## Online Appendix to "The First Half-Century of Empirical Capital Markets Research in Accounting in Pictures"

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**Description**: This Appendix includes all supplemental plots mentioned in the paper as well as an Excel file containing each figure's estimated time-series coefficients, accounting variables of interest, and macroeconomic and market-wide determinants.

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Figure A.1 – Ball and Brown (1968): "An Empirical Evaluation of Accounting Income Numbers"

Panel A: Abnormal performance index (API) in event time relative to the earnings announcement month (m = 0) for earnings increase and decrease portfolios (using all observations with fiscal year-end dates spanning Dec. 1972 – Dec. 2022)



Panel B: Annual mean values of the difference in the abnormal performance index (API) as of the earnings announcement month (m = 0) for samples of firms with earnings increases versus earnings decreases



#### Figure A.1, continued

To illustrate Ball and Brown's (BB's) (1968) relation, Figure A.1, Panel A pools observations across firms and over time using all firms with data available on CRSP and COMPUSTAT with a fourth-quarter earnings announcement (EA) date available for fiscal years ending between December 1972 and December 2022; a December 31 fiscal yearend; and annual earnings per share (EPS) available in years *t* and *t*-1 (EPSPX in COMPUSTAT). Panel A plots the mean value of the monthly *Abnormal Performance Index* (as in BB, *API* measures the month-to-month buy-and-hold abnormal return to a \$1 starting investment) for months -12 to +6 surrounding the month of the EA (m=0). While BB use three measures of earnings expectations to assign firms to portfolios with a positive (i.e., "good news") or a negative (i.e., "bad news") annual earnings change, to reduce computational requirements, we report results where earnings increases and decreases are based on the change in annual earnings (i.e., a random walk, which corresponds to BB's Model (3)). Figure A.1, Panel A looks remarkably similar to BB's classic Figure 1 that was based on the 1957–1966 period. For their Model (3), BB reported that the value of the *API* reaches roughly \$1.07 (\$0.89) by the EA month for their "good news" ("bad news") portfolio. The corresponding *API* for our 1972–2022 pooled sample period is roughly \$1.11 (\$0.89) for the earnings increase (decrease) portfolio.<sup>1</sup>

Panel B uses all available COMPUSTAT and CRSP data for firm-year observations: with a fourth-quarter earnings announcement (EA) date available for fiscal years ending between December 1972 and December 2022; a December 31 fiscal year-end; and annual earnings per share (EPS) available in years *t* and *t*-1 (EPSPX in COMPUSTAT). Earnings news (i.e., unexpected earnings, UE) is measured using the sign of the change in annual EPS from year *t*-1 to *t*. For each portfolio, the monthly *API* is measured using monthly size-adjusted returns based on market capitalization decile portfolio assignments available from CRSP. The figure plots the mean of the difference in the *API* value of the *Earnings Increase* and *Earnings Decrease* samples in the month of the earnings announcement (m = 0) for each annual reporting year from 1972 to 2022. The figure includes a separate line for the variance of the daily CRSP value-weighted market index return (*Index Return Variance*, multiplied by 100 for presentation purposes) measured over the calendar reporting year in which earnings is measured.

<sup>&</sup>lt;sup>1</sup> We find similar results (untabulated) for the *API* for firms with a non-December 31 fiscal year-end. The *API* in the EA month (m = 0) over the 1972–2022 sample period for these firms is approximately \$1.17 (\$0.88) for firms with a positive (negative) change in annual earnings.

Figure A.2 Beaver (1968): "The Information Content of Annual Earnings Announcements"



Panel A: Abnormal trading volume (AVOL) (all observations 1972 - 2023)









Panel C: Annual averages of abnormal trading volume (AVOL) during the EA week

Panel D: Annual averages of abnormal return variance (AVAR) during the EA week



### Figure A.2, continued



Panel E: Annual averages of abnormal return variance difference (AVAR\_Diff)

Panel F: Calendar year abnormal adjusted R<sup>2</sup> for earnings announcement windows (Ball and Shivakumar 2008)



#### Figure A.2, continued

This figure plots abnormal trading volume (*AVOL*) and abnormal security price variability (*AVAR*), for all firms with a quarterly earnings announcement (EA) date between January 1973 and December 2023 and data available on COMPUSTAT/CRSP. The figure includes separate plots for 12/31 and non-12/31 fiscal year-end firms. Panel A (B) plots the behavior of abnormal trading volume, *AVOL* (abnormal security price variability, *AVAR*), in the weeks surrounding the quarterly EA.<sup>2</sup> For non-12/31 firms, the plots for the full sample period in Panels A and B look remarkably similar to those in Beaver (1968) in that *AVOL* and *AVAR* spike in the EA week. In particular, *AVOL* and *AVAR* for 12/31 year-end firms are roughly 100% higher than the non-announcement period average. For comparison, Beaver reported that abnormal volume and abnormal price variability were roughly 30% and 67% higher in the week of the annual EA, respectively. Consistent with Beaver's original motivation to focus on non-12/31 firms, namely, the argument that their EAs would reveal more new information than those of more closely followed 12/31 firms, Panel A's plot shows a larger spike in abnormal volume in the EA week for non-12/31 firms (mean *AVOL*=0.875). On the other hand, Panel B's plots of abnormal price variability in weeks surrounding the EA for non-12/31 and 12/31 firms are virtually indistinguishable.

Panels C – E of Figure 2 use all available COMPUSTAT and CRSP data with a quarterly earnings announcement (EA) date between January 1973 and December 2023; quarterly earnings before extraordinary items (IBQ in COMPUSTAT) available; and a quarter-end stock price (PRCCO in COMPUSTAT) of at least \$1 per share. Panel C's plot uses the pooled sample of firm-quarter observations to compute abnormal volume (AVOL) as the mean daily share turnover (VOL / SHROUT in CRSP) during the calendar week (Monday – Friday) of the EA (t=0) less mean daily share turnover during a pre-period covering calendar weeks -9 to -4 relative to the EA week. Panel D's plot uses the pooled sample of firm-quarter observations to compute the ratio of abnormal security price variability (AVAR) as the variance of daily size-adjusted returns measured during the calendar week (Monday – Friday) of the EA (t=0) divided by the variance of daily size-adjusted returns during a pre-period covering weeks -9 to -4. Panel E's plot uses the pooled sample of firm-quarter observations to compute the difference in abnormal security price variability (AVAR Diff) as the variance of daily size-adjusted returns measured during the calendar week (Monday -Friday) of the EA (t=0) less the variance of daily size-adjusted returns during a pre-period covering weeks -9 to -4, following the approach by Thomas, Zhang, and Zhu (2022). Panels C – E report mean values by calendar year for AVOL, AVAR, and AVAR Diff, respectively, as the equal-weighted average of EA-week observations, with separate lines provided for firms with a December 31 fiscal year-end (12/31 firms) and for firms without a December fiscal year-end (Non-12/31 firms), following the sample filter used by Beaver (1968). Each calendar year, we drop the top 1% of AVOL, AVAR, and AVAR Diff to eliminate potential outlying observations.

Panel F uses all available firm-year observations with at least 240 trading days of returns available in the CRSP daily returns file in a given calendar year; exactly four quarterly earnings announcements [EAs] available in COMPUSTAT for a given calendar year; and where the three-trading-day event windows surrounding each quarterly EA lie entirely within the calendar year. In Panel F, calendar year returns are computed using the CRSP daily returns file and include all calendar years and corresponding EAs between January 1973 and December 2023. To generate the plot, annual cross-sectional regressions of calendar year buy-and-hold returns on returns earned in the three-trading-day [-1,+1] windows surrounding each of the four quarterly earnings announcements that occur during the calendar year are estimated. Panel F plots the abnormal adjusted R<sup>2</sup> values (*Abn\_R*<sup>2</sup>) from this regression, based on the difference between the adjusted R<sup>2</sup> from the annual cross-sectional regression and the fraction of trading days represented by the windows surrounding the quarterly EAs (e.g., 12 trading days / 251 total trading days for the year). All panels include separate lines for the annual growth in real GDP (*Real GDP Growth*), the annual average one-month Treasury bill yield (*T-Bill Yield*) available from the St. Louis Federal Reserve's FRED database, and the variance of the daily CRSP value-weighted market index return (*Index Return Variance*, multiplied by 100 for presentation purposes).

<sup>&</sup>lt;sup>2</sup> For brevity, we exclude a plot of raw volume, which closely resembles Beaver's original finding.

**Figure A.3** – Beaver, Clarke, and Wright (1979): "The Association between Unsystematic Security Returns and the Magnitude of Earnings Forecast Errors"



Pooled sample (all observations with fiscal years ending between December 1972 and December 2022)

This figure uses all available COMPUSTAT and CRSP data with a fourth-quarter earnings announcement (EA) date for fiscal years ending between December 1972 and December 2022 and annual earnings per share (EPS) available in years t and t-1. Unexpected earnings (UE) is measured as the change in annual EPS (EPSPX in COMPUSTAT) from year t-1 to t, scaled by price per share at the end of fiscal year t (PRCC\_F in COMPUSTAT). Firms are ranked separately each year on the basis of UE to form 25 portfolios, where firms with a rank of 1 (25) have the lowest (highest) UE. For each portfolio, the average 12-month buy-and-hold size-adjusted return ending in the month of the fourth-quarter EA (UR) is calculated using the market capitalization decile assignments available from CRSP. To illustrate intertemporal variation in the relation, Figure A.3 plots the mean UR for each of the 25 UE portfolios for the entire sample period. To generate the figure, we average portfolio returns across years and then plot each portfolio's grand mean UR (y-axis) vs. the corresponding UE portfolio number (1 – 25, x-axis). Given the positive correlation documented by BCW, the (UE:UR) datapoints should fall along an upward-sloping line. Figure A.3's picture largely reproduces BCW's positive magnitude relation in that as the UE increases (the portfolio number), so too does the magnitude of the portfolio's mean UR. The mean UR for UE portfolios 1, 2, 24, and 25 are -47.48%, -31.30%, 11.91%, and -4.67%, respectively. While the plot is not characterized by a strict monotonic relation in that the mean portfolio UR falls after UE portfolio 22, the Spearman rank correlation between the UE portfolio number and mean UR of 0.827 is quite high (and statistically significant).<sup>3</sup>

<sup>&</sup>lt;sup>3</sup> One explanation for why the relation is not strictly monotone (i.e., does not have a rank correlation of 1.0) is nonlinearities in the UR-UE relation documented in later studies (e.g., Freeman and Tse 1992).





Panel A: Regression coefficients for subsequent growth in earnings on percentage change in price

1.8 0.1 PE Real GDP Growth  $\rho = -0.532^{***}$ RWWD Real GDP Growth  $\rho = -0.426^{***}$ 1.6 0.08 1.4 0.06 Mean Absolute Error 1.2 Growth Rate 0.04 1 0.8 0.02 0.6 0 0.4 -0.02 0.2 0 -0.04 1959 1950 1962 1,965 1968 2019 2022 ~91A \* 2911 ୍ <sub>ବି</sub>ଷ୍ଟ୍ର କରି <sub>ସ</sub>ର୍ଚ୍ଚ , ବ୍ରତି , ବ୍ରତି , ବ୍ରତି , ବ୍ରତି 2002,004,001,010,013,016  $\sqrt{3^{1}}$ Fiscal Year of Earnings Growth RWWD MAE PE MAE --- Real GDP Growth

Panel B: Earnings forecast errors from price-based and random walk with drift forecast models

#### Figure A.4, continued

Figure 4 uses all available COMPUSTAT data for firms with a December fiscal year-end between 1951 and 2023 (variable measurement requires data for the prior 60 months, so plots begin in 1956); with earnings per share (EPSPX in COMPUSTAT) and year-end stock price (PRCC\_F in COMPUSTAT) available. Firms are annually sorted into 25 portfolios on the basis of the buy-and-hold annual calendar-year stock return. Panel A plots the coefficient from regressions of the portfolio's median percentage change in earnings per share (EPS) from year t to t+1 on the portfolio's median buy-and-hold annual return for year t following Eq. (1), where the plot reports coefficients based on the year in which earnings growth is measured (year t+1). Panel B plots the mean absolute error (MAE) of annual EPS forecasts using a price-earnings (PE) forecast model and a random walk with drift (RWWD) forecast model, respectively, to measure year-ahead expected earnings, where the plot reports coefficients based on the year in which earnings growth is measured (year t+1). In Panel B, we annually sort firms into 10 (decile) portfolios on the basis of their price-earnings ratio (PE). PE earnings forecasts for year t+1 are estimated as EPS in year t multiplied by one plus the median growth rate for earnings per share in the PE-sorted decile portfolio estimated using all available annual data for periods 1951 through year t (i.e., an expanding window of data). Forecasts of earnings in year t+1 based the RWWD are calculated as the EPS in year t plus the drift (estimated by the cumulative portfolio mean change in EPS for each portfolio estimated using all annual data from 1951 through year t). Both panels include plots of the annual growth in real GDP (Real GDP Growth), measured over the year in which earnings growth is measured in each plot (year *t*+1).

**Figure A.5** – Collins, Kothari, and Rayburn (1987): "Firm Size and the Information Content of Prices with Respect to Earnings"



Panel A: Annual median absolute earnings forecast errors for small (bottom quintile) and large (top quintile) firms

Panel B: Annual percent of observations with lower price-based forecasts for small and large firms



#### Figure A.5, continued

Figure A.5 uses all available COMPUSTAT and CRSP data after imposing the following requirements for each firm-year observation: an active listing on the NYSE, AMEX, or NASDAQ stock exchange; positive prior-year (t-1) income before extraordinary items (IB in COMPUSTAT), and data to compute current (t) and prior (t-1) fiscal year size-adjusted returns. Observations with earnings changes less than -100% are set to -1 while those above 100% are set to +1 to address the influence of potential outlying observations. Each year, observations meeting these filters are sorted into 25 portfolios based on prior-year (t-1) size-adjusted returns, where portfolios are formed separately within each quintile of firm size (beginning of year market capitalization) (i.e., 125 annual portfolios, based on 25 return portfolios for each size quintile). The mean percentage change in earnings for each of portfolio is then regressed on the mean size-adjusted portfolio return over rolling 10-year windows ending in year t-1. Predictions for earnings growth in year t are formed using year t-1 size-adjusted returns for each firm-year observation multiplied by the fitted value from the rolling regression. The random-walk forecast of earnings uses prior-year earnings as a forecast of current year earnings. Panel A plots the median absolute earnings forecast error for each fiscal year from 1983-2023, measured separately for small firms (bottom quintile of market capitalization based on the CRSP market capitalization portfolio assignments) and large firms (top quintile of market capitalization) for price-based (PB) and random walk (RW) earnings forecast models. Following Collins, Kothari, and Rayburn (CKR) (1987), we eliminate observations with small denominators when computing percentage forecast errors by requiring current-year earnings per share (EPSPX in COMPUSTAT) to be greater than or equal to \$0.20. Panel B plots, by year, the percentage of firm-year observations with a lower absolute forecast error for the PB forecast model relative to the RW model, separately for small (bottom quintile) and large (top quintile) firms. Both panels include a plot for the annual mean value of special items (Special Items), calculated as COMPUSTAT item SPI scaled by average total assets.

**Figure A.6** – Foster, Olsen and Shevlin (1984) and Bernard and Thomas (1989): Post-Earnings-Announcement Drift



Panel A: Post-earnings-announcement returns for the full (pooled) sample (all observations from 1974 - 2023)

Panel B: Post-earnings-announcement returns for large firms (top quintile of market capitalization)



#### Figure A.6, continued





This figure illustrates PEAD's features for a pooled sample of observations with a quarterly earnings announcement date (EA) between January 1975 and September 2023 by plotting the mean post-announcement returns for 10 portfolios formed each calendar quarter based on the *SUE* distribution. Panel A's pooled sample plot shows that the return for the lowest (highest) *SUE* portfolio reaches roughly -1.5% (2.3%) by the end of the post-announcement period. For comparison, Bernard and Thomas (BT) (1989) report a return of roughly -2.0% (2.0%) for the lowest (highest) *SUE* portfolio (see BT's Figure 2). Panel B plots the PEAD for the sample of large firms (top market capitalization quintile based on CRSP market capitalization portfolio assignments) over the entire sample period. Panel B's plot shows evidence of a smaller PEAD for large firms (which have a more liquid market and correspondingly lower trading costs). For large firms, the bottom (top) *SUE* portfolio's return reaches only -0.2% (1.1%) by the end of the post-announcement period. For comparison, BT report a return for large firms of roughly -1.8% (1.8%) for the lowest (highest) *SUE* portfolio (see BT's Figure 3). Panel C plots the PEAD for the small firm sample (bottom two market capitalization quintiles) over the entire sample period. Panel C's plot shows that PEAD is more pronounced for small firms. The return for the lowest (highest) *SUE* portfolio for small firms reaches roughly -3.5% (2.1%) for the lowest (highest) *SUE* portfolio (see BT's Figure 6).

Figure A.9 - Dechow (1994): "Earnings versus Cash Flow as a Summary Measure of Performance"



Panel A: R<sup>2</sup> and correlations from earnings, cash flows, and accruals

Panel B: R<sup>2</sup> and correlations from earnings, cash flows, and accruals (12/31 fiscal-year end firms only)



#### Figure A.9, continued

This figure uses all available COMPUSTAT and CRSP data for firms with a fourth-quarter earnings announcement (EA) date available for fiscal years ending between December 1987 and December 2023; annual earnings before extraordinary items available in year *t* (IB in COMPUSTAT); operating cash flow (OCF) available from the cash flow statement (OANCF in COMPUSTAT); and market capitalization available as of the beginning of year *t* (CSHO \* PRCC\_F in COMPUSTAT). The figure plots annual R<sup>2</sup>s based on annual cross-sectional regressions of 12-month buy-and-hold returns measured over the fiscal-year regressed on earnings-to-price (*EP*, measured as IB<sub>t</sub> / [CSHO<sub>t-1</sub> \* PRCC\_F<sub>t-1</sub>] in COMPUSTAT) and operating-cash-flow-to-price (adjusted for cash flow associated with extraordinary items, *CFO* measured as [OANCF<sub>t</sub> – XIDOC<sub>t</sub>] / [CSHO<sub>t-1</sub> \* PRCC\_F<sub>t-1</sub>] in COMPUSTAT). The figure also plots the annual cross-sectional Pearson correlation between accruals-to-price (*ACC*, measured as *EP* – *CFO*) and *CFO*. As in Dechow (1994), observations in the top and bottom 1% of the distributions of *EP* and OCF in each fiscal year are dropped. Panel A includes a plot for the percentage of firms reporting negative earnings before extraordinary items each year (*Loss* %). Panel B additionally requires that firms have a December (12/31) fiscal year-end date.



Figure A.11 – Hayn (1995): "The Information Content of Losses" (12/31 FYE only)

This figure uses all available COMPUSTAT and CRSP data with a December (12/31) fiscal year-end date between December 1962 and December 2022; annual earnings before extraordinary items available in year *t* (IB in COMPUSTAT); and market capitalization available as of the beginning of year *t* (CSHO \* PRCC\_F in COMPUSTAT). The figure plots the annual percent of observations reporting negative earnings before extraordinary items (*LOSS* %) and the R<sup>2</sup> from annual cross-sectional regressions of 12-month buy-and-hold returns (*RET*, measured for the period ending 3 months after the fiscal year-end) on earnings-to-price (*EP*, measured as IB<sub>t</sub> / [CSHO<sub>t-1</sub> \* PRCC\_F<sub>t-1</sub>] in COMPUSTAT), estimated separately for portfolios of loss firms and all remaining firms reporting zero earnings or a profit. Observations in the top and bottom 1% of the distribution of *EP* each fiscal year dropped to eliminate potential outlying observations. Prior to 1967, there are too few firm-year observations reporting losses to estimate annual cross-sectional regressions of *RET* on *EP* in these periods.



**Figure A.12** – Sloan (1996): "Do Stock Prices Fully Reflect Information in Accruals and Cash Flows about Future Earnings?" (12/31 FYE only)

This figure uses all available COMPUSTAT and CRSP data with a December (12/31) fiscal year-end date between December 1962 and December 2021; and with data on COMPUSTAT to calculate annual accruals: changes in current assets (ACT), changes in cash (CHE), changes in current liabilities (LCT), changes in taxes payable (TXP), changes in short-term debt (DLC), depreciation (DP), and average total assets (AT, for both the current and prior year). Taxes payable are set to zero for firms with missing values. As in Sloan (1996), annual accruals are measured using changes from year *t*-1 to *t* as:  $[(\Delta CA - \Delta CHE) - (\Delta LCT - \Delta DLC - \Delta TXP) - DP] / [(AT_t + AT_{t-1})/2]$ . Each year, firms are sorted into 10 accrual (deciles) portfolios. The figure plots the mean *Hedge Portfolio Return* in each year (*t*+1, *Return Measurement Year*), measured as the difference in the mean 12-month buy-and-hold size-adjusted return ending three months after the fiscal year-end between the lowest and highest accrual deciles.

**Figure A.13** – Basu (1997) and Ball, Kothari, and Robin (2000): Asymmetric Timeliness of Earnings (12/31 FYE Only)



Coefficient estimates of annual cross-sectional regressions of the Basu (1997) model for the subsample of firms with a December (12/31) fiscal-year end

This figure uses all available COMPUSTAT and CRSP data with a December (12/31) fiscal year-end date between Dec. 1963 and Dec. 2021; annual earnings before extraordinary items available in year *t* ( $E_{it}$ , measured by IB in COMPUSTAT); and market capitalization available as of the beginning of year *t* ( $P_{it-1}$ , measured by CSHO \* PRCC\_F in COMPUSTAT). For this sample, the following regression is estimated annually:  $E_{it} / P_{it-1} = \alpha_0 + \alpha_1 DR_{it} + \beta_0 R_{it} + \beta_1 R_{it} * DR_{it} + \epsilon_{it}$ , where  $R_{it}$  is the 12-month buy-and-hold equity return ending three months after the fiscal year-end and *DR* is an indicator variable set equal to one (zero) for observations with a negative (non-negative) 12-month buy-and-hold return. The figure plots the  $\beta_0$  and  $\beta_1$  coefficients from these annual cross-sectional regressions. As in Basu (1997), each fiscal year, observations in the top and bottom 1% of  $E_{it} / P_{it-1}$  distribution are dropped.



**Figure A.14** – Collins, Maydew, and Weiss (1997): "Changes in the Value-Relevance of Earnings and Book Values over the Past Forty Years" (12/31 FYE Only)

This figure uses all available COMPUSTAT and CRSP data with a December (12/31) fiscal year-end between 1962 and 2022; financial statement data for annual earnings before extraordinary items, earnings per share (EPS) including extraordinary items, book value of equity per share, and common shares outstanding (IB, EPSPI, BKVLPS, and CSHO, respectively, all in COMPUSTAT); and positive fiscal year- and quarter-end stock prices (PRCC\_F and PRCCQ in COMPUSTAT). To generate the figure, three cross-sectional regressions are estimated each year where price per share is regressed on: (1) EPS, (2) book value of equity per share, and (3) both earnings and book value of equity per share. The incremental explanatory power of book values (*Incr BV*) is the R<sup>2</sup> from regression (3) minus that from regression (2). The incremental explanatory power of earnings (*Incr EARN*) is the R<sup>2</sup> from regression (3) minus that from regression (1). The total explanatory power (*TOTAL*) is the R<sup>2</sup> from regression (3) minus that from regression (1). The total explanatory power (*TOTAL*) is the R<sup>2</sup> from regression (3). As in Collins et al. (1997), observations in the top and bottom 0.5% of earnings-to-price or book-to-market; in the top 0.5% of one-time items as a percentage of income; and observations with studentized residuals greater than four standard deviations from zero in any of the regressions are dropped. The figure plots the total and incremental explanatory power of earnings and book value (unstacked).