The Persistence of Systematic and Idiosyncratic Components of Earnings

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Abstract

We offer an assessment of persistence based upon the framework that a firm's individual earnings is attributable to a systematic, or macroeconomic, component and an idiosyncratic, or firm-specific, component of earnings. Our analysis framework, which is adopted from Bonsall, Bozanic, and Fischer (2013), uses the prior history of a firm's earnings coupled with proxies for macroeconomic factors to decompose its earnings into macroeconomic and firm-specific components. We find that, on average, the persistence of the macroeconomic component of net income, operating income, and revenues is more persistent than the firm-specific component. We then consider whether the phenomenon is constrained to particular earnings properties. We document that i) the macroeconomic component of earnings is more persistent than the firm-specific component of earnings, regardless of whether or not a loss is recorded for the quarter and ii) the macroeconomic component of accruals and cash flows are both more persistent than their firm-specific counterparts. Lastly, we examine whether economic decisions predicated on future beliefs are influenced by the persistence of earnings components. Our results suggest that i) firm-level investment decisions have a greater association with macroeconomic innovations than firm-specific innovations and ii) innovations in the macroeconomic earnings series have a greater association with equity prices than firm-specific earnings series.

1. Introduction

A critical element of any valuation exercise is the development of earnings forecasts, which, in turn, tend to rely heavily on an analysis of past earnings. Not surprisingly, this approach to forecasting has led to a good deal of research to understand the determinants of earnings persistence. Factors that have been identified in prior literature as being predictors of earnings persistence include the extent to which earnings is driven by cash flows or accruals, the nature of the accruals, the extent of special items included in earnings, the volatility of past earnings, whether the firm's past performance ranks highly relative to its peers, and when the innovation occurred during the business cycle. We offer an assessment of persistence based upon the longstanding framework that a firm's individual earnings is attributable to a systematic, or macroeconomic, component and an idiosyncratic, or firm-specific, component of earnings.[1] Our assessment is predicated on the conjecture that there is differential persistence between macroeconomic and firm-specific components of earnings.

Our analysis framework, which is adopted from Bonsall, Bozanic, and Fischer (2013), uses the prior history of earnings coupled with proxies for macroeconomic factors to decompose firm earnings into macroeconomic and firm-specific components. For each firm, we then consider the relative persistence of the macroeconomic and firm-specific series. We hypothesize that earnings attributable to macroeconomic events are, on average, more persistent than earnings attributed to firm-specific events. Our priors are motivated by the idea that firms, or their competitors, can generally respond more effectively to shocks that affect only them (e.g., change strategy, alter product mix), but they are somewhat more constrained in being able to respond to macroeconomic shocks that influence aggregate demand or input costs. Furthermore, in many

[1] See, for example, Ball and Brown (1967), Gonedes (1973), and Magee (1974), who all document that a significant amount of the variation in earnings can be attributed to a limited number of factors (e.g., one common and industry-specific factors).

cases, firms' collective responses to macroeconomic shocks can cause the shocks to propagate over time throughout the economy, which would increase persistence. Consistent with our priors, we document that, on average, the macroeconomic component of earnings is more persistent than the firm-specific component of earnings.

Having documented the phenomenon in earnings, we then consider whether the phenomenon is constrained to particular elements of earnings. First, we assess whether the phenomenon is attributable solely to special transitory items towards the bottom of the income statement, which might be thought to be largely firm-specific in nature. We provide evidence to the contrary by showing the phenomenon is present for revenues and operating income as well (i.e., each's macroeconomic component is more persistent than its firm-specific component). Second, given the possibility that the differential persistence might be due to accruals management, we decompose earnings into accruals and cash flows using a statement of cash flow approach (Collins and Hribar, 2000) and find that the macroeconomic component of accruals and cash flows are both more persistent than their firm-specific counterparts.

We also assess how the phenomenon relates to the well-documented observation that losses are less persistent than profits. Consistent with prior findings that losses are less persistent, we find that the firm-specific earnings series is, on average, less persistent in loss quarters, but we find no significant difference in the persistence of the macroeconomic series during loss quarters. Most relevant to our focus, the macroeconomic component of earnings is more persistent than the firm-specific component of earnings, regardless of whether or not a loss is recorded for the quarter.

If earnings innovations associated with macroeconomic events tend to be more persistent than those associated with firm-specific events, we would expect the former innovations to have

greater association with economic decisions influenced by beliefs about the future. We provide two tests to ascertain whether that expectation bears out in the data. First, we conjecture that firms' investment decisions should have a greater association with macroeconomic innovations than firm-specific innovations. Second, we conjecture that innovations in the more persistent macroeconomic earnings series will have a greater impact on equity prices than the less persistent firm-specific earnings series. We provide evidence consistent with both conjectures.

Our analysis of persistence extends a long research stream seeking to understand the determinants of earning persistence.[2] Our work adds to this stream of literature by suggesting that persistence is linked to the macroeconomic and firm-specific components of earnings, namely, that the macroeconomic component of earnings is more persistent than its firm-specific counterpart. Because we document our findings at the bottom and top of the income statement, our results are not solely attributable to transitory special items at the bottom of the income statement. We also extend this literature by considering characteristics that have been shown to be associated with differences in earnings persistence. For example, we find that both accrual and cash flow components of earnings are relatively more persistent when they can be attributed to macroeconomic events, while the differential persistence of loss years is largely driven by idiosyncratic as opposed to macroeconomic events.

Second, we extend the literature on earnings properties and firm investment decisions (e.g., McNichols and Stubben, 2008; Li, 2011a) and show how differential persistence manifests in firm decision making. Consistent with more persistent innovations having greater influence on

[2] Sloan (1996) identifies the differential persistence of cash flows and accruals. Fairfield, Whisenant, and Yohn (2003), Richardson, Sloan, Soliman, and Tuna (2005), Collins and Kim (2015), Casey, Gao, Kirschenheiter, Li, and Pandit (2016) study how the nature of accruals determines persistence of the accruals component of earnings. Dechow and Ge (2006) assess the role of special items in assessing earnings persistence. Dichev and Tang (2009) consider how past earnings volatility is related to persistence. Finally, Johnson (1999), Tomy (2012), and Park and Shin (2015) consider how the persistence of earnings varies with the business cycle.

long-term investment decisions, we find that macroeconomic innovations exhibit a larger association with future firm investment decisions. Third, we extend the literature regarding the association between earnings and equity prices by assessing whether the more persistent macroeconomic earnings innovations are associated with greater equity price movements. Our analysis of earnings is predicated on the observation that more persistent earnings innovations should be associated with more significant price responses. Consistent with this observation, we find that macroeconomic-driven innovations to earnings exhibit a larger association with equity price movements than firm-specific innovations.

Our study is perhaps most closely related to the work of Johnson (1999) and a concurrent study by Jackson, Plumlee, and Rountree (2017). Johnson proposes and provides evidence consistent with her hypotheses that earnings is expected to exhibit more persistence in expansions relative to recessions, and in the credit crunch phase of a recession relative to a reliquification phase of a recession.[3] We do not focus on the stage of the business cycle as a predictor of overall persistence, but instead focus on isolating earnings attributable to the macroeconomic state from those attributable to firm-specific state. One practical benefit of our approach is that it permits a contemporaneous determination of the persistence of earnings innovations, as opposed to having to rely on an ex post determination of the economy's stage in the business cycle to ascertain the persistence of earnings innovations. Jackson et al. (2017) decompose return on net operating assets (RNOA) into market, industry, and firm-specific components and show that the differential mean reversion of the components improves RNOA forecast accuracy. In contrast, our study focuses on the relative persistence of earnings. We shed light on how that persistence is revealed in (i) performance metrics at the top and bottom of

[3] Tomy (2012) adopts a similar perspective in the sense that she also examines earnings persistence during stages of the business cycle, which she divides into expansion, recession, and transition.

the income statement, (ii) commonly-studied elements of earnings (e.g., the relative persistence of accruals versus cash flows), and, finally, (iii) firm investment decisions and equity pricing.

The remainder of the paper proceeds as follows. In Section 2 we outline our primary hypotheses. Section 3 presents our analysis framework, and the sample is described in Section 4. We report our empirical findings on the relative persistence of the macroeconomic and firm-specific components of earnings in Section 5. We then consider investment and equity price responses to those components in Section 6. Section 7 concludes.

2. Hypotheses

Earnings are determined by the economic environment faced by the firm, coupled with the decisions made by firm management. The underlying economic environment of the firm, in turn, can be thought of as reflecting a macroeconomic state variable and a firm-specific state variable, and the decisions of firm management are in response to those states. Given this framework, the persistence of earnings is determined by the underlying persistence of the macroeconomic and firm-specific states, as well as how management responds to changes in those states. Our hypotheses are primarily grounded upon an underlying premise that the responses taken by a firms and/or its competitors to changes in the firm's economic environment differ depending upon whether earnings are attributable to the current macroeconomic state or to a firm-specific state.

Consider first earnings realizations attributable to broad macroeconomic shocks, such as an economy-wide demand fall-off attributable to, say, a credit crunch brought on by a financial crisis. In general, we expect that firms primarily react to these shocks by scaling production – they expand when the economy expands and contract when the economy contracts. Furthermore, it is plausible that the collective responses of firms, in turn, are one mechanism by

which these shocks propagate, which manifests in persistence. For example, if all firms cut back in response to an adverse macroeconomic shock to demand, the associated reduction in employment would propagate that demand shock into subsequent periods.

In contrast, a firm, or its competitors, can often address firm-specific shocks much more proactively, which can reverse the effects of the shock rather quickly. For example, a firm whose long-term relationship with its bank or commodity supplier goes south, which causes an adverse shock to earnings, will actively seek out another relationship. As another example, a firm with a current management team that performs poorly will seek out another management team. As a final example, a firm that experiences a favorable shock arising from its managers being quick to identify a change in consumer tastes will soon face competition from other firms providing similar goods or services. We conjecture that the ability of a firm or its competitors to more proactively respond to firm-specific shocks will, on average, be associated with firm-specific performance effects of lower persistence.[4] In summary, we offer the following hypothesis:

> ***H1****: Performance attributable to the macroeconomic state will, on average, be more persistent than performance attributable to the firm-specific state.*

The motivation for this hypothesis presumes that changes in accounting earnings are due in large part to fundamental operating and investing decisions made by management, as opposed to patterns induced by accrual accounting (e.g., one time write-offs or accruals management). To the extent that the incentives for earnings management activities vary with the business cycle, any findings we obtain might be attributable to accrual accounting as opposed to firm

[4] Obviously, there will be exceptions to the average. For example, if a firm is able to identify and produce a unique product that is not replicable by others, we might expect the earnings innovation associated with this product's release to be quite persistent.

fundamentals. Hence, we test variants of H1 for components of earnings less subject to one off discretionary special charges (i.e., revenues and operating earnings), as well as operating accruals and cash flows. In addition, given that earnings are less persistent in loss periods, we assess whether H1 holds for both profit and loss periods.

If performance innovations attributable to the macroeconomic state are relatively more persistent than those attributable to the firm-specific state, we would expect decisions that hinge upon expectations of the future aggregate state (i.e., macroeconomic plus firm-specific states) to be more sensitive to innovations in the macroeconomic state. Consider a manager at a firm that is making a decision about how much to invest in equipment that will increase productivity. If a positive (negative) innovation in revenues is driven by a higher (lower) demand innovation that is likely to persist, the manager's investment is likely to be somewhat higher (lower). As a consequence, the association between a revenue innovation and investment is likely to be higher when the demand innovation underlying the revenue innovation is likely to persist. If macroeconomic demand innovations are, on average, more persistent than firm-specific demand innovations, then the following hypothesis should hold.

H2*: Investment decisions will exhibit greater association with the macroeconomic state than the firm-specific state.*

In our final hypothesis, we consider equity market investor responses to a favorable (unfavorable) performance innovation. If the innovation is more persistent, then equity investors would demand (supply) relatively more shares at any given price. Hence, the equilibrium price would have to change to a larger extent to clear the market. That is, the association between a performance innovation and the equity price change is likely to be higher when the persistence of that innovation is greater. If earnings attributable to the macroeconomic state are, on average,

more persistent than earnings attributable to the firm-specific state, then the following hypothesis should hold.

> ***H3****: The association between changes in share price and an unexpected earnings innovation will be larger if the innovation is attributable to unexpected changes in the macroeconomic state as opposed to the firm-specific state.*

3. Analysis Framework

Let Y_t denote a measure of financial performance for a given firm during period t, and assume that the performance can be decomposed into a macroeconomic component, M_t, and a firm-specific component, F_t:

$$Y_t = M_t + F_t, \tag{1}$$

where M_t and F_t follow processes of the form:

$$M_{t+1} = \underline{M} + \beta_M M_t + \mu_{t+1} \tag{2}$$

and

$$F_{t+1} = \underline{F} + \beta_F F_t + \phi_{t+1}, \tag{3}$$

where the intercepts $\underline{M}$ and $\underline{F}$ are constants, the coefficients β_M and β_F are constants, and μ_{t+t} and ϕ_{t+1} are the innovations in the macroeconomic and firm-specific state variables. We assume the innovations are mean 0 and mutually independent. Consistent with empirical definitions of persistence, β_M and β_F reflect the persistence of the macroeconomic component and firm-specific component, respectively.

Equations (1), (2), and (3) imply that, given the macroeconomic and firm-specific components of financial performance, M_t and F_t, the following holds:

$$Y_{t+1} = \Delta + \beta_M(M_t - \underline{M}) + \beta_F(F_t - \underline{F}) + \eta_{t+1}, \tag{4}$$

where $\Delta = (1+\beta_M)\underline{M} + (1+\beta_F)\underline{F}$ and $\eta_{t+1} = \mu_{t+1} + \phi_{t+1}$. Equation (4) forms the foundation for our primary regression analysis.

To conduct the empirical analysis tied to the structure above, we first estimate the underlying macroeconomic and firm-specific series. To do so, for each firm we estimate regressions of the form:

$$Y_t = \alpha + \lambda' X_t + e_t, \tag{5}$$

where X_t is a vector of statistics capturing the macroeconomic state (e.g., GDP, inflation, unemployment, etc.) and e_t is the error term. We employ the estimate of λ, $\hat{\lambda}$, and the residuals from this regression to derive estimates for $M_t - \underline{M}$ and $F_t - \underline{F}$. That is, we proxy for the macroeconomic series $M_t - \underline{M}$ with the series $\widehat{M}_t = \hat{\lambda}' X_t$, and the firm-specific series $F_t - \underline{F}$ with the residuals $\widehat{F}_t = e_t$.

In order to estimate the persistence parameters, we estimate regressions of the form:

$$Y_{t+1} = \delta + B_M \widehat{M}_t + B_F \widehat{F}_t + \varepsilon_{t+1}, \tag{6}$$

which maps into the analytical representation in equation (4). That is, the estimates for B_M and B_F, $\widehat{B}_M$ and $\widehat{B}_F$, proxy for the analytical persistence constructs β_M and β_F, and the estimate for δ, $\hat{\delta}$, proxies for Δ. Hence, if our primary hypothesis is true, we expect that $\widehat{B}_M > \widehat{B}_F$, where a '^' denotes the regression estimate of the relevant parameter.

4. Sample

To construct our sample, we first obtain all quarterly observations for firms in Compustat for the fiscal period 1991:Q4 – 2016:Q3, which provides us with roughly 100 quarters of data for estimation purposes. We begin in 1991 due to the availability of the macroeconomic time series data we use, which are obtained from the Federal Reserve Bank of Philadelphia. We retain only those firms with positive annual assets and revenues, and require a minimum of 30 quarterly observations per firm in order to estimate firm-specific regressions. Compustat variables that are on a year-to-date basis are converted to their quarterly equivalent. Please see the Variable Appendix for further detail, where variables are grouped by the dependent variables examined, macroeconomic state variables, and finally the variables computed for the accruals analysis.

Table 1 provides the descriptive statistics for the variables used in the study. The firms we study are moderately large, with an average net income in the sample period of $39 million, revenue of $727 million, and operating income of $134 million. The firms in our sample report cash flow of $95 million and income decreasing accruals of $54 million. Finally, in terms of investment, the average firm increases it's PP&E in a given quarter by $20 million, while only reporting a modest quarterly change in investing cash flow of $0.5 million.

Our final sample for our initial regressions is comprised of 8,720 firms (some regressions vary depending upon data availability). Thus, to form the basis for our inferences on the relative persistence of macroeconomic and firm-specific components of earnings, we interpret the average coefficient (i.e., persistence parameter) estimated across the 8,720 firm-specific regressions.

5. Empirical Analysis

Our primary empirical analysis considers whether, on average, performance attributable to innovations in the macroeconomic state are more persistent than those attributable to innovations in the firm-specific state. We begin with the broadest measure of performance, GAAP earnings. In the first stage, we estimate quarterly firm-level regressions of the form in (5), where the dependent variable is GAAP earnings (*Net Income*) and the independent variables, consistent with Chen, Roll, and Ross (1986) and subsequent work, are eight variables that collectively proxy for the macroeconomic state: Moody's Aaa corporate bond yield (*BOND*), the consumer price index inflation rate (*CPI*), housing starts (*HOUSING*), the index of industrial production (*IND PROD*), real gross domestic product (*RGDP*), the three-month treasury bill rate (*TBILL*), the 10-year treasury bond rate (*TBOND*), and the unemployment rate (*UNEMP*). For each firm, we use the estimates and residuals from the regression of the form in (5) to proxy for the time-series component of earnings attributable to the macroeconomic state, $\widehat{M}_t$, and the time-series component of earnings attributable to the firm-specific state, $\widehat{F}_t$. With these series, in the second stage, we then estimate firm-level regressions of the form in (6). Second stage independent variables are winsorized at the 1% level where appropriate, and regressions include quarterly fixed affects to mitigate seasonality concerns. This two-stage procedure yields estimates of the persistence of earnings attributable to innovations in the macroeconomic state and those attributable to innovations in the firm-specific state for each firm.

5.1. Primary Results

Table 2 provides our initial regression analyses pertaining to the patterns exhibited in Figure 1. We find in Column 1 that the average persistence across firms is 0.83 for the macroeconomic component of net income ($\hat{B}_M$), suggesting that, on average, about 83% of an innovation attributable to the macroeconomic series persists into the subsequent quarter. In

contrast, the average persistence across firms is 0.08 for a firm-specific innovation in net income ($\hat{B}_F$), suggesting that, on average, about 8% of an innovation attributable to the firm-specific series persists into the subsequent quarter. Each of these persistence parameters are statistically different from zero (untabulated). Furthermore, consistent with Hypothesis 1, the difference in means between the persistence parameters is positive and significant. Figures 1-3 provide histograms for the estimates of $\hat{B}_M$ and $\hat{B}_F$, as well as $\hat{B}_M - \hat{B}_F$. The histograms suggest that the distribution of $\hat{B}_M$ is to the right of that for $\hat{B}_F$, and that $\hat{B}_M$ exceeds $\hat{B}_F$ for the vast majority of firms. More specifically, the persistence of macroeconomic innovations exceeds that for firm-specific innovations for 97% of firms.[5]

Our initial analysis focuses on a single performance metric, GAAP earnings, but can be applied to other summary performance metrics. Because the larger persistence of macroeconomic innovations to earnings might be attributable to special items that are further down the income statement, we assess whether the differential persistence applies to performance metrics that are further up the income statement, namely, revenues and operating income. To do so, we use the same approach as used with the GAAP earnings analysis, but use revenues or operating income as the independent variable in both equations (5) and (6).

Columns 2 and 3 of Table 2 report the results for the analysis of revenues (*Revenues*) and operating income (*Operating Income*), respectively. Consistent with the conjecture that transitory items down the income statement are more likely to be attributable to firm-specific events, the persistence of the macroeconomic and firm-specific components of operating income are larger than those for net income. Each of these persistence parameters are statistically different from zero (untabulated). Consistent with H1, innovations attributable to

[5] The persistence parameters from the firm-specific regressions are winsorized at the 1% level to adjust for the influence of outliers. Similar inferences are obtained when using medians instead of winsorized means.

macroeconomic state innovations are, on average, more persistent than those applicable to firm-specific state innovations. For example, the mean persistence for an operating income innovation attributable to an innovation in the macroeconomic state is 91% whereas its firm-specific counterpart is 33%. Furthermore, the persistence of macroeconomic innovations exceeds that for firm-specific innovations for 98% of firms.

A similar pattern is observed for the top line of the income statement, revenues. The persistence of both macroeconomic and firm-specific innovations is larger for revenues than net income. Each of these persistence parameters are statistically different from zero (untabulated), with the only exception being the persistence parameter on $\hat{F}_t$ in Table 5, Panel A, Column 3. As before, the macroeconomic innovations are, on average, more persistent than the firm-specific innovations, consistent with H1. For example, a revenue innovation attributable to a change in the macroeconomic state is 95% at the mean as opposed to 54% for a firm-specific innovation. Furthermore, the persistence of macroeconomic innovations exceeds that for firm-specific innovations for 94% of firms.[6]

In summary, we find that the differential persistence between the macroeconomic and firm-specific innovations is evident for elements of earnings higher up in the income statement, which suggest that our results are not solely attributable to transitory special items at the bottom of the income statement. With that said, the differential is smaller in revenues and operating income than it is with net income, which is consistent with special items being more idiosyncratic in nature.[7]

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[6] Similar inferences are obtained when we transform earnings components to a standard normal distribution (i.e., $\hat{M}_t \sim$ N(0,1) and $\hat{F}_t \sim$ N(0,1)).

[7] In addition to using the eight variables used as a primary proxy for the macroeconomic state (X_t), we also employ aggregate corporate profits as a secondary proxy. Similar inferences are obtained when using the secondary macroeconomic state proxy, although the persistence differentials are somewhat less pronounced.

5.2. Profit versus Loss Years

A large body of work has documented that losses tend to be less persistent than profits (e.g., Hayn, 1995; Joos and Plesko, 2005; Li 2011b; and Lawrence et al. 2017). In this section, we ascertain how the persistence of earnings attributable to macroeconomic versus firm-specific innovations differ across loss and profit periods. To do so, we estimate regressions of the form:

$$Y_{t+1} = \delta + B_M\widehat{M}_t + B_F\widehat{F}_t + B_L Loss + B_{ML}(Loss \times \widehat{M}_t) + B_{FL}(Loss \times \widehat{F}_t) + \varepsilon_{t+1}, \qquad (7)$$

where Y_{t+1} is either net or operating income for quarter t+1, the macroeconomic and firm-specific components of Y_t are $\widehat{M}_t$ and $\widehat{F}_t$ respectively, and $Loss$ = 1 if there is a loss in quarter t and is 0 otherwise.

The results from estimating regressions of the form in (7) are reported in Table 3. Consistent with our previous findings, macroeconomic innovations are more persistent than firm-specific innovations in quarters with profits (*t-test*: (i)-(iii)) as well as those with losses (*t-test:* (ii)-(iv)), with the differential for loss quarters being larger than that for profit quarters. Comparing profit and loss quarters for the firm-specific innovations, we find that loss quarters are, on average, less persistent (*t-test:* (iii)-(iv)). However, we do not document a similar pattern in persistence between profit and loss quarters for macroeconomic innovations (*t-test:* (i)-(ii)). Hence, our analysis suggests that the lower persistence of losses is primarily driven by a decline in the persistence of firm-specific innovations in loss years.

5.3. Accruals versus Cash Flows

Extant research suggests that cash flow components of earnings tend to be more persistent than accruals components of earnings (Sloan, 1996). Taking as given that cash flows and accruals are likely to exhibit differential persistence, we first decompose earnings from into cash

flows and accruals. To approximate quarterly accruals, we follow Collins and Hribar (2000), who employ earnings from continuing operations (ECO_t), which are defined as income before extraordinary items from the statement of cash flows. We then utilize our framework from equation 5 to decompose cash flows and accruals each into macroeconomic and firm-specific time-series components. We then regress ECO_{t+1} on its four components: macroeconomic accruals, macroeconomic cash flows, firm-specific accruals, and firm-specific cash flows:

$$ECO_{t+1} = \delta + B_{M_Accr}\widehat{M_Accr}_t + B_{M_CF}\widehat{M_CF}_t + B_{F_Accr}\widehat{F_Accr}_t + B_{F_CF}\widehat{F_CF}_t + \varepsilon_{t+1}, \quad (8)$$

where $\widehat{M_CF}_t$ is the estimate of macroeconomic component of cash flows for period t, $\widehat{F_CF}_t$ is the firm-specific component of cash flows for period t, $\widehat{M_Accr}$ is the macroeconomic component of accruals for period t, and $\widehat{F_Accr}$ is the firm-specific component of accruals for period t. If H1 holds, we expect $B_{M_CF} > B_{F_CF}$ and $B_{M_Accr} > B_{F_Accr}$.

The results presented in Table 4 show that the mean persistence for a cash flow or accrual innovation is more persistent for those attributable to changes in the macroeconomic than firm-specific state. For example, the average persistence parameter for macroeconomic cash flow innovations is about 83%, which significantly exceeds that for firm-specific cash flow innovations, which is about 12% (*t-test:* (ii)-(iv)). Similarly, the average persistence parameter for macroeconomic accruals innovations, about 74%, significantly exceeds that for firm-specific accruals innovations, which is about 5% (*t-test:* (i)-(iii)). Hence, H1 is supported for both cash flows and accruals.[8]

6. Investment and Equity Price Responses

[8] Similar inferences are obtained when, following Sloan (1996), we estimate pooled instead of firm-specific regressions.

All else equal, we would generally anticipate that managers and equity market participants would alter their decisions depending on whether earnings innovations are more or less persistent. Hence, given our prior analysis of differential persistence, we expect management's investment decisions and investors' equity valuations to be more responsive to macroeconomic innovations than to firm-specific innovations in earnings. These expectations are reflected in H2 and H3, which pertain to management's investment decisions and investor valuations of equity, respectively.

6.1. Management's Investment Decisions

If an innovation to performance is expected to persist, and the innovation is attributable to a persistent innovation in the firm's economic opportunities, we expect firm investments should increase if the innovation is favorable and decrease if the innovation is unfavorable. On the other hand, if an innovation to performance is expected to be quite transitory, we expect firm investments to be less sensitive to the innovation. This reasoning, coupled with the observation that performance innovations attributable to innovations in the macroeconomic state are more persistent, underlies H2.

To test H2, we assess the association between macroeconomic and firm-specific innovations in firm performance and firm investing behavior by estimating regressions of the form:

$$I_{t+1} = \delta + B_M \widehat{M}_t + B_F \widehat{F}_t + \varepsilon_{t+1}, \tag{9}$$

where I_{t+1} represents either the quarterly change in property, plant, and equipment (PP&E) or the quarterly change in investing cash flows (both scaled by total assets).

Table 5 reports the results of estimating equation 9. Across columns 1-3 in both panels, the performance measures decomposed to derive the macroeconomic and firm-specific innovation

estimates, $\widehat{M}_t$ and $\widehat{F}_t$, are net income, revenues, and operating income, respectively. In both panels A and B, the average association between the macroeconomic component of net income (Column 1) and investment is positive, with the same holding true for the firm-specific component. However, across both panels, the opposite is found for revenues (Column 2) insofar as the coefficients for either component are negative (though less negative for macroeconomic innovations), while we find mixed coefficients on the components of operating income (Column 3). While the mean negative association is unexpected, a possible reason for why this pattern is exhibited by the data is that increases in revenue may also be induced by management adding capacity. For example, a fast food franchise will naturally increase revenues when it adds an unusually large number of stores, and that increase in revenues will be associated with a subsequent scaling back in investment activities in a later period. Despite this reasoning, and most important to our focus, the average association for macroeconomic innovations exceeds that for firm-specific innovations for five out of the six specifications (Column 1 of Panel B being the only exception).

In summary, the evidence we offer with net income is consistent with H2. That is, investment behavior exhibits greater associations with macroeconomic innovations in performance than firm-specific innovations in performance. These observations are consistent with macroeconomic innovations in performance reflecting more persistent innovations in firms' underlying economic opportunities.

6.2. Price Associations with Performance Surprises

Fundamental valuation frameworks in which equity value is increasing in expectations of future cash or earnings flows suggest that more persistent innovations in performance should be associated with greater changes in equity value. This logic, coupled with the observation that

macroeconomic innovations in performance appear to be more persistent than firm-specific innovations, gives rise to H3. To test H3, we estimate regressions of the form:

$$BHR_t = \delta + B_M \widehat{MSURP}_t + B_F \widehat{FSURP}_t + \varepsilon_{t+1}, \tag{10}$$

where $\widehat{MSURP}_t$ is the macroeconomic performance innovation surprise, measured as the residual, μ_t, from a regression of the form

$$\widehat{M}_t = \underline{M} + \beta_M \widehat{M}_{t\text{-}1} + \mu_t, \tag{11}$$

and $\widehat{FSURP}_t$ is the firm-specific performance innovation surprise, measured as the residual, ϕ_t, from a regression of the form:

$$\hat{F}_t = \underline{F} + \beta_F \hat{F}_{t\text{-}1} + \phi_t. \tag{12}$$

The regressions used to estimate the surprises, (11) and (12), are employed to be consistent with the underlying framework equations (2) and (3).

The results from estimating equation 10 are presented in Table 6. In column 1, the average association between returns and both macroeconomic and firm-specific net income surprises is predictably positive. Most relevant to our study, however, we find that the average association between a macroeconomic net income surprise exceeds that for a firm-specific net income surprise (multiple of 1.67), which is consistent with H3. Similar results are obtained for revenues and operating income surprises in columns 2 and 3, respectively.[9]

7. Conclusion

[9] We should acknowledge, however, that we have not controlled for discount rates, which confounds our ability to isolate the valuation impact of differential persistence.

We offer an assessment of persistence based upon the framework that a firm's earnings is attributable to a macroeconomic component and a firm-specific component. Our analysis framework, which is adopted from Bonsall, Bozanic, and Fischer (2013), uses the prior history of earnings coupled with proxies for macroeconomic factors to decompose firm earnings into macroeconomic and firm-specific components. For each firm, we then consider the relative persistence of the macroeconomic and firm-specific series. We find that, on average, the persistence of the macroeconomic component of earnings is more persistent than the firm-specific component of earnings. As the phenomenon could be attributable to special transitory items towards the bottom of the income statement, a similar pattern is obtained when we examine revenues and operating income.

We then consider whether the documented pattern is constrained to particular earnings properties. First, we assess how the phenomenon relates to the observation that losses are less persistent than profits. Consistent with prior findings that losses are less persistent, we find that the firm-specific earnings series is, on average, less persistent in loss quarters. Most relevant to our focus, the macroeconomic component of earnings is more persistent than the firm-specific component of earnings, regardless of whether or not a loss is recorded for the quarter. Second, given the possibility that the differential persistence might be due to accruals management, we decompose earnings into accruals and cash flows, and find that the macroeconomic component of accruals and cash flows are both more persistent than their firm-specific counterparts.

Lastly, if earnings innovations associated with macroeconomic events tend to be more persistent than those associated with firm-specific events, we would expect the former innovations to have greater association with economic decisions influenced by beliefs about the future. Consistent with our conjectures, we find that i) firms' investment decisions have a

greater association with macroeconomic innovations than firm-specific innovations and ii) innovations in the macroeconomic earnings series have a greater impact on equity prices than the less persistent firm-specific earnings series.

Our analysis of persistence extends a long research stream seeking to understand the determinants of earning persistence. Our work adds to this stream of literature by suggesting that persistence is linked to the macroeconomic and firm-specific components of earnings, namely, that the macroeconomic component of earnings is more persistent than its firm-specific counterpart. We also extend this literature by considering characteristics that have been shown to be associated with differences in earnings persistence, such as the relative persistence of accruals versus cash flows as well as loss periods. We also contribute to the literature on earnings properties and firm investment decisions by documenting that macroeconomic innovations have a larger association with future firm investment decisions. Finally, we contribute to the literature on the association between earnings and equity prices by documenting that macroeconomic-driven innovations to earnings exhibit a larger association with equity price movements than firm-specific innovations.

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VARIABLE APPENDIX

Dependent Variables	**Description**
Net Income	Quarterly net income (NIQ)
Revenue	Quarterly revenue (REVTQ)
Operating Income	Quarterly operating income before depreciation (OIBDPQ)
ΔPP&E	Quarterly change in property, plant, and equipment (PPENTQ), scaled by total assets.
Δ Investing CF	Quarterly change in investing activities (IVNCFY), scaled by total assets. IVNCFY*-1 is converted to a quarterly basis prior to differencing.
BHR	Quarterly (90 day) buy-and-hold raw return.
Macro Variables	**Description**
BOND	Moody's Aaa corporate bond yield
CPI	Consumer price index inflation rate
HOUSING	Housing starts
INDPROD	Index of industrial production
RGDP	Real gross domestic product
TBILL	Three-month treasury bill rate
TBOND	10-year treasury bond rate
UNEMP	Unemployment rate
Accruals Variables	**Description**
ECO	Quarterly earnings from continuing operations following Collins and Hribar (2000), and defined as Income Before Extraordinary Items (IBCY), scaled by average total assets. IBCY is from the cash flow statement and is converted to a quarterly basis.
Accruals	Accruals following Collins and Hribar (2000), defined as Income Before Extraordinary Items (IBCY) less Cash Flow, scaled by average total assets. IBCY is from the cash flow statement and is converted to a quarterly basis prior to differencing.
Cash Flow	Cash flow following Collins and Hribar (2000), defined as Operating Activities (OANCFY) less Extraordinary Items and Discontinued Operations (XIDOCY), scaled by average total assets. OANCFY and XIDOCY are from the cash flow statement and are converted to a quarterly basis prior to differencing.

Notes

According to Compustat, OIBDPQ "includes the effects of adjustments for Cost of Goods Sold and Selling, General, and Administrative Expenses", while IBCY "represents the income of a company after all expenses, including special items and income taxes." (Compustat ExpressFeed Data Guide, 2017)

FIGURES

Distribution of B_M from $Net\ Income_{t+1} = \delta + B_M\widehat{M}_t + B_F\widehat{F}_t + \varepsilon_{t+1}$

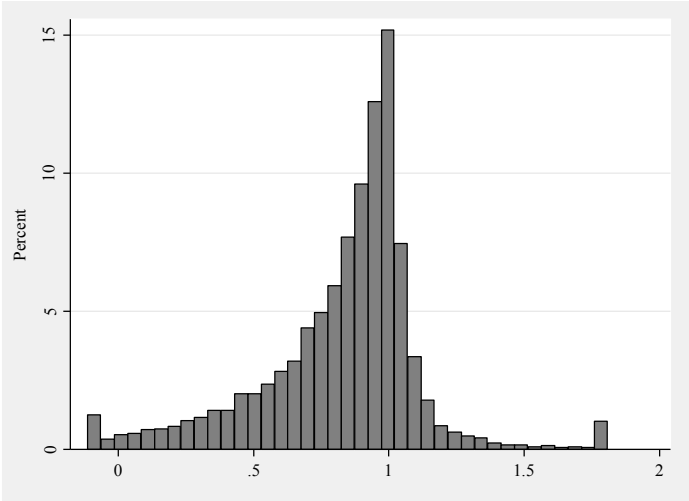

Figure 1

Distribution of B_F from $Net\ Income_{t+1} = \delta + B_M\widehat{M}_t + B_F\widehat{F}_t + \varepsilon_{t+1}$

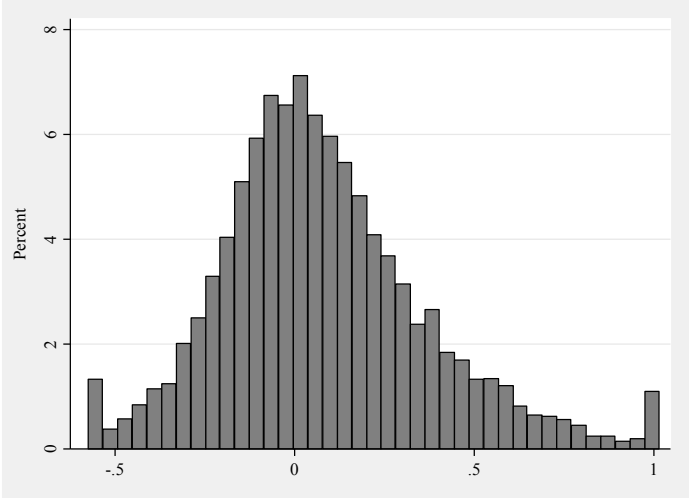

Figure 2

Distribution of B_M - B_F from *Net Income*$_{t+1}$ = $\delta + B_M\widehat{M}_t + B_F\widehat{F}_t + \varepsilon_{t+1}$

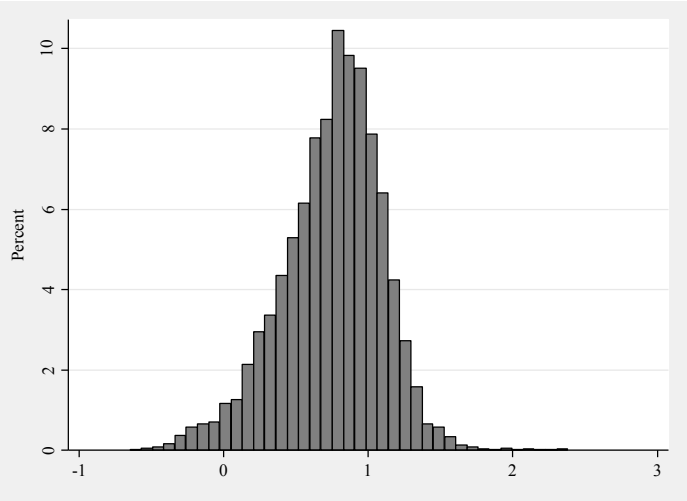

Figure 3

Table 1 – Descriptive Statistics

Dependent and Accruals Variables	N Firms	Mean	S.D.	25th Pctile	Mdn	75th Pctile
Net Income	8,720	39.82	483.23	-0.6	1.17	14.22
Revenue	8,720	727.68	3,545	8.19	55.68	296.6
Operating Income	8,720	134.8	732.51	0.21	6.27	46.42
ECO	8,720	41.25	495.63	-0.49	0.8	0.8
Accruals	8,720	-54.1	884.85	-16.21	-1.24	0.38
Cash Flow	8,720	95.35	922.32	-0.31	2.05	27.02
ΔPP&E	8,684	20.63	929.44	-0.41	0.01	3.35
Δ Investing CF	8,604	0.52	1,174	-3.15	0	3.69
BHR	6,039	0.07	0.43	-0.13	0.03	0.2

Macroeconomic Variables	N Qtrs	Mean	S.D.	25th Pctile	Mdn	75th Pctile
BOND	101	6.01	1.33	5.2	5.75	7.16
CPI	101	2.32	2.04	1.5	2.5	3.4
HOUSING	101	1.36	0.44	1.03	1.46	1.66
INDPROD	101	115.87	14.68	105.6	113	125.1
RGDP	101	10,350	3,240	7,558	10,709	13,013
TBILL	101	2.68	2.09	0.21	2.96	4.82
TBOND	101	4.55	1.57	3.46	4.6	5.89
UNEMP	101	5.96	1.59	4.7	5.6	6.9

Table 1 presents descriptive statistics for the variables (unscaled, $ in millions where appropriate) used in the analysis for the fiscal period 1991:Q4 – 2016:Q3.

Table 2 – The Relative Persistence of Macroeconomic and Firm-Specific Earnings Innovations

	Net Income$_{t+1}$ (1)	Revenue$_{t+1}$ (2)	Operating Income$_{t+1}$ (3)
Macroeconomic ($\widehat{M}_t$)	0.83	0.95	0.91
Firm-specific ($\widehat{F}_t$)	0.08	0.54	0.33
N obs	8,720	8,720	8,720
t-test: $\widehat{M}_t$ **-** $\widehat{F}_t$	0.75	0.41	0.59
p-val	0.00	0.00	0.00

Table 2 examines the relative persistence of the macroeconomic (M) and firm-specific (F) components of earnings, where earnings $Y_t \in$ {net income, revenue, and operating income}. For each firm, M and F earnings components are obtained from a regression of Y_t on a set of macroeconomic state variables, X_t, where $\widehat{M}_t$ ($\widehat{F}_t$) is the predicted (residual) value from the firm-level regression represented by $Y_t = \alpha + \lambda' X_t + e_t$ (Equation 5). The values presented in the table are the mean values of the estimated coefficients (winsorized at the 1% level) on $\widehat{M}_t$ and $\widehat{F}_t$, $\widehat{B}_M$ and $\widehat{B}_F$ respectively, from firm-level regressions represented by $Y_{t+1} = \delta + B_M\widehat{M}_t + B_F\widehat{F}_t + \varepsilon_{t+1}$ (Equation 6). All regressions include quarter fixed effects. We compare the average difference between the firm-level coefficients on $\widehat{M}_t$ and $\widehat{F}_t$ using paired sample t-tests. Please refer to Appendix A for variable definitions.

Table 3 - The Relative Persistence of Macroeconomic and Firm-Specific Earnings Innovations: Adverse Earnings Shocks

		Net Income$_{t+1}$ (1)	Operating Income$_{t+1}$ (2)
(i)	$\widehat{\mathbf{M}}_t$	0.756	0.872
(ii)	$\widehat{\mathbf{M}}_t$ + **Loss** * $\widehat{\mathbf{M}}_t$	0.776	0.866
(iii)	$\widehat{\mathbf{F}}_t$	0.155	0.341
(iv)	$\widehat{\mathbf{F}}_t$ + **Loss** * $\widehat{\mathbf{F}}_t$	-0.044	0.267
	N Obs	8,720	8,720
	***t-test:* (i)-(iii)**	0.601	0.531
	p-val	0.00	0.00
	***t-test:* (i)-(ii)**	-0.020	0.007
	p-val	0.18	0.71
	***t-test:* (ii)-(iv)**	0.820	0.599
	p-val	0.00	0.00
	***t-test:* (iii)-(iv)**	0.199	0.074
	p-val	0.00	0.00

Table 3 extends the analysis from **Table 2** on the relative persistence of the macroeconomic (*M*) and firm-specific (*F*) components of earnings to examine the case of adverse earnings shocks. A firm is considered to experience an adverse earnings shock if net income < 0 in period *t*. We create a binary indicator variable, *Loss*, to capture loss firm-quarters and re-estimate an augmented form of Equation 6, $Y_{t+1} = \delta + B_M\widehat{M}_t + B_F\widehat{F}_t + B_L Loss + B_{ML}(Loss \times \widehat{M}_t) + B_{FL}(Loss \times \widehat{F}_t) + \varepsilon_{t+1}$. As before, the values presented in the table are the mean values of the estimated coefficients (winsorized at the 1% level) from firm-level regressions. All regressions include quarter fixed effects. We compare the average difference between the firm-level coefficients using paired sample t-tests. Please refer to Appendix A for variable definitions.

Table 4 - The Relative Persistence of Macroeconomic and Firm-Specific Earnings Innovations: Accruals versus Cash Flows

		ECO_{t+1} (1)
(i)	$\widehat{M_Accr}_t$	0.745
(ii)	$\widehat{M_CF}_t$	0.838
(iii)	$\widehat{F_Accr}_t$	0.054
(iv)	$\widehat{F_CF}_t$	0.127
	N Obs	8,720
	***t-test:* (i)-(iii)**	0.691
	p-val	0.00
	***t-test:* (i)-(ii)**	-0.093
	p-val	0.00
	***t-test:* (ii)-(iv)**	0.710
	p-val	0.00
	***t-test:* (iii)-(iv)**	-0.073
	p-val	0.00

Table 4 extends the analysis from **Table 2** on the relative persistence of the macroeconomic (*M*) and firm-specific (*F*) components of earnings to examine accruals versus cash flows. To approximate quarterly accruals, we follow Collins and Hribar (2000), who employ earnings from continuing operations (*ECO*), which are defined as income before extraordinary items from the statement of cash flows. Similar to the procedure in Equation 5, we then separately decompose accruals and cash flows into their macroeconomic and firm-specific components. Namely, for each firm, the accruals (cash flows) components are obtained from a regression of accruals (cash flows) on a set of macroeconomic state variables, X_t, where $\widehat{M_Accr}_t$ and $\widehat{F_Accr}_t$ ($\widehat{M_CF}_t$ and $\widehat{F_CF}_t$) are the predicted and residual values, respectively, from the firm-level regression represented by $Accruals_t = \alpha + \lambda' X_t + \varepsilon_t$ ($Cash\ Flows_t = \alpha + \lambda' X_t + \varepsilon_t$). We re-estimate an augmented form of Equation 6, $ECO_{t+1} = \delta + B_{M_Accr}\widehat{M_Accr}_t + B_{M_CF}\widehat{M_CF}_t + B_{F_Accr}\widehat{F_Accr}_t + B_{F_CF}\widehat{F_CF}_t + \varepsilon_{t+1}$. As before, the values presented in the table are the mean values of the estimated coefficients (winsorized at the 1% level) from firm-level regressions. All regressions include quarter fixed effects. We compare the average difference between the firm-level coefficients using paired sample t-tests. Please refer to Appendix A for variable definitions.

Table 5 – Macroeconomic and Firm-Specific Earnings Innovations: Firm Investment

Panel A – Property, Plant, and Equipment (ΔPP&E)

	ΔPP&E (1)	ΔPP&E (2)	ΔPP&E (3)
$\widehat{\mathbf{M}}_t$	0.0029	-0.0012	0.0007
$\widehat{\mathbf{F}}_t$	0.0008	-0.0027	-0.0001
N obs	8,684	8,684	8,684
t-test: $\widehat{\mathbf{M}}_t$ **-** $\widehat{\mathbf{F}}_t$	0.0021	0.0016	0.0007
p-val	0.00	0.00	0.01

Panel B – Investing Cash Flows (ΔInv_CF)

	ΔInv_CF (1)	ΔInv_CF (2)	ΔInv_CF (3)
$\widehat{\mathbf{M}}_t$	0.0007	-0.0019	-0.0006
$\widehat{\mathbf{F}}_t$	0.0030	-0.0035	-0.0013
N obs	8,604	8,604	8,604
t-test: $\widehat{\mathbf{M}}_t$ **-** $\widehat{\mathbf{F}}_t$	-0.0023	0.0015	0.0007
p-val	0.00	0.00	0.08

Table 5 examines the association between the relative persistence of the macroeconomic (*M)* and firm-specific (*F*) components of earnings and future firm investment (*I*). We proxy for firm investment using both balance sheet and statement of cash flow approaches, i.e., changes to property, plant, and equipment scaled by assets (ΔPP&E in **Panel A**) and changes in investing cash flows scaled by assets (ΔInv_CF in **Panel B**). Similar to **Tables 2** and **3**, for each firm, *M* and *F* earnings components are obtained from a regression of Y_t on a set of macroeconomic state variables, X_t, where $\widehat{M}_t$ ($\widehat{F}_t$) is the predicted (residual) value from the firm-level regression represented by $Y_t = \alpha + \lambda' X_t + \varepsilon_t$. The dependent variable across all three columns in **Panel A** (**Panel B**) is $\Delta PP\&E$ (ΔInv_CF), while the *M* and *F* decomposition varies by Y_t (i.e., columns 1, 2, and 3 represent decompositions of net income, revenue, and operating income, respectively). The values presented in the table are the mean values of the estimated coefficients (winsorized at the 1% level) on $\widehat{M}_t$ and $\widehat{F}_t$, $\widehat{B}_M$ and $\widehat{B}_F$ respectively, from firm-level regressions represented by $I_{t+1} = \delta + B_M\widehat{M}_t + B_F\widehat{F}_t + \varepsilon_{t+1}$. All regressions include quarter fixed effects. We compare the average difference between the firm-level coefficients using paired sample t-tests. Please refer to Appendix A for variable definitions.

Table 6 – Macroeconomic and Firm-Specific Earnings Innovations: Equity Market Returns (BHR)

	BHR (1)	BHR (2)	BHR (3)
$\widehat{\mathbf{M}}_t$ **Surprise**	0.040	0.016	0.049
$\widehat{\mathbf{F}}_t$ **Surprise**	0.024	0.008	0.035
N obs	6,039	6,039	6,039
t-test: $\widehat{\mathbf{M}}_t$ **-** $\widehat{\mathbf{F}}_t$	0.016	0.008	0.015
p-val	0.00	0.00	0.00

Table 6 examines the association between the relative persistence of the macroeconomic (*M*) and firm-specific (*F*) components of earnings and contemporaneous equity market returns. We measure equity market returns using 90 day buy-and-hold returns, *BHR*. Similar to **Tables 2** and **3**, for each firm, *M* and *F* earnings components are obtained from a regression of Y_t on a set of macroeconomic state variables, X_t, where $\widehat{M}_t$ ($\hat{F}_t$) is the predicted (residual) value from the firm-level regression represented by $Y_t = \alpha + \lambda' X_t + \varepsilon_t$. The dependent variable across all three columns is *BHR*, while the *M* and *F* decomposition varies by Y_t (i.e., columns 1, 2, and 3 represent decompositions of net income, revenue, and operating income, respectively). To capture the portion of the macroeconomic component unexpected by the market, we isolate the residual ($\widehat{M}_t$ *Surprise*) from a regression of the form $\widehat{M}_t = \gamma + \widehat{M}_{t-1} + \varepsilon_t$, and similarly for the firm-specific component. The values presented in the table are the mean values of the estimated coefficients (winsorized at the 1% level) on $\widehat{M}_t$ *Surprise* and $\hat{F}_t$ *Surprise*, $\hat{B}_{M_Surp}$ and $\hat{B}_{F_Surp}$ respectively, from firm-level regressions represented by $BHR_t = \delta + B_{M_Surp}\widehat{M}_t Surprise + B_{F_Surp}\hat{F}_t$ *Surprise* $+ \varepsilon_t$. All regressions include quarter fixed effects. We compare the average difference between the firm-level coefficients using paired sample t-tests. Please refer to Appendix A for variable definitions.