

# HOW SHOULD WE CALCULATE FIRM PROFITABILITY?

*The Ruthven Institute has developed 12 rules for business success, based on 45 years of analysis of Australia's top 1000 companies. The RI Hub is set to embark on research into key aspects of these rules. In this initial Research Note we review various common measures of business success, particularly of profitability. This will inform how we empirically investigate the rules.*

Achieving high rates of return and maximising profitability is typically agreed as the prime (or at least a key) objective of firms. Yet, any study of firm performance requires a choice about how to measure profitability. A number of performance ratios and metrics are utilised by academics and practitioners. We set out to review and assess these alternatives, in terms of their relative informativeness/usefulness, so as to build a sound methods base for our subsequent empirical works. We conclude that simple ratio measures – Return on Equity (ROE) and Return on Assets (ROA) – appear most robust, practical and effective, with the caveat that removing non-recurring expenses increases their utility considerably. Return on Market Value of Equity is another useful alternative that can be considered when comparing the performance of public companies.

## Our approach

While prior academic research has predominantly focused on identifying the set of financial and non-financial measures that are jointly informative about a given firm's value and future profitability, some studies have also explored which of these measures outperform others. Our review surveys studies whose empirical methodologies and/or findings allow us to gain an insight into the relative informativeness and usefulness of various performance measures. Applying a filter based on this criterion is necessary as these studies do not constitute a single stream of academic literature that is concerned with ranking measures according to the level of their usefulness. A study is thus included in this survey not by the merit of belonging to specific literature but by employing a methodological design that considers, or requires the inclusion of, more than one performance measure in its empirical tests and allows the readers to compare these measures.

## Which performance measures better reflect firm profitability?

Perhaps the biggest challenge of conducting such a survey stems from the fact that singling out the most informative performance measure is an objective-oriented and

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contextual task. For example, a performance metric that is useful for predicting market value may not be very useful for predicting bankruptcy or next year's earnings, when in fact all three factors capture future profitability in different ways. "Future profitability" is key here as we need some kind of benchmark against which to compare the most commonly used performance measures (such as return on equity or return on assets).<sup>1</sup> Since stock valuation methods use expectations of future earnings, we have identified the most relevant studies for the purposes of this review to be the ones that attempt to predict firm value using accounting information.<sup>2</sup> We have also had an extensive look into the studies that attempt to predict future earnings – rather than stock returns – using financial ratios. However, research designs and/or findings of these studies did not allow us to reasonably compare the different profitability ratios. Consequently, only the relevant papers from the former are presented in this survey.

The oldest of studies that compare the relevance of different profitability measures for security price determination (also called value-relevance literature in accounting) is Lee and Zumwalt (1981). Their paper examines how six alternative profitability measures – sales to assets ratio, earnings before interest and taxes (EBIT) to assets ratio, net income to assets ratio, net income to common equity ratio, profit margin, and net income to sales ratio (net profit margin) – are related to stock returns in each industry using U.S. data spanning from 1960 to 1975. All six variables are found to be significantly associated with stock returns, but the two most consistent ones are the EBIT to assets and net income to common equity ratios. These happen to be the most common methods of calculating ROA and ROE ratios, respectively. One caveat regarding these findings is that since the analyses were performed for each industry separately, the sample size in each regression was quite small (nine observations per regression, performed using simulations) and results might be different for a bigger sample.

Dhaliwal, Subramanyam, and Trezevant (1999) ask a broader question: is comprehensive income a better measure of firm performance than net income? Comprehensive income consists of net income and other comprehensive income, the

1 One cannot use current profitability as a benchmark because (1) a perfect measure of profitability does not exist (we would use it if it did) and (2) one cannot compare the imperfect measures of current profitability against themselves.

2 These studies assume that markets are at least semi-efficient.

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latter of which includes “items of income and expense (including reclassification adjustments) that are not recognised in profit or loss as required or permitted by other Australian Accounting Standards” (Australian Accounting Standards Board, 2009). Requiring firms to report other comprehensive income – which comprises unrealised gains and losses – is intended to give the users of financial statement additional information not contained in net income. However, Dhaliwal et al. (1999) find no evidence that comprehensive income is a more informative measure of firm performance than net income or cash flows.

The empirical analysis by Biddle, Bowen, and Wallace (1997) focuses on whether Economic Value Added (EVA), a proprietary measure of profitability, outperforms traditional accounting measures of performance. The accounting measure used by the authors in empirical tests is earnings before extraordinary items, divided by market value of equity to achieve comparability across firms. The classification of extraordinary items was specific to the U.S. generally accepted accounting principles (GAAP) and comprised gains and losses that are both unusual and infrequent in nature, e.g., losses from natural disasters<sup>3</sup>. EVA is obtained by making numerous adjustments to earnings before extraordinary items. For example, accounting standards require the research and development costs to be expensed unless certain conditions are met. EVA, on the other hand, requires the capitalisation and amortisation of research and development costs at all times (Biddle et al., 1997). The study finds that earnings before extraordinary items are generally more highly associated with stock returns than EVA. EVA performs better than cash flows from operations in short-window tests but performs worse in long-window tests. Decomposing EVA into separate components reveals that the components unique to EVA (in addition to the reported accounting measures) are generally not significant in explaining stock returns. A potential caveat of these results is that the study uses Stern Stewart’s (the consulting company that owns EVA trademark) publicly available database to estimate EVA, which does not include many custom adjustments they use for their clients to make EVA potentially more value-relevant.

3 The “Extraordinary items” classification was eliminated in the U.S. in 2015. International Financial Reporting Standards (IFRS) do not have such a designation either (more about non-recurring items will be discussed later). Since much of seminal works in accounting literature is based on the U.S. setting (due to data availability and the high reputation of U.S.-centric journals in academia), the expression extraordinary items will appear frequently in the remainder of this paper. However, findings from these studies are easily generalisable to other settings.

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The further set of studies come from the asset pricing stream of finance literature, which seeks to identify factors relevant to the pricing of securities. The reviewed studies include several dozen factors in their asset-pricing models with the purpose of identifying the most informative and redundant ones. Light, Maslov, and Rytchkov (2017) aggregate 26 firm characteristics using econometric techniques and test whether the aggregated variable predicts stock returns better than previous models. Although not the main focus of the study, one of the analyses involves exploring the returns on portfolios that are structured based on different ratios, including ROA and ROE. Results suggest that ROA performs slightly better than ROE in these tests (both ratios use earnings before extraordinary items as the numerator).

Green, Hand, and Zhang (2017) include 94 firm characteristics simultaneously in one empirical model to examine their incremental informativeness. From the profitability ratios, the study considers three: ROA, ROE, and earnings before extraordinary items to market value ratio. Their findings indicate ROA and ROE are borderline significant in explaining returns, while the earnings to market value ratio has better explanatory power than the other two ratios. Another noteworthy result from the study is that the incremental informativeness of all three profitability measures has disappeared since 2003. Although the authors are not able to pinpoint the specific reason behind this result, they postulate that three major changes in 2003 in the information and trading environment – the adoption of the Sarbanes Oxley Act, the acceleration of new filing requirements, and the introduction of autoquoting by NYSE – might have made it less costly to implement arbitrage strategies. Consequently, this result is likely to be driven not by the decrease in the informativeness of accounting ratios, but rather by the increase in the efficiency of stock markets in the US since 2003. This finding highlights a potential drawback of using stock returns to gauge the usefulness of profitability ratios.

Using machine learning to identify the variables important for asset pricing, Gu, Kelly, and Xiu (2020) document results that are somewhat supportive of these findings. Specifically, profitability ratios are generally found not to be important in explaining stock returns. However, one should be cautious in interpreting these findings as it is likely that the reason why profitability measures are not significant in such an empirical test is because other ratios included in the model – mainly the ratios based on various revenue and expense items – already capture what is communicated through profitability measures.

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Barry (2019) also uses machine learning to examine which fundamentals predict stock returns. Results suggest that portfolios based on ROA and ROE provide similar returns in simple models, but the latter outperforms the former in more complex linear models (the numerator in both ratios is earnings before extraordinary items). Portfolios based on cash flow from operations to assets ratio seems to yield slightly better returns than those based on ROE, although it is unclear if the difference is significant. The so-called Fama-French profitability factor, which is calculated as operating profit divided by equity, outperforms all three ratios in this regard. Interestingly, the correlation matrix suggests that Fama-French profitability factor is very highly correlated (0.94) with operating income before depreciation and amortization, suggesting that the ratio of operating income before depreciation and amortisation to equity can be a highly informative performance measure. The ranking of variables according to their informativeness also reveals that ROA and ROE where the numerator is net income instead of earnings before extraordinary items are at the bottom of the list of 104 variables examined, indicating the importance of excluding at least extraordinary items when calculating profitability ratios.

## **Which earnings measures to use in calculating profitability ratios?**

This section discusses accounting studies that explore what components of earnings better reflect a firm's true profitability. The merit behind examining these studies stems from the fact that once the desired profitability ratio is chosen for cross-comparison, that ratio can be made more informative by refining the earnings figure used in its calculation. An earnings number can be refined by retaining the portion of it that is sustainable and persistent while excluding the portion that is transitory (Beaver, Lambert, & Morse, 1980; Kormendi & Lipe, 1987).

The extent to which disaggregating earnings into *permanent* and *transitory* components improves the informativeness of earnings has drawn considerable attention in accounting literature. Although the vast majority – if not all – of studies have found such disaggregation useful, studies have differed in how they empirically execute it. While some studies have used econometric techniques to derive the permanent component of earnings (typically some form of autoregressive moving average models), others have attempted to obtain an earnings figure that is more

4 The word *permanent* refers to the portion or level of earnings that is expected to be achieved by the company in the foreseeable future under similar conditions. It is intended to capture the part of earnings that is sustainable.

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representative of the firm's operational performance by subtracting various non-recurring items from net income. This review focuses mainly on the second group of empirical studies since they can be used as guidance in calculating profitability measures in practice.

Perhaps the earliest work seeking to analytically model and empirically disentangle the permanent and transitory components of earnings is Beaver et al. (1980) and Lieber, Melnick, and Ronen (1983). Beaver et al. (1980) use changes in stock prices whereas Lieber et al. (1983) use a statistical technique called Kalman filtering to infer the permanent element of earnings. Upon employing a different statistical technique to isolate the permanent component of earnings, Ramesh and Thiagarajan (1993) find the association between the stock returns and permanent component of earnings to be stronger than that between stock returns and the transitory element of earnings. Results from further tests indicate gross margin and operating expenses are the primary determinants of permanent earnings. Another important finding from their study is that the significance of special items, which predominantly include non-recurring items, in explaining transitory income has been increasing over the last few decades.<sup>5</sup> The difference between extraordinary and non-recurring items is that the former is both unusual and infrequent, whereas the latter is either infrequent or unusual but not both.

Based on numerous analyst and practitioner comments that negative special items (i.e., write-offs) distort a company's earnings picture and investors' earnings estimates, Elliott and Hanna (1996) examine the value relevance of recurring and non-recurring items. They find that as firms report a sequence of write-offs, they experience declining levels of accounting earnings as the sequence lengthens. The association between stock returns and the unexpected portion of earnings (called earnings response coefficient in accounting literature) generally decrease in the presence of write-offs and remain relatively low for some time. Consistent with these results and the findings from Ramesh and Thiagarajan (1993), the study also shows that unexpected earnings before write-offs are more important than are unexpected operating earnings in explaining stock returns. Taken together, these findings support the conjecture that investors view write-offs as being relatively non-recurring in nature. Results from Burgstahler, Jiambalvo, and Shevlin (2002) and Jones and Smith (2011) render further support to the presumption that negative

<sup>5</sup> For simplicity, the terms *special* and *non-recurring items* are used interchangeably in this review.

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special items are largely transitory and have no persistence (special items are nevertheless value relevant).

That the transitory nature of some gain and loss items affects the degree to which markets react to earnings announcements has been studied by several others as well. Easton, Shroff, and Taylor (2000) find that the earnings response coefficients are high for the subsample of firms where earnings are likely to be permanent, and close to zero for the subsample of firms where earnings are likely to be transitory.<sup>6</sup> Brown and Sivakumar (2003) examine whether the operating income figure reported by managers can better predict future earnings and stock returns. They document the self-reported operating earnings to be more value relevant than GAAP earnings, likely because the former does a better job at isolating recurring items. This interpretation is consistent with the findings from other studies that suggest non-recurring items – especially those relating to restructuring charges, tax resolutions, and acquisition-related charges – are the most common form of adjustments applied by managers in the U.S. (Black, Christensen, Ciesielski, & Whipple, 2018). Wieland, Dawkins, and Dugan (2013) conduct a similar analysis using a uniform earnings metric devised by S&P and find that this performance metric, called “Core Earnings”, is more informative than GAAP earnings. The Core Earnings measure is calculated as net income plus pension interest cost, minus implied stock option expense, minus/plus gains or losses from asset sales, plus goodwill impairment charges, minus settlements and litigation proceeds, plus post-retirement costs, and minus reversals of prior-year charges (Wieland et al., 2013).

Fairfield, Sweeney, and Yohn (1996) examine the predictive ability of specific earnings components to improve the forecasts of future profitability. They find that operating income should be given the biggest weight in predicting next year’s ROE (calculated as net income divided by equity), followed by non-operating income. Special items and extraordinary items should be given only a small and zero weight, respectively. In forecasting ROE where the numerator is earnings before non-recurring items (including extraordinary items) and discontinued operations, both special items and extraordinary items should be given zero weight in linear models as they have no forecasting power. The follow-up work in this area, however, have found special items to have predictive power in forecasting future earnings (Jones & Smith, 2011). That non-recurring items have some predictive ability while extra-

<sup>6</sup> Also see Ali and Zarowin (1992).

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ordinary items and discontinued operations are uninformative regarding future earnings is due to the likelihood of each earnings category to recur in the future and their relation to the normal operations of the company.

It is important to note, however, the evidence to suggest restructuring charges are associated with positive market reaction even as earnings decline due to higher expenses (Brickley & Van Drunen, 1990). This is likely because restructuring signals increased efficiency and also frequently occurs in healthy firms as part of their growth process. This interpretation is consistent with the findings documented by Chaney, Hogan, and Jeter (1999), that analysts revise downwards their short-term but not long-term earnings forecasts following a restructuring. Interestingly, restructuring charges (along with the expenses related to acquisitions) are also included in the calculation of operating income by credit rating agencies.<sup>7</sup>

## Conclusion

Which profitability measure is *better* is a subjective question and there are arguments and evidence in support of many commonly used profitability measures. The informativeness of a given profitability measure can vary across industries as well, making different performance measures more suitable for different industries (Aksu, Eckstein, Greene, & Ronen, 1996). Furthermore, recent evidence suggests that the accounting numbers relevant for firm valuation have changed drastically moving into the new economy. For example, in 1960s net income alone explained a big proportion of firm value. From 1960s to 2010s, however, the explanatory power of net income has decreased significantly, while alternative performance measures have become more important predictors of a firm's performance (Barth, Li, & McClure, 2019).<sup>8</sup> Among these alternative performance measures, the most notable ones are revenues and cash flow from operations. R&D expenses and capital expenditures have also become increasingly value-relevant, highlighting the importance of innovation and investment in this new age economy.

Even if one decides to use earnings-based profitability ratios for cross-comparison, the question still remains as to what measure of earnings is most representative of a company's true and sustainable performance. Collectively, findings from the studies reviewed speak to the importance of disentangling the recurring components of earnings from non-recurring and unusual items to achieve more informative

<sup>7</sup> For example, see S&P (2019)'s guidance on ratios and adjustments.

<sup>8</sup> Despite the decline in explanatory power, net income is still the most value-relevant performance measure. See Figure 1 of Barth et al. (2019).



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profitability measures. Therefore, a recommended course of action would be to deduct unusual and infrequent items from net income before calculating the desired profitability ratios (such as ROE). Since International Accounting Standards do not provide strict guidance on what constitutes a non-recurring item, however, what items are truly non-recurring is a judgement call and will certainly differ across firms and industries.<sup>9</sup> This suggests a closer look at firms' financial statements may be necessary to identify the non-recurring and unusual items. Lastly, recent empirical evidence suggests that the persistence of non-recurring items with respect to future earnings increases significantly as they become frequent (Cready, Lopez, & Sisneros, 2010). Therefore, a preferred measure of earnings would include these "recurring non-recurring items" despite the companies' labelling them as non-recurring.

9 This may change in the near future as there have recently been proposals to better define and restrict the use of unusual and infrequent items to improve comparability across companies (Australian Accounting Standards Board, 2017; IFRS, 2018).

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## References

- Aksu, C., Eckstein, C., Greene, W. H., & Ronen, J. (1996). Time-series properties, adjustment processes, and forecasting of financial ratios. *Journal of Accounting, Auditing & Finance*, 11(1), 1-44.
- Ali, A., & Zarowin, P. (1992). Permanent versus transitory components of annual earnings and estimation error in earnings response coefficients. *Journal of Accounting and Economics*, 15(2-3), 249-264.
- Australian Accounting Standards Board. (2009). *AASB 101 Presentation of Financial Statements*. Retrieved from [https://www.aasb.gov.au/admin/file/content105/c9/AASB101\\_09-07\\_COMPjun09\\_01-10.pdf](https://www.aasb.gov.au/admin/file/content105/c9/AASB101_09-07_COMPjun09_01-10.pdf)
- Australian Accounting Standards Board. (2017). Proposals to define and restrict use of unusual and infrequent items will significantly improve financial statements [Press release]. Retrieved from <https://aasb.gov.au/Media-Releases/Proposals-to-define-and-restrict-use-of-unusual-and-infrequent-items-will-significantly-improve-financial-statements?newsID=260929>
- Barry, T. (2019). *Which fundamentals predict returns? An Application of machine learning*. (Honours Research Essay). University of Melbourne,
- Barth, M.E., Li, K., & McClure, C. (2019). Evolution in value relevance of accounting information. Available at SSRN: <https://ssrn.com/abstract=2933197>.
- Beaver, W., Lambert, R., & Morse, D. (1980). The information content of security prices. *Journal of Accounting and Economics*, 2(1), 3-28.
- Biddle, G.C., Bowen, R. M., & Wallace, J.S. (1997). Does EVA<sup>®</sup> beat earnings? Evidence on associations with stock returns and firm values. *Journal of Accounting and Economics*, 24(3), 301-336.
- Black, D.E., Christensen, T. E., Ciesielski, J.T., & Whipple, B.C. (2018). Non-GAAP reporting: Evidence from academia and current practice. *Journal of Business Finance & Accounting*, 45(3-4), 259-294.
- Brickley, J.A., & Van Drunen, L.D. (1990). Internal corporate restructuring: An empirical analysis. *Journal of Accounting and Economics*, 12(1-3), 251-280.
- Brown, L.D., & Sivakumar, K. (2003). Comparing the value relevance of two operating income measures. *Review of Accounting Studies*, 8(4), 561-572.
- Burgstahler, D., Jiambalvo, J., & Shevlin, T. (2002). Do stock prices fully reflect the implications of special items for future earnings? *Journal of Accounting Research*, 40(3), 585-612.
- Chaney, P.K., Hogan, C.E., & Jeter, D.C. (1999). The effect of reporting restructuring charges on analysts' forecast revisions and errors. *Journal of Accounting and Economics*, 27(3), 261-284.
- Cready, W., Lopez, T.J., & Sisneros, C.A. (2010). The persistence and market valuation of recurring nonrecurring items. *Accounting Review*, 85(5), 1577-1615.
- Dhaliwal, D., Subramanyam, K., & Trezevant, R. (1999). Is comprehensive income superior to net income as a measure of firm performance? *Journal of Accounting and Economics*, 26(1-3), 43-67.
- Easton, P., Shroff, P., & Taylor, G. (2000). Permanent and transitory earnings, accounting recording lag, and the earnings coefficient. *Review of Accounting Studies*, 5(4), 281-300.
- Elliott, J. A., & Hanna, J.D. (1996). Repeated accounting write-offs and the information content of earnings. *Journal of Accounting Research*, 34, 135-155.
- Fairfield, P.M., Sweeney, R.J., & Yohn, T.L. (1996). Accounting classification and the predictive content of earnings. *Accounting Review*, 71(3), 337-355.
- Green, J., Hand, J.R., & Zhang, X.F. (2017). The characteristics that provide independent information about average us monthly stock returns. *The Review of Financial Studies*, 30(12), 4389-4436.
- Gu, S., Kelly, B., & Xiu, D. (2020). Empirical asset pricing via machine learning. *The Review of Financial Studies*, 33(5), 2223-2273.
- IFRS. (2018). Unusual or infrequent items. *Staff Paper*.
- Jones, D.A., & Smith, K.J. (2011). Comparing the value relevance, predictive value, and persistence of other comprehensive income and special items. *Accounting Review*, 86(6), 2047-2073.
- Kormendi, R., & Lipe, R. (1987). Earnings innovations, earnings persistence, and stock returns. *Journal of Business*, 60(3), 323-345.

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- Lee, C.-F., & Zumwalt, J.K. (1981). Associations between alternative accounting profitability measures and security returns. *Journal of Financial and Quantitative Analysis*, 16(1), 71-93.
- Lieber, Z., Melnick, E.I., & Ronen, J. (1983). The filtering of transitory noise in earnings numbers. *Journal of Forecasting*, 2(4), 331-350.
- Light, N., Maslov, D., & Rytchkov, O. (2017). Aggregation of information about the cross section of stock returns: A latent variable approach. *Review of Financial Studies*, 30(4), 1339-1381.
- Ramesh, K., & Thiagarajan, S.R. (1993). Estimating the permanent component of accounting earnings using the unobservable components model: Implications for price-earnings research. *Journal of Accounting, Auditing & Finance*, 8(4), 399-425.
- S&P. (2019). Corporate Methodology: Ratios And Adjustments. Retrieved from [https://www.standardandpoors.com/en\\_US/web/guest/article/-/view/type/HTML/id/2189082](https://www.standardandpoors.com/en_US/web/guest/article/-/view/type/HTML/id/2189082)
- Wieland, M.M., Dawkins, M.C., & Dugan, M.T. (2013). The differential value relevance of S&P's core earnings versus GAAP earnings: the role of stock option expense. *Journal of Business Finance & Accounting*, 40(1-2), 55-81.

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