth in future dividends "backed out" of the Gordon growth model. The growth effects in Table 9. are for four months maximum, and it is therefore not inconsistent that the difference between results during expansions and contractions is much larger in Table 9 than in Table 7.

[11] For example, Bollerslev, Engle and Woodridge (1988), Ferson and Harvey (1991, 1993, 1999) and Ferson and Korajczyk (1993) empirically examine linear beta pricing models where the betas are allowed to vary over time. Jagannathan and Wang (1996) and Harvey (1999) follow Chen, Roll and Ross (1986) and use macroeconomic variables as factors, but allow factor betas to vary over time. Cochrane (2000) shows how time varying beta models can be examined using the stochastic discount factor approach.