The News in Financial Asset Returns

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Are returns on financial markets useful for predicting the future course of the economy? It is widely thought that financial markets' movements reflect the economy's future and that finding the message in financial asset returns is one way to discern this future. The message is not always clear, though. For example, on November 3, 2003, a *Wall Street Journal* story attempted to reconcile apparently conflicting signals from stock and bond prices about whether economic growth would continue to be high in the future (Browning and Lucchetti 2003).

The widespread notion that financial asset returns are related to future economic activity is plausible. An improvement in a company's prospects is likely to result in a rise in its stock prices (Kamstra 2003). If a widespread increase in stock prices occurs, it is possible that many companies' prospects have improved and the economy will grow faster. Those brighter prospects can be associated with faster output growth simply because increases in asset prices reflect good news about future economic conditions. Rising stock prices also can be associated with faster output growth because higher stock prices increase households' wealth, thus boosting consumption and output and thereby improving firms' prospects. Either way, rising stock prices can be associated with future increases in output.

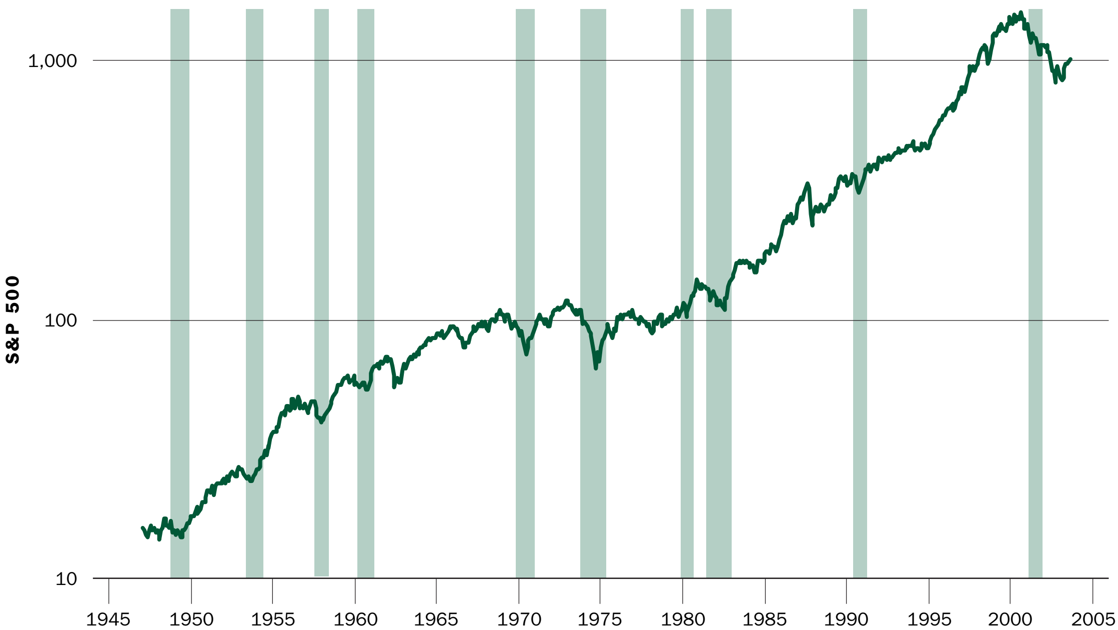
Returns on bonds also can reflect the economy's future although the relationship is slightly more complex. The actual return on a bond in any period includes both an expected and an unexpected return. By definition, the expected return is not a surprise and is not news. The unexpected return, on the other hand, reflects news about the future. Higher growth lowers bond prices and therefore returns; lower growth raises bond prices and therefore returns.[1]

Detailed analyses provide surprisingly little support for financial markets' ability to reveal future economic activity. For example, Stock et al. (1989) find that aggregate stock returns have little value for predicting economic activity, given other variables. They emphasized new leading indicators such as term and default spreads, which promptly failed to forecast a recession (Stock and Watson 2003). The evidence on alternative indicators based on asset prices is mixed (Smith 1999). In part, the problem is that a variety of indicators based on different, seemingly plausible lines of argument have been proposed. Typically, researchers who propose an indicator find the data consistent with its importance, and then other researchers who test the indicator find the evidence lacking (Stock and Watson 2003).

Despite the less than sterling record associated with such indicators, there is a strong temptation to use movements in stock indexes and more general returns on financial markets to help discern the

FIGURE

Stock Prices and Recessions, January 1947 through December 2003



Source: S&P 500 from CRSP

future of the economy. After all, other forecasts are not particularly helpful either. Stock prices reflect investors' expectations of the future, and it is hard to imagine that they do not contain useful information.[2]

Even if stock returns do help predict future economic activity, the level of stock prices measured by an index number is not necessarily the best way to use asset prices to forecast the economy. Lamont (2001) provides evidence that the market stock portfolio is not the best portfolio for predicting future economic activity. Creating a market portfolio based on firms' market values can bury industry-specific data that might be informative about future economic activity such as output growth and inflation. As a consequence, Lamont investigates predictions of economic activity from alternative combinations of the information contained in asset prices, which he calls economic tracking portfolios—portfolios of stocks and bonds with returns that have the best-fitting joint linear relationship with economic activity.[3] Lamont (2001) finds that tracking portfolios are related to future economic activity and presents evidence that they are useful for forecasting economic activity over the next year.

Curiously, there is more solid evidence that financial markets reflect news about economic activity than that markets' reflection of news helps predict economic activity. Two early papers on the effect on financial markets of news about economic activity are Chen, Roll, and Ross (1986) and Dwyer and Hafer (1989), and two recent papers are Flannery and Protopapadakis (2002) and Balduzzi, Elton, and Green (2001). Overall, these studies do find evidence of relationships between financial asset returns and economic activity although the relationship is more evident for bonds than for stocks.

This article examines and answers two questions: First, what is a good way of extracting information about future economic activity from asset prices? Second, do financial asset returns help predict economic activity over horizons from one month to five years? While the questions are similar, in part, to Lamont's (2001), the methods used here are different in some regards, and more recent data allow us to examine the late 1990s and the recession in 2001.

Stock Returns and Recessions

Before delving into evidence from a more technical analysis, we present some simple evidence on a basic question: How well do stock prices predict recessions? The figure above shows the S&P 500 stock index from January 1947 to December 2003; the shading represents periods of recession as defined by the National Bureau of Economic Research (NBER).

TABLE 1

Recessions and Stock Returns

Recessions (years)	Peak of stock index (1) (month)	Peak of business cycle (2) (month)	Lead time between peaks (months)	Stock index decline from (1) to (2) (percent)	Trough of the stock index (month)	Maximum decline of stock index (percent)	End of the recession (month)	Lead time from trough to the end of the recession (months)	Length of the recession (months)
1948–49	06/48	11/48	5	–11.95	06/49	–15.47	10/49	5	12
1953–54	12/52	07/53	7	–6.83	08/53	–12.23	05/54	10	11
1957–58	07/57	08/57	1	–5.62	12/57	–16.53	04/58	5	9
1960–61	07/59	04/60	9	–10.15	10/60	–11.77	02/61	5	11
1969–70	11/68	12/69	13	–15.05	06/70	–32.90	11/70	6	12
1973–75	12/72	11/73	11	–17.37	09/74	–46.18	03/75	7	17
1980	01/80	01/80	0	0	03/80	–10.57	07/80	5	7
1981–82	11/80	07/81	8	–6.83	07/82	–23.79	11/82	5	17
1990–91	05/90	07/90	2	–1.40	10/90	–15.84	03/91	6	9
2001	08/00	03/01	7	–23.55	09/01	–31.41	11/01	3	9
Average			6.3	–9.88		–21.67		5.7	11.4

The figure makes it easy to see why it is tempting to use a stock market index to predict recessions. Every recession is associated with a fall in the S&P 500, with all but the drop in 1980 preceding the recession.

Table 1 summarizes details from the figure. The analysis is similar to Siegel's (1998, chap. 12) analysis of decreases in the S&P 500 index before recessions.[4] Table 1 shows whether the stock market falls before the beginning of a recession and starts to rise before the end of a recession. Stock prices can rise and fall on successive days, so it would be meaningless to simply examine whether stock prices fall before a recession. On some days they do; on some days they don't. A more informative definition is Siegel's; he defines a fall before a recession as a decline of 8 percent or more and a peak as the highest level from which prices fall 8 percent. The low point of the index—a trough—is the lowest level before stock prices rise 8 percent. Table 1 also examines whether a stock market increase signals the end of the recession; we use a related definition of such a signal as being a rise of 8 percent or more that started during the recession.

Table 1 shows that stock prices peak anywhere from zero to thirteen months before the start of a recession. The average lead time between the peak of the S&P 500 and the start of a recession is 6.3 months, and the average stock market decline before a recession is 9.9 percent. The average decline in the stock market before and during a recession is 21.7 percent, with a wide range from a 10.6 percent fall in 1953–54 to the collapse of stock prices by 46.2 percent in 1973–75. On average, these declines took place over twelve months. Typically, the stock market falls less before a recession than during it, which limits the market's value

1. In general, higher growth is associated with a higher expected return. News of higher growth in the future, though, is associated with a lower unexpected return today because the price of a fixed-income security must fall to provide higher expected returns in the future.
2. See, for example, Del Negro (2001), Smith (1999), and Stock et al. (1989). The basic idea is related to Hayek (1948).
3. Economic tracking portfolios are similar to "maximum correlation portfolios," introduced by Breeden, Gibbons, and Litzenberger (1989), and "mimicking portfolios," which have been used for a variety of purposes, including tests of asset pricing models. For example, Breeden, Gibbons, and Litzenberger (1989) construct tracking portfolios for current consumption to test the consumption capital asset pricing model, and Balduzzi and Robotti (2001) use tracking portfolios to test the intertemporal capital asset pricing model. Returns on such portfolios also can be used to calculate the risk premia received by holders of various types of risk. In fact, the economic risk premia are the excess cash flows on the mimicking portfolios (Robotti 2002). Such portfolios can be used as hedging devices by individuals who wish to insure themselves against a particular economic risk; for example, to insure themselves against inflation, individuals can take a position in the mimicking portfolio for inflation to offset predictable inflation.
4. The NBER recession dates—other than the 2001 recession, which occurred after Siegel's analysis was published—are identical. The dates and stock market returns are similar but differ at least partly because Siegel appears to have used monthly averages of the S&P 500 index and this study uses the value at the end of the last trading day of the month.

for forecasting recessions. Still, decreases in the stock market appear to be useful for identifying whether the economy is currently in a recession. Given the typical ups and downs of the economy, there have been many times in the last fifty years when it has been difficult to determine that the economy is in a recession even while one is under way—a difficulty even in the two most recent recessions. The stock market does not necessarily decline substantially before a recession, but the onset of a recession is invariably associated with a substantial decline in stock prices.

In every case, prices have begun to increase before the end of a recession. The figure shows this pattern, with stock prices starting to increase 5.7 months, on average, before the end of the recession.

It is widely thought that financial markets' movements reflect the economy's future and that finding the message in financial asset returns is one way to discern this future.

This analysis answers part—but not all—of the question about stock prices' ability to predict recessions. The analysis shows that if the NBER identifies a recession, then a fall in stock prices has occurred about the same time in every recession since World War II.

These results do not imply that substantial decreases in stock prices indicate that there is a recession. Falling stock prices are not a certain indicator of a recession, as the patterns for 2001 to early 2003 show. The S&P 500 index fell 29.0 percent from December 2001 to September 2002, rose 14.9 percent from September to November 2002, and then fell 10.2 percent from November 2002 to February 2003. There was no recession within twelve months of the start of the 2002–03 decreases in stock prices. In fact, the revised estimate of GDP growth for the third quarter of 2003 is growth at more than an 8 percent annual rate—more than a little distant from a recession. Table 2 presents the other episodes since World War II in which stock prices fell 8 percent or more and no recession began within twelve months after the fall began. Even though they are associated with recessions, falling stock prices do not necessarily mean that a recession is coming or is under way.

In the post–World War II period, an 8 percent drop in stock prices has signaled nineteen recessions—nearly twice as many as the ten that have in fact occurred.[5] Recessions have occurred only 53 percent of the time that falling stock prices would suggest a recession, indicating that falling stock prices are roughly a fifty-fifty predictor of recessions. This statement is not the same as saying that falling stock prices would predict a recession 50 percent of the time. Fortunately, an 8 percent drop in stock prices is not that common. If stock prices drop by 8 percent or more, there is about a 50 percent chance of a recession. Given that falling stock prices do appear to be a signal about the economy's prospects, is there a way to extract more general information about the economy from stock prices and other financial asset returns?

Asset Returns and News about Economic Activity

This section outlines a way to extract the news about future economic activity from returns on financial assets. The unexpected part—by definition, the part that is news—of an asset's excess return can reveal information about unexpected economic activity.[6] Let ε_{t+1} be the unexpected part of economic activity from t to $t+1$ and η_t be the unexpected part of a financial asset's excess return from $t-1$ to t. The linear relationship between the unexpected part of economic activity and the news in the asset's return is given by

$$(1)\quad \varepsilon_{t+1} = b\eta_t + e_{t+1},$$

where $b\eta_t$ is the part of the next period's economic activity predicted by the current news in the asset's excess return, η_t, and e_{t+1} is the part of economic activity not predicted by the news in the asset's return.

There are no data series called "unexpected economic activity" and "news in financial returns." To determine ε_{t+1} and η_t, we must estimate expected economic activity and assets' expected excess returns because the unexpected parts of economic activity and returns are the differences between actual values and expected values. Let y_{t+1} denote a measure of economic activity such as the growth rate of industrial production from period t to $t+1$, and let r_t denote the excess return on an asset from the end of period $t-1$ to the end of period t. The unexpected part of the variation of economic activity and of the excess return can then be written as

$$(2)\quad \begin{aligned} \varepsilon_{t+1} &= y_{t+1} - \mathrm{E}[y_{t+1} | \Omega_{t-1}] \\ \eta_t &= r_t - \mathrm{E}[r_t | \Omega_{t-1}], \end{aligned}$$

TABLE 2

Years of False Alarm

False alarms (years)	Peak of stock index (month)	Trough of stock index (month)	Maximum decline of stock index (percent)
1956–57	07/56	02/57	–12.42
1962	12/61	06/62	–23.48
1966	01/66	09/66	–17.57
1978	08/78	10/78	–9.82
1984	11/83	05/84	–9.53
1987	08/87	11/87	–30.17
1998	06/98	08/98	–15.57
2001–02	12/01	09/02	–28.99
2002–03	11/02	02/03	–10.16

where Ω_{t-1} is the set of information available at the end of period $t-1$, $E[y_{t+1} | \Omega_{t-1}]$ is the expected level of economic activity conditional on information available at the end of period $t-1$, and $E[r_t | \Omega_{t-1}]$ is the expected return in period t conditional on information available at the end of period $t-1$.

Only the unexpected part of economic activity is related to news in the asset's return because the information already known about economic activity is reflected in the expected part of economic activity and the asset's expected excess return. These unexpected parts of economic activity and the asset's return can be related to actual economic activity and the actual return on an asset by linear regressions.[7] The news in the asset's return about future economic activity is uncorrelated with the part of economic activity not predicted by such news by construction.

This simple relationship easily can be extended to include more assets and cover more periods. If the unexpected return on asset i is $\eta_{i,t}$ and there are N assets, then the relationship between unexpected growth of economic activity and the unexpected returns on the N assets is

$$(3)\quad \varepsilon_{t+1} = b_1\eta_{1,t} + b_2\eta_{2,t} + \ldots + b_N\eta_{N,t} + e_{t+1}.$$

It is useful to extend economic activity in equation (1) to cover several periods instead of one period because the unexpected return on an asset in any given month generally reflects information about more than one month. For an asset such as stock or a bond with a life longer than one period, the unexpected return on the asset in period t reflects changes in expectations not just for this period but for all future periods reflected in the asset's price. The unexpected return is part of the capital gain portion of the asset's total dollar return—the change in the asset's price—and the unexpected part of the change in this price reflects changes in the payoffs to investors in any or all of the periods over the entire life of the asset. This version of equation (1) over a longer horizon for economic activity is

$$(4)\quad \varepsilon^k_{t+1} = b\eta_t + e^k_{t+1},$$

where e^k_{t+1} is the part of the growth rate of economic activity from t to $t+k$ that is not predicted by the news in asset prices in period t and the superscript indicates the number of periods for which growth rates are computed. The error term in equation (4) is serially correlated in general if the data are sampled every period (that is, at $t+1$, $t+2$,. . .) and unexpected economic activity overlaps.[8] This serial

5. This finding is similar to the findings of Samuelson (1966) and Siegel (1998, chap. 12).
6. The excess return on an asset is defined as the return on that asset minus the return on a riskless security.
7. We use the notation of mathematical expectations and call the measures "expected," but linear projections are sufficient for our purposes.
8. This overlap induces a moving-average error term with k nonzero autocorrelations. This autocorrelation is consistent with the definition of news and unexpected economic activity. News (η_t, η_{t+1},…) is serially uncorrelated. Unexpected economic activity for one period (ε^1_{t+1}, ε^1_{t+2},…) has one moving-average term because expected economic activity from t to $t+1$ is conditioned on information in $t-1$. Unexpected economic activity for two periods (ε^2_{t+1}, ε^2_{t+2},…) has two moving-average error terms, and so on.
If the underlying relationship between news in asset returns and economic activity is exactly linear, then equation (1) with standard forecast updating and equation (4) yield identical forecasts with minimum mean-squared error.

correlation complicates estimation of equation (4) but does not preclude the usefulness of the one-period unexpected return's information about economic activity over several future periods.

Identifying unexpected economic activity and the unexpected excess return is more problematic because neither is directly observable. To identify ε^k_{t+1} and $\eta_{j,t}(j = 1,\ldots,N)$, equation (2) shows that it is necessary to estimate expected economic activity and expected excess returns on the assets because the unexpected parts of economic activity and returns are the differences between actual and expected values. With multiple periods and assets, equation (2) becomes

$$(5)\quad \varepsilon^k_{t+1} = y^k_{t+1} - \mathrm{E}[y^k_{t+1} | \Omega_{t-1}]$$
$$\eta_{i,t} = r_{i,t} - \mathrm{E}[r_{i,t} | \Omega_{t-1}],$$

where y^k_{t+1} is the growth rate of economic activity from t to $t + k$ and $r_{i,t}$ is the return on asset i in period t. If there is a linear relationship between expected economic activity, the expected excess returns on assets, and other variables known to investors $(z_{j,t-1}, j = 1,\ldots, M)$, expected economic activity and expected excess returns are given by

$$(6)\quad \mathrm{E}[y^k_{t+1} | \Omega_{t-1}] = \alpha_y + \beta_{1,y} z_{1,t-1} + \beta_{2,y} z_{2,t-1} + \ldots + \beta_{M,y} z_{M,t-1}.$$

$$(7)\quad \mathrm{E}[r_{i,t} | \Omega_{t-1}] = \alpha_r + \beta_{1,r} z_{1,t-1} + \beta_{2,r} z_{2,t-1} + \ldots + \beta_{M,r} z_{M,t-1}.$$

Including the same variables in both equations may seem restrictive, but it is not because some coefficients in equations (6) and (7) can be zero. It is more restrictive to limit the analysis to a linear relationship. This limitation can be justified by assuming that variables are jointly normally distributed, but this assumption is implausible. Even without the assumption of normal distributions, the econometric analysis and conclusions are correct if they are limited to linear relationships—that is, if the analysis is limited to the information in the linear relationships among variables. Equations (6) and (7) raise another important issue, though. There is no reason to think that the set of variables used in equations (6) and (7) is the complete set of information known to investors.

What are the consequences of not knowing all the information available to investors? The implications can be illustrated with one asset. Using equations (6) and (7), we can rewrite equation (4) as

$$(8)\quad y^k_{t+1} - (\alpha_y + \beta_{1,y} z_{1,t-1} + \beta_{2,y} z_{2,t-1} + \ldots + \beta_{M,y} z_{M,t-1})$$
$$= b[r_t - (\alpha_r + \beta_{1,r} z_{1,t-1} + \beta_{2,r} z_{2,t-1} + \ldots$$
$$+ \beta_{M,r} z_{M,t-1})] + e^k_{t+1},$$

which can be simplified to

$$(9)\quad y^k_{t+1} = (\alpha_y - b\alpha_r) + br_t + (\beta_{1,y} - \beta_{1,r} b) z_{1,t-1}$$
$$+ (\beta_{2,y} - \beta_{2,r} b) z_{2,t-1} + \ldots$$
$$+ (\beta_{M,y} - \beta_{M,r} b) z_{M,t-1} + e^k_{t+1}.$$

The coefficients in equation (9) can be summarized for convenience by

$$(10)\quad y^k_{t+1} = \gamma + br_t + \delta_1 z_{1,t-1} + \delta_2 z_{2,t-1}$$
$$+ \ldots \delta_M z_{M,t-1} + e^k_{t+1}.$$

If only a subset of the information available to investors—say, $z_{1,t-1}$—is included in (10), the estimated equation is

$$(11)\quad y^k_{t+1} = c_0 + c_1 r_t + d z_{1,t-1} + v^k_{t+1}$$

instead of equation (10). The estimated relationship between unexpected economic activity and the unexpected excess return, measured by the coefficient c_1, will be the same as b if the excess return is uncorrelated with the variables left out of the estimated equation. If the variables included in equation (10) but left out of (11) are correlated with the excess return, then the estimated coefficient c_1 will not be the same as b. In general, this source of bias is not likely to be empirically important in our analysis because we use monthly data on excess returns, and excess returns on stocks and bonds are not very predictable at this frequency. It might seem that we could lessen the likelihood of this bias by including numerous, possibly superfluous, variables, but obtaining an excellent fit in sample and a worse fit out of sample is a likely and often serious consequence of this strategy. Given that the purpose of the analysis is to forecast economic activity, we limit the analysis to a relatively small set of variables to lessen problems of overfitting.

Even if variables left out of the estimated equation do not help predict the excess return, they might help predict economic activity, in which case the estimated error term, v^k_{t+1}, in equation (11) is bigger than the underlying error term, e^k_{t+1}. If so, we are more likely to find that the relationship between economic activity and the excess return is statistically insignificant and therefore conclude that the excess return provides little information about economic activity even if there is such a relationship.

The remainder of this article focuses on estimates of the following equation:

$$(12)\quad y_{t+1}^{k} = c_0 + c_1 r_{1,t} + c_2 r_{2,t} + \ldots + c_N r_{N,t} + d_1 z_{1,t-1} + d_2 z_{2,t-1} + \ldots + d_M z_{M,t-1} + \zeta_{t+1}^{k}.$$

For each measure of economic activity, y, with N financial assets and M additional variables, we study the properties of the "economic tracking portfolio," $c_1 r_1 + c_2 r_2 \ldots + c_N r_N$. Equation (12) can be estimated by ordinary least squares (OLS), and we do so. The standard errors and test statistics reported in the article are based on the Newey and West (1987) correction of estimated standard errors with twelve lags; this method corrects for the serial correlation in ζ_{t+1}^{k} caused by economic activity being measured over overlapping periods.

The Data

For asset returns and economic activity, the period covered by the data in this article generally is February 1947 to August 2002, and for other variables, January 1947 to July 2002.[9] These starting and ending dates are dictated by data availability and the end of World War II. All series are monthly.

Economic activity. The measures of aggregate economic activity examined include industrial production, consumption, labor market activity, inflation, and future returns on financial markets. Industrial production is measured by total industrial production and broad production classes: manufacturing, consumer durable goods, consumer nondurable goods, mining, and utilities. Production of durable goods has more cyclical variation than the other classes of production, so it is worthwhile to examine durable goods separately from nondurable goods and manufacturing. Consumption is measured by total consumption and two components: consumption of durable goods and consumption of nondurable goods and services. Labor market activity is measured by real labor income—a variable suggested by risk factors for returns (Veronesi and Santos 2001)—and the unemployment rate. The inflation rate is based on the consumer price index. Measures of future financial economic activity included are the excess return on the Center for Research in Security Prices (CRSP) value-weighted aggregate portfolio over the horizon, the excess return on a portfolio of long-term government bonds (with a term of approximately twenty years), and the return on one-month Treasury bills.

The analysis uses growth rates for all but two of the variables; the analysis uses the change in the unemployment rate and financial assets' excess returns themselves. Growth rates better represent the short-run variation in the series, which we are trying to predict, instead of long-term trends. The change in the unemployment rate filters out long-term trends in the level, and the excess returns themselves do not have long-term trends, so it is unnecessary, and undesirable, to use changes in returns.

Rising stock prices can be associated with faster output growth because higher stock prices increase households' wealth, thus boosting consumption and output and thereby improving firms' prospects.

Returns. In the base set of regressions, returns are measured by one aggregate stock index, eight industry stock portfolios, and four bond returns. All excess returns are one-month returns in excess of the one-month Treasury bill return. The aggregate stock index is the NYSE-AMEX-Nasdaq value-weighted stock market portfolio (from CRSP). The industry indexes are for basic industries, capital goods, construction, consumer goods, energy, finance, transportation, and utilities.[10] These industries are partly related to the component industries in industrial production but are far from a one-to-one mapping. The four bond returns are returns on

9. The change in the unemployment rate starts in January 1948 and ends in August 2002. The growth rate of real consumption starts in February 1959 and ends in August 2002.

10. The data appendix provides a more detailed description of the industries. We also conducted the empirical analysis with the five Fama-French industries, which did not affect the conclusions. The five industry returns are for manufacturing, utilities, shops, finance, and a catch-all category called "other industries." These other industries include agriculture, mining, oil, construction, telecommunications, health services, and legal services. Again, further details on the definitions of the industries are presented in the data appendix.

a long-term government bond, an intermediate-term government bond, a one-year government bond, and a high-grade corporate bond. The long-term, intermediate-term, and high-grade bond returns are from Ibbotson Associates. The one-year bond return and the one-month Treasury bill rate are from CRSP.

Additional variables. The estimates of the expected values of economic activity and returns are based on regressions that include a constant term and past values of eight variables that have been used in tests of asset pricing models and studies of stock and bond return predictability (including, among others, Chen, Roll, and Ross 1986; Burmeister and McElroy 1988; Ferson and Harvey 1991, 1999; Downs and Snow 1994; Kirby 1998; Balduzzi and Robotti 2001; and Lamont 2001). All of these additional variables are the same in every estimated equation.[11] Three of the variables are measured over the prior twelve months, and the rest are measured over the prior month. The difference in the time frames is suggested by prior evidence of differences in the apparent persistence of variables' effects. The variables measured over the prior twelve months, which are assumed to have more persistent effects, are industrial production growth, the inflation rate, and the aggregate excess return on the CRSP value-weighted stock index. The variables measured over the prior month, which are assumed to have less persistent effects, are the dividend yield, term premia for one-year Treasury securities and long-term government bonds relative to the one-month Treasury bill yield, default premia measured by the commercial paper yield minus the Treasury bill yield and the BAA bond yield minus the yield on AAA corporate bonds, and the return on a one-month Treasury bill itself.

Creating a market portfolio based on firms' market values can bury industry-specific data that might be informative about future economic activity such as output growth and inflation.

The Evidence

In this section, we examine the importance of news in financial market returns for future economic activity. We investigate whether the estimated tracking portfolios are related to otherwise unpredicted economic activity, and we estimate rolling regressions to assess the out-of-sample performance of the tracking portfolios in forecasting future economic activity.

The statistical significance of news in excess returns. Is the news in asset returns related to unexpected changes in economic activity? Table 3 summarizes the evidence by presenting p-values of tests whether all of the thirteen excess returns are related to the measures of unexpected economic activity at horizons from one month to twelve months.[12] These p-values are the probability of a test statistic as large as the one observed if the coefficients in equation (12) are zero. A large p-value means that the test statistic is quite likely if the restrictions are correct, and a small p-value means that the test statistic is unlikely if the restrictions are correct. A small p-value provides more support for a relationship between the excess return and the measure of economic activity, with a p-value of 0.05 or less being fairly unlikely if the variables do not belong in the regression. Hence, we use the conventional p-value of 0.05, or 5 percent, for deciding whether news in financial asset returns is statistically related to a measure of economic activity.[13] These tests are not independent, most obviously for components of an aggregate; hence, we examine the results for broad patterns and ignore occasional inexplicable "statistically significant" results. For each measure of economic activity and for each time horizon, Table 3 presents p-values for excluding all returns.

The tests show that news in financial assets' excess returns is related to unexpected economic activity. The p-values in Table 3 indicate that the news in financial returns is related to total industrial production, production of manufacturing goods, mining, and production of consumer durable goods—all cyclically sensitive—up to a six-month horizon. Production of consumer nondurable goods and of utilities are not related to the excess returns. This result is consistent with the permanent income theory of consumption, which implies that nondurable goods will be little affected by temporary changes in income. The general relationship between the news in financial asset returns and consumption of durables goods, and the general lack of such a relationship for consumption of nondurables and services, can be explained in a similar way. The only p-value of 5 percent or less for real labor income is at a horizon of twelve months. News in financial returns is related to changes in the unemployment rate and the inflation rate at all horizons. At all horizons, future excess returns are foreshadowed by news in financial returns.

TABLE 3

Economic Activity and All Returns

Measure of economic activity	Horizon: 1 Month	3 Months	6 Months	12 Months
***P*-values for Excluding All Returns from Basic Equation**				
Industrial production				
Total	0.02	0.00	0.00	0.22
Manufacturing	0.03	0.00	0.00	0.20
Mining	0.57	0.06	0.03	0.08
Consumer durable goods	0.48	0.03	0.03	0.25
Consumer nondurable goods	0.13	0.72	0.65	0.65
Utilities	0.07	0.56	0.38	0.88
Consumption				
Total	0.17	0.00	0.20	0.06
Durable goods	0.24	0.00	0.00	0.00
Nondurable goods and services	0.25	0.05	0.31	0.14
Labor market				
Unemployment rate	0.02	0.00	0.00	0.00
Real labor income	0.19	0.66	0.30	0.04
Inflation rate	0.00	0.00	0.00	0.00
Financial market returns				
Excess stock return	0.01	0.03	0.00	0.01
Excess bond return	0.00	0.00	0.00	0.00
Treasury bill rate	0.00	0.00	0.00	0.00

Both stock and bond returns are related to economic activity. Table 4 shows the p-values for deleting the stock returns and for separately deleting the bond returns.[14] The low p-values show that news in the market stock return and the eight industry portfolio returns are related to economic activity, with the strongest relationship at the three-month and six-month horizons. There is little relationship between returns and industrial production and consumption one month in the future but more of a relationship in the next three to six months. This result is not necessarily surprising: It is plausible that news about longer-term developments has larger effects on these securities' returns.[15]

Stock returns are represented in the regressions by the return on the aggregate market portfolio and by returns on industry portfolios. Taken together, the p-values in Table 4 indicate that the combination of these returns is related to both total and manufacturing industrial production over the next three to six months. News in stock returns is related to unexpected changes in both unemployment and inflation at all horizons. Interestingly, little evidence exists that stock returns are related to unexpected changes in consumption, a surprising result given all the emphasis put on the "wealth effect"—a relationship between wealth in corporate stock and consumption. News in stock returns appears to be related to unexpected changes in the future financial returns on bonds at all horizons and on stocks at horizons of six months and more.

11. This strategy can be contrasted with a strategy of estimating autoregressions for the expected returns and measures of economic activity, which would include different variables in every equation and would run a risk of overfitting in sample and quite possibly fitting worse out of sample.
12. In addition to one to twelve months, we also examined the ability of returns to forecast economic activity five years ahead. There is little evidence that returns help to predict activity over this longer horizon.
13. This method is not always a good way to proceed, but it is informative here because of the large number of tests and the underlying concern that an apparent relationship for one period will not persist in later data.
14. The excess returns on fixed-income securities are termed "bonds" for brevity in the table and the text.
15. Six months is, of course, a short horizon in other contexts.

TABLE 4

Economic Activity and Stock and Bond Returns

Measure of economic activity	Horizon: 1 Month	3 Months	6 Months	12 Months
***P*-values for Excluding Market and Industry Returns from Basic Equation**				
Industrial production				
Total	0.13	0.00	0.00	0.13
Manufacturing	0.16	0.00	0.00	0.19
Mining	0.57	0.08	0.05	0.10
Consumer durable goods	0.87	0.38	0.05	0.60
Consumer nondurable goods	0.18	0.42	0.50	0.87
Utilities	0.04	0.37	0.23	0.78
Consumption				
Total	0.40	0.08	0.24	0.55
Durable goods	0.34	0.10	0.05	0.47
Nondurable goods and services	0.37	0.08	0.53	0.46
Labor market				
Unemployment rate	0.01	0.00	0.00	0.00
Real labor income	0.12	0.68	0.19	0.04
Inflation rate	0.00	0.00	0.00	0.00
Financial market returns				
Excess stock return	0.15	0.13	0.02	0.00
Excess bond return	0.00	0.00	0.00	0.00
Treasury bill rate	0.49	0.48	0.09	0.00
***P*-values for Excluding Bond Returns from Basic Equation**				
Industrial production				
Total	0.04	0.01	0.23	0.84
Manufacturing	0.06	0.02	0.24	0.63
Mining	0.43	0.23	0.16	0.19
Consumer durable goods	0.19	0.30	0.26	0.21
Consumer nondurable goods	0.12	0.99	0.91	0.26
Utilities	0.46	0.71	0.85	0.75
Consumption				
Total	0.13	0.03	0.04	0.05
Durable goods	0.31	0.03	0.02	0.02
Nondurable goods and services	0.14	0.20	0.29	0.07
Labor market				
Unemployment rate	0.40	0.06	0.20	0.62
Real labor income	0.68	0.70	0.82	0.75
Inflation rate	0.07	0.00	0.00	0.00
Financial market returns				
Excess stock return	0.01	0.06	0.00	0.07
Excess bond return	0.00	0.08	0.54	0.15
Treasury bill rate	0.00	0.00	0.00	0.00

At the one-month and three-month horizons, news in bond returns generally is related to industrial production—total and manufacturing. At horizons beyond one month, bond returns are related to total consumption and consumption of durable goods in particular. At all horizons beyond one month, bond returns also are related to inflation. Excess bond returns appear to be more closely related to excess stock returns and the Treasury bill rate than to the excess bond return although there is some relationship between news in excess bond returns and excess bond returns in the next few months.

Is the news in stock returns due to news reflected in the aggregate market return, or is there substantial information in returns by industry? Table 5 presents evidence on this issue. The first two parts of the table show p-values for excluding aggregate stock returns and for excluding industry returns from the basic equation with both aggregate and industry returns included in the regressions. The second two parts of the table show p-values for excluding market stock returns with industry returns excluded and for excluding industry returns with the market return excluded.

Even though Table 4 shows that news in the combination of aggregate stock market and industry returns is important, a pattern is evident in the first two parts of Table 5—news in neither the market return nor the industry returns seems to be generally important. A glaring exception is the informativeness of the industry returns for inflation—a surprising result.[16] These p-values, though, are for tests that drop the market return with industry returns included in the regression and for tests that drop the industry returns with the market return included.

Correlation of the aggregate market return and the industry returns is a plausible explanation of these results. It may not matter whether the market return or the set of industry returns is included as long as one of the two is included. In fact, it would not be entirely surprising if the regressions might include either the aggregate return or the set of industry returns because the aggregate market return is a weighted average of the industry returns with time-varying weights. This relationship between the market return and the industry returns suggests that correlation of the aggregate return and the industry returns may well explain why either can be deleted with the other left in the regressions.[17]

The importance of the correlation of the industry and market returns is supported by comparing the p-values in the last two parts of Table 5 with the p-values in the first two parts. Both the market return and the set of industry returns have low p-values if the other is excluded. Overall, the p-values in Table 5 indicate that it is important to include either the market return or the industry returns, but once one is included, the other generally is uninformative.

Is there some reason to prefer the market return or the industry returns? There is little evidence in Table 5 to support a choice of one over the other.[18] The market return appears to be more closely related to industrial production, especially at a horizon of one year. The industry returns appear to be more closely related to inflation. On the other hand, the market return has one estimated coefficient instead of the eight coefficients for industry returns. Fitting well in sample and predicting poorly out of sample is likely to be less of a problem with one estimated coefficient than with eight. In the rest of the article, we report results based on estimates with the market return but not the industry returns included in regressions. Appendix tables show statistics for evaluating the informativeness of forecasting with both the market return and industry returns as well as with industry returns alone. Forecasts with the industry returns and market return are roughly as accurate as forecasts with the market return or industry returns.

The stock market does not necessarily decline substantially before a recession, but the onset of a recession is invariably associated with a substantial decline in stock prices.

The economic significance of news in excess returns. While p-values are measures of statistical significance, they do not provide a measure of the economic significance of the news in returns for unexpected economic activity. This section reports statistics that summarize the economic significance of the news.

16. The inflation rate reflects price changes in the entire economy, and it is not obvious why financial news by industry should be informative about this aggregate variable.
17. Even though the market portfolio is an aggregate of the industry portfolios, the industry returns can be less informative than the market return in a linear regression because the market return is not a constant linear function of the industry returns.
18. This result is in contrast with Lamont's (2001) for a different period.

TABLE 5

Stocks versus Industry Returns

Measure of economic activity	Horizon: 1 Month	3 Months	6 Months	12 Months
***P*-values for Excluding Market Return from Basic Equation When Industry Returns Included**				
Industrial production				
Total	0.57	0.87	0.77	0.79
Manufacturing	0.63	0.98	0.72	0.74
Mining	0.68	0.67	0.82	0.81
Consumer durable goods	0.78	0.47	0.15	0.46
Consumer nondurable goods	0.49	0.93	0.30	0.74
Utilities	0.78	0.40	0.23	0.88
Consumption				
Total	0.64	0.45	0.95	0.74
Durable goods	0.68	0.95	0.67	0.70
Nondurable goods and services	0.91	0.12	0.62	0.37
Labor market				
Unemployment rate	0.29	0.98	0.65	0.64
Real labor income	0.09	0.76	0.50	0.56
Inflation rate	0.29	0.14	0.93	0.32
Financial market returns				
Excess stock return	0.93	0.22	0.29	0.25
Excess bond return	0.02	0.04	0.07	0.04
Treasury bill rate	0.74	0.48	0.05	0.37
***P*-values for Excluding Industry Returns from Basic Equation When Market Return Included**				
Industrial production				
Total	0.31	0.31	0.79	0.87
Manufacturing	0.27	0.29	0.75	0.88
Mining	0.58	0.20	0.10	0.44
Consumer durable goods	0.87	0.29	0.44	0.52
Consumer nondurable goods	0.20	0.60	0.79	0.97
Utilities	0.06	0.71	0.76	0.95
Consumption				
Total	0.67	0.11	0.36	0.48
Durable goods	0.71	0.08	0.26	0.41
Nondurable goods and services	0.36	0.15	0.43	0.37
Labor market				
Unemployment rate	0.04	0.14	0.48	0.44
Real labor income	0.08	0.69	0.63	0.30
Inflation rate	0.00	0.00	0.00	0.00
Financial market returns				
Excess stock return	0.11	0.43	0.13	0.28
Excess bond return	0.00	0.03	0.03	0.00
Treasury bill rate	0.50	0.70	0.28	0.50

TABLE 5 (continued)

Measure of economic activity	Horizon: 1 Month	3 Months	6 Months	12 Months
***P*-values for Excluding Market Return from Basic Equation When Industry Returns Not Included**				
Industrial production				
Total	0.04	0.00	0.00	0.00
Manufacturing	0.08	0.00	0.00	0.00
Mining	0.30	0.03	0.07	0.01
Consumer durable goods	0.41	0.00	0.00	0.65
Consumer nondurable goods	0.22	0.10	0.06	0.13
Utilities	0.11	0.04	0.00	0.09
Consumption				
Total	0.05	0.13	0.10	0.62
Durable goods	0.03	0.56	0.01	0.51
Nondurable goods and services	0.32	0.07	0.88	0.86
Labor market				
Unemployment rate	0.02	0.00	0.00	0.00
Real labor income	0.99	0.09	0.01	0.00
Inflation rate	0.12	0.01	0.03	0.00
Financial market returns				
Excess stock return	0.83	0.02	0.00	0.00
Excess bond return	0.00	0.00	0.00	0.00
Treasury bill rate	0.28	0.08	0.00	0.00
***P*-values for Excluding Industry Returns from Basic Equation When Market Return Not Included**				
Industrial production				
Total	0.10	0.00	0.00	0.09
Manufacturing	0.12	0.00	0.00	0.14
Mining	0.48	0.05	0.04	0.06
Consumer durable goods	0.81	0.02	0.06	0.55
Consumer nondurable goods	0.15	0.33	0.52	0.82
Utilities	0.02	0.34	0.24	0.69
Consumption				
Total	0.32	0.06	0.17	0.47
Durable goods	0.26	0.07	0.03	0.38
Nondurable goods and services	0.28	0.12	0.45	0.44
Labor market				
Unemployment rate	0.01	0.00	0.00	0.00
Real labor income	0.19	0.40	0.15	0.03
Inflation rate	0.00	0.00	0.00	0.00
Financial market returns				
Excess stock return	0.10	0.14	0.01	0.04
Excess bond return	0.00	0.00	0.00	0.00
Treasury bill rate	0.40	0.42	0.00	0.00

TABLE 6

The Percentage of Variation in Unexpected Economic Activity Predicted by News in Financial Returns

	Horizon			
Measure of economic activity	1 Month	3 Months	6 Months	12 Months
Industrial production				
Total	2.60	4.60	4.00	2.00
Manufacturing	2.20	4.10	3.90	2.10
Mining	0.80	1.60	1.70	2.00
Consumer durable goods	1.30	2.10	2.50	1.40
Consumer nondurable goods	1.20	0.50	0.90	1.30
Utilities	1.00	0.90	1.40	0.70
Consumption				
Total	2.30	4.00	4.40	2.80
Durable goods	2.10	4.30	6.70	4.20
Nondurable goods and services	1.40	1.90	1.40	2.00
Labor market				
Unemployment rate	1.60	3.50	4.00	3.20
Real labor income	0.50	0.70	1.40	2.00
Inflation rate	2.70	5.40	4.50	4.40
Financial market returns				
Excess stock return	2.20	2.40	4.20	2.70
Excess bond return	5.40	4.40	3.20	3.00
Treasury bill rate	19.80	27.30	20.40	19.20

Analysis. Table 6 presents estimates of the closeness of the relationship between unexpected economic activity and unexpected excess returns, measured by the percentage of the variation of otherwise unexpected economic activity associated with unexpected excess returns.[19] The estimates are noisy because unexpected economic activity and unexpected returns are not directly observable and must be estimated, and the estimates of expected returns and expected economic activity are themselves noisy. As a result, these estimates are likely to understate the value of the news in unexpected returns, especially if part of what we estimate to be unexpected activity really was expected and unexpected returns are well estimated.[20] Even so, the estimates in Table 6 are not exactly overwhelming. For example, the highest percentage of variation for a variable other than a financial asset return is 5.4 percent for inflation at the three-month horizon. This percentage is not high enough to inspire confidence in using the estimated relationship for hedging. The percentages of variation predicted by news in excess returns are positive, but they are far from the maximum value of 100. These estimates provide a partial measure of unexpected news' importance: News in financial returns has some information about future unexpected economic activity, but it is far from perfect. An alternative estimate of the relative importance of news is its importance for forecasting, which is examined next.

Forecasting using excess returns. Tables 3 through 5 indicate that financial assets' excess returns do contain news about future economic activity. While informative, this evidence is not really sufficient to ensure that the excess returns are useful for forecasting because the estimated regressions are based on the data that the excess returns supposedly are forecasting. How well do these returns help to predict the future when the relationship is estimated based only on the past?

Tables 7 and 8 summarize the results of using rolling regressions estimated using data for successive twenty-year periods to evaluate the out-of-sample performance of the financial returns. For each month, we estimate the basic equation (12) using data for the most recent twenty years and make a forecast for a horizon from one to twelve months. The forecasts are "out of sample" because the forecast is made for a period that is not included in the estimated regression. Running these regressions for every possible period generates a set of forecasts for every possible month.

Not all the measures of economic activity included in Tables 3 through 6 are included in Tables 7 and 8. The evidence in Tables 3 through 6 suggests financial news generally is not informative for some of the measures of economic activity in these tables, and there is little reason to buttress that evidence by showing that financial news does not help to predict these measures.[21] Tables 7 and 8 include industrial production—total, manufacturing, and consumer durable goods—consumption of durable goods, the unemployment rate, the inflation rate, the excess returns on stocks and bonds, and the Treasury bill return.

Table 7 summarizes the forecasting ability of the regressions at various horizons by their mean-squared errors (MSEs) and R^2s. The table presents the MSEs of forecasts based on the rolling regressions and, for comparison, the MSEs of forecasts based on the estimated regressions for the whole period. The estimated regressions for the whole period can be considered in-sample regressions that can be contrasted with the rolling regressions used to forecast out of sample. The rolling regressions' MSEs in Table 7 are higher than the in-sample MSEs, a result that is not surprising. The regressions for the whole period are the minimum MSEs from constant regressions for the period; the rolling regressions have extra flexibility because the estimated coefficients can change over time, but the rolling regressions cannot fit idiosyncratic changes in the data and then forecast those same idiosyncratic changes. Apparently, too good a fit is a more serious issue than changing coefficients. Table 7 also shows out-of-sample R^2-like measures (1 – rolling regression MSE/variance of the measure of economic activity) for the rolling regressions and, for comparison, the R^2s for the regressions estimated for the whole period. The out-of-sample R^2s are lower. The lower fit out of sample indicates that deterioration of forecast accuracy compared to in-sample fit has to be considered when using tracking portfolios for forecasting or for hedging risks.

The rolling regressions have the highest R^2s for the Treasury bill return, the inflation rate, and the unemployment rate. The R^2s for the Treasury bill return are quite high, but enthusiasm over the rolling regressions' R^2s—from 82 percent one month ahead to 65 percent twelve months ahead—must be tempered by the likelihood that the prior month's Treasury bill return included in the rolling regressions plays a large role in these relatively high R^2s. The R^2s for the inflation rate are not as high, ranging from 44 percent at the nine-month horizon to 16 percent at the twelve-month horizon. But enthusiasm over these results must be tempered somewhat again by the realization that the prior year's inflation rate is included in the rolling regressions. While not particularly helpful for explaining the unemployment rate a month ahead, the forecasts from the rolling regressions predict 27 percent of changes in the unemployment rate over the next year, with no lagged unemployment rate in the regressions; this result is the most promising one in the table.

Expected returns on stocks and bonds are affected by developments in the economy, and it is impossible for those developments to affect future expected returns without affecting prices and current returns.

The rolling regressions forecast total and manufacturing industrial production much worse than the in-sample fit suggests, but the R^2 of 20 percent for industrial production over the next six months is not entirely trivial.[22] The rolling regressions uniformly have negative R^2s for the excess returns on stocks and bonds, which indicates that a forecast of a recent average might have been better than these forecasts conditional on past financial returns and economic activity. Interestingly, given its cyclical sensitivity, the rolling regressions also are particularly poor at forecasting growth of consumption of durable goods.

The rolling regressions are estimated regressions for each month based on data for the most recent twenty years; the forecasts over the horizons can be broken into two parts—one part due to the excess returns in the economic tracking portfolio and the

19. In other words, Table 6 shows the R^2s for the estimates of equation (11) times 100.
20. Variables that are left out and uncorrelated with the excess returns raise the residual variance of the regression including the financial returns. Because they are uncorrelated with the excess return, the variables left out do not affect the estimated increase in the residual variance associated with deleting the financial returns. Hence, the marginal R^2, which is the change in the residual variance divided by the residual variance with all variables, is lower than it would be otherwise. Table 6 reports this marginal R^2 times 100.
21. The statistics in Tables 7 and 8 for measures of economic activity not included in the table show that financial returns are not useful for forecasting variables that are unrelated to financial returns.
22. Recall, though, that the prior year's growth of total industrial production is included in the regressions.

TABLE 7

Forecast Accuracy
Stock Market Returns and Bond Returns

Measure of economic activity	Horizon: 1 Month	3 Months	6 Months	12 Months
Industrial production total				
Rolling MSE	0.54	2.57	7.45	21.67
In-sample MSE	0.42	1.59	3.63	7.25
Rolling R^2	0.11	0.18	0.15	0.04
In-sample R^2	0.31	0.49	0.58	0.68
Industrial production manufacturing				
Rolling MSE	0.67	3.11	8.69	25.73
In-sample MSE	0.52	1.94	4.27	8.96
Rolling R^2	0.11	0.19	0.20	0.08
In-sample R^2	0.30	0.49	0.61	0.68
Industrial production of consumer durable goods				
Rolling MSE	6.30	21.77	40.60	76.08
In-sample MSE	5.33	14.88	23.65	34.71
Rolling R^2	–0.03	–0.02	0.07	0.10
In-sample R^2	0.13	0.30	0.46	0.59
Consumption of durable goods				
Rolling MSE	10.14	17.14	24.89	53.71
In-sample MSE	8.65	12.83	15.57	25.24
Rolling R^2	–0.07	–0.09	–0.07	–0.43
In-sample R^2	0.09	0.18	0.33	0.33
Unemployment rate				
Rolling MSE	0.03	0.10	0.31	0.87
In-sample MSE	0.02	0.07	0.15	0.34
Rolling R^2	0.08	0.25	0.24	0.27
In-sample R^2	0.23	0.50	0.62	0.71
Inflation rate				
Rolling MSE	0.07	0.39	1.27	6.86
In-sample MSE	0.06	0.24	0.61	1.76
Rolling R^2	0.35	0.43	0.44	0.16
In-sample R^2	0.47	0.65	0.73	0.78
Excess stock return				
Rolling MSE	22.71	73.83	161.22	351.71
In-sample MSE	19.76	59.06	102.97	183.77
Rolling R^2	–0.07	–0.10	–0.22	–0.32
In-sample R^2	0.08	0.12	0.22	0.31
Excess bond return				
Rolling MSE	8.83	29.49	57.45	148.35
In-sample MSE	7.54	23.27	40.16	65.46
Rolling R^2	–0.03	–0.05	–0.08	–0.26
In-sample R^2	0.12	0.17	0.24	0.44
Treasury bill return				
Rolling MSE	0.01	0.07	0.38	2.01
In-sample MSE	0.01	0.05	0.22	0.79
Rolling R^2	0.82	0.82	0.75	0.65
In-sample R^2	0.86	0.88	0.86	0.86

TABLE 8

Contribution of Financial News to the Forecasts

Measure of economic activity	Horizon: 1 Month	3 Months	6 Months	12 Months
Industrial production total				
Constant	0.037	0.168	0.285	0.826
Financial news	0.090	0.332	0.367	0.644
Other variables	0.653	0.628	0.605	0.526
Industrial production manufacturing				
Constant	0.038	0.193	0.294	0.863
Financial news	0.064	0.331	0.430	0.672
Other variables	0.665	0.633	0.627	0.546
Industrial production of consumer durable goods				
Constant	0.028	0.227	0.160	0.227
Financial news	–0.061	0.024	0.567	0.898
Other variables	0.527	0.519	0.556	0.562
Consumption of durable goods				
Constant	0.520	0.896	1.379	3.762
Financial news	0.456	0.830	0.730	0.617
Other variables	–0.141	0.254	0.394	0.331
Unemployment rate				
Constant	0.008	0.020	0.031	0.048
Financial news	–0.094	0.164	0.434	0.891
Other variables	0.660	0.695	0.650	0.650
Inflation rate				
Constant	0.082	0.353	0.776	2.278
Financial news	0.345	0.815	0.499	0.762
Other variables	0.802	0.734	0.712	0.564
Excess stock return				
Constant	0.282	0.923	1.952	3.828
Financial news	0.218	0.349	0.477	0.152
Other variables	0.289	0.280	0.207	0.177
Excess bond return				
Constant	0.094	0.283	0.524	0.620
Financial news	0.543	0.522	0.497	0.401
Other variables	0.301	0.333	0.400	0.310
Treasury bill return				
Constant	0.000	0.031	0.095	0.430
Financial news	0.923	1.281	1.289	1.469
Other variables	1.068	1.054	1.060	1.017

Note: For each variable and horizon, the three numbers listed are the estimated constant term, estimated coefficient for the improvement in the forecast due to including the estimated news in financial returns, and the estimated coefficient for the forecast using the variables other than the unpredictable part of financial returns.

other part due to other variables that help predict expected economic activity. Table 8 summarizes the value of adding financial news to forecasts by comparing forecasts based on the basic equation (12) to forecasts excluding the estimated news in financial returns. Table 7 is based on rolling-regression estimates of the basic equation (12), and the forecast values from these rolling regressions can be denoted $f^{r,z}$.[23] The superscripts r and z reflect the financial returns, r, and the other variables, z, included in the regressions. Rolling regressions also can be estimated without the recent returns on financial assets, and these regressions can be used to generate forecast values that can be denoted f^{z}.

What is the additional value of using the returns to make forecasts? A standard way of combining forecasts is to regress the actual values of the series on the two forecasts of the series, with the two coefficients reflecting the relative value of the two forecasts.[24] In our application, the two forecasts are correlated because they are based on the common base set of variables, z; the coefficient on the forecast including financial returns, $f^{r,z}$, is the value of that forecast, not the marginal improvement in forecasts by adding financial returns. To estimate the more informative improvement in forecasts by adding financial market returns, we estimate the parts of the forecast $f^{r,z}$ from rolling regressions that are uncorrelated with f^{z} and include them in the forecast regressions with f^{z}.[25]

Table 8 presents the results of estimating these regressions for horizons of one to twelve months.[26] If the forecasts were unbiased, the constant terms would be zero and the sums of the two coefficients would be one. Because the forecasts underlying Table 8 are based on rolling regressions, the constant terms in Table 8 need not be zero and the sums of coefficients need not add up to one; the regressions generally do not satisfy these restrictions.

With variation by horizon, the news in financial returns is useful for all the series. For example, financial news is uninformative for changes in the unemployment rate over the next month and is more informative than other variables over the next year. The overall picture in Table 8 is one of financial news being informative about the future in addition to, and often more than, the other variables.

Conclusions and Discussion

The evidence in this article shows that movements in financial markets do presage developments in the economy. In one sense, this evidence is not surprising. Expected returns on stocks and bonds are affected by developments in the economy, and it is impossible for those developments to affect future expected returns without affecting prices and current returns. In another sense, the results are surprising. Evidence on the connection between movements in financial markets and the economy is mixed, with conclusions that typically do not survive scrutiny in a succeeding paper or the passage of time. This article provides evidence of exactly that pattern: Lamont's (2001) evidence that industry returns are useful complements of the market return is not borne out by the experience of the 1990s.

What is to say that the results of this study will hold up? Our conclusion is extremely general: Returns on financial markets are informative about future developments in the economy. We believe this conclusion is unlikely to be affected by variations in technique or the passage of time, but only future research and time will tell. As it stands, the evidence indicates that news revealed in financial markets helps to predict future economic activity.

Whether the passage of time will be kind to other conclusions also remains to be seen. We find that asset returns are informative about both real developments, such as industrial production, and inflation. We find that returns on both stocks and bonds are informative about future economic activity and that industry returns are no more informative about future economic activity than is the overall market return. We also find that forecasts based on data actually available before a forecast is made are noticeably less informative than is suggested by computed forecasts based on subsequent data available later.

The deterioration of forecasts with rolling regressions compared to forecasts based on all the data is not inevitable. The reasons for such deterioration, other than the trivial one of using fewer observations, are likely to be informative about the relationship between asset returns and economic activity, which can itself inform knowledge about asset returns and about the economy.

23. The subscript t is suppressed for notational simplicity.
24. Diebold et al. (1996) provide a convenient summary of the literature.
25. Operationally, the additional information in the basic equation due to financial market returns is estimated by the residuals from a regression of $f^{r,z}$ on f^{z}.
26. Reported standard errors are calculated using the Newey and West (1987) correction with a truncation lag of twelve months.

APPENDIX

Data and Sources

This appendix presents details about the data and the sources. All growth rates are continuously compounded.

Economic Activity

- The growth rate of industrial production is the change in the logarithm of total production, seasonally adjusted. Industrial production by sectors is included for manufacturing production, consumer durables, consumer nondurables, mining, and utilities. These series are seasonally adjusted and are from Data Research Inc. (DRI).
- The growth rate of consumption is the change in the logarithm of total real consumption. Consumption also is analyzed for the component parts, consumption of durable goods and consumption of nondurable goods and services. All series are seasonally adjusted and expressed in real terms using deflators from DRI for the corresponding part of total consumption.
- The growth rate of real labor income is the change in the logarithm of personal income from wages and salaries, seasonally adjusted, minus the inflation rate measured by the consumer price index (CPI) for all consumers. Personal income from wages and salaries and the inflation rate are from DRI.
- The unemployment rate is the total unemployment rate for all workers sixteen years and over, seasonally adjusted. This series is from DRI.
- The inflation rate is the change in the logarithm of the CPI for all urban consumers, not seasonally adjusted. This series is from DRI.
- The excess return on the CRSP value-weighted index is the continuously compounded return on the CRSP value-weighted index minus the continuously compounded return on Treasury bills. Both series are from CRSP.
- The excess return on long-term government bonds is the continuously compounded return on a portfolio of long-term government bonds minus the continuously compounded return on Treasury bills. The return on long-term bonds is from Ibbotson Associates, and the return on Treasury bills is from CRSP.
- The return on Treasury bills is the continuously compounded return on a Treasury bill from CRSP.

Returns

- The aggregate stock price index is the CRSP NYSE-AMEX-Nasdaq value-weighted stock market portfolio.
- Industry portfolios are computed in two ways. The returns in the paper are based on industries calculated as in Lamont (2001) and Sharpe (1982). For each year, the industry indexes are based on every NYSE-AMEX-Nasdaq stock being assigned to an industry portfolio based on its four-digit standard industrial classification (SIC) code at the end of June. This classification then is used for returns computed until the following June. Returns are then computed from the end of the month to the end of the next month. The industry definitions are from Sharpe (1982). The eight industry stock portfolios (and their SIC codes) are finance (6000–6999), utilities (4800–4829, 4900–4999), transportation (3720–3799, 4000–4799), energy (1300–1399, 2900–2999), basic industries (1000–1299, 1400–1499, 2600–2699, 2800–2829, 2879–2899, 3300–3399), capital goods (3400–3419, 3440–3599, 3670–3699, 3800–3849, 5080–5089, 5100–5129, 7300–7399), construction (1500–1999, 2400–2499, 3220–3299, 3430–3439, 5160–5219), and consumer goods (0000–0999, 2000–2399, 2500–2599, 2700–2799, 2830–2869, 3000–3219, 3420–3429, 3600–3669, 3700–3719, 3850–3879, 3880–3999, 4830–4899, 5000–5079, 5090–5099, 5130–5159, 5220–5999, 7000–7299, 7400–9999).

  French's classification of industries produces similar results. For each year, the industry indexes are based on every NYSE-AMEX-Nasdaq stock being assigned to an industry portfolio based on its four-digit SIC code at the end of June. This classification then is used for returns computed until the following June. Returns are then computed from the end of the month to the end of the next month. The five industry stock portfolios (and their SIC codes) are manufacturing (2000–3999), utilities (4900–4999), shops (wholesale, retail, and some services (5000–5999, 7000–7999), finance (6000–6999), and other. The five industry stock portfolios were downloaded from Kenneth French's Web page <mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html> (June 12, 2003).

TABLE A

Forecast Accuracy
Stock Market, Industry, and Bond Returns

	Horizon			
Measure of economic activity	1 Month	3 Months	6 Months	12 Months
Industrial production total				
Rolling MSE	0.58	2.71	7.96	23.72
In-sample MSE	0.42	1.56	3.54	7.14
Rolling R^2	0.04	0.13	0.09	–0.06
In-sample R^2	0.32	0.50	0.59	0.68
Industrial production manufacturing				
Rolling MSE	0.70	3.23	9.24	28.22
In-sample MSE	0.51	1.89	4.14	8.83
Rolling R^2	0.07	0.16	0.15	–0.01
In-sample R^2	0.31	0.51	0.62	0.68
Industrial production of consumer durable goods				
Rolling MSE	6.75	23.07	43.26	84.97
In-sample MSE	5.24	14.45	22.83	33.63
Rolling R^2	–0.10	–0.08	0.01	–0.00
In-sample R^2	0.15	0.32	0.48	0.60
Consumption of durable goods				
Rolling MSE	10.72	17.49	25.47	57.79
In-sample MSE	8.51	12.32	14.64	24.48
Rolling R^2	–0.13	–0.11	–0.09	–0.54
In-sample R^2	0.10	0.21	0.37	0.35
Unemployment rate				
Rolling MSE	0.03	0.11	0.32	0.93
In-sample MSE	0.02	0.07	0.15	0.33
Rolling R^2	0.03	0.22	0.21	0.22
In-sample R^2	0.25	0.52	0.63	0.72
Inflation rate				
Rolling MSE	0.07	0.38	1.26	7.02
In-sample MSE	0.05	0.22	0.55	1.59
Rolling R^2	0.35	0.44	0.45	0.14
In-sample R^2	0.52	0.68	0.76	0.80
Excess stock return				
Rolling MSE	23.66	76.92	167.20	367.55
In-sample MSE	19.18	57.59	99.19	179.33
Rolling R^2	–0.10	–0.14	–0.27	–0.38
In-sample R^2	0.10	0.14	0.25	0.35
Excess bond return				
Rolling MSE	8.89	30.86	60.62	149.11
In-sample MSE	6.96	22.60	38.77	62.27
Rolling R^2	–0.04	–0.10	–0.14	–0.26
In-sample R^2	0.19	0.19	0.27	0.47
Treasury bill return				
Rolling MSE	0.01	0.07	0.39	2.11
In-sample MSE	0.01	0.05	0.21	0.78
Rolling R^2	0.82	0.82	0.75	0.64
In-sample R^2	0.87	0.88	0.86	0.86

- Four bond returns are also included in the regressions. The bond returns are for a long-term government bond, an intermediate-term government bond, a one-year government bond, and a high-grade corporate bond. The long-term, intermediate-term, and high-grade bond returns are from Ibbotson Associates (see the *Stocks, Bonds, Bills, and Inflation 2003 Yearbook* for further details). The one-year bond return is from CRSP. All rates of return in the regressions are excess returns relative to the one-month Treasury bill return from CRSP and are based on month-end bid-ask average values.

Additional Variables

Estimates of the expected value of economic activity and excess returns are based on a constant term and lagged values of variables. Eight lagged variables are included that have been used in tests of multiple-beta models and studies of stock-bond return predictability in, among others, Chen, Roll, and Ross (1986); Burmeister and McElroy (1988); Ferson and Harvey (1991, 1999); Downs and Snow (1994); Kirby (1998); Balduzzi and Robotti (2001); and Lamont (2001). Some of these lagged variables span the prior twelve months and some span only the prior month.

Variables for the prior twelve months

- The inflation rate for the prior twelve months is the change over the prior twelve months in the logarithm of the CPI, not seasonally adjusted, from DRI.
- The excess aggregate stock return is the aggregate return (including dividends) on the NYSE-AMEX-Nasdaq value-weighted stock market portfolio from CRSP for the prior twelve months minus the one-month Treasury bill return over the past twelve months from CRSP.
- The growth rate of industrial production for the prior twelve months is the change in the logarithm of total production, seasonally adjusted, from DRI.

Variables for the prior month

- The prior month's term premium on one-year Treasury securities is the yield on the one-year constant maturity note from Global Financial Data Inc. minus the thirty-day Treasury bill yield from CRSP.
- The prior month's long-term premium is the yield on long-term government bonds minus the one-month Treasury bill yield. The yield on long-term government bonds is from Ibbotson Associates, and the Treasury bill yield is from CRSP.
- The return on a one-month Treasury bill is from CRSP.
- The default premium on short-term debt is the yield on commercial paper minus the one-month Treasury bill yield. The commercial paper rate is from various issues of *Banking and Monetary Statistics*, *Annual Statistical Digest*, and *Domestic Financial Statistics.* The one-month Treasury bill rate is from CRSP.
- The default premium on corporate securities is the BAA yield on corporate debt minus the AAA yield on corporate debt. Both series are from DRI.
- The prior month's dividend yield is the annualized dividend yield on the S&P 500 composite common stock. The series is from DRI.

TABLE B

Forecast Accuracy
Industry and Bond Returns

	Horizon			
Measure of economic activity	1 Month	3 Months	6 Months	12 Months
Industrial production total				
Rolling MSE	0.57	2.66	7.85	23.35
In-sample MSE	0.42	1.57	3.55	7.15
Rolling R^2	0.06	0.15	0.10	–0.04
In-sample R^2	0.31	0.50	0.59	0.68
Industrial production manufacturing				
Rolling MSE	0.69	3.19	9.10	27.72
In-sample MSE	0.52	1.90	4.16	8.83
Rolling R^2	0.08	0.17	0.16	0.01
In-sample R^2	0.31	0.50	0.62	0.68

(continued)

APPENDIX (continued)

TABLE B (continued)

Measure of economic activity	Horizon			
	1 Month	3 Months	6 Months	12 Months
Industrial production of consumer durable goods				
Rolling MSE	6.68	23.03	43.07	82.21
In-sample MSE	5.24	14.51	23.06	33.63
Rolling R^2	–0.09	–0.08	0.02	0.03
In-sample R^2	0.15	0.32	0.47	0.60
Consumption of durable goods				
Rolling MSE	10.57	17.35	25.19	57.28
In-sample MSE	8.51	12.32	14.65	24.50
Rolling R^2	–0.12	–0.10	–0.08	–0.53
In-sample R^2	0.10	0.21	0.37	0.35
Unemployment rate				
Rolling MSE	0.03	0.10	0.32	0.92
In-sample MSE	0.02	0.07	0.15	0.33
Rolling R^2	0.05	0.24	0.21	0.22
In-sample R^2	0.25	0.52	0.63	0.72
Inflation rate				
Rolling MSE	0.07	0.38	1.25	6.89
In-sample MSE	0.05	0.22	0.56	1.59
Rolling R^2	0.36	0.44	0.45	0.16
In-sample R^2	0.52	0.68	0.76	0.80
Excess stock return				
Rolling MSE	23.40	76.71	166.98	364.82
In-sample MSE	19.18	57.97	99.22	179.38
Rolling R^2	–0.09	–0.14	–0.27	–0.37
In-sample R^2	0.10	0.14	0.25	0.32
Excess bond return				
Rolling MSE	8.81	30.79	60.34	150.11
In-sample MSE	6.99	22.69	38.90	62.83
Rolling R^2	–0.03	–0.10	–0.13	–0.27
In-sample R^2	0.18	0.19	0.27	0.47
Treasury bill return				
Rolling MSE	0.01	0.07	0.39	2.08
In-sample MSE	0.01	0.05	0.22	0.78
Rolling R^2	0.82	0.82	0.75	0.64
In-sample R^2	0.87	0.88	0.86	0.86

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