Predicting Restatements in Macroeconomic Indicators using Accounting Information

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Abstract

Earnings growth dispersion contains information about trends in labor reallocation, unemployment, and, ultimately, aggregate output. We find that initial macroeconomic estimates released by government statistical agencies do not fully incorporate this information. As a consequence, aggregate earnings growth dispersion predicts future restatements in nominal and real GDP growth (and unemployment). Out-of-sample tests suggest that early GDP growth estimates can be significantly improved by incorporating earnings growth dispersion information. Such improvements are important for many economic decisions that rely on the timely and accurate macroeconomic estimates, including monetary policy, bank regulation, and economic forecasting.

1. Introduction

We investigate whether real-time aggregate accounting information can be used to detect errors in early announcements of gross domestic product (GDP). Macroeconomic expectations shaped by these announcements affect a large spectrum of decisions by government agencies and economic agents. However, initial announcements are based on imprecise and incomplete information and are routinely restated over the course of several subsequent years as more information becomes available.[1] We find that a simple accounting-based aggregate measure—earnings growth dispersion—can predict future GDP (and unemployment) restatements. Therefore, earnings growth dispersion reflects information about trends in GDP and unemployment that macroeconomists do not fully take into account.

When estimating GDP, the U.S. Bureau of Economic Analysis (BEA) relies on information from multiple sources, some of which are not yet available when the initial estimates are produced for the quarter that just ended. The unavailable components of GDP have to be "nowcasted" using trend estimates to extrapolate information from prior months, quarters, or years.[2] Thus, the precision of early GDP estimates can be improved by applying more accurate trend assumptions, which can be achieved by incorporating information on other macroeconomic variables that co-vary with the GDP. Unemployment represents one such variable. According to

[1] For example, the initial announcement of nominal (real) GDP growth for the first quarter of 2008 (2001), positive 3.19% (1.98%), was subsequently revised to negative 0.46% (negative 1.14%).

[2] Approximately 30% of the initial quarterly GDP estimate is based on a combination of the Census Bureau's monthly surveys from only the first two months of the quarter extrapolated for the third month, whereas 25% of the estimate is based solely on the trend data derived from various indicators (Grimm and Weadock 2006). An example of a trend-based estimate for which no monthly or quarterly "hard" survey data is available is spending in the "personal care" category (including health clubs, barbers, and beauty shops), where quarterly estimates are based on a combination of population growth, consumer price index in "personal care services", and data from prior Census Bureau Services Annual Surveys (Landefeld, Seskin, and Fraumeni 2008).

Okun's Law (Okun 1962), aggregate unemployment and GDP growth move in opposite directions. A change in the unemployment rate should, therefore, provide information about contemporaneous GDP growth. However, early unemployment estimates are also prone to estimation and restatement issues (e.g., Gilbert 2011). Therefore, information sources that help produce more accurate unemployment estimates should also help improve GDP figures.

In this paper, we argue that earnings growth dispersion is such information source because it is associated with the movement of labor. Economic theory links increases in performance dispersion to higher unemployment (Lucas and Prescott 1974). Poorly performing firms downsize and lay off workers, while well-performing firms grow and extend their labor force. Therefore, greater dispersion in performance should lead to greater reallocation of workers across firms. Due to labor reallocation frictions related to job search, re-training, or physical relocation, changing jobs takes time, which leads to higher unemployment in the interim. If earnings growth dispersion contains information related to labor reallocation and such information is not fully incorporated by macroeconomists, it can be used to improve early unemployment and GDP estimates.

Importantly, it is unlikely that economists do not take into account *any* information related to friction-induced unemployment. We only suggest that *accounting* information is not fully incorporated because prior research does not use accounting figures to infer impending labor reallocation. Instead, prior studies used across-industry dispersion in employment changes (Lilien 1982) or stock returns (Loungani, Rush, and Tave 1990; Brainard and Cutler 1993).[3] We suggest that using across-firms dispersion in earnings growth as a labor reallocation proxy has

[3] Note that these studies use performance dispersion to understand the nature of unemployment, but not to predict restatements in unemployment or GDP figures. To the best of our knowledge, our study is the first to use *any* performance dispersion measures to predict restatements in macroeconomic indicators.

several advantages. Specifically, unlike sectoral employment changes, accounting information is available on a firm-level basis, it is timely, and it is less likely to be restated.[4] Unlike stock returns, accounting earnings changes are better aligned with cash flow (rather than discount rate) news. Whether these benefits are sufficiently high for earnings growth dispersion to have incremental information content for inferring labor reallocation or "nowcasting" unemployment and GDP is ultimately an empirical question.

Our sample combines accounting and macroeconomic information, including real and nominal GDP growth, unemployment rates, and corresponding restatements for 158 quarters from 1973 to 2012. Our main empirical analyses consist of two parts. First, we investigate whether lagged earnings growth dispersion is incrementally useful in "nowcasting" unemployment and GDP growth.[5] At the firm level, we find that firms with higher (lower) earnings growth in the past are more likely to increase (reduce) their workforce, controlling for stock returns and prior employment growth. Therefore, lagged cross-sectional earnings growth dispersion can be used to gauge unobserved labor reallocation across firms. At the aggregate level, we estimate a VAR system that simultaneously models performance dispersion, GDP, and unemployment dynamics. The VAR results suggest that earnings growth dispersion is incrementally useful in predicting changes in both GDP and unemployment, even after controlling for dispersion in stock returns and sectoral employment changes. Specifically, a

[4] Our earnings-based aggregates closely approximate information available to macroeconomists in real time. When companies restate earnings, Compustat changes earnings figures contained in the quarterly Fundamentals dataset retroactively. However, Konchitchki (2014) concludes that restated earnings in the Fundamentals dataset are close to the initially reported figures contained in the Preliminary History Compustat dataset. The differences that he finds are insignificant and occur in less than two percent of observations.

[5] In accounting literature, the link between earnings dispersion and unemployment has been noted in Jorgensen, Li, and Sadka (2012) and empirically confirmed in Kalay, Nallareddy, and Sadka (2014). However, Kalay et al. do not test whether earnings growth dispersion has incremental predictive ability with respect to real GDP growth and unemployment after controlling for dispersion variables used in macroeconomics. In addition, neither study provides empirical evidence on the ability of GAAP earnings to predict or explain employment changes at the firm level.

positive shock to earnings growth dispersion results in a significant decrease (increase) in nominal and real GDP growth (unemployment) for up to 6 and 3 quarters (up to 3 quarters), respectively. Overall, earnings growth dispersion contains information incremental to other labor reallocation proxies that is relevant for "nowcasting" GDP.

Second, we test whether earnings growth dispersion information is fully incorporated into early GDP estimates. Our results suggest that prior-quarter earnings growth dispersion is a robust restatement predictor, with high earnings dispersion precipitating downward restatements in GDP growth. Specifically, a one standard deviation increase in prior-quarter earnings dispersion predicts a 0.50% (0.47%) lower restatement for nominal (real) GDP growth. These magnitudes correspond to 8% (20%) of average initial nominal (real) GDP growth estimates. In contrast, sectoral employment growth dispersion and return dispersion do not predict restatements. These results suggest that initial GDP estimates do not fully incorporate the *incremental* information related to labor reallocation contained in earnings growth dispersion.

These results are robust to controlling for a set of GDP restatement predictors identified in prior literature (e.g., Aruoba 2008) and other variables potentially associated with both aggregate earnings growth dispersion and GDP restatements. These variables include aggregate quarterly market returns, initial macro-announcement-day market returns, initial macro estimates, lagged restatements, aggregate liquidity, time trend, and a recession indicator. The results also hold after excluding the Great Recession period (the fourth quarter of 2007 to the first quarter of 2009). Finally, we obtain similar results when we accumulate restatements over one or two years, rather than between the initially announced and currently available estimates.

To strengthen our inferences, we link our results to frictions associated with labor reallocation. First, we document that, similar to GDP restatements, unemployment rate

restatements are robustly predictable using lagged aggregate earnings growth. Second, we decompose earnings growth dispersion into across-industry dispersion and residual components. Re-allocation of labor across industries should be associated with greater job-search and training frictions and should thus have a greater effect on unemployment and aggregate output. Consistent with this conjecture, we find that the effect of across-industry dispersion on GDP growth restatements is almost twice as large as the effect of the remaining dispersion. Third, we rule out an alternative interpretation of our findings related to uncertainty. Specifically, earnings growth dispersion remains a significant GDP restatement predictor after controlling for the stock market and economic uncertainty measures (the VIX and economic policy uncertainty indices).

Finally, we conduct out-of-sample restatement prediction tests. Using only information available by the end of quarter *t*-1, we form regression-based forecasts of one- or two-year-horizon restatements following the initial GDP growth announcements made in quarter *t*.[6] Our results suggest that a simple earnings-growth-dispersion-based model can significantly outperform a naïve moving-average benchmark for both real and nominal GDP growth, with greater restatement predictability observed in more recent periods. These findings suggest that incorporating accounting information can improve early GDP estimates in real time.

Our study is related to research on efficiency of macroeconomic forecasts with respect to accounting information (e.g., Kothari, Shivakumar, and Urcan 2013; Konchitchki and Patatoukas 2014a, 2014b; Kalay et al. 2014). In this paper, we go beyond *forecast* efficiency and ask whether the *realized* macroeconomic indicators fully incorporate accounting information. This

[6] Specifically, we regress one- or two-year GDP growth restatements on prior aggregate earnings growth dispersion within an expanding window ending with restatements made in quarter *t*-1. The obtained regression coefficients are combined with accounting variables available by the end of quarter *t*-1 to form restatement forecasts for GDP growth estimates initially announced in quarter *t*. To ensure that these tests have no look-ahead bias, we use restatements made over finite horizons, adjust for AR(2) in earnings growth dispersion on a rolling basis within expanding estimation periods, and allow for the appropriate gaps between the estimation and testing windows.

question is important because, while forecasts are available from multiple sources that differ in accuracy, realized indicator announcements represent a unique, widely utilized information source. We also contribute to macroeconomics research that evaluates the quality of early macroeconomic estimates. This research finds that restatements in major macro indicators are either unpredictable (Faust, Rogers, and Wright 2005) or can be predicted using a few macro variables (Aruoba 2008). Our results suggest that accounting information can reliably predict macroeconomic restatements above and beyond previously suggested predictors.

Our findings have several practical implications. First, policy decisions (such as setting the federal funds rate using a Taylor rule) based on the initial GDP estimates significantly differ from hypothetical decisions based on the final revised estimates (Orphanides 2001; Rudebusch 2001). Incorporating accounting information should allow early estimates to better reflect the true underlying state of the economy and thereby improve the effectiveness of policy making. Second, Basel III proposes a countercyclical capital buffer provision that requires banks to dynamically adjust their risk-weighted asset ratios (Basel Committee of Banking Supervision 2011). The use of GDP estimates is hardwired into this provision—minimal capital ratios depend on deviations of quarterly credit-to-GDP ratios from a historical trend (Basel Committee of Banking Supervision 2010). Improving the accuracy of early GDP estimates can directly affect banks' investment and lending decisions. More importantly, a better alignment between early GDP estimates and true underlying economic conditions helps fulfill the purpose of the provision—mitigating economic crises. Finally, economic and business indicator forecasts are more accurate when prediction models use final revisions rather than initial estimates as inputs (Stark and Croushore 2002). Bringing initial estimates closer to final estimates with the help of accounting information should improve the accuracy of macroeconomic forecasts.

2. Institutional Background and Related Literature

2.1. GDP Restatement Process

The BEA issues an initial quarterly GDP estimate three weeks after the quarter end. The estimate is largely based on voluntary-response monthly Census Bureau surveys that poll businesses and other economic agents and cover about 35,500 reporting units (Landefeld et al. 2008). Overall, approximately 45% of the estimate is based on the full three-months information; 30% on a combination of surveys from the first two months of the quarter and trend extrapolations for the third month; and the remaining 25% solely on the trend data derived from various indicators (Grimm and Weadock 2006).

The GDP estimate is revised one and two months following the initial announcement due to either receiving information from additional sources (e.g., Census Bureau monthly surveys covering the last month of the quarter) or obtaining more precise information related to prior sources (e.g., questionnaires from late survey responders). It is further revised annually over the next three years by incorporating new information, for example, annual tax filings or annual Census Bureau surveys. The latter are mandatory and cover a larger number of reporting units (approximately 150,000) compared to monthly surveys.

Finally, every five years the BEA releases a comprehensive revision of accounts that is based on results from the recent economic census that covers virtually all businesses in the United States (in these years, no annual revisions are published). Based on the census results, the BEA revises its benchmark estimates for the structure of the economy. GDP component estimates for the quarters following the census date are re-weighted based on the new benchmark data. Five-year comprehensive revisions may also include methodological or statistical changes.

For example, starting in 1999 the BEA includes investment in computer software as part of fixed investment.

2.2. GDP, Unemployment, and Earnings Growth Dispersion

As explained in the previous section, early GDP estimates are based, in part, on trend-extrapolated information from prior periods. The accuracy of trend estimates, and therefore early GDP figures, can be improved by incorporating trend information on any indicators that co-vary with aggregate output. One such indicator is unemployment, which is robustly negatively correlated with GDP (Okun 1962). However, employment figures for recent quarters are also imprecise and regularly restated (e.g., Gilbert 2011). Therefore, improving unemployment trend estimates can help improve GDP growth trend estimates, which can lead to more accurate early GDP figures.

The unemployment estimate's accuracy can be improved by taking into account the extent of recent labor reallocation. In the presence of frictions associated with job search, new skills acquisition, and physical relocation, the turnover of workers across employers takes time and leads to unemployment in the interim (Lucas and Prescott 1974). The pace of reallocation and the associated unemployment level varies over time and across the business cycle (Davies 1987). Prior research on sectoral shift theory uses various proxies to capture the extent of labor reallocation associated with unemployment. Lilien (1982) measures the dispersion in employment changes across sectors and infers friction-caused unemployment from a positive association between such dispersion and unemployment. Alternatively, Loungani et al. (1990) and Brainard and Cutler (1993) employ dispersion in sectoral stock returns that proxy for shocks to firms' labor demand and subsequent labor reallocation. They document a positive association between dispersion in lagged stock returns and unemployment.

These studies do not use accounting profitability as a predictor of changes in firm-specific labor demand and subsequent worker reallocation.[7] However, it is reasonable to expect that firms' layoff and hiring decisions are affected by changes in profitability. Further, accounting-based performance measures offer distinct advantages as predictors of changes in employment. First, unlike sectoral employment changes, GAAP earnings are available at the firm level and are more precise, i.e. less likely to be restated compared to macroeconomic employment figures that are based on limited-size surveys. Second, unlike stock returns that, to a significant extent, capture market-wide discount-rate news (Vuolteenaho 2002), innovations in firms' profits are better aligned with firm-specific cash-flow news related to firm performance. Whether these properties of accounting-based profitability measures translate into incremental information about labor reallocation is ultimately an empirical question.

Overall, our paper provides empirical evidence on two related questions. First, does earnings growth dispersion contain information about labor reallocation, and thus unemployment, that is incremental to reallocation proxies used in macroeconomics? Second, does the BEA that compiles GDP estimates fully incorporate this incremental information?

2.3. Prior Research on Predictability of GDP Restatements

The accuracy and efficiency of early GDP estimates is the subject of a stream of literature in economics that debates a "news versus noise" interpretation of macroeconomic restatements. Under the "news" interpretation, restatements are completely unpredictable using any

[7] In accounting literature, Jorgensen et al. (2012) and Kalay et al. (2014) note a possible link between earnings-change dispersion to unemployment. However, neither study provides empirical evidence on the ability of GAAP earnings to predict or explain employment changes incrementally to other macroeconomic measures.

information available at the time of the initial estimate and thus occur only as a consequence of receiving new economic information. Under the "noise" interpretation, restatements reflect information that is already available at the time of the initial estimate. Therefore, initial estimates are not rationally set.

Conclusions from this literature are mixed. Early studies provide little evidence of predictability in GDP growth restatements in the United States. Mankiw and Shapiro (1986) conclude that restatements in real and nominal GNP growth estimates are unpredictable using initial GNP estimates, aggregate stock market returns, three-month Treasury bill rates, and lagged GNP growth estimates. Faust et al. (2005) find that two-year restatements in real quarterly GDP growth are not predictable either in sample or out of sample, whereas restatements relative to the final estimate are predictable using the level of initial forecasts.

Later studies document restatement predictability. Aruoba (2008) finds that three-year restatements in both nominal and real GDP growth rates can be predicted using initially announced estimates, past restatements, and unemployment rates (the latter are used to proxy for the stage of the business cycle). However, the real-time forecasting tests yield no evidence of out-of-sample predictability in either real or nominal GDP growth restatements. Specifically, hold-out-regression-based forecasts do not provide a statistically significant improvement over a naïve extrapolation of the historical average restatements. Gilbert (2011) provides indirect evidence consistent with predictability of GDP restatements. He finds that returns around the second and especially third restatement announcements (two and three months following the quarter end) are correlated with subsequent restatements. However, such announcement returns are not known ex-ante, and this information cannot be used to improve GDP figures in real time.

Overall, evidence on GDP restatement predictability in the United States is mixed. In our empirical tests, we control for the previously documented predictability to establish whether aggregate earnings growth dispersion is incrementally useful in predicting GDP restatements.

3. Data and Variable Measurement

3.1. Data

We obtain GDP and unemployment data from the Real-Time Data Set for Macroeconomists maintained by the Federal Reserve Bank of Philadelphia. [8] Sectoral employment data are from the Current Employment Statistics, reported by the Bureau of Labor Statistics (BLS).[9] Nominal and real GDP growth rates represent seasonally adjusted percentage changes.[10] We use seasonally adjusted civilian unemployment rates, as reported by the BLS. Unemployment rates and GDP growth rates are measured at the quarterly frequency and are expressed in percent. The growth rates are annualized.

Accounting data come from the intersection of the CRSP and Compustat datasets from 1973 to 2012. The sample period is restricted by quarterly data availability.[11] Our sample includes firms listed on NYSE, AMEX, or NASDAQ that have CRSP share codes 10 or 11. To align macroeconomic data with firm-level accounting data, we include only firms with fiscal-

[8] http://www.phil.frb.org/research-and-data/real-time-center/real-time-data/

[9] The BLS reports employment statistics for 15 super sectors (mining and logging, construction, durable goods, nondurable goods, wholesale trade, retail trade, transportation and warehousing, utilities, information, financial activities, professional and business services, education and health services, leisure and hospitality, other services, and government). The data are released monthly on the third Friday after the week including the 12th of the month.

[10] Prior to 1992, the dataset includes gross national product (GNP) instead of GDP. The initial GDP estimates are missing for the fourth quarter of 1995 due to the government shutdown. We omit this quarter from our sample.

[11] Compustat quarterly data are available starting in 1972. Our sample starts in 1973 because we require two lags to estimate innovations in aggregate measures and additional two lags to measure aggregate earnings and earnings dispersion over the prior two quarters.

year ends in March, June, September, or December. Every quarter, we winsorize the top and bottom two percent of firm-level observations before calculating aggregate measures to reduce the influence of outliers. Our final sample that is used to construct aggregate measures contains 471,284 firm-quarter observations.

3.2. GDP Restatements

The BEA releases initial GDP estimates for each quarter within one month of the quarter end. Our main tests rely on cumulative restatements between the initially released values for quarter *t* and the final restated values as they appear today (our last vintage of macroeconomic data is from December 2013). We also track restatements accumulated at fixed-time intervals following the initial estimate release. In other words, we use restated estimates as of the end of quarters *t*+2 (*1st restated estimate*), *t*+6 (*2nd restated estimate*), and *t*+10 (*3rd restated estimate*), as described in Figure 1. We use currently available final estimates to measure restatements, because they represent homogenously measured macroeconomic indicators that incorporate all latest methodological changes (Gilbert 2011). However, evaluating the initially announced estimates relative to the current estimates has several disadvantages. It implies very long forecast horizons that vary in length depending on the vintage of the initial estimate. Further, very late restatements are less likely to result from newly available information and are more likely to be driven by methodological changes. Accordingly, we also report robustness tests using restatements accumulated over two years (*3rd restated estimate – initial estimate*). We expect two years to be a sufficiently long horizon to accumulate most information-related restatements.

3.3. Labor Reallocation Predictors based on Earnings, Employment, and Returns

Dispersion in Aggregate Earnings Growth

Dispersion in aggregate earnings growth is measured in four steps. First, we estimate seasonal earnings changes (*ChEarn*) for each firm *i* and quarter *t* as follows:

$$ChEarn_{i,t} = \frac{(Earn_{it} - Earn_{it-4})}{BV_{it-1}}, \quad (1)$$

where $Earn_{it}$ ($Earn_{it-4}$) is realized earnings for firm *i* in quarter *t* (*t*-4), and BV_{it-1} is the book value of equity for firm *i* at the end of quarter *t*-1.

Second, we estimate aggregate earnings changes (*AggChEarn*) for quarter *t* as an equal-weighted average of firm-level earnings changes:

$$AggChEarn_t = \frac{1}{N_t}\sum_{i=1}^{N_t} ChEarn_{i,t}, \quad (2)$$

where $ChEarn_{i,t}$ is as previously defined and N_t is the number of firms in quarter *t*.[12]

Third, we estimate aggregate earnings changes dispersion (*AggEarDisp*) for quarter *t* as:

$$AggEarDisp_t = \sqrt{\frac{1}{N_t}\sum_{i=1}^{N_t}(ChEarn_{i,t} - AggChEarn_t)^2}, \quad (3)$$

where $AggChEarn_t$, $ChEarn_{i,t}$, and N_t are as previously defined.

Fourth, we are interested only in the new information contained in earnings dispersion that is not fully incorporated into macroeconomic estimates. Therefore, our earnings growth

[12] Our findings are robust to the use of the value-weighted average of firm-level earnings.

dispersion measure, Ear_Disp_t, is the innovation in aggregate earnings changes dispersion. We estimate it as a residual from the AR(2) model:[13]

$$AggEarDisp_t = \rho_0 + \rho_1 AggEarDisp_{t-1} + \rho_2\ AggEarDisp_{t-2} + e_t, \qquad (4)$$

where $AggEarDisp_t$, $AggEarDisp_{t-1}$, and $AggEarDisp_{t-2}$ are aggregate earnings changes dispersion estimates for quarters t, t-1, and t-2, respectively; Ear_Disp_t is equal to the residual e_t.

Dispersion in Employment Growth

Aggregate employment growth dispersion (*EmpG_Disp*) is based on quarterly employment data for the 15 economy super sectors reported by the BLS. We first calculate quarterly growth (quarter-over-quarter) in employment for each sector. Then we estimate employment growth dispersion as a standard deviation in these sectoral employment growth estimates. Finally, we remove the persistent component of the series. Specifically, our employment growth dispersion measure, *EmpG_Disp,* is the residual from the AR(2) model.[14]

Dispersion in Stock Returns

Aggregate return dispersion (*Ret_Disp*) is estimated using equations (2), (3), and (4) after replacing earnings changes with stock returns for the quarter. Aggregate return dispersion is autocorrelation-adjusted and represents a residual from the AR(2) model.[15]

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[13] We verify that higher-order adjustment for autocorrelation is unnecessary by estimating the AR(1) coefficient for the residual from equation (4). This coefficient equals -0.046 and is statistically insignificant, with a *t*-statistic equal to -0.58.

[14] The AR(1) coefficient for *EmpG_Disp* is equal to 0.004 (t-statistics of 0.09). Therefore, AR(2) estimation successfully isolates innovations in the employment growth dispersion series.

[15] The AR(1) coefficient for *Ret_Disp* is equal to -0.033 (*t*-statistics of -0.41). Therefore, AR(2) estimation successfully isolates innovations in the return dispersion series.

3.4. Alternative GDP Restatement Predictors

As discussed in Section 2, prior research identifies several macroeconomic and stock-market variables as significant predictors of GDP restatements. These variables include initial GDP estimates, unemployment rates, prior GDP restatements, and initial GDP announcement-day market returns. Initial GDP estimates (*Initial_est*) are the initially released nominal or real GDP growth figures for quarter *t*. Initial unemployment rates (*Ini_Unemp*) are the initially released unemployment figures for quarter *t.* Prior GDP restatements (*Res*) are restatements made over the prior quarter for the nominal or real GDP growth estimates initially announced in quarter *t*-1. Announcement-day market return (*Ann_Ret*) is the S&P500 index return on the day of the initial macroeconomic indicator for quarter *t* is announced. In regressions predicting GDP (unemployment) restatements, the GDP (unemployment) announcement date is used.

In addition to the previously documented restatement predictors, we control for aggregate stock market returns and aggregate GAAP earnings. Aggregate stock market return (*Mkt_Ret*) is the equal-weighted average return on all stocks in our sample in a given quarter. We control for aggregate GAAP earnings because prior research documents that macroeconomic forecasts do not fully incorporate information contained in simple aggregated earnings (e.g. Konchitchki and Patatoukas 2014a; Kothari et al. 2013). In our setting, it is unlikely that such information is not taken into account because the BEA relies on GAAP earnings as a supplemental source of information in estimating the corporate profits component of GDI (gross domestic income).[16]

[16] Corporate profits are a component of GDI (gross domestic income), which is an income-based alternative to final-expenditure-based GDP. Although the NIPA definition of corporate profits used by the BEA is operationally derived from taxable income reported to the IRS, aggregate GAAP earnings and "Corporate Profits" are still highly correlated (e.g., Dichev (2013) reports a correlation exceeding 0.89 prior to 1980). Complete tax data are available only with a two-year lag, so quarterly NIPA profit estimates are extrapolated from the most recent annual figure using a combination of the Census Bureau Quarterly Financial Report that samples manufacturing, trade, and mining

Nevertheless, we include innovations in aggregate earnings changes as an additional control variable. Similar to aggregate earnings dispersion, innovations in aggregate earnings changes are measured as AR(2) residuals from a time-series regression, equation (4), where *AggEarDisp* is replaced with *AggChEarn* from equation (2).[17]

Finally, we control for aggregate liquidity shocks and industrial production because prior research finds that earnings dispersion is related to these variables (Jorgensen et al. 2012). Aggregate liquidity shocks (*Liquidity*) based on Pastor and Stambaugh's (2003) liquidity definition are obtained from WRDS.

Figure 1 describes the timeline of our variable measurement. Most restatement predictors, including aggregate earnings growth dispersion, are estimated using information that is publicly available by the end of quarter *t*. Namely, we use earnings for fiscal quarter *t*-1 (released in quarter *t*), stock market returns for quarter *t*-1, and sectoral employment changes for quarter *t*-1. We also control for quarter *t*-2 returns and return dispersion measures because stock market returns are a leading indicator of the state of the economy. In addition, we control for quarter *t* market return and return dispersion, quarter *t* employment growth dispersion, prior-quarter macro restatements, and initial macroeconomic estimates. These variables are available to economists at the time when the initial GDP estimates for quarter *t* are announced.

Our full model also controls for variables that are not available at the time when the GDP "nowcast" is made. These variables include GDP announcement returns, recession indicator, and

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companies and publicly available corporate reports for the companies in industries not surveyed by the Census Bureau (Landefeld et al. 2008).

[17] This adjustment is important because Sadka and Sadka (2009) show that aggregated earnings changes are persistent. We verify that higher-order adjustment of aggregate earnings surprises for autocorrelation is unnecessary by estimating the AR(1) coefficient for *Ear*. The obtained coefficient is equal to -0.015 and is statistically insignificant (*t*-statistics of -0.19), suggesting the that AR(2) estimation successfully isolates aggregate earnings surprises.

time trend. Regressions that include these controls represent conservative tests aimed at ruling out alternative explanations for the link between earnings growth dispersion and future restatements.

3.5. Descriptive Statistics

Table 1 presents descriptive statistics. In our sample period, GDP estimates are, on average, revised upward. The mean (median) restatement in nominal GDP growth (*NGDP_Res*) is 0.53% (0.43%). The mean (median) restatement in real GDP growth (*RGDP_Res*) is 0.46% (0.41%). Both the mean and median restatements are statistically significant (untabulated).

The restatements are economically significant. Although restatements are, on average, substantially smaller in magnitude than the initial estimates, they are highly variable. Specifically, the standard deviation of nominal (real) GDP growth restatement is 1.98 (2.08), which is at least 50% of the standard deviation of initially announced nominal (real) GDP growth that is equal to 3.60 (3.15). The ranges of restatements are also large. The fifth percentile of restatements in nominal (real) GDP growth is -3.09% (-3.04%) and the 95th percentile is 3.65% (3.46%). In addition, we observe changes in the sign of growth from initial to current estimate. The nominal (real) GDP growth estimates switch signs from positive to negative and vice versa in 2.5% (7.5%) of quarters. For example, the initial announcement of nominal (real) GDP growth for the first quarter of 2008 (2001)—3.19% (1.98%)—was subsequently revised to -0.46% (-1.14%). Overall, the variability of restatements, their magnitude ranges, and the presence of sign changes between the initial and current revised values suggest that restatements are economically significant. Compared to GDP restatements, the magnitude and variability of unemployment restatements are lower; however, on average, they are statistically significantly different from zero.

The mean values of earnings dispersion (*Ear_Disp*), employment growth dispersion (*EmpG_Dis*), and return dispersion (*Ret_Disp*) are zero by construction, as these estimates are residuals from the AR(2) process.

4. Empirical Results

4.1. Earnings Growth Dispersion and "True" Underlying Unemployment and GDP Growth

Earnings Growth and Employment: Firm-level Evidence

In motivating aggregate earnings growth dispersion as a predictor of unemployment, and consequently GDP growth, we propose that earnings growth is associated with labor reallocation. That is, firms with worsening (improving) performance tend to lay off (hire) workers. Further, we expect that earnings-based performance measures have incremental information compared to labor movement predictors used in macroeconomics—past employment changes and stock returns. Although it is intuitive to expect that earnings growth is associated with decisions to expand or contract the work force, prior empirical evidence confirming such association mostly pertains to large-scale layoffs (e.g., Ofek 1993; Chen, Mehrotra, and Sivakumar 2001). Accordingly, in this section we verify that changes in earnings are associated with changes in firm-level employment. We use annual data because employment figures are available in Compustat only at the yearly frequency. We restrict the sample to December fiscal-year-end firms. Compustat annual data are available starting in 1962, whereas quarterly data used in our main aggregate-level analyses start in 1972. To maintain consistency across analyses, this section reports results for both sample periods.

Specifically, we estimate the following yearly cross-sectional regressions, where *i* and *t* subscripts correspond to firms and years, respectively:

$$EmpGr_{i,t} = Int_t + ChEarn_{i,t-1} + ChEarn_{i,t-2} + EmpGr_{i,t-1} + EmpGr_{i,t-2} + Ret_{i,t-1} + Ret_{i,t-2} + \varepsilon_{i,t}, \quad (5)$$

where $EmpGr_{i,t}$ is employment growth estimated as a change in the number of employees (Compustat item *EMP*) from year *t*-1 to year *t*, scaled by the book value of equity at the end of year *t*-1; $ChEarn_{i,t}$ is change in annual earnings from year *t*-1 to year *t*, scaled by book value at the end of year *t*-1; and $Ret_{i,t}$ is annual stock return for calendar year *t*.

Table 2 reports regression results, where reported regression coefficients are averages from annual cross-sectional regressions. The statistical significance is estimated using Fama-MacBeth (1973) *t*-statistics, with Newey-West (1987) adjustment for autocorrelation. The results suggest that all three predictors, earnings changes, employment growth, and stock returns, are significantly associated with future employment growth. Importantly, earnings changes are incrementally useful in predicting employment growth as far as two years (one year) ahead in the full sample (sample starting in 1972).

Earnings Growth Dispersion, Unemployment, and GDP Growth: Macro-level Evidence

In this section, we investigate how the micro-level association between earnings growth and employment changes translates into macroeconomic relationships between aggregate earnings growth dispersion, unemployment, and GDP. Figure 2 describes the framework underlying our tests. Unemployment and GDP growth are contemporaneously negatively associated according to Okun's Law (Okun 1962). Unemployment is affected by labor reallocation (e.g., Lucas and Prescott 1974). Labor reallocation is not directly observed. It can be proxied for by a dispersion in industry-level employment growth (Lilien 1982), dispersion in

stock returns (Loungani et al. 1990; Brainard and Cutler 1993), or, as we propose, dispersion in earnings growth. The primary purpose of empirical analyses in this section is to establish whether aggregate earnings growth dispersion is incrementally predictive of unemployment and GDP growth after controlling for the two other labor reallocation proxies. We use current restated values of GDP growth and unemployment because we are interested in information that can improve the "nowcasts" of the *true* underlying macroeconomic aggregates.

Table 3 reports correlations among the variables used in the framework in Figure 2. Several univariate correlations are worth noting (for brevity, we only discuss the Pearson correlation coefficients). First, consistent with Okun's Law, unemployment changes are strongly negatively contemporaneously associated with both nominal and real GDP growth (correlation coefficients of -0.49 and -0.68, respectively). Second, all three lagged dispersion variables—earnings growth, employment growth, and returns—are significantly positively correlated with the next-quarter unemployment changes. The latter result is consistent with all three dispersion variables capturing labor reallocation.

To fully take into account the time-series and cross-sectional correlations among dispersion measures, unemployment, and nominal and real GDP growth, we model co-evolution of these variables through the vector autoregression analysis (VAR).[18] Our VAR specification includes three macro variables (nominal and real GDP growth, and unemployment changes) and three labor reallocation proxies (earnings growth dispersion, employment growth dispersion, and return dispersion). All six variables included in our VAR estimation are stationary, according to Augmented Dickey-Fuller test (Dickey and Fuller 1979).

[18] In untabulated tests, we also estimate the VAR system with either real or nominal GDP, but not both. The inferences from these tests are similar to those discussed in this section.

We specify the following one-lag VAR system:[19]

$$\mathbf{Z}_t = \mathbf{A} + \mathbf{B}\mathbf{Z}_{t-1} + \mathbf{e}_{t,} \quad (6)$$

where $\mathbf{Z}_t$ is a vector of stationary variables including nominal GDP growth, real GDP growth, change in unemployment, earnings growth dispersion (*Ear_Disp*), employment growth dispersion (*Emp_Disp*), and return dispersion (*Ret_Disp*) for quarter *t*. **A** (**B**) is a 6x1 (6x6) coefficient matrix, and $\mathbf{e}_t$ is a 6x1 vector of shocks (or impulses).

The results of the VAR estimation are presented in the form of impulse response functions (IRFs) in Figure 3. IRFs capture the over-time reaction of a response variable to a one-standard-deviation shock to an impulse variable. The band around the IRF curve corresponds to a 90% confidence interval estimated using the bootstrap procedure.

The results are consistent with all three dispersion measures capturing labor reallocation in the framework presented in Figure 2. Namely, there is a contemporaneous negative association between all three dispersion measures and unemployment. However, impulse response at one or more lags is statistically significant only for the shocks to earnings or employment growth dispersion.[20] The (untabulated) IRFs constructed with unemployment and GDP growth as impulse variables suggest that unemployment and both real and nominal GDP growth are negatively contemporaneously associated.

The VAR results confirm our main conjecture that aggregate earnings growth dispersion captures reallocation-related unemployment incrementally to other dispersion measures. After

[19] One lag is the most appropriate in our setting, according to Schwarz Bayesian information criterion. An alternative Hannan-Quinn information criterion recommends using two lags. When we define a VAR system with two lags, we obtain similar conclusions regarding the effects of various labor reallocation proxies on GDP and unemployment.

[20] Our VAR estimation relies on the first-differenced unemployment rates because unemployment series are not stationary in Dickey and Fuller (1979) test. Brainard and Cutler (1993) find that shocks to return dispersion predict innovations in unemployment *levels*. When we use unemployment levels instead of changes, we find that return dispersion predicts unemployment rates up to two quarters ahead.

controlling for the effects of other VAR variables, a positive earnings growth dispersion shock results in a significant decrease (increase) in nominal and real GDP growth (unemployment) for up to 6 and 3 quarters (up to 3 quarters), respectively. Further, while employment growth and return dispersion shocks significantly affect future nominal GDP growth, only shocks in earnings growth dispersion lead to a significant response in real GDP growth.

Overall, these results are consistent with earnings growth dispersion being associated with labor reallocation that, in the presence of frictions, increases unemployment and depresses output. Further, the ability of earnings growth dispersion to predict unemployment and GDP growth is incremental to labor reallocation proxies used in macroeconomics.

4.2. Predicting GDP Growth Restatements

The results from the previous section suggest that earnings growth dispersion contains information relevant for GDP growth "nowcasting". In this section, we investigate whether such publicly available information is fully incorporated into initially announced GDP estimates. Specifically, we test whether aggregate earnings growth dispersion can predict GDP growth restatements.

Our restatement predictability tests rely on OLS regressions, which is consistent with other macro restatement research (e.g., Aruoba 2008). Such approach evaluates simple statistical predictions, rather than testing a structural model. In addition, OLS regressions allow us to establish incremental predictive ability of earnings growth dispersion relative to other known restatement predictors.[21] Specifically, we estimate the following time-series regressions that

[21] Our full regression specification includes 20 independent variables, excluding the intercept. Estimating a one-lag VAR system with 20 variables requires determining 420 (20x1+(20x20)) coefficient estimates. Such estimation is infeasible for our sample of 158 observations.

include lagged earnings growth dispersion and other previously documented or potentially important restatement predictors:

$$\begin{aligned} Restatement_t = {} & \beta_0 + \beta_1 \cdot Ear\_Disp_{t-1} + \beta_2 \cdot EmpG\_Disp_{t-1} + \beta_3 \cdot Ret\_Disp_{t-1} \\ & + \beta_4 \cdot Ear\_Disp_{t-2} + \beta_5 \cdot EmpG\_Disp_{t-2} + \beta_6 \cdot Ret\_Disp_{t-2} \\ & + \beta_7 \cdot EmpG\_Disp_t + \beta_8 \cdot Ret\_Disp_t + \beta_9 \cdot Mkt\_ret_t \\ & + \beta_{10} \cdot Mkt\_ret_{t-1} + \beta_{11} \cdot Mkt\_ret_{t-2} + \beta_{12} \cdot Ear_{t-1} + \beta_{13} \cdot Ann\_ret_t \\ & + \beta_{14} \cdot Initial\_est_t + \beta_{15} \cdot Ini\_Unemp_t + \beta_{16} \cdot Ini\_Indp_t + \beta_{17} \cdot Time\_Trend_t \\ & + \beta_{18} \cdot Recession_t + \beta_{19} \cdot Liquidity_t + \beta_{20} \cdot Res_{t-1} + \varepsilon_t \quad , \end{aligned} \tag{7}$$

where $Restatement_t$ is the restatement in nominal or real GDP growth for quarter t (equal to final restated estimate minus initial estimate); Ear_Disp_{t-1} is earnings growth dispersion (measured using earnings for fiscal quarter t-1 that are released in quarter t); $EmpG\_Disp_{t-1}$ is employment growth dispersion for quarter t-1; Ret_Disp_{t-1} is dispersion in quarter t-1 returns; Mkt_ret_t is market return for quarter t; Ear_t is aggregate earnings for quarter t; Ann_ret_t is the S&P 500 return on the day when initial GDP for quarter t is announced; Ini_est_t is the initially announced real or nominal GDP growth for quarter t; Ini_Unemp_t is the initially announced unemployment rate for quarter t; Ini_Indp_t is the initially announced estimate of industrial production growth for quarter t; $Time\_Trend_t$ is the time trend (equal to 1 for 1973:Q1 and increasing by 1 every quarter); $Recession_t$ is a dummy variable that equals 1 for quarters classified as recessionary by the NBER; $Liquidity_t$ is aggregate liquidity shocks for quarter t; and Res_{t-1} is a restatement made over the prior quarter for the nominal or real GDP growth estimate initially announced in quarter t-1. See the Appendix for details of variable estimation.

Results are presented in Table 4. A one-standard-deviation increase in lagged earnings growth dispersion predicts a 0.50% (0.47%) decrease in restatement in the nominal (real) GDP

growth.[22] This association is not only statistically, but also economically significant. The change in the nominal (real) GDP growth restatement due to a one-standard-deviation increase in lagged earnings growth dispersion amounts to 8% (20%) of the mean initial nominal (real) GDP growth estimate, i.e. a 0.50% (0.47%) change in restatement relative to the mean initial estimate of 6.07% (2.36%). In contrast, one-quarter-lagged dispersion in employment growth or stock returns does not predict GDP restatements. These results suggest that it is the *incremental* information content of earnings growth dispersion that macroeconomists do not fully incorporate.

Next, we investigate whether performance dispersion measures from other quarters can predict GDP restatements. First, we include two-quarter lags for all three labor reallocation proxies. The VAR results suggest that dispersion in aggregate earnings growth predicts unemployment and GDP growth at lags longer than one quarter. Further, stock returns may be a leading indicator of labor reallocation shocks. Second, we include return and employment growth dispersion for the quarter contemporaneous to a GDP estimate. These measures represent more recent labor-reallocation-related information that is already available at the time when an initial GDP estimate is announced.[23] The results of regressions that include labor reallocation proxies from different quarters are reported in columns (2) and (6) of Table 4. Neither earnings growth dispersion at a longer lag, nor any of the return- or employment-growth-based dispersion measures can significantly predict GDP restatements beyond dispersion in one-quarter-lagged earnings growth.

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[22] The real (nominal) GDP restatement change due to a one-standard-deviation change in earnings dispersion is obtained by multiplying the coefficient on earnings growth dispersion from column (1) (column (5)) of Table 4, equal to -20.22 (-19.14), by the standard deviation of earnings dispersion (0.0245).

[23] Return information is available immediately at the end of the quarter, whereas initial sectoral employment changes are announced in the first week following quarter end. The initial GDP estimates are announced three weeks after the quarter end.

Finally, we control for other known predictors of macroeconomic restatements and variables potentially associated with both earnings growth dispersion and restatements. Specifically, we add aggregate market returns for the three prior quarters, aggregate earnings for the prior quarter, initial GDP and unemployment estimates, initial-announcement-day market return, restatements in GDP made over the prior quarter for the estimate initially announced in quarter *t*-1, and a recession dummy as control variables. The latter variable is motivated by prior research documenting that macroeconomic indicators are especially difficult to predict during economic recessions (Swanson and Van Dijk 2006). In addition, we include industrial production estimates and aggregate liquidity shocks as controls because Jorgensen et al. (2012) report that these variables are significantly correlated with aggregate earnings dispersion. Finally, we control for the time trend in restatements. Several control variables, including initial-announcement-day returns, recession indicator, and time trend, are not available to the BEA economists when the initial GDP estimates are compiled. The purpose of controlling for these variables is to establish whether the restatement prediction ability of aggregate earnings growth dispersion is distinct from any empirical associations documented previously.

Regression results with a full set of controls are reported in columns (3) and (7) of Table 4. The coefficient on lagged earnings dispersion remains statistically significant. Among other performance dispersion measures, return dispersion for the prior quarter becomes statistically significant when predicting nominal GDP restatements. Out of the additional restatement predictors, only initial estimates of real GDP growth and industrial production are significantly associated with subsequent real GDP restatements. In addition, there is a statistically significant downward time trend in all GDP restatements, whereas real GDP growth restatements are significantly lower in recessions. Overall, these results suggest that earnings-dispersion-based

restatement predictability is incremental to predictability documented in prior research.

Our sample period contains the most severe recession since the Great Depression. To verify that a single business-cycle episode does not drive our results, we re-estimate predictive regressions after dropping observations from the fourth quarter of 2007 to the first quarter of 2009. Results are reported in columns (4) and (8) of Table 4. The ability of lagged earnings information to predict restatements is robust to excluding the crisis period. Specifically, lagged earnings growth dispersion continues to predict restatements in both nominal and real GDP growth.

Overall, restatement predictability results suggest that economists do not fully take into account the link between lagged (quarter *t*-1) aggregate earnings growth dispersion and quarter *t* GDP. The previously documented restatement predictors do not subsume this predictability.

4.3. Labor Reallocation versus Alternative Explanations

Our results suggest that earnings growth dispersion provides useful information about the "true" state of the economy that government statistical agencies do not completely take into account when compiling the initial GDP estimates. In this section, we provide further evidence that this information pertains to labor reallocation.

Predicting Unemployment Restatements

If higher earnings growth dispersion signals lower output because it is associated with increases in unemployment, and macroeconomists do not fully take that link into account, we should observe similar predictability in unemployment restatements. Unemployment figures are compiled and announced by the BLS. Similar to GDP figures, early unemployment estimates are based on incomplete and imprecise information. The initial estimates are then revised over

several subsequent years. The BLS releases unemployment estimates on a monthly basis. To keep our research design in line with the GDP-based analysis, we use average quarterly estimates contained in the Real-Time Data Set for Macroeconomists maintained by the Philadelphia Federal Reserve.

Table 5 reports results of regressing unemployment restatements on earnings growth dispersion and other predictors. The coefficient on earnings growth dispersion is statistically significant — higher earnings dispersion leads to higher unemployment restatements. The results are robust to controlling for other restatement predictors and the time trend, as well as exclusion of the Great Recession period. Interestingly, earnings growth dispersion from two quarters ago also predicts unemployment restatements. Overall, these results are consistent with macroeconomists not fully taking into account information contained in earnings growth dispersion that pertains to labor reallocation frictions and unemployment.

Decomposing Earnings Growth Dispersion

The frictions associated with labor reallocation should be higher when workers relocate to a different industry and thus need to acquire new skills or relocate. As a result of higher frictions, the unemployment increase and loss of output should be larger. All else equal, we should observe that across-industry earnings growth dispersion leads to greater downward (upward) restatements in GDP growth (unemployment).

We estimate across-industry earnings growth dispersion as follows. Every quarter, we assign firms to one of the 49 Fama-French industries (Fama and French 1997).[24] For each industry, we estimate the equally weighted average of firm-level earnings growth measures. The

[24] We obtain industry definitions from Kenneth French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

standard deviation in these industry earnings growth estimates is across-industry earnings growth dispersion. We remove the persistent component in across-industry earnings growth dispersion by estimating the AR(2) model and using residuals from the model as our measure of innovation in dispersion. To obtain two components of total dispersion (*Ear_Disp*) that pertain to across-industry and within-industry dispersion, we regress total dispersion on across-industry dispersion from the previous step. The fitted value is the across-industry dispersion component of total dispersion (*Ear_Disp_Ind*). The residual is the component orthogonal to the across-industry dispersion component (*Ear_Disp_Orth*).

Results based on the dispersion decomposition are reported in Table 6. The evidence is consistent with our conjectures. Specifically, the regression coefficient on across-industry dispersion is almost twice as large as the coefficient on the orthogonal dispersion component in GDP restatement regressions (columns 1 and 4). The differences are economically significant. A one-standard-deviation increase in prior-quarter across-industry dispersion predicts a 0.39% (0.36%) decrease in restatement of nominal (real) GDP growth.[25] A corresponding one-standard-deviation increase in the orthogonal component predicts only a 0.24% (0.23%) decrease in restatement of nominal (real) GDP growth. The unemployment-restatement results similarly point to larger effects pertaining to across-industry earnings growth dispersion. Across all restatements, the coefficients on the across-industry component of earnings growth dispersion remain larger in magnitude after controlling for other restatement predictors and excluding the crisis period.

[25] Standard deviations of across-industry dispersion and the orthogonal component are 0.015 and 0.019, respectively (untabulated). The restatement change due to a one-standard-deviation change in earnings dispersion is obtained by multiplying the coefficient on earnings dispersion by the standard deviation of earnings dispersion.

Controlling for Uncertainty

Ample empirical evidence in economics and finance suggests that aggregate economic uncertainty is countercyclical (Bloom 2009, 2014). An alternative interpretation of our results is that earnings growth dispersion does not capture labor reallocation and resulting unemployment, but instead points to increased economic uncertainty. While this explanation does not preclude the usefulness of earnings growth dispersion in improving early GDP growth estimates, it suggests a different mechanism through which dispersion is linked to economic conditions. Such different mechanism requires establishing incremental usefulness of accounting-based dispersion compared to other uncertainty measures. Accordingly, we include two widely used uncertainty measures as additional control variables in our restatement prediction tests. The first variable, VIX index (*VIX*), is the Chicago Board Options Exchange (CBOE) market volatility index. It captures uncertainty in the stock market (Whaley 1993; Bekaert, Hoerova, and Lo Duca 2013; Jorgensen et al. 2012). The second variable, economic policy uncertainty index (*EU*), captures uncertainty associated with policy changes and future economic conditions (Baker, Bloom, Canes-Wrone, Davis, and Rodden 2014; Baker, Bloom, and Davis 2014). This index has three components: (1) newspaper coverage of policy-related economic uncertainty, (2) the number of federal tax code provisions set to expire in future years, and (3) disagreement among economic forecasters.[26] Regressions that include VIX (economic policy uncertainty index) are restricted to the post-1990 (post-1985) period when the corresponding data are available.

Regression results controlling for uncertainty measures are reported in Table 7. Earnings growth dispersion continues to be a significant predictor of future GDP growth and unemployment restatements. Out of the two uncertainty measures, only information contained in

[26] Economic policy uncertainty data are obtained from http://www.policyuncertainty.com/us_monthly.html.

the VIX index is not fully incorporated in macroeconomic estimates. Specifically, the VIX index predicts unemployment restatements. In untabulated results, we also include lagged uncertainty measures as additional controls. These measures are not significantly related to restatements, while earnings growth dispersion continues to be a significant restatement predictor.

5. Out-of-Sample Tests

In this section, we conduct out-of-sample tests to investigate whether initial macroeconomic estimates can be improved using real-time accounting information. Our main analyses rely on restatements accumulated between the initial and currently available estimates. Using such restatement specification is infeasible in out-of-sample tests because the current (as of December, 2013) vintage of macroeconomic estimates is not available in real time. Accordingly, we conduct out-of-sample tests using one-year (five-quarter) or two-year (nine-quarter) horizon restatements, i.e. second or third restated estimate less initial estimate in Figure 1. One or two years provide sufficient time to accumulate changes in macroeconomic estimates due to new information arrival, whereas a finite restatement horizon allows us to avoid look-ahead bias in out-of-sample tests. In addition, we alter the last step of earnings growth dispersion estimation, adjusting for autocorrelation. In our in-sample tests, the AR(2) residuals for earnings growth dispersion are estimated using the full sample. In this section, we estimate AR(2) residuals within each hold-out model estimation period on a rolling basis, which avoids a look-ahead bias.

To conduct out-of-sample tests, we first regress restatements on earnings dispersion within expanding windows starting in the third quarter of 1972 and ending with earnings dispersion estimated at the end of quarter *t*:

$$Rest_{t+1} = \mu_0 + \mu_1 \cdot Ear\_Disp_{t-1} + \vartheta_{t+1}, \quad (8)$$

where $Rest_{t+1}$ is a one- or two-year horizon restatement in nominal (real) GDP growth (the restated value as of the end of quarter t+6 or t+10 minus the value initially released in quarter t+1), and Ear_Disp_{t-1} is quarter t-1 earnings dispersion measured at the end of quarter t.

Second, we combine coefficient estimates, $\hat{\mu}_0$ and $\hat{\mu}_1$, with earnings dispersion measured at the end of quarter t+10 to arrive at the restatement forecast for the value that is initially announced in quarter t+11. Thus at the time of the restatement forecast, all data used to estimate model (8) are publicly available. Namely, the forecast of a restatement is equal to

$$Pred\_Rest_{t+11} = \hat{\mu}_0 + \hat{\mu}_1 \cdot Ear\_Disp_{t+9}, \quad (9)$$

where $Pred\_Rest_{t+11}$ is the restatement forecast for the initial value announced in quarter t+11, $\hat{\mu}_0$ and $\hat{\mu}_1$ are coefficient estimates from equation (8), and Ear_Disp_{t+9} is earnings dispersion for quarter t+9 measured at the end of quarter t+10.

We compare our forecasts to the historical average of restatements from the same expanding hold-out window, which is equivalent to estimating equation (8) with only an intercept. Historical average is a simple and intuitive benchmark used both in macro forecasting literature (e.g., Aruoba 2008) and in equity premium forecasting (e.g., Campbell and Thompson 2008; Welch and Goyal 2008). In line with these studies, we evaluate out-of-sample forecast efficiency by comparing the mean squared prediction error (MSPE) of our model to that of the benchmark. Specifically, we estimate the Clark and West (2007) adjusted MSPE statistic as follows:

$$CW_t = (Rest_t - Avg\_Rest_t)^2 - [(Rest_t - Pred\_Rest_t)^2 - (Avg\_Rest_t - Pred\_Rest_t)^2], \quad (10)$$

where CW_t is the Clark and West statistic, $Rest_t$ is the actual restatement for quarter t, $Pred\_Rest_t$ is the forecast of a restatement for quarter t from the accounting equation (9), and Avg_Rest_t is the historical average of restatements estimated over the hold-out period used in equation (8).

The first two components in equation (10) correspond to MSPEs of the benchmark historical average and our prediction models, respectively, whereas the third component adjusts for the noise introduced by estimating more parameters in the more complex model. A positive average *CW* implies that our prediction model has lower MSPE relative to the historical average. To formally evaluate the (alternative) hypothesis that mean $CW > 0$, *CW* statistics for all quarters in the forecast evaluation period are regressed on a constant. The intercept indicates average out-of-sample predictive performance of our model relative to the benchmark, where statistical significance is evaluated using one-sided bootstrapped *p*-values.

Table 8 contains average *CW* statistics and corresponding *p*-values. To benchmark our out-of-sample forecast performance against evidence from the most recent comprehensive macroeconomic restatement predictability study (Aruoba 2008), our longest forecast evaluation period includes forecasts starting from the first quarter of 1984 (Panel A of Table 8). We also report results for three more recent evaluation periods: starting in the first quarter of 1989 (Panel B), the first quarter of 1994 (Panel C), and the first quarter of 1999 (Panel D).

Irrespective of the forecast evaluation period used, evidence presented in Table 8 suggests that a simple earnings-dispersion-based model significantly outperforms historical-average estimates when predicting one-year restatements in both real and nominal GDP growth. For the two-year restatements, there is overwhelming evidence of predictability in real GDP growth. Specifically, all *CW* statistics are positive and statistically significant, with the exception of the forecast evaluation period starting in 1989. For the two-year restatements in nominal GDP

growth, *CW* statistics are marginally significant for the periods starting in 1984 and 1994, and significant for the latest period starting in 1999. Overall, predictability has been increasing over time, with *CW* statistics (almost) monotonically increasing for the one-year (two-year) horizon restatements when moving from the earlier to the more recent forecast evaluation periods.

6. Robustness Checks

We conduct several robustness checks. First, we verify that our results are not sensitive to the restatement horizon. Our main results are based on restatements accumulated between the initially announced and currently available final estimates. As discussed in Section 3, using final estimates has both advantages and disadvantages. Accordingly, we verify that our results are robust to using fixed-horizon restatements. When we replicate our tests using either two-year restatements (the third restated estimate minus the initial estimate in Figure 1) or one-year restatements (the second restated estimate minus the initial estimate in Figure 1), our results remain qualitatively similar. Specifically, lagged earnings growth dispersion continues to significantly predict restatements in nominal and real GDP growth and unemployment.

Second, to understand at what stage of the restatement process aggregate accounting information is incorporated into macroeconomic estimates, we examine the term-structure of restatements. Specifically, in addition to the total cumulative restatement (final minus initial estimate), we also explore predictability of restatements accumulated since different vintage points, including restatements accumulated after one, five, and nine quarters following the initial estimate release (i.e., restatements relative to the first, second, and third restated estimates in Figure 1). Lagged earnings growth dispersion robustly predicts restatements at all considered horizons. However, predictability decreases when the restatement accumulation starting point is

moved to later quarters. Such reduction in restatement predictability suggests that the BEA uses alternative sources of information to gradually adjust GDP estimates in the direction initially suggested by accounting information.

Third, our main results use equal-weighted earnings and returns to estimate aggregate earnings and market returns, respectively. The results are similar when we use value-weighted averages for aggregate earnings and returns estimation.

Fourth, we examine the robustness of findings to alternative deflators for earnings. Specifically, we re-estimate aggregate earnings and earnings dispersion after replacing the book value of equity deflator in equation (1) with either total assets or market value of equity. The re-estimated earnings growth dispersion continues to robustly predict restatements.

Finally, in addition to the VIX and economic policy uncertainty controls, we examine the robustness of our results to the inclusion of realized return volatility. This variable is estimated at the quarterly frequency as the standard deviation of daily returns on the value-weighted CRSP market index. The results (untabulated) suggest that earnings growth dispersion continues to be a significant predictor of GDP growth and unemployment restatements after controlling for the realized return volatility.

7. Conclusion

We find that at the firm level accounting-based earnings growth estimates have incremental ability to predict employment changes relative to employment reallocation predictors used in macroeconomic research. At the macro level, earnings dispersion is incrementally useful in predicting future unemployment and GDP growth. Government agencies

do not fully incorporate this information in early GDP estimates. As a result, earnings growth dispersion predicts restatements in both real and nominal GDP growth estimates.

The restatement predictability results are robust to various research design changes and can be replicated in an out-of-sample setting using information available to statistical agencies in real time. Importantly, accounting information predicts restatements even after controlling for other known restatement predictors. Further, investors do not fully anticipate restatements that can be predicted by earnings growth dispersion. Specifically, lagged earnings growth dispersion predicts GDP restatements after controlling for the initial GDP announcement-day stock market returns. The latter are used in prior research to gauge the extent to which the stock market anticipates future GDP revisions (Gilbert 2011).

The notion that accounting earnings contain macroeconomic information is widely recognized.[27] Studies that are closest to our research objective explore the efficiency of macroeconomic forecasts with respect to accounting information, including forecasts of inflation (Kothari et al. 2013), nominal and real GDP growth (Konchitchki and Patatoukas 2014a, 2014b), and unemployment and industrial production (Kalay et al. 2014). Unlike these studies, we investigate whether the "realized" values of macroeconomic aggregates contain predictable errors. That is an important question in itself. Numerous economists issue macroeconomic forecasts and several surveys aggregate such forecasts. These forecasts differ in efficiency and

[27] Studies that explore macroeconomic content of aggregate earnings or earnings forecasts include, among others, Kothari, Lewellen, and Warner (2006), Anilowski, Feng, and Skinner (2007), Shivakumar (2007, 2010), Sadka and Sadka (2009), Cready and Gurun (2010), Hann, Ogneva, and Sapriza (2012), Choi, Kalay, and Sadka (2012), and Gallo, Hann, and Li (2013). A related stream of research examines the macroeconomic information content of firm-specific earnings and analysts' and/or management's forecasts, including Basu, Markov, and Shivakumar (2010), Hutton, Lee, and Shu (2012), Bonsall, Bozani, and Fischer (2013), Ogneva (2013), Hugon, Kumar, and Lin (2014), and Li, Richardson, and Tuna (2014). Some of the above studies document the macroeconomic content of earnings indirectly by relating them to aggregate stock returns, whereas others explicitly link earnings or earnings forecasts to such macroeconomic indicators as GDP, consumption, industrial production, inflation, and interest rates.

accuracy (e.g., Kothari et al. 2013) report different findings for CPI forecasts from MMS and SPF surveys). In contrast, a single realized value of each macroeconomic indicator is reported by a specific government agency and is heavily scrutinized by investors, policy makers, and economic forecasters.

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Appendix: Variable Definitions

Macro-level Variables

NGDP_Res$_t$	restatement (final restated value minus initially announced value) in seasonally adjusted nominal quarterly GDP growth rate for quarter *t*.
RGDP_Rest	restatement (final restated value minus initially announced value) in seasonally adjusted real GDP growth rate for quarter *t*.
UNEMP_Res$_t$	restatement (final restated value minus initially announced value) in seasonally adjusted civilian unemployment rate for quarter *t*.
Ini_NGDP$_t$	initially announced value of nominal GDP growth for quarter *t*.
Ini_RGDP$_t$	initially announced value of real GDP growth for quarter *t*.
Ini_UNEMP$_t$	initially announced value of civilian unemployment rate for quarter *t*.
NGDP$_t$	final vintage value of nominal GDP growth for quarter *t*.
RGDP$_t$	final vintage value of real GDP growth for quarter *t*.
UNEMP$_t$	final vintage value of unemployment rate for quarter *t*.
Ear_Disp$_{t-1}$	earnings growth dispersion for quarter *t*-1, measured as the residual from an AR(2) model: $$AggEarDisp_{t-1} = \rho_0 + \rho_1 AggEarDisp_{t-2} + \rho_2 AggEarDisp_{t-3} + e_{t-1},$$ where $AggEarDisp_{t-1}$, $AggEarDisp_{t-2}$, and $AggEarDisp_{t-3}$ are aggregate earnings changes dispersion estimates (standard deviation of firm-level earnings changes scaled by lagged book values) for quarters *t*-1, *t*-2, and *t*-3, respectively.
EmpG_Disp$_{t-1}$	sector-level employment growth dispersion for quarter *t*-1, measured as a residual from an AR(2) model: $$AggEmpGDisp_{t-1} = \rho_0 + \rho_1 AggEmpGDisp_{t-2} + \rho_2 AggEmpGDisp_{t-3} + e_{t-1},$$ where $AggEmpGDisp_{t-1}$, $AggEmpGDisp_{t-2}$, and $AggEmpGDisp_{t-3}$ are aggregate employment growth dispersion estimates (standard deviation in 15 sectoral employment growth rates) for quarters *t*-1, *t*-2, and *t*-3, respectively.
Ret_Disp$_{t-1}$	return dispersion in quarter *t*-1, estimated as a residual from the AR(2) model: $$AggRetDisp_{t-1} = \rho_0 + \rho_1 AggRetDisp_{t-2} + \rho_2 AggRetDisp_{t-3} + e_{t-1},$$ where $AggRetDisp_{t-1}$, $AggRetDisp_{t-2}$, and $AggRetDisp_{t-3}$ are aggregate return dispersion (standard deviation in quarterly stock returns) for quarters *t*-1, *t*-2, and *t*-3, respectively.
Mkt_ret$_t$	equal-weighted average return for our sample stocks in quarter *t*.
Ann_ret$_t$	S&P 500 index return on the day of the initial macro indicator announcement for quarter *t*. In regressions predicting GDP (unemployment) restatements, the GDP (unemployment) announcement date is used.
Ear$_{t-1}$	aggregate earnings for quarter *t*-1, measured as the residual from AR(2) model:

	$AggEar_{t-1} = \rho_0 + \rho_1 AggEar_{t-2} + \rho_2 AggEar_{t-3} + e_{t-1}$, where $AggEar_{t-1}$, $AggEar_{t-2}$, and $AggEar_{t-3}$ are aggregate earnings changes (average of firm level earnings changes scaled by lagged book values) for quarters t-1, t-2, and t-3, respectively.
Ini_Indp$_t$	initially announced estimate of industrial production growth for quarter *t*.
Recession	dummy variable that equals 1 for recessionary quarters, classified according to the NBER.
Liquidity$_t$	aggregate liquidity shock based on Pastor and Stambaugh (2003) liquidity definition.
Res$_{t-1}$	restatements made over the prior quarter for the estimate initially announced in quarter t-1. In regressions predicting GDP (unemployment) restatements, the GDP (unemployment) prior-quarter restatements are used.
Ear_Disp_Ind$_{t-1}$	component of earnings growth dispersion pertaining to across-industry variation in quarter t-1 earnings growth.
Ear_Disp_Orth$_{t-1}$	component of earnings growth dispersion orthogonal to across-industry variation in quarter t-1 earnings growth.
VIX$_t$	Chicago Board Options Exchange market volatility index based on the implied volatility of S&P 500 index options for quarter *t*.
EU$_t$	economic policy uncertainty index (Baker et al. 2014) for quarter *t* consisting of three components: (1) newspaper coverage of policy-related economic uncertainty, (2) the number of federal tax code provisions set to expire in future years, and (3) disagreement among economic forecasters.

Firm-level Variables

EmpGr$_t$	growth in annual firm-level employment for year *t*.
ChEarn$_{t-1}$	change in annual firm-level earnings over year t-1 deflated by lagged book value of equity.
Ret$_{t-1}$	firm's stock return for calendar year t-1.

Figure 1. Timeline for Variable Measurement

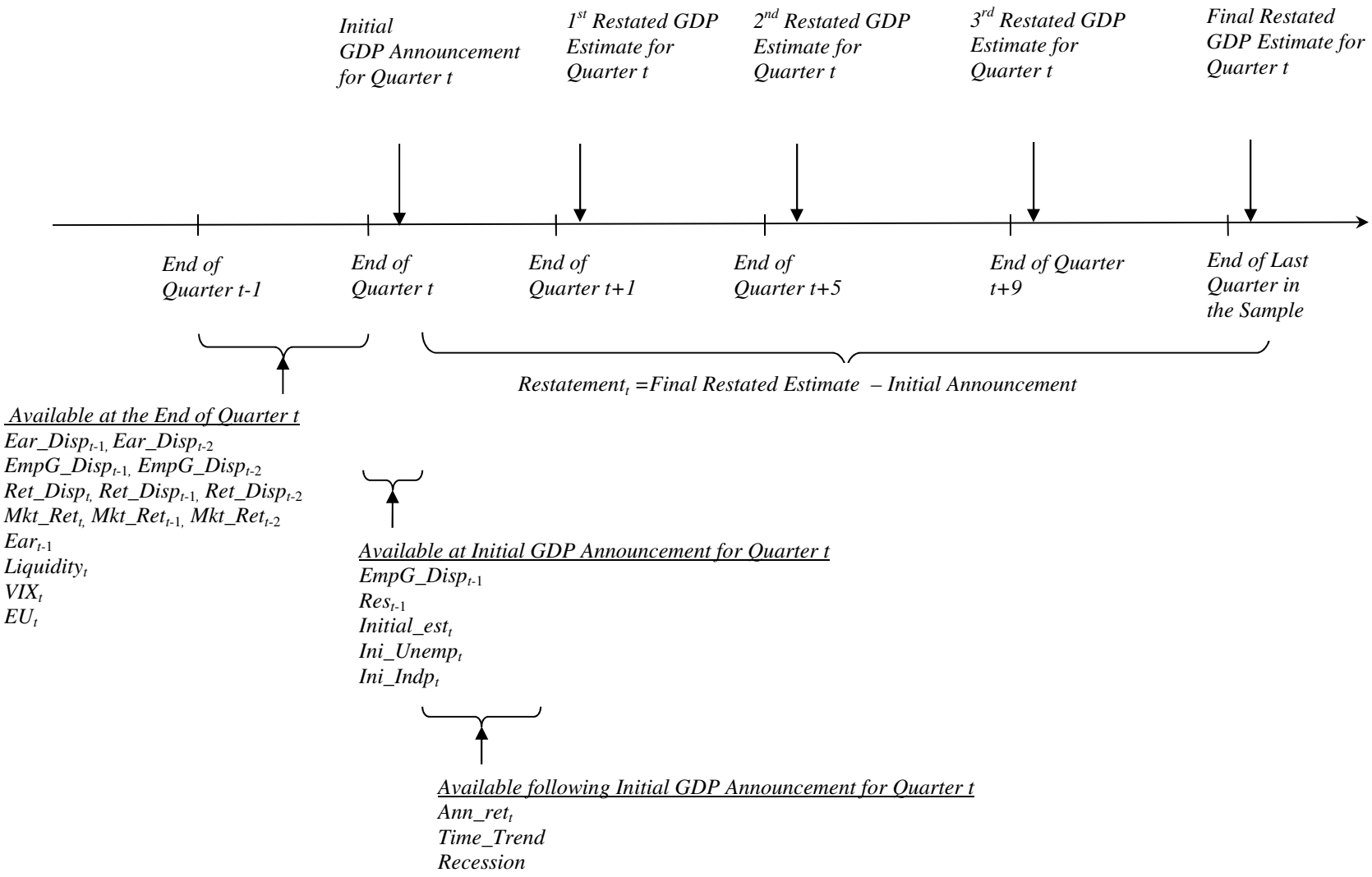


Figure 2. Framework

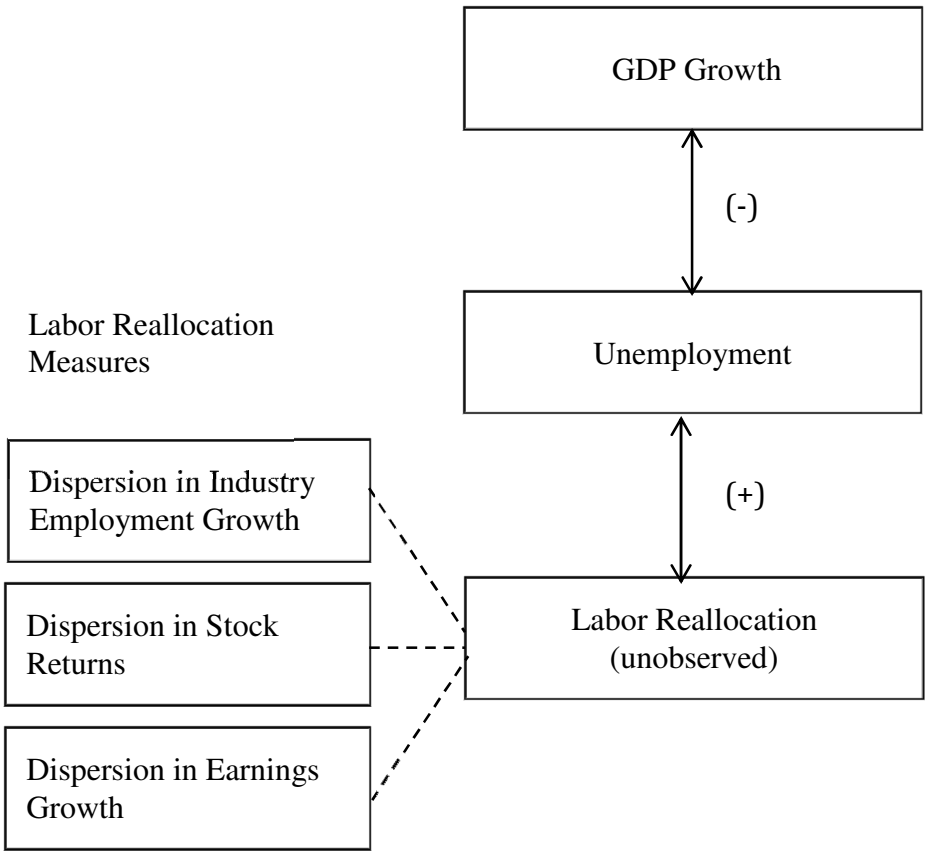
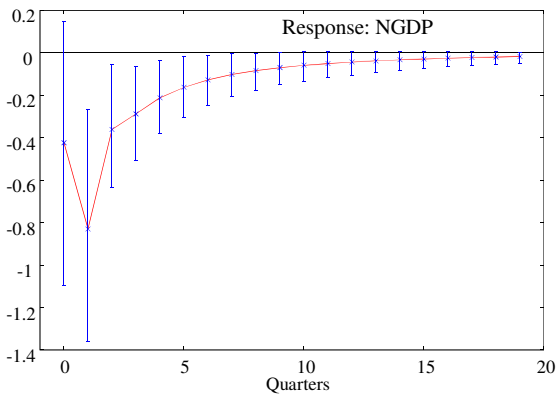
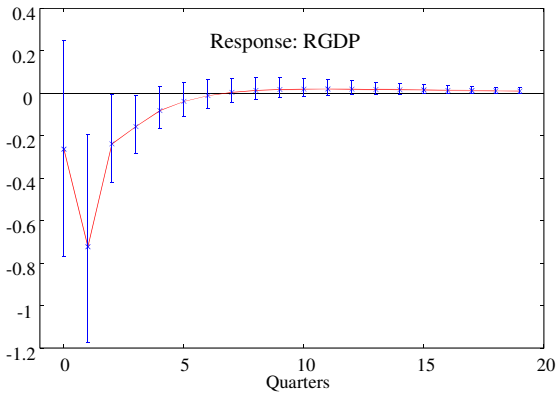


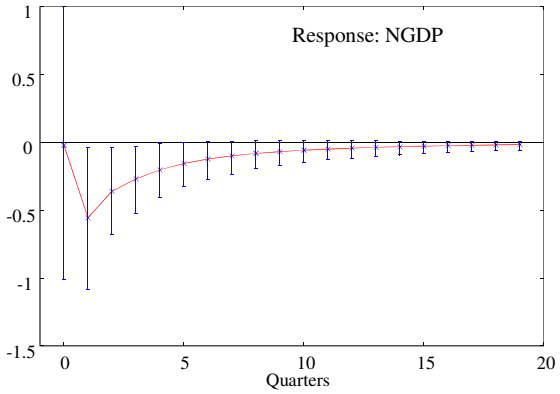
Figure 3. Labor Reallocation Shocks and Macroeconomic Indicators

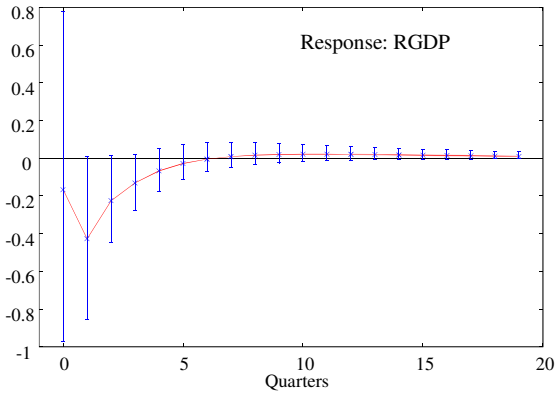
Panel A: Impulse: Earnings Growth Dispersion

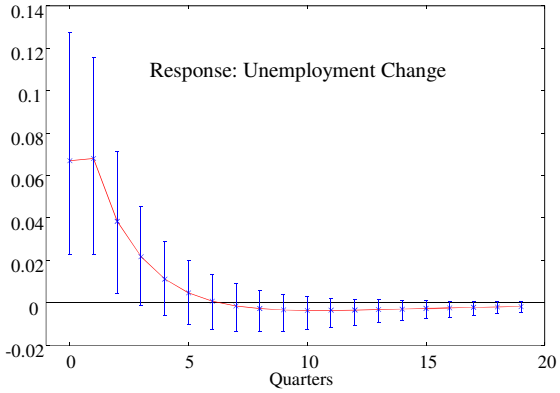




Panel B: Impulse: Employment Growth Dispersion







Panel C: Impulse: Stock Return Dispersion

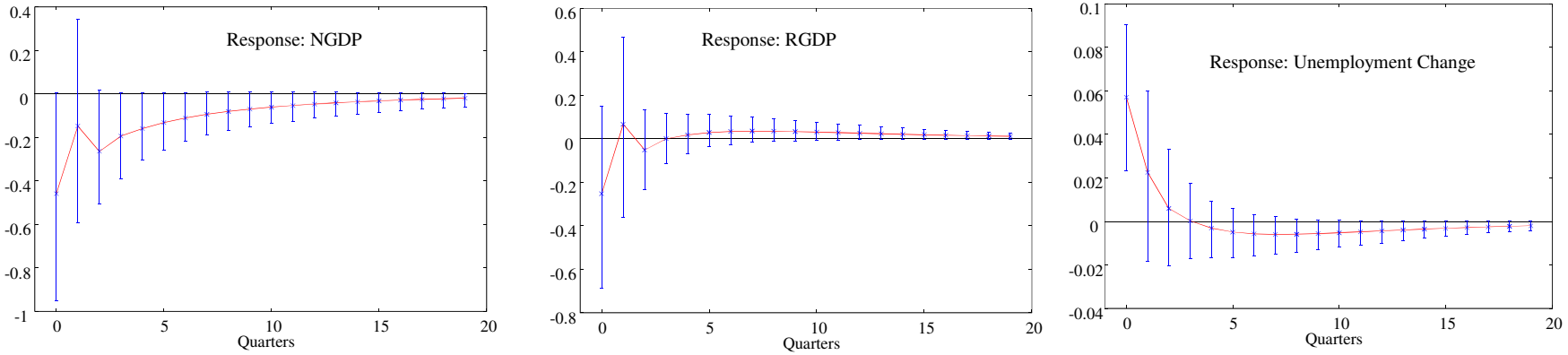


Figure 3 contains impulse response functions from a Vector Autoregression (VAR) estimation. Panels A, B, and C plot responses of macroeconomic indicators (nominal and real GDP growth and unemployment changes) to a one-standard-deviation shock in earnings growth dispersion, employment growth dispersion, and stock return dispersion, respectively. Quarters following the initial shock (quarter 0) are on the horizontal axis. Magnitudes of responses to the initial shock (changes in respective macroeconomic indicators) are on the vertical axis. Vertical lines around each impulse response function curve correspond to 90% confidence intervals estimated using the bootstrap procedure with 10,000 iterations.

Figure 4. Macroeconomic Indicator Restatements

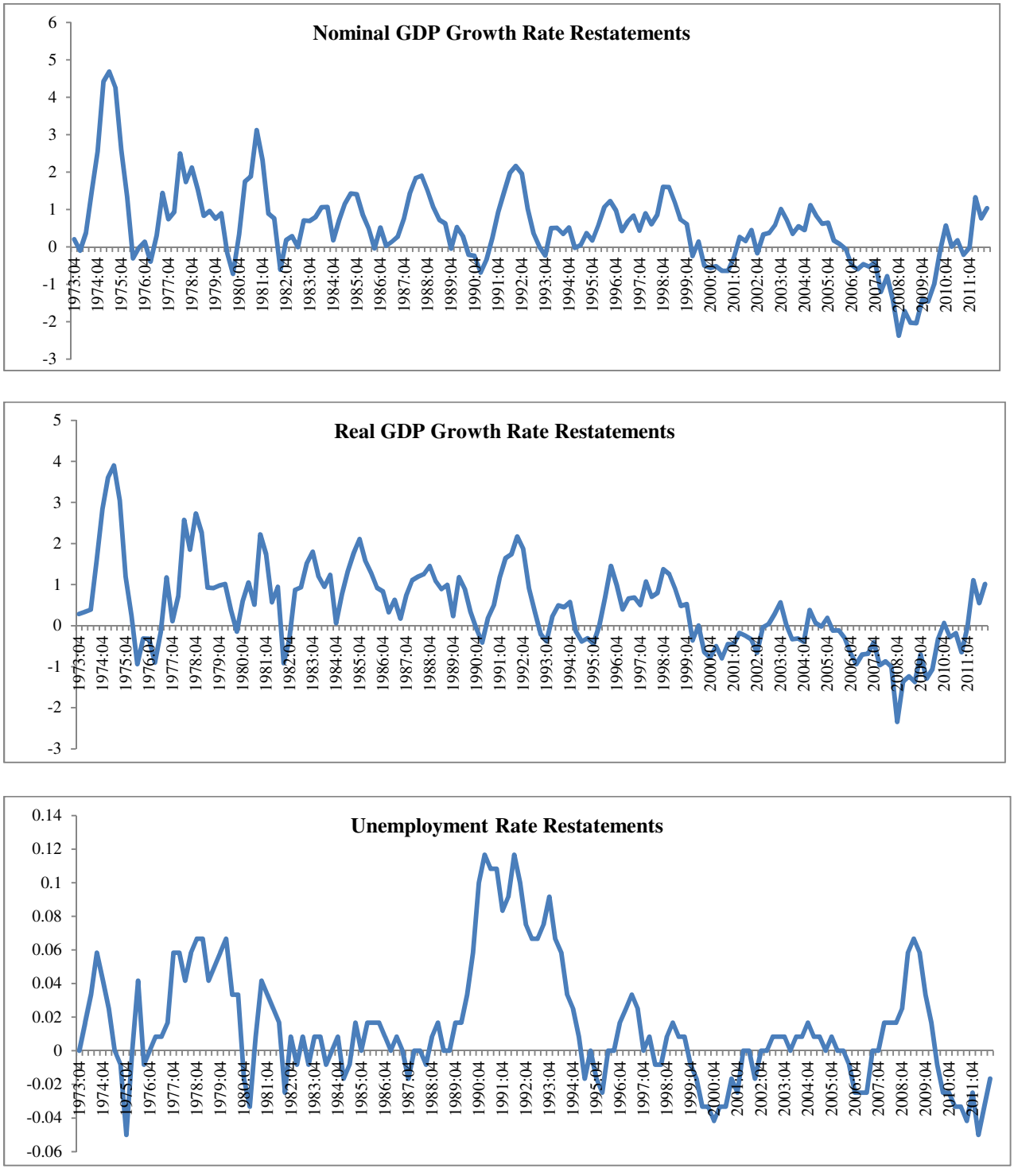


Figure 4 shows the four-quarter moving average of restatements in macroeconomic indicators for 158 quarters from Q1:1973 to Q3:2012. Restatement for quarter *t* is measured as the final restated value minus the initially announced value (see Figure 1 for a timeline description).

Table 1. Descriptive Statistics

	Mean	Std Dev	5%	25%	Median	75%	95%
$NGDP\_Res_t$	0.53	1.98	-3.09	-0.62	0.43	1.59	3.65
$RGDP\_Res_t$	0.46	2.08	-3.04	-0.86	0.41	1.67	3.46
$UNEMP\_Res_t$	0.01	0.07	-0.10	-0.03	0.00	0.07	0.13
Ini_NGDP_t	6.07	3.60	0.41	4.04	5.72	7.78	13.49
Ini_RGDP_t	2.36	3.15	-3.80	1.28	2.54	4.02	7.40
Ini_UNEMP_t	6.43	1.61	4.27	5.27	5.97	7.43	9.63
Ear_Disp_{t-1}	0.00	0.02	-0.03	-0.01	0.00	0.01	0.03
$EmpG\_Disp_{t-1}$	0.00	0.54	-0.51	-0.24	-0.08	0.11	0.73
Ret_Disp_{t-1}	0.00	0.05	-0.06	-0.03	-0.01	0.02	0.09
Mkt_ret_t (%)	3.37	12.33	-19.47	-4.01	3.59	10.80	23.34
Ear_{t-1} (*100)	0.00	0.80	-0.63	-0.23	-0.04	0.14	0.92
Ann_retGDP_t (%)	0.06	1.02	-1.78	-0.52	0.07	0.55	1.91
Ann_retUNP_t (%)	-0.07	1.24	-2.24	-0.69	0.05	0.62	1.75
Ini_Indp_t	2.18	6.65	-11.49	0.00	3.16	5.83	11.63
Recession	0.16	0.37	0.00	0.00	0.00	0.00	1.00
$Liquidity_t$	0.00	0.10	-0.24	-0.03	0.02	0.06	0.12

Table 1 presents descriptive statistics for restatements in real and nominal GDP growth and unemployment, as well as other macro variables. The sample spans 158 quarters from Q1:1973 to Q3:2012. See the Appendix for variable definitions.

Table 2. Firm-level Evidence: Employment Changes Following Earnings Growth

Dep Var	$EmpGr_t$				$EmpGr_t$			
	Sample: 1962-2012				Sample: 1972-2012			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	1.07***	0.70***	0.51**	0.31*	0.78***	0.54**	0.32*	0.21
	(3.64)	(3.36)	(2.34)	(1.82)	(3.35)	(2.68)	(1.70)	(1.23)
$ChEarn_{t-1}$	18.55*	11.21**	10.17*	5.11**	3.81**	3.13**	1.78**	1.42*
	(1.88)	(2.17)	(1.84)	(2.25)	(2.66)	(2.63)	(2.02)	(1.86)
$ChEarn_{t-2}$	10.31*	4.67**	6.08**	2.60**	2.55**	1.69**	1.30*	0.83
	(1.95)	(2.41)	(2.03)	(2.13)	(2.46)	(2.19)	(1.72)	(1.54)
Ret_{t-1}			4.13***	3.81***			2.43***	2.18***
			(3.43)	(3.50)			(5.49)	(5.36)
Ret_{t-2}			1.37**	0.57			1.05**	0.58**
			(2.54)	(1.58)			(4.11)	(2.49)
$EmpGr_{t-1}$		0.14***		0.13***		0.13***		0.11***
		(8.73)		(8.04)		(15.26)		(13.22)
$EmpGr_{t-2}$		0.09***		0.09***		0.08***		0.09***
		(5.37)		(5.78)		(5.48)		(5.76)
Adj. R^2	0.02	0.06	0.04	0.07	0.01	0.05	0.03	0.06
Obs.	140,048	140,048	140,048	140,048	131,501	131,501	131,501	131,501
Number of Years	48	48	48	48	41	41	41	41

Table 2 reports results for cross-sectional regressions of firm-level annual employment growth on lagged firm-level earnings changes, stock returns, and employment growth. $EmpGr_t$ is growth in employment for year t, $ChEarn_{t-1}$ is change in annual earnings over year t-1 deflated by lagged book value of equity, and Ret_{t-1} is a firm's stock return for year t-1. The table contains average coefficients from yearly cross-sectional regressions, as in Fama and MacBeth (1973). t-statistics with Newey-West correction for autocorrelation are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 3. Correlations among Macro Indicators and Labor Reallocation Measures

	Ear_ $Disp_t$	EmpG_ $Disp_t$	Ret_ $Disp_t$	$NGDP_t$	$RGDP_t$	$UNEMP_t$	Ear_ $Disp_{t-1}$	EmpG_ $Disp_{t-1}$	Ret_ $Disp_{t-1}$	$NGDP_{t-1}$	$RGDP_{t-1}$	$UNEMP_{t-1}$
Ear_Disp_t	1	-0.03	0.02	**-0.19**	-0.10	**0.17**	-0.04	0.02	0.06	**-0.15**	-0.09	0.10
$EmpG\_Disp_t$	-0.03	1	**0.14**	-0.01	**-0.14**	**0.32**	0.07	0.03	0.00	-0.08	**-0.20**	**0.15**
Ret_Disp_t	0.09	**0.14**	1	**-0.24**	**-0.16**	**0.29**	0.10	0.04	-0.03	**-0.21**	**-0.17**	**0.17**
$NGDP_t$	**-0.23**	**-0.21**	**-0.33**	1	**0.77**	**-0.49**	**-0.27**	-0.11	**-0.15**	**0.52**	**0.28**	**-0.32**
$RGDP_t$	-0.05	**-0.26**	**-0.22**	**0.73**	1	**-0.68**	**-0.22**	**-0.18**	-0.03	**0.24**	**0.38**	**-0.42**
$UNEMP_t$	**0.13**	**0.29**	**0.18**	**-0.45**	**-0.60**	1	**0.20**	**0.28**	**0.14**	**-0.34**	**-0.56**	**0.66**
Ear_Disp_{t-1}	-0.01	0.07	**0.27**	**-0.32**	**-0.16**	0.09						
$EmpG\_Disp_{t-1}$	0.02	**0.28**	0.08	**-0.19**	**-0.22**	**0.37**						
Ret_Disp_{t-1}	-0.02	0.06	-0.01	**-0.18**	-0.07	**0.14**						
$NGDP_{t-1}$	**-0.20**	-0.10	**-0.16**	**0.49**	**0.22**	**-0.35**						
$RGDP_{t-1}$	-0.10	**-0.21**	-0.09	**0.25**	**0.36**	**-0.47**						
$UNEMP_{t-1}$	0.12	**0.28**	0.07	**-0.31**	**-0.37**	**0.54**						

Table 3 presents Pearson (above diagonal) and Spearman (below diagonal) correlation coefficients for macroeconomic indicators (nominal and real GDP growth and unemployment changes) and alternative labor reallocation measures (earnings growth dispersion, employment growth dispersion, and stock return dispersion). The sample spans 158 quarters from Q1:1973 to Q3:2012. $NGDP_t$ ($RGDP_t$) and $UNEMP_t$ are the final vintage estimates of nominal (real) GDP growth and unemployment rate for quarter *t*, respectively. All other variables are as defined in the Appendix. Values in bold indicate statistical significance at 10% or less.

Table 4. GDP Restatements and Aggregate Earnings Growth Dispersion

Dep Var	NGDP_Res$_t$				RGDP_Res$_t$			
		Full Sample		Ex. Crisis		Full Sample		Ex. Crisis
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.53***	0.53***	2.96**	2.67**	0.46***	0.46***	2.35***	1.98***
	(3.43)	(3.43)	(2.57)	(2.34)	(3.13)	(3.13)	(3.47)	(2.86)
Ear_Disp$_{t-1}$	**-20.22*** **	**-21.31*** **	**-17.63*** **	**-23.38*** **	**-19.14*** **	**-20.19*** **	**-14.98*** **	**-16.38*** **
	(-3.96)	**(-3.75)**	**(-3.10)**	**(-3.92)**	**(-3.62)**	**(-3.71)**	**(-3.04)**	**(-2.90)**
EmpG_Disp$_{t-1}$	0.28	0.25	0.02	0.06	0.45	0.40	0.20	0.19
	(0.76)	(0.82)	(0.10)	(0.38)	(1.32)	(1.62)	(1.13)	(1.16)
Ret_Disp$_{t-1}$	-4.04	-4.19	-9.06*	-6.86*	-1.58	-1.93	-0.50	-0.04
	(-1.19)	(-1.21)	(-1.94)	(-1.72)	(-0.44)	(-0.55)	(-0.10)	(-0.01)
Ear_Disp$_{t-2}$		0.43	-0.95	-2.49		4.26	4.12	0.96
		(0.09)	(-0.24)	(-0.59)		(0.90)	(1.14)	(0.20)
EmpG_Disp$_{t-2}$		0.34	0.45	0.55		0.38	0.50	0.56
		(0.90)	(1.11)	(1.35)		(0.76)	(1.05)	(1.18)
Ret_Disp$_{t-2}$		-1.60	2.30	3.57		-1.72	1.21	2.72
		(-0.67)	(0.73)	(1.36)		(-0.67)	(0.33)	(0.87)
EmpG_Disp$_t$		0.63	0.63	0.64		0.77	0.73	0.73
		(1.35)	(1.29)	(1.39)		(1.24)	(1.14)	(1.17)
Ret_Disp$_t$		1.00	3.13	4.93		0.66	4.83	7.00*
		(0.31)	(0.77)	(1.32)		(0.21)	(1.07)	(1.70)
Mkt_Ret$_t$			-0.04	-0.54			0.01	-1.19
			(-0.02)	(-0.24)			(0.00)	(-0.46)
Mkt_Ret$_{t-1}$			2.70	2.19			0.85	0.82
			(1.16)	(1.00)			(0.37)	(0.38)
Mkt_Ret$_{t-2}$			-2.90	-3.66*			-1.30	-2.17
			(-1.35)	(-1.72)			(-0.57)	(-0.98)
Ear$_{t-1}$			0.73	11.49			-5.68	-14.10
			(0.04)	(0.66)			(-0.37)	(-0.72)
Ann_ret$_t$			-17.14	-23.02*			-17.48	-29.69**
			(-1.32)	(-1.83)			(-1.21)	(-2.40)
Initial_est$_t$			-0.14	-0.15*			-0.37***	-0.37***
			(-1.51)	(-1.67)			(-3.73)	(-3.69)
Ini_Unemp$_t$			-0.05	-0.02			-0.03	0.01
			(-0.51)	(-0.16)			(-0.29)	(0.07)
Ini_Indp$_t$			0.01	0.03			0.12**	0.13**
			(0.28)	(0.62)			(2.15)	(2.13)
Time_trend$_t$			-0.01***	-0.01**			-0.01***	-0.01*
			(-2.68)	(-2.20)			(-2.84)	(-1.94)
Recession			-0.79	-0.27			-1.23*	-0.82
			(-1.17)	(-0.37)			(-1.70)	(-0.98)
Liquidity$_t$			0.50	-0.34			0.28	0.19
			(0.27)	(-0.18)			(0.15)	(0.09)
Res$_{t-1}$			-0.01	-0.04			-0.37	-0.35
			(-0.06)	(-0.19)			(-1.61)	(-1.44)
Adj. R^2	0.06	0.08	0.11	0.11	0.05	0.08	0.17	0.18
Obs	158	158	158	152	158	158	158	152

Table 4 reports results for time-series regressions of restatements in GDP growth on earnings growth dispersion, employment growth dispersion, return dispersion, and control variables for a sample of 158 quarters from Q1:1973 to Q3:2012. Columns (4) and (8) contain regression results for a sample that excludes the Great Recession (Q4:2007

to Q1:2009). $NGDP\_Res_t$ ($RGDP\_Res_t$) is the restatement in nominal (real) GDP growth rate for quarter t. Ear_Disp_{t-1} is earnings growth dispersion for quarter t-1. $EmpG\_Disp_{t-1}$ is employment growth dispersion for quarter t-1. Ret_Disp_{t-1} is return dispersion for quarter t-1. All other variables are as defined in the Appendix. All independent variables in columns (1), (2), (5), and (6) are publicly available prior to the starting date of restatement accumulation (see Figure 1 for the timeline of variable measurement). t-statistics with Newey-West correction for autocorrelation are reported in parentheses. *, **, and *** denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 5. Unemployment Restatements and Aggregate Earnings Growth Dispersion

Dep Var	UNEMP_Res$_t$			
		Full Sample		Ex. Crisis
	(1)	(2)	(3)	(4)
Intercept	0.01**	0.01**	0.05	0.07*
	(2.45)	(2.46)	(1.27)	(1.91)
Ear_Disp$_{t-1}$	**0.54*** **	**0.60*** **	**0.74*** **	**0.50** **
	(2.65)	**(3.02)**	**(3.93)**	**(2.28)**
EmpG_Disp$_{t-1}$	0.00	0.00	0.00	0.00
	(0.34)	(0.32)	(0.20)	(-0.10)
Ret_Disp$_{t-1}$	0.05	0.03	-0.02	-0.10
	(0.45)	(0.24)	(-0.15)	(-0.79)
Ear_Disp$_{t-2}$		0.36**	0.41**	0.26*
		(2.56)	(2.22)	(1.75)
EmpG_Disp$_{t-2}$		0.00	-0.01	-0.01
		(-0.11)	(-0.79)	(-0.92)
Ret_Disp$_{t-2}$		-0.14	-0.20	-0.26**
		(-1.36)	(-1.58)	(-2.02)
EmpG_Disp$_t$		0.00	0.00	0.00
		(0.57)	(0.54)	(0.34)
Ret_Disp$_t$		-0.16	0.07	0.05
		(-1.34)	(0.35)	(0.25)
Mkt_Ret$_t$			-0.05	-0.04
			(-0.62)	(-0.39)
Mkt_Ret$_{t-1}$			0.09	0.13**
			(1.45)	(2.17)
Mkt_Ret$_{t-2}$			0.04	0.06
			(0.63)	(0.99)
Ear$_{t-1}$			-0.52	0.34
			(-0.84)	(0.48)
Ann_ret$_t$			0.56	0.51
			(1.04)	(0.88)
Initial_GDP$_t$			0.00	-0.01*
			(-0.66)	(-1.76)
Ini_Unemp$_t$			0.00	0.00
			(-0.57)	(-0.65)
Ini_Indp$_t$			0.00	0.00
			(1.23)	(1.17)
Time_trend$_t$			0.00	0.00*
			(-1.44)	(-1.69)
Recession			0.04	0.04
			(1.49)	(1.41)
Liquidity$_t$			-0.05	-0.04
			(-0.78)	(-0.58)
Res$_{t-1}$			-0.57**	-0.56**
			(-2.38)	(-2.01)
Adj. R^2	0.02	0.01	0.08	0.05
Obs	158	158	158	152

Table 5 reports results for time-series regressions of restatements in unemployment on earnings growth dispersion, employment growth dispersion, return dispersion, and control variables for a sample of 158 quarters from Q1:1973

to Q3:2012. Column (4) contains regression results for a sample that excludes the Great Recession (Q4:2007 to Q1:2009). *UNEMP_Res*$_t$ is the restatement in unemployment rate for quarter *t*. *Ear_Disp*$_{t-1}$ is earnings growth dispersion for quarter *t*-1. *EmpG_Disp*$_{t-1}$ is employment growth dispersion for quarter *t*-1. *Ret_Disp*$_{t-1}$ is return dispersion for quarter *t*-1. All other variables are as defined in the Appendix. All independent variables in columns (1) and (2) are publicly available prior to the starting date of restatement accumulation (see Figure 1 for the timeline of variable measurement). *t*-statistics with Newey-West correction for autocorrelation are reported in parentheses. *, **, and *** denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 6. GDP Restatements and Across-Industry Earnings Growth Dispersion

Dep Var	$NGDP\_Res_t$			$RGDP\_Res_t$			$UNEMP\_Res_t$		
	Full Sample		Ex. Crisis	Full Sample		Ex. Crisis	Full Sample		Ex. Crisis
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Intercept	0.53***	2.60***	2.53**	0.46***	2.17***	2.03***	0.01**	0.03	0.05**
	(3.38)	(2.72)	(2.59)	(3.06)	(4.52)	(4.02)	(2.46)	(1.15)	(2.31)
$Ear\_Disp\_Ind_{t-1}$	**-25.83*** **	**-17.25** **	**-19.35** **	**-24.03*** **	**-17.52** **	**-16.94** **	**0.44***	**0.81*** **	**0.65** **
	(-4.24)	**(-2.17)**	**(-2.58)**	**(-4.38)**	**(-2.50)**	**(-2.51)**	**(1.68)**	**(2.69)**	**(2.61)**
$Ear\_Disp\_Orth_{t-1}$	**-12.63*** **	**-12.88*** **	**-14.77*** **	**-12.10*** **	**-10.31*** **	**-9.42** **	**0.34** **	**0.43** **	**0.16**
	(-3.45)	**(-2.98)**	**(-2.96)**	**(-3.80)**	**(-2.83)**	**(-2.24)**	**(2.14)**	**(2.41)**	**(0.86)**
$EmpG\_Disp_{t-1}$		-0.02	0.05		0.18	0.19		0.00	0.00
		(-0.11)	(0.31)		(1.04)	(1.18)		(0.24)	(-0.06)
Ret_Disp_{t-1}		-7.42*	-5.80*		0.08	0.35		-0.07	-0.12
		(-1.94)	(-1.67)		(0.02)	(0.08)		(-0.48)	(-1.01)
$EmpG\_Disp_{t-2}$		0.42	0.53		0.48	0.56		-0.01	-0.01
		(1.08)	(1.32)		(1.05)	(1.20)		(-1.11)	(-1.21)
Ret_Disp_{t-2}		2.87	3.58		1.91	2.83		-0.12	-0.18
		(1.05)	(1.55)		(0.61)	(1.07)		(-1.08)	(-1.58)
$EmpG\_Disp_t$		0.60	0.62		0.73	0.74		0.01	0.00
		(1.24)	(1.36)		(1.15)	(1.19)		(0.64)	(0.27)
Ret_Disp_t		2.89	3.67		4.80	5.79*		0.15	0.10
		(0.77)	(1.15)		(1.27)	(1.73)		(0.81)	(0.57)
Mkt_Ret_t		-0.13	-0.42		-0.08	-0.97		-0.09	-0.06
		(-0.06)	(-0.19)		(-0.03)	(-0.41)		(-1.05)	(-0.63)
Mkt_Ret_{t-1}		2.30	1.76		0.60	0.56		0.12*	0.15**
		(0.99)	(0.80)		(0.25)	(0.25)		(1.96)	(2.54)
Mkt_Ret_{t-2}		-3.34	-3.98*		-1.86	-2.48		0.02	0.05
		(-1.55)	(-1.89)		(-0.78)	(-1.11)		(0.36)	(0.78)
Ear_{t-1}		-0.50	2.61		-8.25	-19.68		-0.49	0.65
		(-0.03)	(0.17)		(-0.66)	(-1.20)		(-0.71)	(1.03)
Ann_ret_t		-16.95	-22.05*		-18.75	-28.77**		0.47	0.39
		(-1.35)	(-1.81)		(-1.33)	(-2.41)		(0.91)	(0.72)
$Initial\_est_t$		-0.13	-0.15		-0.37***	-0.38***		0.00	-0.01
		(-1.44)	(-1.61)		(-3.81)	(-3.85)		(-0.47)	(-1.60)
Ini_Indp_t		0.01	0.03		0.12**	0.13**		0.00	0.00
		(0.24)	(0.62)		(2.22)	(2.27)		(0.97)	(0.90)
$Time\_trend_t$		-0.01***	-0.01**		-0.01***	-0.01*		0.00	0.00*
		(-2.67)	(-2.15)		(-2.74)	(-1.82)		(-1.48)	(-1.92)
Recession		-0.90	-0.38		-1.31*	-0.93		0.05*	0.05
		(-1.37)	(-0.54)		(-1.93)	(-1.18)		(1.76)	(1.64)
$Liquidity_t$		0.56	-0.38		0.32	0.03		-0.02	-0.01
		(0.31)	(-0.21)		(0.17)	(0.02)		(-0.34)	(-0.10)
Res_{t-1}		0.00	-0.02		-0.37*	-0.35		-0.55**	-0.54**
		(0.01)	(-0.13)		(-1.67)	(-1.51)		(-2.42)	(-1.98)
Adj. R^2	0.07	0.13	0.13	0.05	0.19	0.20	0.02	0.07	0.05
Obs	158	158	152	158	158	152	158	158	152

Table 6 reports results for regressions of restatements in nominal and real GDP growth and unemployment on decomposed lagged earnings growth dispersion. The sample in columns (4) and (8) excludes the Great Recession (Q4:2007 to Q1:2009). $NGDP\_Res_t$ ($RGDP\_Res_t$) and $UNEMP\_Res_t$ are restatements in nominal (real) GDP growth and unemployment rate for quarter *t*, respectively. $Ear\_Disp\_Ind_{t-1}$ ($Ear\_Disp\_Orth_{t-1}$) is a component pertaining to across-industry variation (orthogonal to across-industry variation) in quarter *t*-1 earnings growth. All other variables are as defined in the Appendix. *t*-statistics with Newey-West correction for autocorrelation are reported in parentheses. *, **, and *** denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 7. GDP Restatements and Market and Economic Policy Uncertainty

Dep Var	NGDP_Res$_t$		RGDP_Res$_t$		UNEMP_Res$_t$	
	VIX	EU	VIX	EU	VIX	EU
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	2.79***	2.72***	2.54***	2.45***	0.10***	0.04
	(2.84)	(3.30)	(2.99)	(4.68)	(2.77)	(1.41)
Ear_Disp$_{t-1}$	**-13.97*** **	**-15.73*** **	**-14.36*** **	**-13.93** **	**0.48** **	**0.59*** **
	(-2.66)	**(-2.77)**	**(-2.67)**	**(-2.42)**	**(2.16)**	**(2.74)**
EmpG_Disp$_{t-1}$	0.29	0.34	0.37	0.86	-0.02	0.01
	(0.28)	(0.55)	(0.35)	(1.42)	(-0.57)	(0.31)
Ret_Disp$_{t-1}$	-13.15**	-10.94***	-9.99*	-7.89*	-0.05	-0.03
	(-2.65)	(-2.67)	(-1.91)	(-1.81)	(-0.35)	(-0.23)
Ear_Disp$_{t-2}$	-0.06	1.27	2.78	5.07	0.18	0.25
	(-0.02)	(0.29)	(0.72)	(1.22)	(1.25)	(1.48)
EmpG_Disp$_{t-2}$	-0.66	-0.72	-0.53	-0.89*	0.01	-0.03
	(-0.77)	(-1.43)	(-0.65)	(-1.66)	(0.16)	(-1.04)
Ret_Disp$_{t-2}$	6.68**	5.85**	7.24**	6.51***	-0.42***	-0.24**
	(2.19)	(2.22)	(2.50)	(2.73)	(-3.64)	(-2.16)
EmpG_Disp$_t$	0.10	-0.28	0.52	-0.04	0.06**	0.00
	(0.12)	(-0.70)	(0.49)	(-0.08)	(2.13)	(-0.06)
Ret_Disp$_t$	2.68	2.64	2.76	3.25	-0.06	-0.10
	(0.64)	(0.74)	(0.66)	(0.93)	(-0.32)	(-0.77)
Mkt_Ret$_t$	0.39	-1.18	1.13	-0.60	-0.06	0.01
	(0.15)	(-0.61)	(0.38)	(-0.27)	(-0.57)	(0.08)
Mkt_Ret$_{t-1}$	2.66	1.51	2.53	1.87	0.11	0.05
	(0.86)	(0.69)	(0.77)	(0.83)	(1.17)	(0.77)
Mkt_Ret$_{t-2}$	-4.71*	-3.70**	-5.04**	-3.63**	0.09	0.04
	(-1.92)	(-2.24)	(-2.07)	(-2.32)	(1.13)	(0.55)
Ear$_{t-1}$	-15.12	2.12	-14.73	-5.45	-0.35	-0.22
	(-0.97)	(0.12)	(-0.88)	(-0.29)	(-0.60)	(-0.35)
Ann_ret$_t$	-14.22	-4.82	-11.20	-6.42	0.66	0.72
	(-0.88)	(-0.33)	(-0.61)	(-0.40)	(1.35)	(1.58)
Initial_est$_t$	-0.12	-0.18	-0.11	-0.14	0.01**	0.01
	(-0.78)	(-1.54)	(-0.83)	(-1.01)	(2.07)	(1.19)
Ini_Indp$_t$	-0.02	-0.01	-0.03	-0.04	0.00	0.00
	(-0.26)	(-0.17)	(-0.44)	(-0.56)	(-0.66)	(-0.81)
Time_trend$_t$	-0.01**	-0.01***	-0.01**	-0.01***	0.00***	0.00**
	(-2.42)	(-2.79)	(-2.47)	(-3.45)	(-4.40)	(-2.61)
Recession	-1.85**	-1.63*	-2.19***	-2.13***	0.05*	0.05
	(-2.34)	(-1.99)	(-3.04)	(-3.06)	(1.93)	(1.54)
Liquidity$_t$	1.89	0.72	1.33	0.80	-0.14**	-0.02
	(1.00)	(0.36)	(0.87)	(0.50)	(-2.05)	(-0.27)
Res$_{t-1}$	-0.03	0.15	-0.27	-0.14	-0.50	-0.43
	(-0.14)	(0.85)	(-0.90)	(-0.61)	(-1.47)	(-1.35)
VIX$_t$	-0.01		0.01		0.00**	
	(-0.30)		(0.23)		(-2.21)	
EU$_t$		-0.01		0.00		0.00
		(-1.56)		(-0.02)		(-0.19)
Adj. R^2	0.23	0.06	0.19	0.21	0.33	0.15
Obs	88	108	88	108	88	108

Table 7 reports results for time-series regressions of restatements in nominal and real GDP growth and unemployment on lagged earnings growth dispersion after controlling for market uncertainty, economic policy uncertainty, and other variables. $NGDP\_Res_t$ ($RGDP\_Res_t$) and $UNEMP\_Res_t$ are restatements in nominal (real) GDP growth and unemployment rate for quarter t, respectively. VIX_t is the Chicago Board Options Exchange market volatility index for quarter t. EU_t is the economic policy uncertainty index for quarter t. All other variables are as defined in the Appendix. The sample in columns (1), (3), and (5) starts in Q1:1990. The sample in columns (2), (4), and (6) starts in Q1:1985. t-statistics with Newey-West correction for autocorrelation are reported in parentheses. *, **, and *** denote statistical significance at the 1%, 5%, and 10% level, respectively.

Table 8. Out-of-Sample Restatement Predictability

Panel A. Predictability since 1984

	Restatements in GDP Growth			
	1-year Horizon		2-year Horizon	
	Nominal	Real	Nominal	Real
CW statistic	0.20	0.19	0.20	0.26
p-value	(0.04)	(0.05)	(0.11)	(0.04)
Obs	112	112	108	108

Panel B. Predictability since 1989

	Restatements in GDP Growth			
	1-year Horizon		2-year Horizon	
	Nominal	Real	Nominal	Real
CW statistic	0.25	0.20	0.13	0.15
p-value	(0.02)	(0.06)	(0.22)	(0.17)
Obs	92	92	88	88

Panel C. Predictability since 1994

	Restatements in GDP Growth			
	1-year Horizon		2-year Horizon	
	Nominal	Real	Nominal	Real
CW statistic	0.33	0.31	0.18	0.28
p-value	(0.01)	(0.02)	(0.13)	(0.04)
Obs	72	72	68	68

Panel D. Predictability since 1999

	Restatements in GDP Growth			
	1-year Horizon		2-year Horizon	
	Nominal	Real	Nominal	Real
CW statistic	0.43	0.44	0.39	0.52
p-value	(0.01)	(0.01)	(0.03)	(0.01)
Obs	53	53	49	49

Table 8 contains out-of-sample GDP restatement prediction results with forecasts estimated for different sample periods. The tests use one- or two-year restatements in seasonally adjusted nominal (real) quarterly GDP growth rates, estimated as second or third restated GDP estimate minus the initially announced value (see Figure 1 for variable measurement timeline). The table reports Clark and West (2007) adjusted MSPE (Mean Squared Prediction Error) statistics (CW statistics) estimated as a difference between MSPEs of a benchmark model and our prediction model with an additional adjustment for the number model complexity. Our prediction model is estimated by regressing one- or two-year GDP restatements on lagged aggregate earnings dispersion within expanding hold-out windows. Benchmark prediction is a historical average restatement over the same hold-out window. CW statistic > 0 implies that the evaluated prediction model has a lower MSPE than the benchmark model. One-sided bootstrapped *p*-values for the CW statistics are reported in parentheses.