Let's Get "Real" about Using Economic Data*

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April 2000

Abstract

There is a long tradition in finance of studying the reaction of markets to macroeconomic news announcements. Due in part to empirical evidence suggesting that the response of stock prices to news extracted from realized macroeconomic variables is rather weak, however, researchers are left with the unsettling finding that news may indeed not matter. One widely held belief among researchers is that this lack of evidence arises at least in part because realized variables are too noisy to be used to measure changes in expectations and therefore news. Interestingly, macroeconomic data have an additional dimension of complexity which is often ignored and which may also account for the lack of positive empirical evidence when analyzing the impact of news on market behavior. In particular, the macroeconomic data which are so carefully monitored in markets are typically preliminary when they are first released and incorporated into market expectations, and are subsequently subject to many revisions, some of which are substantial and significant. Our purpose in this paper is to show that the use of data which are properly available in real-time when constructing measures of news indeed does make a difference. We do this by focusing on a particular example. Namely, we consider the economic tracking portfolio, which has been used by Breeden, Gibbons and Litzenberger (1989), and subsequently by Lamont (1998), to replace noisy economic data by economic tracking portfolios, which are designed to reflect market expectations. However, as these authors use final releases of data in their analyses, their approaches are prone to news mismeasurement problems. Moreover, by ignoring the real-time aspects of macroeconomic data, many other interesting issues such as the extent to which market participants anticipate revisions and take into account so-called "data uncertainty" are ignored. We examine these and related questions, and find that the incorrect use of final releases of data severely biases tracking portfolios and hence our measure of news. We also find that data uncertainty is anticipated and priced by the market, for example, and that market betas associated with our news measures are significantly different from zero when news is extracted from an inflation variable. Our conclusion is thus that real-time data should be used in the construction of news measures, and more generally that real-time macroeconomic data should not be overlooked when carrying out a variety of empirical analyses for which the timing and availability of macroeconomic information may matter.

JEL classification: E17, E44, G11.

Keywords: market efficiency, expectations, news, data revision process, tracking portfolio.

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Introduction

There is a long tradition in ¯nance of studying the reaction of markets to macroeconomic news announcements. In principle, asset prices react to news announcements that result in changes in expectations regarding future payo®s and/or discount rates, ceteris paribus. In practice, it is not surprising to observe ¯nancial markets responding to releases of news about industrial production, in°ation, labor income, employment, and many other key indicators of the overall health of the economy, for example. Along these lines, many authors have used economic variables as fundamentals in examinations of asset return dynamics (see for instance Chen, Roll and Ross (1986), Fama (1990), Schwert (1990) and Campbell (1996)). Unfortunately, empirical results to date have been rather disappointing, as the response of stock prices to macroeconomic news has broadly been found to be rather weak. For example, Schwert (1981) ¯nds that the daily response of stock prices to news about in°ation is weak and slow. These ¯ndings are con¯rmed by Pearce and Roley (1985) using survey data. In addition, Chen, Roll and Ross (1986) ¯nd that covariances between stock returns, industrial production, and other measures of real economic activity are weak.[1] One argument which is often made when explaining these sorts of ¯ndings is that realized variables are too noisy to be used as measures of changes in expectations. In addition, it is not easy to measure \news". Interestingly, macroeconomic data have one additional dimension of complexity which is often ignored when constructing measures of macroeconomic news. In particular, most macroeconomic data are typically preliminary when they are ¯rst released and are subject to many subsequent revisions. In many cases these revisions are substantial and signi¯cant, both from a statistical and from an economic point of view.[2] In addition, extracting news from variables which have been revised many times may not be reasonable, as agents generally extract most news from preliminary or ¯rst available data. Nevertheless, this seems to be the common approach used in the literature, so that important informational timing issues which must be dealt with when constructing news variables have largely been ignored. In this paper we address the timing and availability of economic information used in the formation of economic news measures, thereby underscoring the importance of using real-time economic data in ¯nancial studies in general. In order to facili-

[1] On the other hand, Fama and French (1989) ¯nd that the term premium is related to the NBER business cycle, while McQueen and Roley (1993) ¯nd evidence of asymmetric market responses to news across business cycles.

[2] In the ¯rst section we review the evidence regarding the magnitude and relevance of revisions of some key macroeconomic conditions variables.

tate our introduction of the use of real-time data in the formation of economic news, we consider the example of economic tracking portfolios that are alternately constructed with real-time and \currently available" (or ¯nal release) economic data.

Breeden, Gibbons and Litzenberger (1989), and more recently Lamont (1998), suggest replacing noisy economic data by \economic tracking portfolios" which are designed to re°ect market expectations, and therefore reveal the impact of news. However, these papers, as well as many related studies which examine the market impact of macroeconomic news, use currently available macroeconomic data. For example, consider economic tracking portfolios which are constructed to have maximum correlation between unexpected returns and news about future macroeconomic activity. Lamont (1998) uses industrial production, consumption, labor income and in°ation series available in 1998 rather than constructing data sets which correspond to information that was actually available in real-time (i.e. when ¯nancial markets reacted to initial economic releases). Since revisions to macroeconomic series accrue over time and may be substantial in aggregate, there is potential for serious mismeasurement of macroeconomic news. Moreover, by ignoring the real-time aspects of macroeconomic data, one ignores many interesting issues which hitherto have not been carefully examined in the literature. For example, the potential impact of revisions in economic variables on ¯nancial markets is ignored, so that questions of the following sort cannot be answered. Is news constructed using initial releases of economic variables more important than news constructed based on subsequent revisions of initial releases? Does the market care about revised economic activity announcements at all, or do only preliminary announcements matter? To what extent do ¯nancial market participants anticipate revisions to economic variables, hence accounting for so-called \data uncertainty" in the formation of expectations? We provide at least partial answers to all of these questions by considering both real-time and currently available data. In particular, our approach is to use newly constructed real-time macroeconomic data sets which contain all releases of numerous key monthly and quarterly macroeconomic variables. Thus, we are able to construct data sets which were available in real-time. By using real-time data, we are able to shed light not only on the real-time impact of macroeconomic news on ¯nancial markets, but also on the methodology used to construct tracking portfolios. We also examine the impact that information (timing) misspeci¯cation has on tracking portfolio weights and associated market betas. This in turn allows us to asses the impact of the (in)correct use of real-time data when analyzing risk premia earned from tracking portfolios. Some of our ¯ndings include the following: (1)

The incorrect use of final releases of data severely biases tracking portfolios and hence our measure of truly real-time news. (2) Data uncertainty associated with the data revision process is anticipated and priced by the market, and market betas associated with our real-time news measures are significantly different from zero when news is extracted from an inflation variable.

It should perhaps be stressed that one of our main goals in this paper is to broadly illustrate the importance of real-time data in finance. As mentioned above, our primary tool in this effort is the construction of economic news variables and their corresponding tracking portfolios. Given the importance we thus place on tracking portfolio construction, it should not come as a surprise to the reader that we also address the methodology used when constructing these portfolios. For example, assets used to build portfolios usually exhibit return patterns which are highly multicolinear, and this colinearity prevents precise estimation of portfolio weights. We discuss a simple regression based approach for reducing the set of assets that helps solve the multicolinearity problem, and more importantly has the advantage that portfolios are generated which are less costly to hold and trade.

The rest of the paper is organized as follows. In the first section we describe the real-time data sets used in our analysis. We then turn in Section 2 to a discussion of real-time tracking portfolios. In Section 3, we appraise the impact of using real-time rather than currently available information to construct measures of news, and subsequently to construct tracking portfolios (Section 4). Market betas are discussed in Section 5, and the extent to which market participants anticipate errors in preliminary data releases, and how data uncertainty is priced in the market, are discussed in Section 6. Section 7 summarizes and concludes the paper.

1 Real-Time Economic Data

There are several articles and monographs which investigate the size, persistence, predictability and importance of macroeconomic data revisions. For example, an early monograph on the subject of errors in economic data was written by Morgenstern (1963). A number of recent articles in this area (from which many other important references can be obtained) are: Pierce (1981), Mankiw et al. (1984), Maravall and Pierce (1986), Fair and Shiller (1990), Keane and Runkle (1990), Diebold and Rudebusch (1991), Harvey et al. (1993), Kavajecz and Collins (1995), Swanson (1996), and Swanson and White (1997), Swanson, Ghysels and Callan (1999), and Ghysels, Swanson and Callan

(2000). Rather than directly dealing with data revision, some papers circumvent the problem by using dummy variables for news announcement dates without actually quantifying the informational content of the news releases (see e.g. Jones, Lamont and Lumsdaine (1998)). Obviously, such an analysis, which focuses only on the announcement event instead of its content, is limited in numerous of ways. A number of other studies which have adopted a variety of related strategies for measuring the impact of news are also not prone to the issues addressed in our paper, but again suffer from similar important limitations. For instance, Mitchell and Mulherin (1994) construct a news index based on the widths of headlines appearing on the front page of the New York Times. While this approach quantifies news coverage, it does not directly measure its reliability and informational content. Note also that revisions to past macroeconomic news releases rarely hit the news wire unless they are substantial.

At this point, it is useful to introduce some notation before proceeding further with our discussion of real-time data. We denote a real-time observation as $x_{t+i}(t)$; which is defined to be the $(t+i)^{th}$ release date of data pertaining to calendar date t, where $i > 0$: In addition, we classify economic data into three categories: (1) *Preliminary, First Released, or Unrevised Data*: These types of data consist of the first reported datum for each variable at each calendar date, t. The first release of a series is defined as $x_{t+1}(t)$, corresponding to the typical one month delay in the release of macroeconomic news (i.e. announcements are of activity in the previous month), which is common for monthly series. (2) *Partially Revised or Real $-$ Time Data*: These types of data are difficult to collect, as they are made up of vectors of observations, $x_{t+i}(t); i = 1; \ldots;$ for each calendar date, t: (3) *Fully Revised or Final Data*: These data are denoted as $x_f(t)$. It is quite possible that true final data will never be available for many economic series. This is because benchmark and definitional changes are ongoing and may continue into the indefinite future, for instance. However, in practice we define final data as those revised figures available at some future point in time for calendar date t, which are no longer subject to revision. (Of course, most financial data are equivalently unrevised and final, as they are not subject to revision.) These are the types of data that researchers often have in mind when modeling economic time series, perhaps simply because these data are no longer subject to revision, and it is felt that if one can adequately forecast a final revised figure, then there is be no need for further modeling, particularly if the preliminary figure is an unbiased estimate of the final figure.[3]

[3] However, final data are clearly not easy to obtain, as data are generally subject to revision for indefinite lengths

We de¯ne several processes which will be used in our examination of tracking portfolios. For illustrative purposes, these processes are discussed for the case of quarterly real output, which is one of the macroeconomic variables which we examine. We focus on k-step ahead predictions of our variables. When k = 4, the focus is on todays' prediction of next years' real output. We try to keep the notation simple, at some cost of incompleteness.[4] The ¯rst release of the $(t + k)^{th}$ growth rate of real output (say y) is de¯ned to be:

$$y^1_{t;t+k} \equiv y_{t+k+1}(t + k) - y_{t+k+1}(t): \qquad (1)$$

This growth rate consists of the di®erence of the ¯rst (log) y ¯gure for month t + k released (with one month delay) in period t + k + 1; hence $y_{t+k+1}(t + k)$, and the k^{th} release of month t's (log) y ¯gure (i.e. $y_{t+k+1}(t)$): Analogously, any updates of this ¯rst released growth rate are denoted as:

$$y^i_{t;t+k} \equiv y_{t+k+i}(t + k) - y_{t+k+i}(t); \qquad (2)$$

for $i = 2; : : :$. The ¯nal concurrently available ¯gure is denoted as:

$$y^f_{t;t+k} \equiv y_f(t + k) - y_f(t): \qquad (3)$$

The following series pertaining to the revision process is useful in our analysis, and can be derived directly from equations (1) through (3):

$$e^i_{t;t+k} \equiv y^f_{t;t+k} - y^i_{t;t+k}: \qquad (4)$$

This series re°ects the (revision) error in the growth rate, relative to the ¯nal data sample point which is concurrently available. When $i = 1$; this error represents the di®erence between the preliminary announcement of the k-step growth rate, and its ¯nal revised value. [5]

In all subsequent analysis, we consider both quarterly as well as monthly macroeconomic and ¯nancial variables. As mentioned above, ¯nancial data are not subject to revision, while macroeconomic data are. The two monthly macroeconomic variables for which we have real-time data

of time, as mentioned above. The construction of seasonally adjusted data serves to illustrate this point, as seasonal adjustment ¯lters are of in¯nite order, at least in principle. See for instance Ghysels and Osborn (2000, Chap. 3) for further discussion.

[4] See Swanson, Ghysels and Callan (1999) a detailed discussion of notation which is useful when characterizing real-time series.

[5] Another error process which will be of interest is the revision error across di®erent vintages, namely: $e1^i_{t;t+k} \equiv y^i_{t;t+k} - y^1_{t;t+k}$:

sets are U.S. seasonally adjusted IP (1950:4 to 1996:2) and the Composite Leading Indicator (CLI: 1968:10 to 1996:2). A typical months' release of data for these variables is comprised of a first, or preliminary release for the previous month, and 4 to 6 months of revisions to data previously released. In addition, more comprehensive benchmark and baseyear revisions occur from time to time for each of the variables.[6]

In our subsequent analysis, we also use two quarterly real-time data sets which were constructed at the Federal Reserve Bank of Philadelphia (see Croushore and Stark (1999)). In particular, we examine real output (GNP prior to 1992, and subsequently GDP) and the implicit price deflator for real output, both for the period 1965:3-1995:3. Data beyond 1995:3 were not used due to a substantial change in the definition of GDP. A detailed discussion of these data sets is given in Croushore and Stark (1999).

Before turning to our discussion of tracking portfolios, it is perhaps worth discussing some of the salient features of our real-time data sets. We do not, however, discuss the monthly data sets[7], as they have been discussed in detail elsewhere (Ghysels, Swanson and Callan (2000) and Swanson, Ghysels and Callan (1999)). In addition, the notable features of our monthly series are similar to those of our quarterly series. For the quarterly series, summary statistic and graphs are given in Table 1 and Figures 1 and 2. For ease of comparison, all data reported on are annualized percentages. In Figure 1, the top 2 panels contain plots of preliminary real output releases (the right panel is $y^1_{t;t+1}$ (annualized) and the left panel is $y^1_{t;t+4}$). These data are representative of the magnitude of annualized quarter on quarter and year on year output growth, as estimated by the reporting agencies immediately after the close of the calendar quarter to which the data pertain. These data can be compared, for example, with final figures, which are plotted in the bottom 2 panels of Figure 1. Interestingly, while annualized growth rates appear smoother after final revision, quarterly growth rates (see the right lower panel) appear more variable. The extent of revision to the data as we move from preliminary to final figures is portrayed in the center two plots in Figure

[6] The main source for seasonally adjusted IP data is the Federal Reserve Bulletin. A complete description of the IP data is given in Swanson, Ghysels and Callan (1999). Our other monthly variable, the CLI, was compiled by the Department of Commerce until 1994:12, and is currently released by The Conference Board. This data set (up until 1988:12) is described in Diebold and Rudebusch (1991), who also provided us with the data. We augment the Diebold Rudebusch data set by including data from Business Consumers Digest (1989:1-1990:12), and from the Survey of Current Business (1991:1-1994:12).

[7] With the exception that plots of the revision processes of our monthly real-time series are given in Figures 3-4.

1, where $e^1_{t;t+1}$and $e^1_{t;t+4}$ are graphed for the period 1965:3-1995:3. Two important observations based on these plots of the revision process are the following. First, the revision process for quarter on quarter growth is indeed highly variable relative to that for year on year growth. Second, the magnitude of revisions is very large relative to the magnitudes of either the raw preliminary or the raw ¯nal data. For example, the revision to the annualized quarterly growth rate for 1975:1 is around 5%, while no single raw output growth rate for any quarter is greater than 11% in absolute magnitude. However, casual inspection of the revision process plots suggests that the mean revision is close to zero. Thus, while revisions play an important role in the characterization of output data, preliminary output ¯gures are not necessarily biased estimates of ¯nal ¯gures. This characteristic of the data is explored further in Table 1, which contains various summary measures of the output and de°ator data sets. The upper panel of the table contains summary statistics for the raw series, which are included in order to help the reader assess the extent of data revision relative to the absolute magnitude of the series. The lower panel contains statistics calculated using various revision series. Notice that summary statistics for $e^1_{t;t+1}$and $e^1_{t;t+4}$; corresponding to those revision processes plotted in the center panels in Figure 1, are given in the ¯rst and fourth row of the second panel in Table 1 for output. Consider $e^1_{t;t+1}$: The mean revision of this series is 0.25, and the p-value associated with a test of the null hypothesis that there is no preliminary release bias is 0.12, which implies rejection of the null at an 88% level of con¯dence. Thus, although the evidence is moderate, we can say that preliminary output growth rate estimates are biased. The sixth row of the second panel of Table 1 summarizes the revision process from ¯rst to second release for year on year output growth, and in this case the mean revision error of 0.06 is signi¯cantly di®erent from zero at a 96% level of con¯dence, suggesting that while the revision from ¯rst to second release is small in magnitude, it varies little from its average value of 0.06%. Summary statistics for the de°ator are also given, and it is clear that there is generally substantial and signi¯cant bias in preliminary and second release data (i.e. see means in the rows with vintages denoted $e^1_{t;t+1}$, $e^2_{t;t+1}$, $e^1_{t;t+4}$, and $e^2_{t;t+4}$). This ¯nding is not obvious if one looks only at the plots of the revision process in Figure 1. Another interesting feature of the revision processes summarized in the table is that the Jarque-Bera test of normality always suggests rejection of the null that the data are normally distributed. One of the reasons for this is that the raw series and the revision series are usually characterized by kurtosis in excess of 3, which suggests that the distributions of the series are leptokurtotic (peaked relative to the normal). Finally, note that the last column of the table contains p-values for Ljung-Box autocorrelation tests with 1, 5, and 10 lags. Rejection of the null hypothesis in this case (which occurs frequently for our revision series based on a 0.10 significance level) suggests that there is a stochastic component of the revision series which is not white noise, and which can be modeled, thereby extracting information about future revisions from current and past revisions. All of these findings suggest that ignoring the timing and availability of macroeconomic data by using only currently available data may lead to spurious conclusions when carrying out real-time analyses such as tracking portfolio assessment, news variable construction, and real-time forecasting. In the next section we focus our attention on one of these, namely tracking portfolios.

2 Real-Time News and Tracking Portfolios

We begin our discussion by proceeding along the lines of Breeden, Gibbons and Litzenberger (1989) and Lamont (1998). In particular, we will replace preliminary, revised and final data by tracking portfolios which are constructed to have maximum correlation with news about future macroeconomic variables. Let us first briefly review the construction of such portfolios and thereby emphasize the type of data typically used in such exercises. The construction involves two steps: First, the definition of economic news (and unexpected returns) as the unexpected component in a regression, and second, the tracking of this news component in another regression. Begin by considering a set of base assets with one month return vector from month $t-1$ to t which is denoted by $R_{t-1,t}$. Out of all possible linear combinations, $bR_{t-1,t}$, the portfolio weights b are chosen to have maximal correlation between unexpected returns (from $t-1$ to t) on the portfolio and unexpected components of y (i.e. economic news) [8]. The first step is to construct the unexpected returns. To characterize the unexpected returns we have to compute a projection of $R_{t-1,t}$ onto information available at time $t-1$. This projection involves instruments $Z_{t+i}(t-1)$. In particular, we compute:

$$E_L[R_{t-1,t} | Z_{t+i}(t-1)] = d' Z_{t+i}(t-1) \tag{5}$$

where $E_L[\cdot]$ denotes the linear projection operator. The choice of instruments consists of a mixture of financial and macroeconomic variables. More specifically, we divide the instrument vector into two parts: $Z_{t+i}(t-1) = (Z^1(t-1), Z^2_{t+i}(t-1))$, where the first subvector pertains to financial data not subject to any revisions, hence the absence of the subscript $t+i$, and the second contains

[8] Note that we are again using real output, y, as our illustrative real-time macroeconomic variable.

macroeconomic data pertaining to time $t-1$, but which are released in $t+i$. The presence of the latter type of data is problematic, as discussed above. In particular, previous studies involve the use of data $Z_f^2(t-1)$, which consist of series of the type $y_f(t-j)$, with $j>0$, for example. The fact that concurrently available data are often used in such analyses constitutes a misrepresentation of the information available to market participants at time $t-1$. To highlight this, write (5) as:

$$E_L[R_{t-1,t}|Z_f(t-1)] = d_1 Z^1(t-1) + d_2^f Z_f^2(t-1). \qquad (6)$$

Further, specialize this equation to the single instrument in Z^2 case by letting $Z_f^2(t-1) = y^f_{t-k-1,t-1}$, where y is the latest available (at time $t-1$) k-step output growth rate in this example. This equation has a well-known errors in variables problem, since:

$$E_L[R_{t-1,t}|Z_f(t-1)] = d_1 Z^1(t-1) + d_2^f [y^1_{t-k-1,t-1} + e^1_{t-k-1,t-1}], \qquad (7)$$

where $y^1_{t-k-1,t-1}$ is the information available at time $t-1$ about the most recent annual output growth rate (assuming $k=4$), while $e^1_{t-k-1,t-1}$ is the error associated with the first release of output growth. If there is always a one-month reporting lag (as in equation (1)), $y^1_{t-k-1,t-1}$ is only known at time t. The consequences of this type misspecification are twofold. First, we will obtain biased estimates of d_2.[9] These biases will affect some of the specification tests discussed later. Second, the unexpected returns obtained from (7), denoted $r^f_{t-1,t} = R_{t-1,t} - E_L[R_{t-1,t}|Z_f(t-1)]$, obviously misrepresent the actual innovations in returns.

The discussion so far highlights the fact that the incorrect use of final data introduces biases in the computation of unexpected returns. A similar problem occurs when unexpected components of y are computed. However, the issues are slightly more complex in this case. Ultimately, we need to construct a surprise component of news releases. We will first show that this component is often mismeasured and then show how this mismeasurement affects the estimates of the portfolio weights. Since the standard procedure uses final data, we denote portfolio weights by b^f. Consider the following setup:

$$y^f_{t,t+k} = E_L[y^f_{t,t+k}|Z_f(t-1)] + (E_L[y^f_{t,t+k}|Z_f(t)] - E_L[y^f_{t,t+k}|Z_f(t-1)]) + \varepsilon^f_{t,t+k}(t). \qquad (8)$$

The second component on the right-hand-side is the innovation in news about the future growth rate $y_{t,t+k}$ obtained from the (mismeasured) incremental information in Z_f from $t-1$ to t. This

[9] We deliberately leave unspecified the superscript on d_2, as will be explained below.

new information, which is the surprise component of news at time t, is the key ingredient of an economic tracking portfolio, as the goal is to maximize correlation between economic news:

$$\eta^f_{t,t+k}(t) \equiv (E_L[y^f_{t,t+k}|Z_f(t)] - E_L[y^f_{t,t+k}|Z_f(t-1)]) \tag{9}$$

and the unexpected return series using the linear projection:

$$E_L[\eta^f_{t,t+k}(t)|r^f_{t-1,t}] = b^f r^f_{t-1,t} \tag{10}$$

From this equation, we can identify the two sources of error in the estimation of the portfolio weights due to the misspecification of information. First, $r^f_{t-1,t}$ is measured with error as discussed earlier. Consequently, estimation of the portfolio weights will be biased. Second, there are also errors in $\eta^f_{t,t+k}(t)$ for the very same reasons as there are errors in $r^f_{t-1,t}$. These are errors in the dependent variable and therefore they do not result in a biased estimate of b. They do have other undesirable consequences, however, as errors in $\eta^f_{t,t+k}(t)$ make inference about b more imprecise and lower the R^2 of the regression fit.

As one of our objectives is to re-examine tracking portfolios when information about news releases is properly taken into account, we use real-time data sets when forming instrument sets (i.e. $Z^2_1(t-1)$), so that these instrument sets include output growth figures available at time $t-1$, for example. Hence, we include the variable $y^1_{t-k-1,t-1}$ in $Z^2_1(t-1)$, as defined in (1). This yields a projection equation similar to (6):

$$E_L[R_{t-1,t}|Z_1(t-1)] = d_1 Z^1(t-1) + d^1_2 Z^2_1(t-1), \tag{11}$$

which enables us to assess the bias in d^f_2 and the misspecification of unexpected returns, as equation (11) yields a series $r^1_{t-1,t}$ which can be compared with $r^f_{t-1,t}$. We also reappraise the surprise component in news, namely:

$$\eta^{i,1}_{t,t+k}(t) \equiv (E_L[y^i_{t,t+k}|Z_1(t)] - E_L[y^i_{t,t+k}|Z_1(t-1)]) \tag{12}$$

The double superscript on $\eta^{i,1}_{t,t+k}(t)$ emphasizes the fact that the i^{th} release of $y_{t,t+k}$ is being considered with the information set $Z_1(t-1)$. This allows us to study real-time news, as well as the traditional final-release news. Note, however that market participants may not necessarily be as interested in predicting $y^f_{t,t+k}$ as policy makers, whom may ultimately affect the outcome of fundamental factors in asset pricing, and who also make decisions in real-time. Suffice it to say that the issue of which vintage of data matters most to market participants is one hitherto not examined rigorously in the context of macroeconomic announcements. We focus first on $\xi^{f,1}_{t,t+k}(t)$, because it isolates the effect of information misspecification, and because it isolates the source of bias discussed in the previous section.[10] We also consider the actual portfolio weights from the projection:

$$E_L[\xi^{f,1}_{t,t+k}(t) | r^1_{t-1,t}] = b^{f,1} r_{t-1,t}, \tag{13}$$

where a double index for the portfolio weights b is used. The first index refers to the vintage of data being tracked, while the second refers to the properly specified information set. We examine the impact of erroneous information specification on the portfolio weights by comparing b^f with $b^{f,1}$ (more generally, one could examine the differences between $b^{f,1}$ and $b^{i,1}$ for $i = 2, \ldots,$ for instance).

Two additional methodological challenges which are not related to the use of real-time data arise when forming tracking portfolios for economic time series. First, within any reasonable set of potential base asset returns, individual returns are likely to be highly correlated. This correlation manifests itself as multicolinearity in the tracking regressions. Second, if the set of potential base asset returns is large, including all assets in the tracking portfolio is likely to lead to prohibitively large trading costs. As multicolinearity prevents precise estimation of the portfolio weights, we recommend judicious reduction of the set of base assets. This not only helps solve the multicolinearity problem, but more importantly has the additional advantage of generating portfolios which are less costly to hold and trade. Our suggested approach is based on the maximization of the adjusted R^2 statistic across all possible combinations of assets, and involves the use of two sets of regressions. In the first set, the optimal instruments are found, while in the second set, the optimal tracking portfolio is found. The details of the method are as follows: In the first set of news regressions (stage 1), assume that a vector of instruments, Z, of dimension k_z is available. The tracking variable, y, along with each asset in the vector of base asset returns, R, of size k_R is regressed on a constant and all possible combination of instruments in Z. This corresponds to running 2^{k_z} regressions for y, and for each of the k_R base assets. The regressions for y and R with the highest adjusted R^2 are then selected and the errors from these regressions are saved. Of course, the optimal instruments for y will typically be different from those for any of the variables in R. In the second set of tracking regressions (stage 2), the errors from the optimal y regression are regressed on all possible combi-

[10] To be coherent one should denote the process $\xi^{f}_{t,t+k}(t)$ defined in the previous section as $\xi^{f,f}_{t,t+k}(t)$. However, we suppress the second index for the sake of simplifying out notation.

nations of optimal errors from the base assets in R. This corresponds to running 2^{k_R} regressions. The regression with the highest adjusted R^2 is finally selected, and yields the weights associated with the optimal tracking portfolio of the particular economic tracking variable.

3 Empirical Findings

We organize the discussion of the empirical results in several subsections. The first deals with results on our first stage regressions (i.e. the construction of economic news based on regressions of economic variables on a set of instruments). In subsequent subsections, we discuss the construction of tracking portfolios, market betas based on tracking portfolios, and finally the pricing of data uncertainty.

3.1 Real-Time News

We study the construction of economic news based on regressions of economic variables on a set of instruments. As mentioned above, we consider data sampled both at quarterly and monthly frequencies. At the quarterly frequency, we examine output (GDP) and the GDP deflator, assuming that these economic variables are useful measures of real activity and inflation. At the monthly frequency, we examine Industrial Production (IP) and the Composite Leading Indicator (CLI), which are two important monthly business cycle indicators. In addition to these real-time data, we also use the same set of instruments and base assets as those used in Lamont (1998). As these other variables are all financial measures, none are subject to revision.

The set of potential instruments consists of: (i) the return on a portfolio of T-bills, (ii) the term-premium on long-term and 1-year bonds, (iii) the default premia for corporate bonds and commercial paper, (iv) the dividend yield on the value-weighted CRSP total market index, (v) the lagged value of the tracked variable and a price variable, if the economic variable is an activity variable, or an activity variable, if the economic variable is a price, and finally (vi) the excess return on the value weighted CRSP total market index, so that $k_z = 1 + 2 + 2 + 1 + 2 + 1 = 9$:

The estimates from regressing economic variables on the instruments are shown in Tables 2 through 5. The residuals from these regressions are our news variables. In each table we report three columns of coefficients which correspond to: (1) final release data regressed on final release instruments, (2) final release data regressed on real-time instruments, and (3) real-time series regressed on real-time instruments. Of course, only (3) uses information that were actually available in real-time, and hence (1) and (2) are included to facilitate comparison with erroneous methods. The reported standard errors use the Newey and West (1987) covariance estimator with 8 lags for quarterly data, and 24 lags for monthly data. Notice that the regression fits are good in general, particularly, of course, for the smoother low-frequency variables. Notice also that the optimal set of instruments in general changes across variables, frequencies and data releases.

In particular, consider Table 2, which contains inflation results for annual and quarterly growth rates. In both cases note the considerable differences in the news regressions across data types. In addition, even when similar assets are selected, weighting coefficients are usually very different. For instance, the news regression for the annual inflation growth rate includes the Bond Default Premium and the CP Default Premium when (incorrectly specified) final data are used throughout, while the correct use of real-time data yields a regression which does not include the CP Default Premium. In addition, for assets which are common to both regressions we observe very different parameter estimates (e.g. -0.27 when incorrectly specified final release data are used versus -0.93 when correctly specified real-time data are used).

The final and real-time news variables constructed from regressions (1) and (3) are plotted in Figures 5 and 6. The panels in the left column are constructed using final-release data and final release instruments, and right side panels show the corresponding real-time news series using real-time instruments. Notice the often dramatic differences between the series across releases. The differences appear particularly striking for the monthly data and at the high frequencies. These differences are confirmed when the simple correlation coefficients are constructed to capture the linear relationship between final and real-time news for a given variable. In the absence of data revisions, these correlations should clearly all be equal to one. The table below shows that they are in fact often quite far from one. The quarterly and monthly correlations are seen to be particularly low confirming the impressions from Figures 5 and 6.

Correlations Between Final and Real-Time News

Series	1-Year Growth	1-Quarter Growth	1-Month Growth
Real Output	.847	.745	–
GDP Deflator	.864	.664	–
Industrial Production	.865	–	.686
Composite Leading Indicator	.650	–	.615

We also calculated correlations across news variables for different data releases. In the absence of data revisions, these correlations would be identical to each other across releases. From the table below, it is clear that the di®erences in correlations can be large across releases (¯rst row), and can even switch signs (second row).

Correlations Across News Variables: Real-Time and Final Releases

Series 1	Series 2	Frequency	Real-Time	Final
Real Output	GDP De°ator	1-Year	-.028	-.431
Real Output	GDP De°ator	1-Quarter	.148	-.085
Industrial Production	Composite Leading Indicator	1-Year	.491	.524
Industrial Production	Composite Leading Indicator	1-Month	.340	.291

We conclude the subsection by stressing that macroeconomic news de¯ned by di®erent data releases can be very di®erent from each other. As we shall see in the next subsection, this has important implications for the construction of tracking portfolios of economic news.

3.2 Real-Time Tracking Portfolios

We now report the results from the second stage regressions (i.e. the regression of the news variables de¯ned above on a set of base assets). The set of potential base asset returns consists of excess returns over a portfolio of T-bills on: (i) the value weighted CRSP total market index, (ii) eight industry stock portfolios, (iii) Ibbotson's long and medium term government bond portfolios, and (iv) Ibbotson's one-year maturity bond and high-yield corporate bond portfolios, so that $k_R = 1 + 8 + 2 + 2 = 13$:

Empirical results based on the quarterly data are reported in Tables 6 and 7, while those for the monthly data are reported in Tables 8 and 9. In each table, we report three columns of coe±cients which correspond to: (1) ¯nal release news tracked with ¯nal release instruments, (2) ¯nal release news tracked with real-time instruments, and (3) real-time news tracked with real-time instruments. We report the maximal adjusted R^2 regressions, as outlined above. The reported p-values are from F-tests of the hypothesis that all portfolio weights are identically zero. Several features are common to Tables 6-9, regardless of whether quarterly (monthly) or annual growth rates are considered, and regardless of whether output or in°ation variables are tracked. First, low F-test p-values suggest that our optimal tracking portfolios do explain innovations in the economic variables, at least to some extent. Second, high colinearity among returns series result in the selection of tracking portfolios (based on R^2 statistic comparison across regressions) which are parsimonious, in the sense that a substantial number of the original base assets are excluded.

Third, the set of base assets selected depends on the timing and availability of the data, so that the use of real-time data is crucial at the portfolio construction stage of the speci¯cation process. Note also that included variables in the tracking regressions are sometimes di®erent when real-time versus ¯nal releases of data are used. In addition, tracking regression adjusted R^2 values are always highest when real-time quarterly output and in°ation data are tracked, although this ¯nding is not robust to the use of more noisy monthly output (IP). For the one-quarter GDP de°ator tracking portfolios, in particular, the regressions di®er considerably, depending upon which type of data are used. Indeed, the two tracking portfolios hardly share any common assets (Table 6). The real-time portfolios involve One-Year Bonds and the Consumer Goods returns, while neither series enter the misspeci¯ed ¯nal release de°ation tracking portfolio regression. The same phenomenon appears in Table 7, which reports results based on one-quarter growth rates in real output. Fourth, as the magnitudes of $b^{f;1}$ and $b^{1;1}$ are generally (very) di®erent, we have clear evidence that tracking the ¯rst-release of a variable implies using a di®erent optimal portfolio than does tracking the ¯nal release of the same variable.

Corresponding results for monthly series are contained in the Tables 8 and 9. While the results in these tables are similar in spirit to our results based on quarterly data, it is clear that the evidence is somewhat weaker. Among the monthly series we ¯nd the strongest e®ect of data misspeci¯cation for the CLI series. These results are not surprising since it is clear from Figures 3 and 4 that revision errors in IP growth releases do not appear to be substantial. In addition, IP is a notoriously noisy measure of real output, and hence economic activity. It is also worth noting here that the base assets selected vary with the horizon of our economic tracking variable. This is not surprising in at least one sense. Tracking the CLI requires a di®erent portfolio than does tracking the IP. While both series are pro-cyclical, it is clear that the former should be a leading indicator of the latter, and this phase shift in the relative cyclical behavior of these variables naturally leads to the selection of di®erent assets.

3.3 Real-Time Market Betas

In this subsection we analyze the market betas of (real-time) tracking portfolios. Table 10 contains estimates of the unconditional market betas of the tracking portfolios for the three di®erent data con¯gurations reported on in Tables 6 through 9. These results are contained in the ¯rst three columns of entries in the table. The last two columns in the table report the results of tests of the equality of the betas constructed using our three di®erent data con¯gurations. P-values are given below Wald test statistic values, and p-values lesser than 0.05, say, imply a rejection of the null hypothesis that the two di®erent market betas are equal at a 95% level of con¯dence, and hence also imply that the di®erent data con¯gurations are relevant. In order to carry out this formal test of the di®erence between betas across information speci¯cations, we estimate a seemingly unrelated regression system involving the projection of the tracking portfolios on the market portfolio (the CRSP VW Return) and perform a Wald test to see whether the betas are statistically signi¯cantly di®erent. Based on the Wald test results, we ¯nd that in three of the eight cases the null hypothesis of equal betas is rejected when comparing $beta^{f;f}$ with $beta^{f;1}$, where the vintage of the tracked data is always ¯nal release, but ¯nal as opposed in real-time data are used in the instrument set. In addition, in four of the eight cases the betas di®er signi¯cantly when comparing $beta^{f;1}$ with $beta^{1;1}$, where the instrument set is always real-time, but the tracked data can be either real-time or ¯nal release. These ¯ndings suggest that although the signs of the market betas do not appear dependent on the variety of data used (see each individual row of betas in the table), the magnitudes of these betas are often (signi¯cantly) dependent on the variety of data used.

3.4 Real-Time Anticipation of Revisions

A natural question in the current context is: To what extent do markets anticipate and therefore incorporate errors in preliminary announcements? To answer this question, we focus on the process appearing in (4), namely $e^i_{t;t+k}$; which re°ects the revision error in the growth rate relative to the ¯nal data, and on the revision process across di®erent vintages, namely $e1^i_{t;t+k}$; appearing in Table 1. We consider regressions of the form:

$$E_L[e^i_{t;t+k}|Z_1(t-1)] = \delta^i_1 Z^1(t-1) + \delta^i_2 Z^2_1(t-1); \qquad (14)$$

where the instrument sets used are as described above. These types of projections are considered for two reasons. First, by maintaining the same information set as used in the construction of our real-time tracking portfolios, we facilitate comparison with the results of previous subsections. Second, note that previous research on data revision has suggested that revision errors have a predictable component.[11] The inclusion of the instruments, $Z^1(t-1)$; allows us to appraise whether, and to what extent, ¯nancial markets incorporate such ine±ciencies in data releases. This is done in Tables

[11]See for instance Swanson, Ghysels and Callan (1999) and the references contained therein.

11 and 12, where we report empirical ¯ndings based on the construction of data revision tracking portfolios. The results clearly show that it is possible to track the revisions. Hence, ¯nancial markets anticipate the revision process. In particular, note that R^2 values are relatively high (e.g. 0.15 for revision errors in annual GDP growth, and 0.17 for the annual GDP de°ator), and that in all cases there exists a statistically signi¯cant set of assets that correlate with the revision errors. As above, we ¯nd similar, albeit somewhat weaker evidence when monthly data are examined (see Table 12).

4 Concluding Remarks

The idea of constructing economic tracking portfolios is elegant. These portfolios are designed to re°ect market expectations, and therefore reveal the impact of news. However, the construction of these portfolios is based on the use macroeconomic data which are subject to revision. Thus, in the case of tracking portfolios as well as in related ¯nancial applications, the timing and availability of economic data may be of crucial concern. In this paper we use the example of economic news and tracking portfolios to illustrate that this is indeed the case. More generally, we use real-time as well as ¯nal release macroeconomic data sets to reappraise the impact of macroeconomic news on ¯nancial markets, and ¯nd numerous signi¯cant sources of error when tracking portfolios are constructed using ¯nal release instead of real-time data. The problems associated with using incorrect (¯nal release) data a®ect not only portfolio weights, but also market betas, for example. In addition, we ¯nd that although data revision error is a problem from an empirical perspective, market participants do anticipate the data revision process to some extent, as evidenced by the existence of a data uncertainty risk premium which can be priced using real-time tracking portfolios. Our primary conclusion is thus that real-time data should be used in the construction of news measures, and more generally that real-time macroeconomic data should not be overlooked when carrying out a variety of empirical analyses for which the timing and availability of macroeconomic information may matter.

References

[1] Breeden, Douglas T., Michael R. Gibbons and Robert Litzenberger (1989), Empirical Tests of the Consumption-oriented CAPM, Journal of Finance, 44, 231-262.

[2] Campbell, John Y. (1996) Understanding Risk and Return, Journal of Political Economy, 104, 267-297.

[3] Chen, Nai-Fu, Richard Roll and Stephen A. Ross, (1986), Economic Forces and the Stock Market, Journal of Business 59, 383-403.

[4] Croushore, Dean and Tom Stark (1999), A Real-Time Dataset for Macroeconomists, Working Paper No. 99-4, Federal Reserve Bank of Philadelphia.

[5] Diebold, Francis X. and Glenn D. Rudebusch (1991), Forecasting Output with the Composite Leading Index: A Real Time Analysis, Journal of the American Statistical Association, 86, 603-610.

[6] Fama, Eugene F. (1990), Stock Returns, Expected Returns and Real Activity, Journal of Finance 45, 1089-1108.

[7] Fama, Eugene F. and Kenneth R. French (1989), Business Conditions and Expected Returns on Stocks and Bonds, Journal of Financial Economics, 25, 23-49.

[8] Fair, Ray and Robert Shiller (1990), Comparing Information in Forecasts from Econometric Models, American Economic Review, 80, 375-389.

[9] Ghysels, Eric and Denise R. Osborn (2000), The Econometric Analysis of Seasonal Time Series, Cambridge University Press.

[10] Ghysels, Eric, Norman R. Swanson and Myles Callan (2000), Monetary Policy with Model and Data Uncertainty, Working Paper, Pennsylvania State University.

[11] Harvey, Andrew C., C.R. McKenzie, D.P.C. Blake and M.J. Desai (1993), Irregular Data Revisions in A. Zellner (ed.), Applied Time Series Analysis of Economic Data, Bureau of the Census, 329-347.

[12] Jones, Charles M., Owen Lamont, and Robin L. Lumsdaine (1998), Macroeconomic News and Bond Market Volatility, Journal of Financial Economics, 47, 315-337.

[13] Kavajecz, K.A. and S. Collins (1995), Rationality of Preliminary Money Estimates, Review of Economic Studies, 62, 32-41.

[14] Keane, Michael P. and David E. Runkle (1990), Testing the Rationality of Price Forecasts, American Economic Review, 80, 714-35.

[15] Lamont, Owen (1998), Economic Tracking Portfolios, Manuscript, Graduate School of Business, University of Chicago.

[16] Mankiw, N. Gregory, David E. Runkle, and Matthew D. Shapiro (1984), Are Preliminary Announcements of the Money Stock Rational Forecasts? Journal of Monetary Economics, 14, 15-27.

[17] Maravall, Augustin and David Pierce (1986), The Transmission of Data Noise Into Policy Noise in U.S. Monetary Control, Econometrica, 54, 961-979.

[18] McQueen, Grant and V. Vance Roley (1993), Stock Prices, News, and Business Conditions, Review of Financial Studies, 6, 683-707.

[19] Mitchell, Mark and Harold Mulherin (1994), The Impact of Public Information on the Stock Market, Journal of Finance, 49, 923-950.

[20] Morgenstern, O. (1963), On the Accuracy of Economic Observations, 2nd Ed., Princeton University Press, Princeton.

[21] Newey, Whitney K., and Kenneth D. West (1987), A Simple, Positive Semi-de¯nite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix, Econometrica, 55, 703-708.

[22] Pearce. D.K. and V.V. Roley (1985), Stock Prices and Economic News, Journal of Business, 58, 49-67.

[23] Pierce, D.A. (1981), Sources of Error in Economic Time Series, Journal of Econometrics, 17, 305-321. Investment Accelerator, Journal of Political Economy, 97, 251-287.

[24] Schwert, G. William. The Adjustment of Stock Prices to Information about In°ation, Journal of Finance, 36, 15-29. March 1981.

[25] Schwert, G.W. (1990), Stock Returns and Real Activity: A Century of Evidence, Journal of Finance, 45, 1237-1257.

[26] Swanson, N.R. (1996), Forecasting Using First-Available Versus Fully Revised Economic Time-Series Data, Studies in Nonlinear Dynamics and Econometrics, 1, 47-64.

[27] Swanson, N.R., E. Ghysels and M. Callan (1999), A Multivariate Time Series Analysis of the Data Revision Process for Industrial Production and the Composite Leading Indicator, in Engle, R.F. and H. White (ed.) Festschrift in Honor of Clive W.J. Granger, Oxford University Press, 45-75.

[28] Swanson, N.R. and H. White (1997), A Model Selection Approach to Real-Time Macroeconomic Forecasting Using Linear Models and Arti¯cial Neural Networks, Review of Economics and Statistics, 79, 540-550.

Table 1
Quarterly Real-Time Data Set Summary Statistics

In the first panel of the table, we consider first, second and final vintages of quarterly and annual growth rates of the Real Output and the GDP Deflator variables. The revision series, which are summarized in the second panel of the table are: final revised minus first available ($e^1_{t,t+i}$), final revised minus second available ($e^2_{t,t+i}$), and second available minus first available($e1^2_{t,t+i}$). All growth rates summarized in the table are expressed as annualized percentages. Bracketed values beside the means of the series are *p*-values associated with a test of the null hypothesis that there is significant bias in the revision process. The *p*-values are constructed using heteroskedasticity and autocorrelation consistent standard error estimates. In addition, *p*-values associated with the Jarque-Bera normality test and Ljung-Box autocorrelation tests (*p*-values given for lags 1,5 and 10) are reported in the 8th and 9th columns of the table. Ljung-Box *p*-values are not reported for the raw series, as they are always 0.00. Data are for the period 1965:3 – 1995:3.

Raw Series

Series	Vintage	Growth Rate	Mean	Strd Err	Skewness	Kurtosis	Jarq.-Bera	Q Stats
Real Output	1st	Quarter	2.45	3.53	-1.11	5.55	0.00	–
	2nd		2.64	3.79	-1.01	5.57	0.00	–
	final		2.71	3.60	-0.51	4.68	0.00	–
	1st	Year	2.62	2.65	-0.72	3.92	0.00	–
	2nd		2.69	2.67	-0.68	3.80	0.00	–
	final		2.74	2.35	-0.42	2.89	0.17	–
GDP Deflator	1st	Quarter	4.54	2.44	0.96	3.54	0.00	–
	2nd		4.67	2.56	1.05	3.67	0.00	–
	final		4.99	2.50	0.70	2.87	0.00	–
	1st	Year	4.64	2.27	0.97	2.95	0.00	–
	2nd		4.66	2.29	1.00	3.00	0.00	–
	final		5.01	2.24	0.63	2.38	0.00	–

Revision Series

Series	Vintage	Growth Rate	Mean	Strd Err	Skewness	Kurtosis	Jarq.-Bera	Q Stats
Real Output	$e^1_{t,t+i}$	Quarter	0.25(.12)	2.01	0.43	4.11	0.01	(.13,.08,.09)
	$e^2_{t,t+i}$		0.07(.63)	1.98	0.39	4.00	0.02	(.27,.07,.06)
	$e1^2_{t,t+i}$		0.20(.00)	0.79	0.11	2.99	0.89	(.13,.70,.17)
	$e^1_{t,t+i}$	Year	0.12(.38)	0.89	1.04	5.26	0.00	(.00,.00,.00)
	$e^2_{t,t+i}$		0.06(.63)	0.82	0.92	5.67	0.00	(.00,.00,.00)
	$e1^2_{t,t+i}$		0.06(.04)	0.32	1.12	8.47	0.00	(.56,.99,.98)
GDP Deflator	$e^1_{t,t+i}$	Quarter	0.45(.00)	1.18	-0.03	4.94	0.00	(.93,.90,.34)
	$e^2_{t,t+i}$		0.35(.00)	1.19	-0.73	7.22	0.00	(.89,.76,.13)
	$e1^2_{t,t+i}$		0.11(.05)	0.49	0.87	5.59	0.00	(.16,.01,.00)
	$e^1_{t,t+i}$	Year	0.38(.00)	0.61	-0.11	4.84	0.00	(.00,.00,.00)
	$e^2_{t,t+i}$		0.35(.00)	0.61	-0.29	5.64	0.00	(.00,.00,.00)
	$e1^2_{t,t+i}$		0.02(.14)	0.15	0.73	5.03	0.00	(.26,.42,.21)

Table 2
Measuring Economic News Using Final and Real-Time Data
GDP Deflator

The economic variable is regressed on all possible permutations of instruments in order to define the residual news component. The regression with maximum adjusted R^2 is selected. The three colums of coefficients correspond to, first, the final news release measured using final-release instruments, second, the final news release measured using real-time instruments, and, third, the real-time news measured using real-time instruments. The reported standard errors are from Newey and West (1987) with 8 lags.

	Final-Release Data Final-Release Instruments		Final-Release Data Real-Time Instruments		Real-Time Data Real-Time Instruments	
4-Quarter Growth Rate						
Instruments	Coef	SE	Coef	SE	Coef	SE
Constant	0.93	0.96	0.99	0.76	0.14	0.73
Treasury Bill Return	-0.27	0.37	-0.93	0.36	–	–
Long Term Premium	–	–	-0.26	0.13	–	–
One-Year Term Premium	–	–	–	–	–	–
Bond Default Premium	-1.31	0.43	–	–	-1.02	0.38
CP Default Premium	0.65	0.32	–	–	–	–
Dividend Yield	–	–	–	–	–	–
Real Output	0.19	0.11	0.41	0.10	0.41	0.13
GDP Deflator	0.97	0.12	1.03	0.12	0.97	0.12
CRSP Value Weighted	0.02	0.01	0.01	0.01	–	–
Adjusted R^2	0.673		0.688		0.662	
1-Quarter Growth Rate						
Instruments						
Constant	1.10	0.99	2.07	0.50	1.07	1.32
Treasury Bill Return	–	–	–	–	–	–
Long Term Premium	-0.20	0.13	-0.27	0.14	-0.36	0.14
One-Year Term Premium	–	–	–	–	–	–
Bond Default Premium	-1.06	0.39	–	–	-0.86	0.49
CP Default Premium	–	–	–	–	–	–
Dividend Yield	0.62	0.30	–	–	0.86	0.45
Real Output	–	–	0.09	0.04	–	–
GDP Deflator	0.63	0.10	0.68	0.08	0.41	0.11
CRSP Value Weighted	0.01	0.01	–	–	–	–
Adjusted R^2	0.568		0.555		0.551	

Table 3
Measuring Economic News Using Final and Real-Time Data
Real Output

The economic variable is regressed on all possible permutations of instruments in order to define the residual news component. The regression with maximum adjusted R^2 is selected. The three colums of coefficients correspond to, first, the final news release measured using final-release instruments, second, the final news release measured using real-time instruments, and, third, the real-time news measured using real-time instruments. The reported standard errors are from Newey and West (1987) with 8 lags.

	Final-Release Data Final-Release Instruments		Final-Release Data Real-Time Instruments		Real-Time Data Real-Time Instruments	
4-Quarter Growth Rate						
Instruments	Coef	SE	Coef	SE	Coef	SE
Constant	2.00	0.79	2.15	0.83	2.50	1.06
Treasury Bill Return	-3.72	0.41	-3.58	0.43	-4.16	0.72
Long Term Premium	-0.21	0.10	-0.17	0.12	-0.37	0.17
One-Year Term Premium	1.23	0.38	1.23	0.38	1.84	0.54
Bond Default Premium	2.28	0.41	1.96	0.46	2.20	0.59
CP Default Premium	–	–	–	–	–	–
Dividend Yield	1.50	0.34	1.49	0.32	1.66	0.55
Real Output	–	–	-0.08	0.07	-0.18	0.10
GDP Deflator	-0.36	0.10	-0.36	0.10	-0.41	0.16
CRSP Value Weighted	0.02	0.01	0.02	0.01	0.04	0.01
Adjusted R^2	0.712		0.700		0.684	
1-Quarter Growth Rate						
Instruments	Coef	SE	Coef	SE	Coef	SE
Constant	3.62	1.12	3.62	1.12	6.88	1.07
Treasury Bill Return	-3.23	0.45	-3.23	0.45	-3.56	0.69
Long Term Premium	–	–	–	–	-0.63	0.30
One-Year Term Premium	1.16	0.67	1.16	0.67	2.98	0.59
Bond Default Premium	1.70	0.82	1.70	0.82	2.96	0.83
CP Default Premium	-1.71	0.68	-1.71	0.68	-3.59	0.86
Dividend Yield	0.79	0.39	0.79	0.39	–	–
Real Output	–	–	–	–	-0.09	0.08
GDP Deflator	–	–	–	–	–	–
CRSP Value Weighted	0.04	0.02	0.04	0.02	0.04	0.02
Adjusted R^2	0.356		0.356		0.562	

Table 4
Measuring Economic News Using Final and Real-Time Data
Industrial Production

The economic variable is regressed on all possible permutations of instruments in order to define the residual news component. The regression with maximum adjusted R^2 is selected. The three colums of coefficients correspond to, first, the final news release measured using final-release instruments, second, the final news release measured using real-time instruments, and, third, the real-time news measured using real-time instruments. The reported standard errors are from Newey and West (1987) with 24 lags.

	Final-Release Data Final-Release Instruments		Final-Release Data Real-Time Instruments		Real-Time Data Real-Time Instruments	
12-Month Growth Rate						
Instruments	Coef	SE	Coef	SE	Coef	SE
Constant	4.68	1.77	4.66	1.76	1.36	2.25
Treasury Bill Return	-21.45	2.59	-21.43	2.59	-20.20	2.72
Long Term Premium	-0.93	0.35	-0.93	0.35	-0.52	0.46
One-Year Term Premium	1.51	0.50	1.50	0.50	1.64	0.62
Bond Default Premium	5.76	0.99	5.75	0.98	5.11	1.11
CP Default Premium	-1.68	0.52	-1.68	0.51	-1.20	0.71
Dividend Yield	1.94	0.60	1.95	0.60	2.64	0.77
Lagged IP	–	–	–	–	–	–
Lagged CPI	-0.43	0.18	-0.43	0.18	-0.56	0.25
CRSP Value Weighted	0.08	0.02	0.08	0.02	0.08	0.03
Adjusted R^2	0.738		0.738		0.682	
1-Month Growth Rate						
Instruments	Coef	SE	Coef	SE	Coef	SE
Constant	7.40	2.05	7.48	1.98	4.85	1.63
Treasury Bill Return	-7.75	2.48	-7.89	2.45	-5.54	2.07
Long Term Premium	–	–	–	–	–	–
One-Year Term Premium	2.29	1.14	2.29	1.13	2.99	0.95
Bond Default Premium	–	–	–	–	–	–
CP Default Premium	-3.59	1.07	-3.56	1.03	-3.83	1.27
Dividend Yield	–	–	–	–	–	–
Lagged IP	0.08	0.05	0.11	0.05	0.26	0.07
Lagged CPI	–	–	–	–	–	–
CRSP Value Weighted	0.16	0.05	0.15	0.05	0.10	0.04
Adjusted R^2	0.260		0.264		0.346	

Table 5
Measuring Economic News Using Final and Real-Time Data
Composite Leading Indicator

The economic variable is regressed on all possible permutations of instruments in order to define the residual news component. The regression with maximum adjusted R^2 is selected. The three colums of coefficients correspond to, first, the final news release measured using final-release instruments, second, the final news release measured using real-time instruments, and, third, the real-time news measured using real-time instruments. The reported standard errors are from Newey and West (1987) with 24 lags.

	Final-Release Data Final-Release Instruments		Final-Release Data Real-Time Instruments		Real-Time Data Real-Time Instruments	
12-Month Growth Rate						
Instruments	Coef	SE	Coef	SE	Coef	SE
Constant	-2.40	1.25	-1.38	1.57	10.64	4.37
Treasury Bill Return	-5.06	1.54	-5.74	1.98	-24.10	6.23
Long Term Premium	--	--	-0.15	0.25	-2.07	0.92
One-Year Term Premium	--	--	--	--	2.51	1.15
Bond Default Premium	3.99	0.63	3.68	0.68	11.43	1.88
CP Default Premium			0.46	0.35	--	--
Dividend Yield	0.70	0.50	0.74	0.42	--	--
Lagged CLI	-0.23	0.08	-0.10	0.03	-0.10	0.10
Lagged CPI	-0.24	0.12	-0.29	0.13	-0.81	0.27
CRSP Value Weighted	--	--	--	--	-0.06	0.02
Adjusted R^2	0.533		0.559		0.547	
1-Month Growth Rate						
Instruments	Coef	SE	Coef	SE	Coef	SE
Constant	-0.25	1.67	-0.21	1.68	11.95	5.24
Treasury Bill Return	-10.54	2.43	-10.55	2.44	-27.40	7.12
Long Term Premium	-0.30	0.28	-0.31	0.28	-1.35	1.03
One-Year Term Premium	-1.27	0.68	-1.26	0.68	-2.29	1.72
Bond Default Premium	5.84	0.71	5.82	0.71	12.83	2.65
CP Default Premium	-1.73	0.83	-1.75	0.82	-4.10	1.34
Dividend Yield	0.91	0.53	0.92	0.55	--	--
Lagged CLI	--	--	--	--	0.09	0.08
Lagged CPI	-0.13	0.06	-0.14	0.07	-0.24	0.17
CRSP Value Weighted	--	--	--	--	-0.08	0.05
Adjusted R^2	0.348		0.349		0.244	

Table 6
Economic Tracking Portfolios for Final and Real-Time Data
GDP Deflator

In the first stage (see the news regression), the economic tracking variable and all base assets are regressed on all possible permutations of instruments. For each variable the regression with maximum adjusted R^2 is selected. In the second stage (shown here), the first-stage errors in the economic variable are regressed on all permutations of first-stage base assets errors, and again the regression with maximum adjusted R^2 is selected. The three columns of coefficients correspond to, first, the final release tracked using final-release instruments, second, the final release tracked using real-time instruments, and, third, the real-time tracked using real-time instruments. The reported standard errors are from Newey and West (1987) with 8 lags. The p-values are from an F-test of overall significance.

	Final-Release Tracked Final-Release Instruments		Final-Release Tracked Real-Time Instruments		Real-Time Tracked Real-Time Instruments	
4-Quarter Growth Rate						
Base Asset Excess Return	Coef	SE	Coef	SE	Coef	SE
CRSP Value Weighted	-0.12	0.04	-0.08	0.03	-0.17	0.06
Basic Industries	0.07	0.04	0.06	0.04	0.09	0.05
Capital Goods	–	–	–	–	–	–
Construction	–	–	–	–	0.03	0.02
Consumer Goods	–	–	–	–	–	–
Energy	0.04	0.02	0.03	0.02	0.03	0.02
Finance	0.03	0.03	–	–	–	–
Transportation	–	–	–	–	–	–
Utilities	–	–	–	–	–	–
Long Government Bond	–	–	–	–	–	–
Intermediate Gov't. Bond	–	–	–	–	0.13	0.08
One-Year Maturity Bond	-0.33	0.10	-0.29	0.09	-0.60	0.25
High-Yield Bond	–	–	–	–	–	–
Adjusted R^2	0.130		0.111		0.168	
p-values from F-test	0.007		0.016		0.001	
1-Quarter Growth Rate						
Base Asset Excess Return	Coef	SE	Coef	SE	Coef	SE
CRSP Value Weighted	–	–	-0.05	0.06	–	–
Basic Industries	–	–	–	–	0.04	0.03
Capital Goods	–	–	–	–	–	–
Construction	–	–	–	–	–	–
Consumer Goods	–	–	–	–	-0.08	0.05
Energy	–	–	0.04	0.03	–	–
Finance	-0.05	0.03	-0.04	0.04	–	–
Transportation	–	–	–	–	–	–
Utilities	0.06	0.06	0.06	0.05	–	–
Long Government Bond	-0.05	0.04	–	–	–	–
Intermediate Gov't. Bond	–	–	–	–	–	–
One-Year Maturity Bond	–	–	-0.42	0.13	-0.31	0.12
High-Yield Bond	-0.06	0.05	–	–	–	–
Adjusted R^2	0.096		0.100		0.120	
p-values from F-test	0.028		0.024		0.011	

Table 7
Economic Tracking Portfolios for Final and Real-Time Data
Real Output

In the first stage (see the news regression), the economic tracking variable and all base assets are regressed on all possible permutations of instruments. For each variable the regression with maximum adjusted R^2 is selected. In the second stage (shown here), the first-stage errors in the economic variable are regressed on all permutations of first-stage base assets errors, and again the regression with maximum adjusted R^2 is selected. The three columns of coefficients correspond to, first, the final release tracked using final-release instruments, second, the final release tracked using real-time instruments, and, third, the real-time tracked using real-time instruments. The reported standard errors are from Newey and West (1987) with 8 lags. The *p* -values are from an *F* -test of overall significance.

	Final-Release Tracked Final-Release Instruments		Final-Release Tracked Real-Time Instruments		Real-Time Tracked Real-Time Instruments	
4-Quarter Growth Rate						
Base Asset Excess Return	Coef	SE	Coef	SE	Coef	SE
CRSP Value Weighted	–	–	–	–	0.17	0.05
Basic Industries	–	–	–	–	-0.05	0.03
Capital Goods	-0.04	0.03	-0.04	0.03	-0.07	0.04
Construction	-0.08	0.02	-0.08	0.02	-0.10	0.02
Consumer Goods	0.07	0.03	0.07	0.03	0.05	0.04
Energy	–	–	–	–	–	–
Finance	0.05	0.02	0.05	0.02	0.06	0.03
Transportation	0.03	0.02	0.02	0.02	–	–
Utilities	–	–	–	–	–	–
Long Government Bond	-0.09	0.03	-0.10	0.04	–	–
Intermediate Gov't. Bond	–	–	–	–	-0.24	0.10
One-Year Maturity Bond	0.42	0.14	0.45	0.15	0.51	0.25
High-Yield Bond	–	–	–	–	–	–
Adjusted R^2	0.141		0.139		0.208	
p -values from *F* -test	0.005		0.005		0.000	
1-Quarter Growth Rate						
Base Asset Excess Return	Coef	SE	Coef	SE	Coef	SE
CRSP Value Weighted	–	–	-0.23	0.18	–	–
Basic Industries	–	–	–	–	–	–
Capital Goods	-0.15	0.08	-0.11	0.11	-0.09	0.06
Construction	–	–	–	–	-0.06	0.04
Consumer Goods	0.17	0.07	0.23	0.08	0.18	0.05
Energy	–	–	–	–	–	–
Finance	–	–	–	–	0.06	0.06
Transportation	–	–	0.05	0.06	–	–
Utilities	0.11	0.05	0.18	0.06	–	–
Long Government Bond	-0.19	0.05	-0.19	0.05	–	–
Intermediate Gov't. Bond	–	–	–	–	–	–
One-Year Maturity Bond	–	–	–	–	-0.71	0.27
High-Yield Bond	–	–	–	–	–	–
Adjusted R^2	0.098		0.102		0.152	
p -values from *F* -test	0.026		0.022		0.003	

Table 8
Economic Tracking Portfolios for Final and First-Release Data
Industrial Production

In the first stage (see the news regression), the economic tracking variable and all base asset are regressed on all possible permutations of instruments. For each variable the regression with maximum adjusted R^2 is selected. In the second stage (shown here), the first-stage errors in the economic variable are regressed on all permutations of first-stage base assets errors, and again the regression with maximum adjusted R^2 is selected. The three columns of coefficients correspond to, first, the final release tracked using final-release instruments, second, the final release tracked using first-release instruments, and, third, the first release tracked using first-release instruments. The reported standard errors are from Newey and West (1987) with 24 lags. The p-values are from an F-test of overall significance.

	Final-Release Tracked Final-Release Instrument		Final-Release Tracked First-Release Instrument		First-Release Tracked First-Release Instrument	
12-Month Growth Rate						
Base Asset Excess Return	Coef	SE	Coef	SE	Coef	SE
CRSP Value Weighted	–	–	–	–	-0.13	0.06
Basic Industries	–	–	–	–	–	–
Capital Goods	-0.07	0.06	-0.07	0.06	–	–
Construction	-0.08	0.05	-0.09	0.05	–	–
Consumer Goods	0.11	0.08	0.11	0.08	–	–
Energy	–	–	–	–	0.06	0.04
Finance	0.12	0.05	0.12	0.05	0.12	0.06
Transportation	–	–	–	–	–	–
Utilities	–	–	–	–	–	–
Long Government Bond	-0.17	0.06	-0.17	0.06	-0.21	0.08
Intermediate Gov't. Bond	–	–	–	–	–	–
One-Year Maturity Bond	1.54	0.26	1.54	0.27	1.86	0.52
High-Yield Bond	–	–	–	–	–	–
Adjusted R^2	0.067		0.067		0.055	
p-values from F-test	0.001		0.001		0.004	
1-Month Growth Rate						
Base Asset Excess Return	Coef	SE	Coef	SE	Coef	SE
CRSP Value Weighted	-1.65	0.56	-1.52	0.51	-1.18	0.43
Basic Industries	0.36	0.18	0.38	0.19	0.39	0.20
Capital Goods	–	–	–	–	–	–
Construction	0.35	0.32	0.40	0.33	–	–
Consumer Goods	0.54	0.28	0.57	0.26	0.51	0.19
Energy	0.24	0.13	0.22	0.12	0.16	0.11
Finance	–	–	–	–	-0.20	0.19
Transportation	0.19	0.14	–	–	0.20	0.13
Utilities	–	–	–	–	–	–
Long Government Bond	–	–	–	–	–	–
Intermediate Gov't. Bond	–	–	–	–	–	–
One-Year Maturity Bond	-1.10	1.16	–	–	-1.53	0.81
High-Yield Bond	-0.47	0.20	-0.63	0.24	–	–
Adjusted R^2	0.044		0.042		0.039	
p-values from F-test	0.012		0.015		0.020	

Table 9
Economic Tracking Portfolios for Final and Real-Time Data
Composite Leading Indicator

In the first stage (see news regression), the economic tracking variable and all base asset are regressed on all possible permutations of instruments. For each variable the regression with maximum adjusted R^2 is selected. In the second stage (shown here), the first-stage errors in the economic variable are regressed on all permutations of first-stage base assets errors, and again the regression with maximum adjusted R^2 is selected. The three columns of coefficients correspond to, first, the final release tracked using final-release instruments, second, the final release tracked using real-time instruments, and, third, the real-time tracked using real-time instruments. The reported standard errors are from Newey and West (1987) with 24 lags. The p-values are from an F-test of overall significance.

	Final-Release Tracked Final-Release Instrument		Final-Release Tracked First-Release Instrument		First-Release Tracked First-Release Instrument	
12-Month Growth Rate						
Base Asset Excess Return	Coef	SE	Coef	SE	Coef	SE
CRSP Value Weighted	0.41	0.18	0.34	0.16	0.67	0.32
Basic Industries	-0.10	0.05	-0.09	0.04	-0.11	0.08
Capital Goods	-0.11	0.06	-0.09	0.05	-0.18	0.09
Construction	-0.12	0.04	-0.10	0.04	-0.19	0.11
Consumer Goods	–	–	–	–	-0.27	0.14
Energy	-0.06	0.03	-0.05	0.03	-0.11	0.08
Finance	–	–	–	–	0.20	0.11
Transportation	–	–	–	–	–	–
Utilities	-0.06	0.06	-0.05	0.06	–	–
Long Government Bond	–	–	–	–	–	–
Intermediate Gov't. Bond	–	–	–	–	–	–
One-Year Maturity Bond	0.84	0.12	0.82	0.13	1.31	0.38
High-Yield Bond	–	–	–	–	0.17	0.12
Adjusted R^2	0.155		0.150		0.113	
p-values from F-test	0.000		0.000		0.000	
1-Month Growth Rate						
Base Asset Excess Return	Coef	SE	Coef	SE	Coef	SE
CRSP Value Weighted	–	–	–	–	–	–
Basic Industries	–	–	–	–	–	–
Capital Goods	-0.14	0.08	-0.12	0.08	–	–
Construction	–	–	–	–	0.49	0.10
Consumer Goods	0.22	0.09	0.20	0.09	–	–
Energy	–	–	–	–	–	–
Finance	–	–	–	–	–	–
Transportation	0.08	0.06	0.07	0.06	–	–
Utilities	–	–	–	–	–	–
Long Government Bond	-0.21	0.16	-0.17	0.14	0.66	0.31
Intermediate Gov't. Bond	-0.60	0.29	-0.66	0.28	-2.83	1.14
One-Year Maturity Bond	4.11	0.99	4.28	1.00	7.86	2.57
High-Yield Bond	–	–	–	–	-0.53	0.38
Adjusted R^2	0.134		0.142		0.096	
p-values from F-test	0.000		0.000		0.000	

Table 10
Market Betas of Economic Tracking Portfolios

Excess returns from the tracking portfolio are regressed on a constant and the excess return on the market portfolio. We report the slope estimate on the market returns, i.e. the beta. The three colums of betas correspond to tracking portfolios where, first, the final release is tracked using final-release instruments, second, the final release is tracked using real-time instruments, and, third, the real-time release is tracked using real-time instruments. We then test the effect of using real-time versus final instruments (tracking final data) by testing the hypothesis that the first two betas are equal. Finally, we test the effect of tracking real-time versus final variables (using real-time instruments) by testing the hypothesis that the last two betas are equal. Tests are carried out in a Seemingly Unrelated Regression framework. Bracketed values below beta coefficients are standard errors (first three columns of numerical entries), while those below beta equality test statistics are p-values for the test (last two columns of of numerical entries).

		Market Beta Estimates		Wald Tests	
Tracking Variable:	Final-Release	Final-Release	Real-Time	Final vs Real Time	Final vs Real Time
Instrument Variable:	Final-Release	Real-Time	Real-Time	Instruments	Tracking Variable
	$beta^{f,f}$	$beta^{f,1}$	$beta^{1,1}$	$beta^{f,f} = beta^{f,1}$	$beta^{f,1} = beta^{1,1}$
Tracking Variable					
GDP Deflator,	-0.0078	-0.0085	-0.0157	0.2561	5.6806
Four-Quarter Growth	(0.0059)	(0.0054)	(0.0068)	(0.6128)	(0.0172)
GDP Deflator,	-0.0484	-0.0440	-0.0581	1.0747	12.3585
One-Quarter Growth	(0.0053)	(0.0059)	(0.0048)	(0.2999)	(0.0004)
Real Output,	-0.0132	-0.0115	0.0104	26.4406	23.7608
Four-Quarter Growth	(0.0057)	(0.0058)	(0.0080)	(0.0000)	(0.0000)
Real Output,	0.0341	0.0331	0.0479	0.0666	2.6845
One-Quarter Growth	(0.0119)	(0.0129)	(0.0110)	(0.7964)	(0.1013)
Industrial Production,	0.0350	0.0350	0.0284	0.0232	1.6252
Twelve-Month Growth	(0.0093)	(0.0093)	(0.0100)	(0.8790)	(0.2024)
Industrial Production,	-0.0354	-0.0253	-0.0399	1.1058	0.5487
One-Month Growth	(0.0296)	(0.0277)	(0.0241)	(0.2930)	(0.4589)
Composite Leading Indicator,	-0.0299	-0.0323	0.0020	11.4115	6.5988
Twelve-Month Growth	(0.0089)	(0.0084)	(0.0199)	(0.0007)	(0.0102)
Composite Leading Indicator,	0.0153	0.0183	0.0572	5.5927	1.1800
One-Month Growth	(0.0201)	(0.0206)	(0.0483)	(0.0180)	(0.2774)

Table 11
Economic Tracking Portfolios for Quarterly Data Revisions
Real Output and GDP Deflator

In the first stage (news regression), the revision series and all base assets are regressed on all possible permutations of instruments. For each variable, the regression with maximum adjusted R^2 is selected. In the second stage (tracking regression), the first-stage errors in the economic variable are regressed on all permutations of first-stage base assets errors, and again the regression with maximum adjusted R^2 is selected. The reported standard errors are from Newey and West (1987) with 8 lags. The p-values are from an F-test of overall significance.

	Real Output				GDP Deflator			
	4-Quarter Growth Real-Time Instruments		1-Quarter Growth Real-Time Instruments		4-Quarter Growth Real-Time Instruments		1-Quarter Growth Real-Time Instruments	
Tracking Regressions								
Base Asset Excess Return	Coef	SE	Coef	SE	Coef	SE	Coef	SE
CRSP Value Weighted	-0.12	0.04	-0.32	0.11	–	–	–	–
Basic Industries	0.04	0.02	0.08	0.03	-0.03	0.02	-0.04	0.02
Capital Goods	0.02	0.02	–	–	-0.01	0.01	–	–
Construction	0.03	0.01	–	–	-0.02	0.01	-0.03	0.02
Consumer Goods	–	–	0.07	0.07	0.04	0.02	0.06	0.03
Energy	–	–	–	–	0.01	0.01	0.03	0.02
Finance	–	–	–	–	–	–	–	–
Transportation	–	–	0.05	0.05	0.02	0.01	–	–
Utilities	–	–	0.19	0.05	0.02	0.01	–	–
Long Government Bond	–	–	-0.13	0.06	–	–	0.06	0.06
Intermediate Gov't. Bond	–	–	–	–	-0.05	0.04	-0.13	0.12
One-Year Maturity Bond	0.19	0.11	0.38	0.29	0.14	0.09	–	–
High-Yield Bond	-0.03	0.03	–	–	-0.02	0.01	–	–
Adjusted R^2	0.153		0.097		0.174		0.064	
p-values from F-test	0.003		0.027		0.001		0.084	
News Regressions								
Instruments								
Constant	-0.71	0.33	-1.96	0.51	0.67	0.32	0.95	0.58
Treasury Bill Return	0.57	0.32	–	–	-0.68	0.19	-0.37	0.35
Long Term Premium	0.22	0.07	0.36	0.08	-0.13	0.09	–	–
One-Year Term Premium	-0.69	0.29	-1.14	0.38	0.30	0.20	0.62	0.21
Bond Default Premium	-0.35	0.31	-1.05	0.42	0.38	0.29	–	–
CP Default Premium	0.23	0.19	1.40	0.30	0.15	0.16	–	–
Dividend Yield	–	–	0.68	0.21	–	–	-0.33	0.30
Real Output	0.09	0.03	–	–	-0.04	0.05	–	–
GDP Deflator	–	–	–	–	0.07	0.04	0.18	0.04
CRSP Value Weighted	-0.02	0.01	–	–	0.01	0.00	0.01	0.00
Adjusted R^2	0.221		0.099		0.267		0.076	

Instrument regressions for base assets not shown

Table 12
Economic Tracking Portfolios for Monthly Data Revisions
Industrial Production and Composite Leading Indicator

In the first stage (news regression), the revision series and all base assets are regressed on all possible permutations of instruments. For each variable the regression with maximum adjusted R^2 is selected. In the second stage (tracking regression), the first-stage errors in the economic variable are regressed on all permutations of first-stage base assets errors, and again the regression with maximum adjusted R^2 is selected. The reported standard errors are from Newey and West (1987) with 8 lags. The *p*-values are from an *F*-test of overall significance.

	Industrial Production				Composite Leading Indicator			
	12-Month Growth Real-Time Instruments		1-Month Growth Real-Time Instruments		12-Month Growth Real-Time Instruments		1-Month Growth Real-Time Instruments	
Tracking Regressions								
Base Asset Excess Return	Coef	SE	Coef	SE	Coef	SE	Coef	SE
CRSP Value Weighted	–	–	–	–	–	–	-0.76	0.28
Basic Industries	-0.07	0.04	–	–	–	–	–	–
Capital Goods	–	–	–	–	–	–	0.27	0.20
Construction	–	–	0.09	0.09	–	–	-0.44	0.20
Consumer Goods	0.06	0.02	–	–	0.17	0.10	0.49	0.24
Energy	-0.02	0.02	–	–	–	–	–	–
Finance	–	–	–	–	-0.18	0.07	–	–
Transportation	0.03	0.03	–	–	0.08	0.06	–	–
Utilities	–	–	0.16	0.12	-0.10	0.06	–	–
Long Government Bond	0.07	0.04	–	–	–	–	-0.78	0.29
Intermediate Gov't. Bond	–	–	–	–	–	–	2.22	0.98
One-Year Maturity Bond	-0.39	0.37	–	–	-0.57	0.43	-3.51	1.95
High-Yield Bond	–	–	-0.36	0.14	-0.17	0.12	0.57	0.31
Adjusted R^2	0.028		0.009		0.077		0.078	
p-values from *F*-test	0.062		0.265		0.000		0.000	
News Regressions								
Instruments								
Constant	3.47	1.45	2.74	0.91	-11.37	4.78	-14.30	5.96
Treasury Bill Return	-1.40	1.69	-2.12	1.37	19.52	5.27	17.07	6.78
Long Term Premium	-0.45	0.23	–	–	2.03	1.01	1.21	0.71
One-Year Term Premium	–	–	-0.73	0.55	-2.28	1.12	–	–
Bond Default Premium	0.69	0.52	–	–	-7.45	1.41	-8.14	1.90
CP Default Premium	-0.50	0.27	–	–	0.79	0.71	2.92	1.03
Dividend Yield	-0.72	0.36	–	–	–	–	1.92	1.33
Lagged Tracking Variable	–	–	-0.15	0.05	–	–	-0.07	0.06
Inflation	0.13	0.11	–	–	0.61	0.26	–	–
CRSP Value Weighted	–	–	0.05	0.02	0.05	0.03	0.10	0.05
Adjusted R^2	0.167		0.041		0.472		0.144	

Instrument regressions for base assets not shown

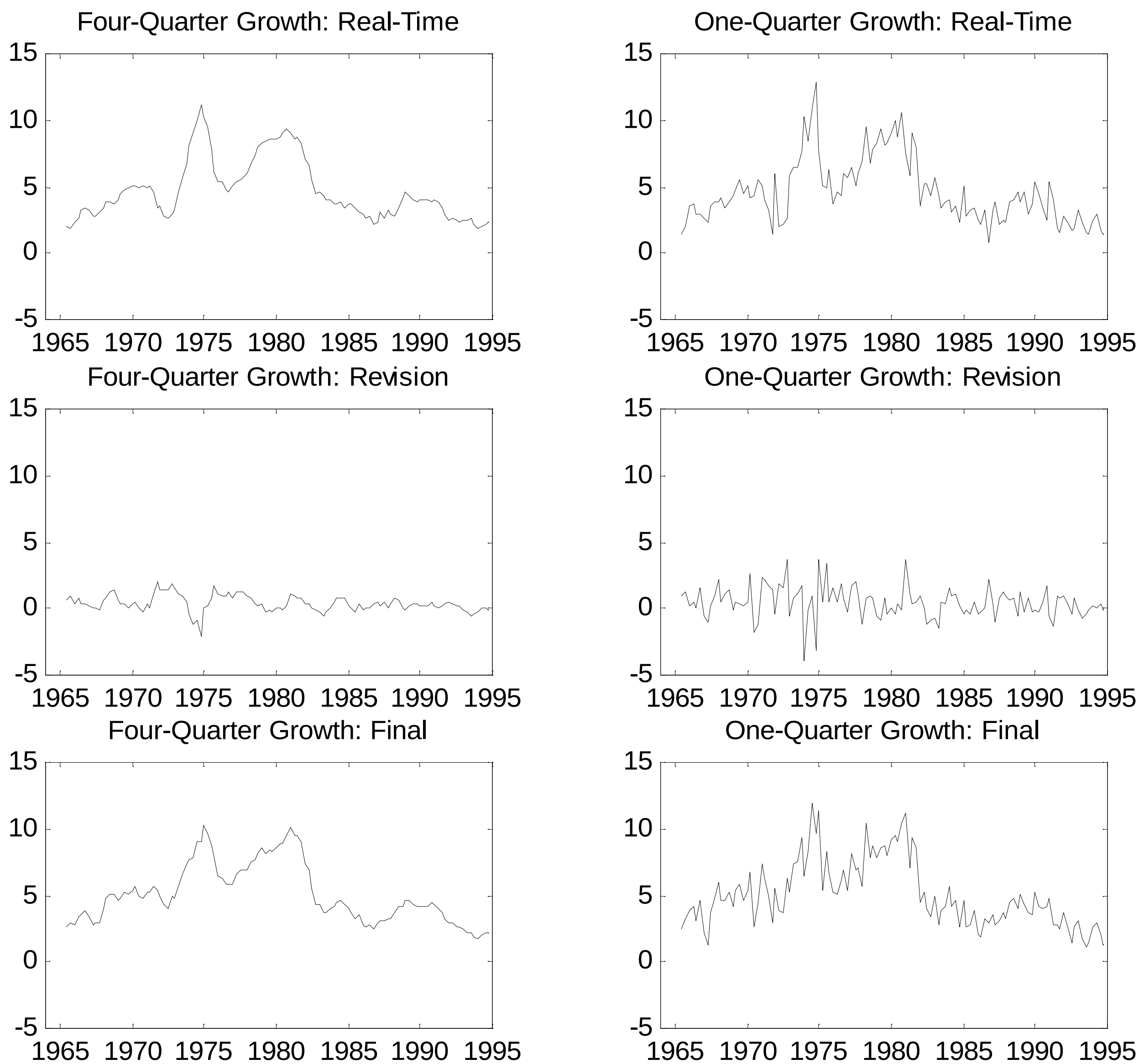

Figure 1. GDP Deflator. The top panels show the four-quarter and one-quarter growth rates in the first-release of the GDP deflator. The middle panels show the difference between the final release and the first release of the four-quarter and one-quarter growth rates. The bottom two panels show the final releases. All growth rates are constructed using the differences in the logs of the series. The one-quarter growth rates are annualized by multiplying by four.

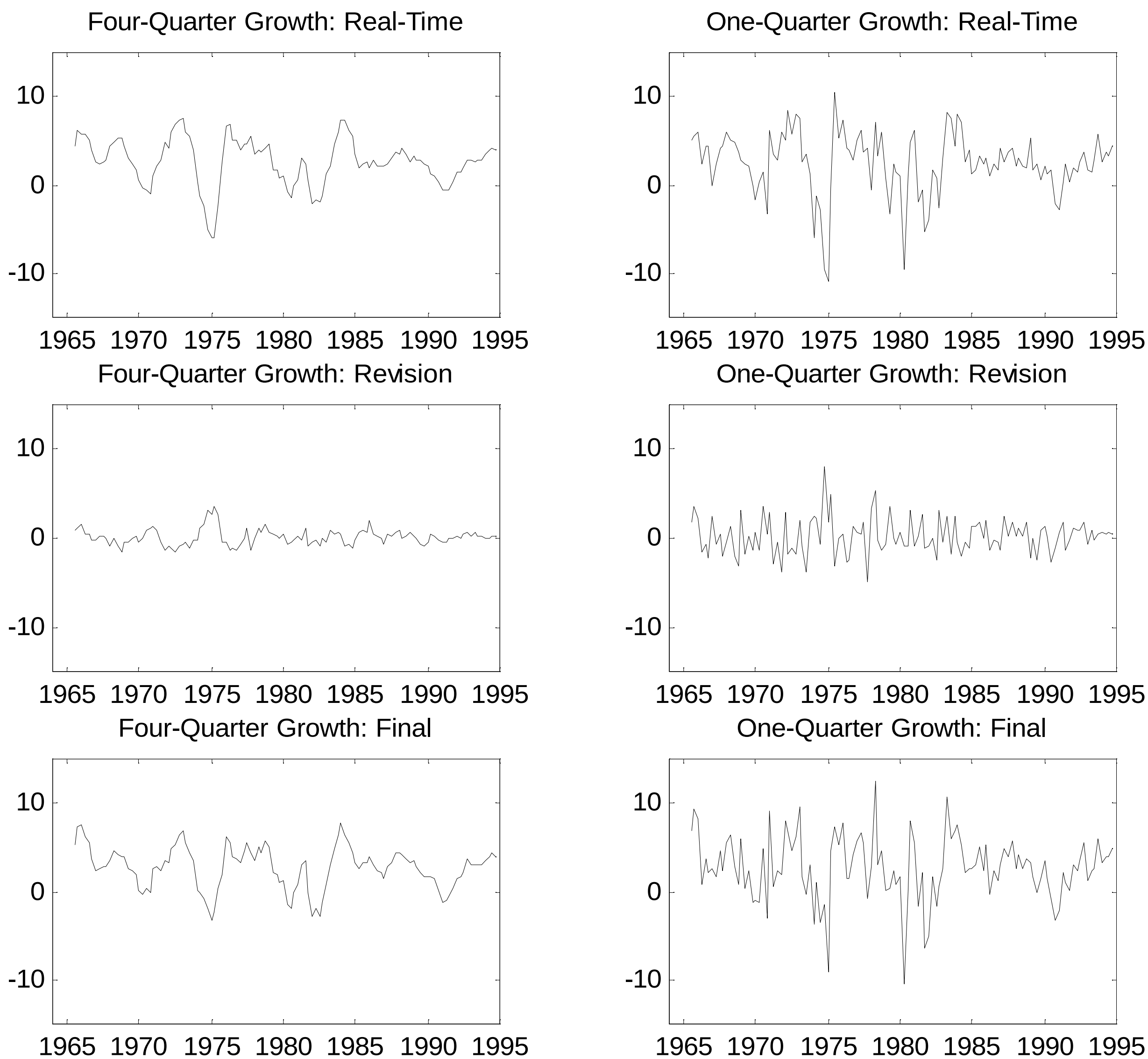

Figure 2. Real Output. The top panels show the four-quarter and one-quarter growth rates in the first-release of real output. The middle panels show the difference between the final release and the first release of the four-quarter and one-quarter growth rates. The bottom two panels show the final releases. All growth rates are constructed using the differences in the logs of the series. The one-quarter growth rates are annualized by multiplying by four.

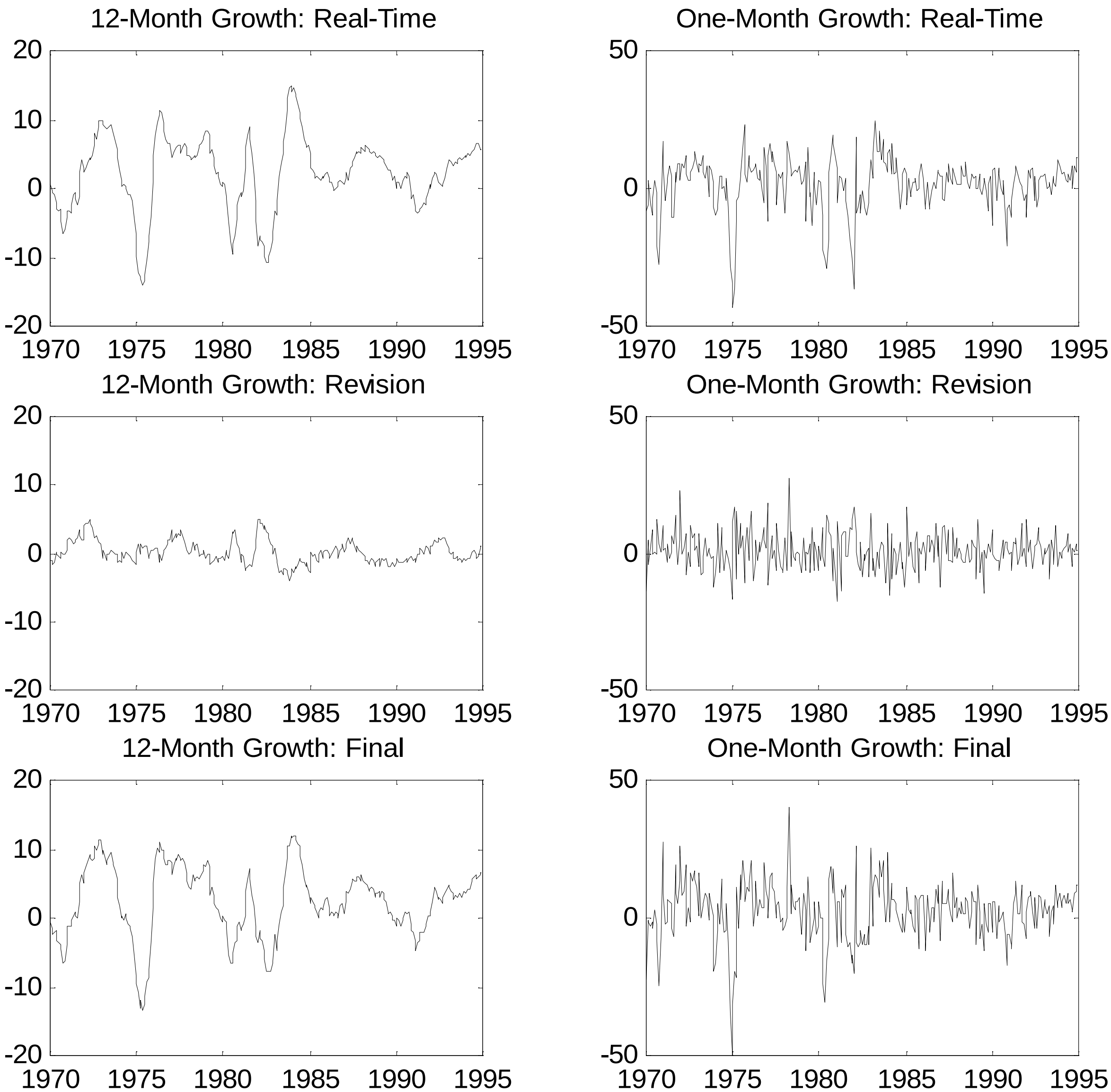

Figure 3. Industrial Production. The top panels show the twelve-month and one-month growth rates in the first-release of industrial production. The middle panels show the difference between the final release and the first release of the twelve-month and one-month growth rates. The bottom two panels show the final releases. All growth rates are constructed using the differences in the logs of the series. The one-month growth rates are annualized by multiplying by twelve.

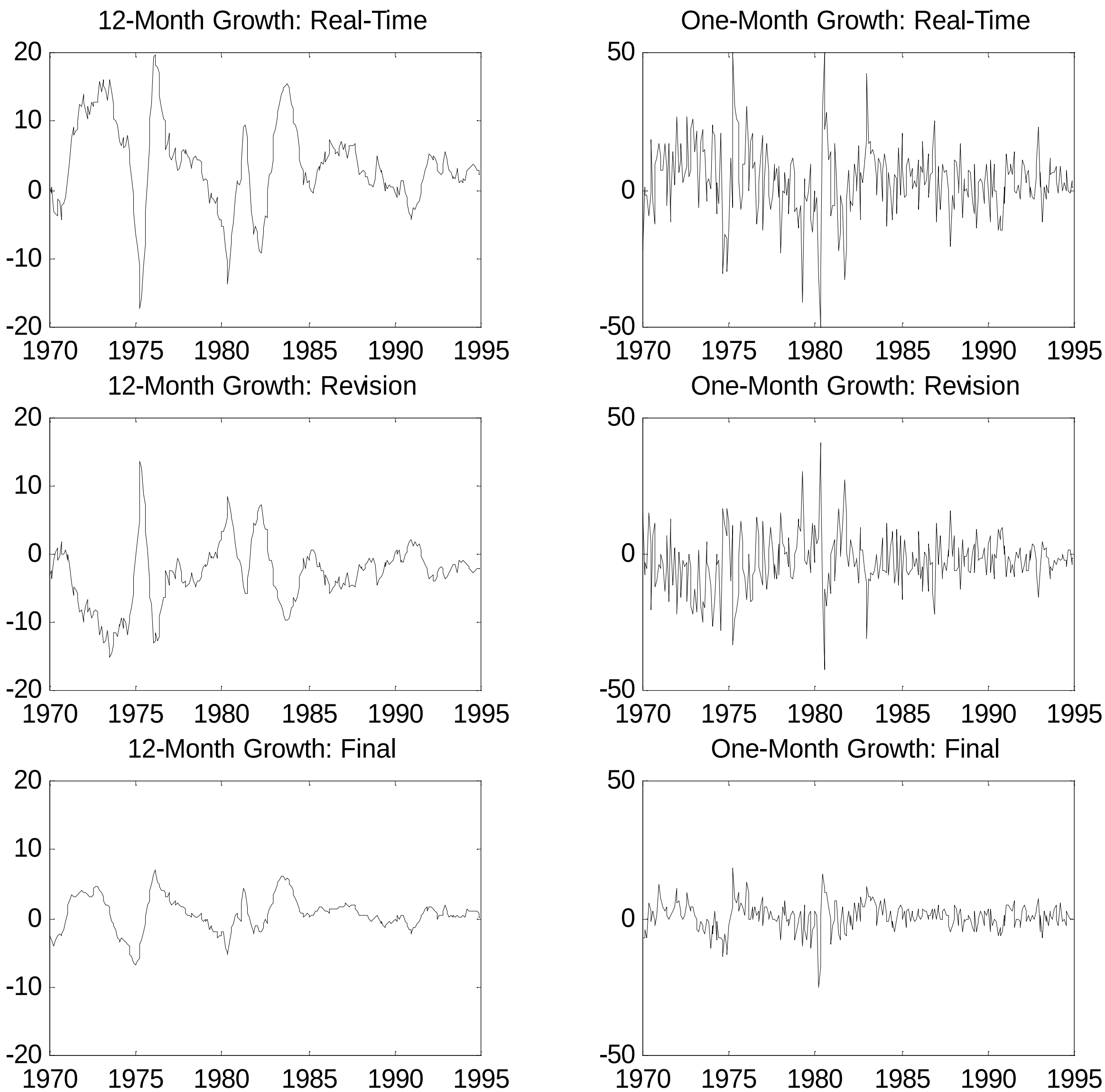

Figure 4. Composite Leading Indicator. The top panels show the twelve-month and one-month growth rates in the first-release of the composite leading indicator. The middle panels show the difference between the final release and the first release of the twelve-month and one-month growth rates. The bottom two panels show the final releases. All growth rates are constructed using the differences in the logs of the series. The one-month growth rates are annualized by multiplying by twelve.

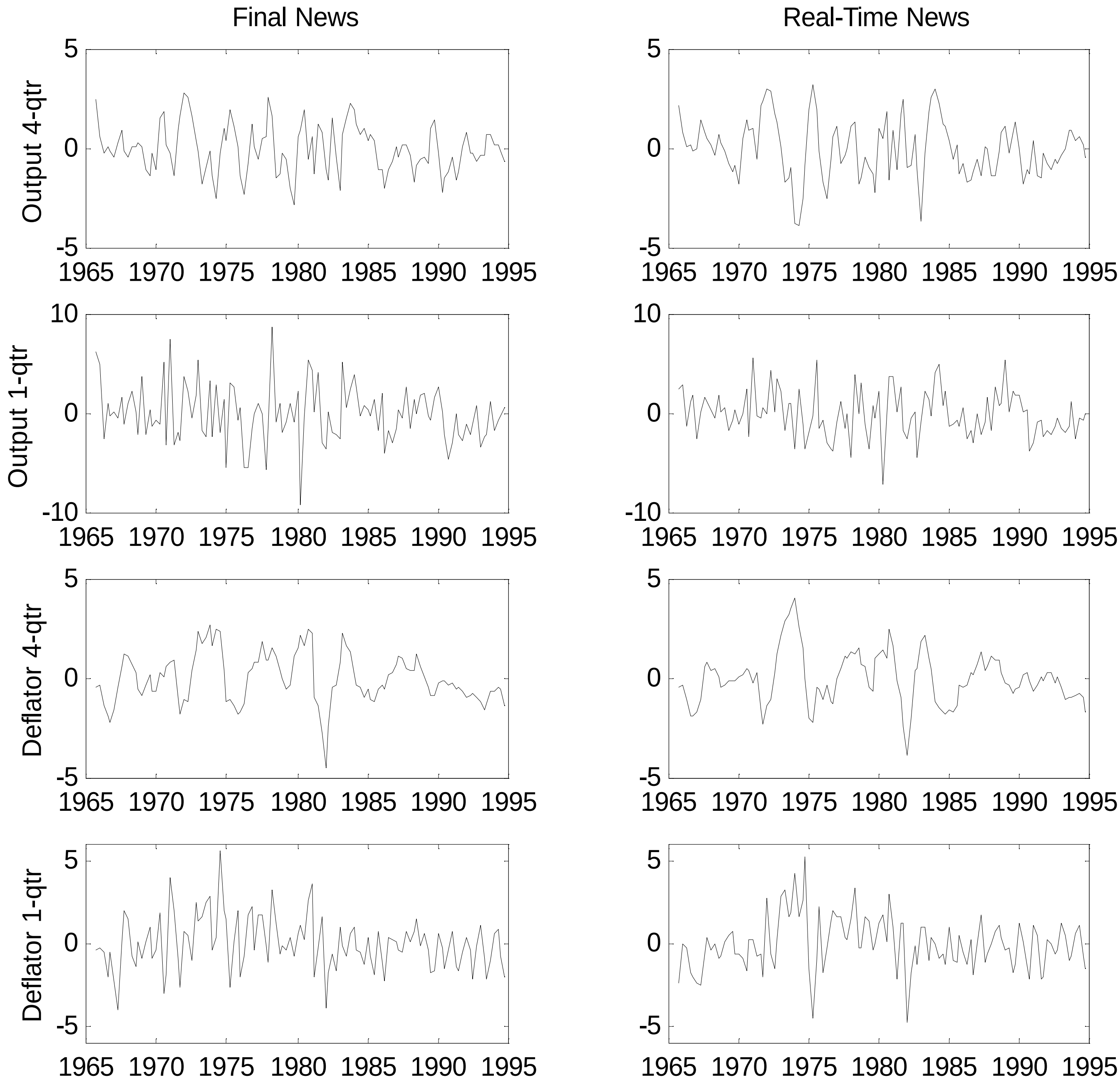

Figure 5. Quarterly News Variables: Real Output and the GDP Deflator. The left-side panels show the residuals from regressing final-release economic data on final-release instruments. The right-side panels show the residuals from regressing real-time economic data on real-time instruments. The series are expressed in one-quarter and four-quarter growth rates respectively. The one-quarter rates are annualized by multiplying by four.

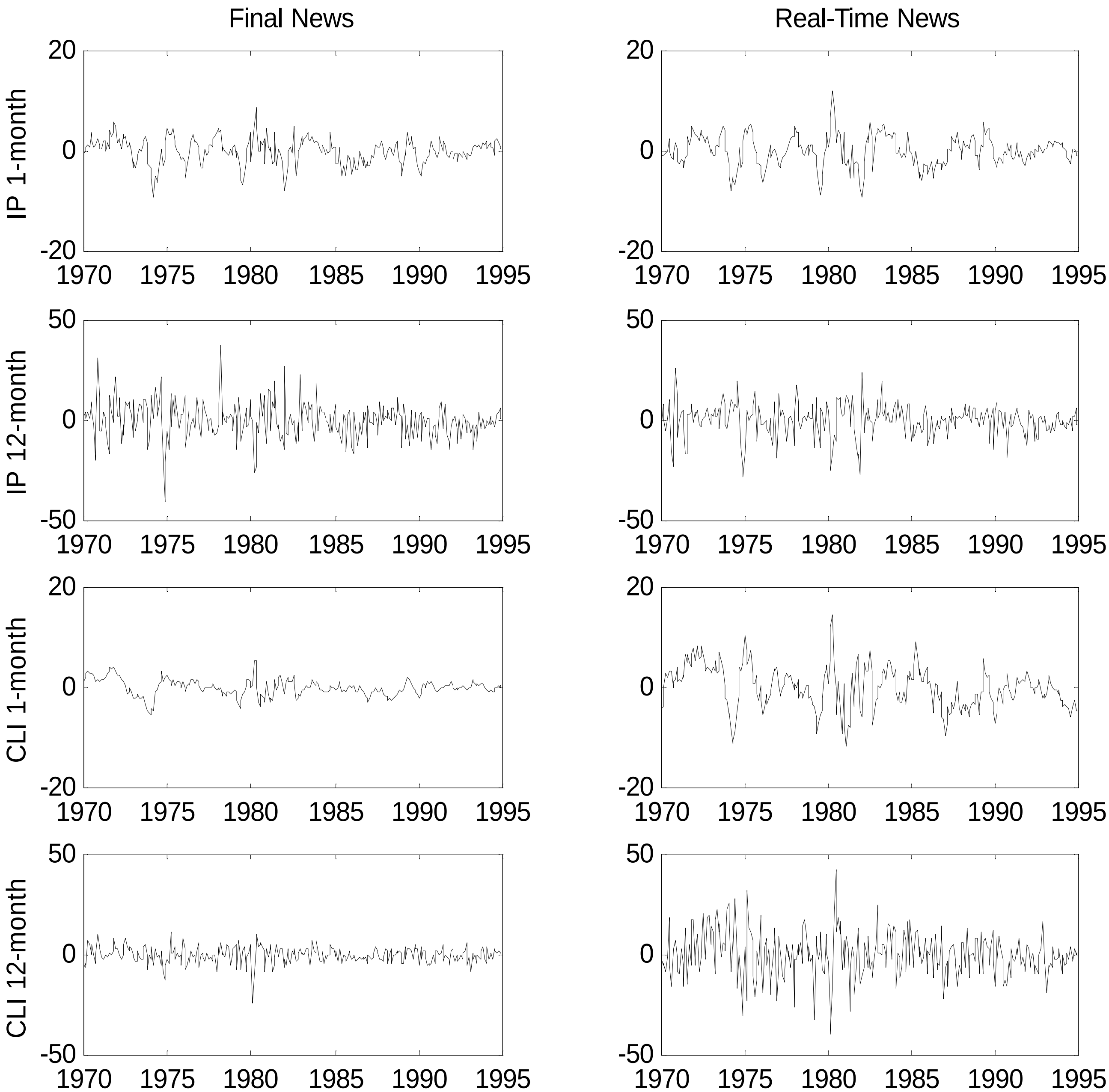

Figure 6. Monthly News Variables: Industrial Production (IP) and the Composite Leading Indicator (CLI). The left-side panels show the residuals from regressing final-release economic data on final-release instruments. The right-side panels show the residuals from regressing real-time economic data on real-time instruments. The series are expressed in one-month and twelve-month growth rates respectively. The one-month rates are annualized by multiplying by twelve.