Financial statement analysis: a review and current issues

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Received 13 October 2021
Revised 28 October 2021
Accepted 1 November 2021

Abstract

Purpose – The literature on financial statement analysis attempts to improve fundamental analysis and to identify market inefficiencies with respect to financial statement information.

Design/methodology/approach – In this paper, the author reviews the extant research on financial statement analysis.

Findings – The author then provides some preliminary evidence using Chinese data and offer suggestions for future research, with a focus on utilising unique features of the Chinese business environment as motivation.

Originality/value – The author notes that there has been no work that the author could locate specifically on Chinese FSA research. The unique business environment in China, relative to the US where the vast majority of this work has been conducted, should motivate any studies, especially given the author documents the robust finding in terms of the mean reversion in profitability.

Keywords Financial statement analysis, Fundamental analysis, Forecasting, Persistence, Mean reversion

Paper type Research paper

1. Introduction

In this paper I review the trends in the literature on financial statement analysis (FSA), and provide insights into the relevance of FSA research in emerging trends. FSA research is generally concerned with two key issues – improving fundamental analysis and identifying market inefficiencies with respect to financial statement information (Yohn, 2020). Improving fundamental analysis is important in order to improve forecasts of profitability and more accurate estimates of firm value. The identification of market inefficiencies is generally within the realm of security equity analysts and quantitative funds that use certain firm or stock characteristics to select hedge portfolios in an attempt to beat the market.

In my survey of the literature, I focus on accounting journals [1] with a keyword search of “financial statement analysis”, “fundamental analysis”, and “forecast*” [2] on Web Of Science. A substantial number of articles from this search, particularly from the “forecast*” search term are related to topics such as analyst and management earnings forecasts, but not directly related to FSA research. Similarly, I exclude a number of papers on valuation and cost of capital which are not directly related to utilising financial statement information to identify market inefficiencies. After manually sorting through the 879 search results, I identify 79 papers that are directly related to what would traditionally be considered as FSA research [3]. This highlights the commentary from Yohn (2020) that this is a stream of research in which relatively few academics have been involved in. The upshot from this, however, is that it also illustrates it is an area with vast opportunities for future research.

An important part of fundamental analysis is the use of a systematic forecasting procedure to estimate firm value. There are alternate methods, but three dominate: the discounted dividend model, discounted cash flow model, and the residual income model. Under certain assumptions, it can be shown that all three methods will provide identical valuations. The residual income model, introduced by Ohlson (1995), has a focus of value

I appreciate the comments from an anonymous reviewer, Chao Li and Wenfeng Wu (editor). I acknowledge funding from a UNSW Scientia Fellowship. This research was supported under the Australian Research Councils Discovery Projects funding scheme (project number DP210101354).

China Finance Review International
Vol. 12 No. 1, 2022
pp. 1-19

2044-1398
DOI 10.1108/CFRI-10-2021-0208

created by the firm, with no consideration of whether it is distributed back to owners, or whether it consists of cash. The usefulness of the residual income model to FSA research is that it expresses value based on financial statement summary measures. This provides guidance for FSA research in that residual income is defined as net income less the capital charge (or alternatively $(ROE_t - r_e) * BV_{t-1}$). This suggests that firm value is a function of return on equity and book value, thus research should focus on forecasting return on equity (ROE) and book value (BV) [4]. The importance of forecasting summary financial statement information, then, was only opened up relatively recently, with a limited literature in the area.

The remainder of the paper is structured as follows. In Section 2, I introduce the literature on fundamental analysis, with a focus on forecasting future profitability. Section 3 then summarises the literature on market inefficiencies. I provide some introductory analysis on persistence and mean reversion of profitability and its components in China in Section 4, with some suggestions for consideration of future research especially taking into account the unique features of the Chinese business environment. Finally, I conclude in Section 5.

2. Fundamental analysis

Within FSA research on fundamental analysis, there are two key concepts regarding the time-series properties of a firm's earnings – persistence and mean reversion:

$$\text{Persistence :}$$

$$X_{t+1} = \alpha_0 + \alpha_1 X_t + \epsilon \tag{1}$$

$$\text{Mean Reversion :}$$

$$\Delta X_{t+1} = \gamma_0 + \gamma_1 \Delta X_t + \gamma_2 X_t + \epsilon \tag{2}$$

The persistence of profitability is captured by α_1 in equation (1), with the value of the co-efficient indicating what percent of profitability in year t will persist into year $t+1$, on average [5].

Mean reversion, on the other hand, documents the rate profitability will revert back to the "mean". From equation (2), γ_2 captures the rate of mean reversion, with a value less than 0 indicating mean reversion, and the larger the value the faster the rate of mean reversion. The co-efficient on ΔX_t (γ_1) indicates the correlation in period-to-period changes in profitability. While the concepts of persistence and mean reversion are similar in nature ($\alpha_1 < 1$ in Eqn (1) implies that profitability will be mean reverting), they have quite different interpretations.

To illustrate the nature of mean reversion, Nissim and Penman (2001, Figure 4a) sort firms into deciles based on ROE and track the behaviour of ROE in each decile over the next five years. It is an empirical regularity that the means of each decile tend towards a mean value, with the top (bottom) decile decreasing (increasing) at a faster rate that the non-extreme deciles.

The economic rationale for why mean reversion in profitability exists come from two main sources, both of which are related to understanding how profitability is calculated, where ROE is defined as net income scaled by average total equity. First, forces of competition will drive down high earnings. Applying basic economics, where firms are able to generate marginal revenues in excess of marginal costs, this will encourage new entrants (assuming low barriers of entry) until the point where marginal revenues equal marginal costs. This does not imply that new entrants will enter a market until net income equals zero. On the other hand, low (negative) earnings are not sustainable, as continued losses will erode a firms' capital.

On the denominator, profitability will decrease, holding all else constant, with prior years profits being reinvested into the firm increasing a firm's equity. Again, mean reversion in profitability does not imply firms earnings will be decreasing, but could signify that a firm's earnings are increasing but at a slower rate than the growth in equity (or assets).

Fairfield *et al.* (2009) consider to what mean does profitability revert - the market as a whole, or to the industry within which a firm operates. They also consider whether the mean reversion in sales growth reverts to the market or industry level. Using out-of-sample tests, Fairfield *et al.* (2009) find that the median forecast improvement at an industry level does not improve forecasts of five-year ahead ROE or RNOA (return on net operating assets). They do, however, find that forecasts of five-year ahead sales growth is improved by industry level analysis. These findings imply that a firm's profitability tends to revert to the average market level, but sales growth tends towards an industry average. The results are generally consistent with a fundamental analysis approach that industry-level competition and a firm's strategic response to that is the key driver of sales growth.

The approach in Fairfield *et al.* (2009) constrains the persistence parameter to be constant for all firms in the market as the baseline, but allow them to vary across industry in the tests of whether there is evidence of a mean reversion to industry averages. The approach in the baseline pools all observations across the market, while the industry approach only pools observations within industry *j* and allows for variation across industries each year.

Schröder and Yim (2018) extend the analysis in Fairfield *et al.* (2009) to consider the underlying economics behind why profitability on average reverts to the economy as a whole, and not to the industry. An important consideration that Schröder and Yim (2018) focus on is the make-up of a firm, particular in terms of their operating segments. Where firms are made up of multiple segments operating across multiple industries, this should lead to a lower likelihood that a firm's profitability reverts to an industry level. Their results support this, in that for single segment firms that clearly operate in only a single segment has profitability that reverts to the industry level. The finding in Fairfield *et al.* (2009), therefore, is largely influenced by firm's operating across a number of different industries.

In a stream of research considering the information content of earnings, Hayn (1995) examines the information content of losses. She posits that reported losses are perceived by investors as temporary, and are thus more weakly associated with returns than are profits. Losses are likely to be considered temporary since shareholders can always liquidate the firm rather than suffer from indefinite losses. Explained alternatively, equity holders have a put option on the future cash flows of the firm whereby they can sell their shares at a price commensurate with the market value of the net assets of the firm.

Assuming an identity between cash flows and earnings, ignoring the liquidation option value, the value of the firm's equity is the higher of the present value of its expected earnings and its liquidation. This conclusion is independent of the earnings generating function (e.g. random walk or mean reverting). It suggests that when a loss is reported, the stock price will not necessarily drop to zero or decline in proportion with the change in earnings.

As a result, it is predicted that inclusion of loss cases in the samples used to estimate the earnings response coefficient (ERC) and the return-earnings correlation should dampen these measures. In addition, to the extent that there is variation in the incidence of losses across firms and over time, such variation will affect the cross-sectional and the intertemporal variation in the measured ERC.

Losses represent only a specific case of a more general situation where the earnings signal indicates future earnings that are sufficiently low, albeit positive, as to make the liquidation option appealing. In these situations, investors do not evaluate firms strictly on the basis of their reported earnings, thus leading to a weak observed earnings-returns association.

Rather than reflecting the existence of a liquidation option, the finding of a muted stock price response to losses may be due to, in part, a mean reversal in earnings and the fact that losses represent extreme realisations from the earnings distribution. While the random walk model has been found to be a fair description of the time series behaviour of firms (Ball and Watts, 1972; Albrecht *et al.*, 1977; Watts and Leftwich, 1977), research has also shown that earnings behave as a mean-reverting process with period of extreme changes in earnings are found to be followed by earnings changes in the opposite direction (Nissim and Penman, 2001; Fairfield *et al.*, 2009). Studies have found that consistent with the mean reversal in earnings, stock price responses are nonlinear with the magnitude of the earnings changes, with weaker responses associated with extreme earnings observations (Freeman and Tse, 1992; Das and Lev, 1994).

Hayn (1995) tests the validity of mean reversal and other competing explanations. Her results suggest that the effect of losses on the return-earnings association is not due to the extremity of the loss observations and the mean-reversal of earnings which may follow loss incidents. In fact, Hayn (1995) interprets her results as showing the return-earnings association is weak not only in loss situations but also in profitable cases in which reported earnings fall below the threshold that evokes the exercise of the liquidation option.

2.1 Forecasting future profitability

Another important approach within the forecasting literature is to consider how disaggregation of earnings is able to improve our ability to forecast future profitability. Fairfield *et al.* (1996) consider the income statement and how disaggregating it into its different components can provide more useful information. They first split total income into continuing operations and non-recurring items. They continue to break it down until individual line items are forecasted separately. Overall, they find that individual line items in the full disaggregation do not exhibit sufficient differential persistence to make them useful for forecasting. They also suggest that the most accurate forecasts are obtained from a model that disaggregates earnings into operating income, non-operating income and taxes, special items and non-recurring items.

Another disaggregation which is often considered in analysing firm performance is the disaggregation of ROE in operating activities and financing activities. That is, disaggregating ROE into RNOA, net borrowing costs (NBC) and leverage (LEV). Under this approach, ROE is equal to RNOA plus the spread between RNOA and NBC and LEV, i.e. $ROE = RNOA + ((RNOA - NBC) * LEV)$.

Esplin *et al.* (2014) take two different approaches to assess their disaggregation. First, they estimate a baseline model, which they term an aggregate model, as a simple pooled persistence model on total ROE. They then take a disaggregated approach, which they term the OPFIN Model, whereby they allow the persistence parameters of RNOA, NBC and LEV to vary in terms of their implications for future profitability. Finally, they take a Component OPFIN model which estimates the persistence of each component on itself, and uses the out of sample forecasts of RNOA, NBC and LEV to forecast year ahead ROE.

The results provided by Esplin *et al.* (2014) demonstrate that the OPFIN model is significantly worse at forecasting future profitability than the baseline model. However, by separately forecasting the individual components and combining to forecast profitability (the Component OPFIN model) outperforms the aggregate approach.

Another disaggregation that is commonly used is the disaggregation of RNOA into asset turnovers (ATO) and profit margins (PM), with the mix of ATO and PM being useful for understanding a firm's strategy. For example, a firm following a cost leadership strategy is expected to have low margins but high turnover, while a firm with high PM and low ATO is likely to use a strategy of superior service or product differentiation.

Fairfield and Yohn (2001) investigate whether considering the mix of PM and ATO is useful for forecasting operating profitability. They examine three types of models; (1) an aggregate model in which the year-ahead change in RNOA is a function of current RNOA, growth in net operating assets, and the current change in RNOA: (2) a model that disaggregates current RNOA into the current ATO and PM; and (3) a model that disaggregates the change in RNOA into the changes in ATO and PM.

The results from Fairfield and Yohn (2001) document that the disaggregation of current RNOA into ATO and PM leads to significantly worse forecasts than the aggregate model. This finding suggests that while knowing a firm's mix of asset turnover and profit margin is useful for understanding a firm's strategy it is not useful for forecasting. A significant improvement is found in disaggregating a firm's current change in RNOA into the current changes in ATO and PM. In addition, they note that the in-sample coefficients suggest that the information content of the disaggregation is driven by ΔATO, and not ΔPM. The change in asset turnover reflects changes in the firm's ability to generate revenues from its assets and should be informative about future profitability; while changes in profit margins could be attributable to either changes in efficiency or changes in accounting conservatism.

In the context of estimating a more accurate implied cost of capital, Hou *et al.* (2012) develop a forecasting model based on total assets, dividend payments, negative earnings and accruals. A difference in the approach that Hou *et al.* (2012) take is that they focus on forecasting dollar earnings, as opposed to profitability (such as Fairfield *et al.*, 1996; Esplin *et al.*, 2014; Fairfield and Yohn, 2001; Jackson *et al.*, 2018, among others). Their forecasts are on average less accurate than analysts' forecasts, but exhibit lower levels of forecast bias and higher levels of ERCs. Additionally, their model is relevant for firms without analyst coverage, which is important in their setting for estimating an implied cost of capital.

The Hou *et al.* (2012) model is tested by Li and Mohanram (2014). They note that while the Hou *et al.* (2012) model is correlated with future returns at the portfolio level, they do not examine the relationship at the firm level, and that underperforms a naive random walk model with high forecast errors. Li and Mohanram (2014) present two models - one as a function of past earnings allowing for differential persistence of profits and losses, and the other motivited by the residual income model incorporating book value and accruals in addition to earnings. They report that both their models outperform Hou *et al.* (2012) on forecast accuracy, bias, ERCs and correlations of implied cost of capital proxies with future returns and risk factors.

A more recent innovation in the forecasting literature is the decomposition of profitability into components related to market wide information, industry-specific sources, and firm-idiosyncratic information. Again, this approach is consistent with many financial statement analysis textbooks in advocating to begin the fundamental analysis process by first understanding the economy, the industry, and firm's strategy. Jackson *et al.* (2018) follow this logic in proposing a method to quantify the amount of firm profitability attributable to common market information, common industry information, and a firm-idiosyncratic component; and then test this decomposition in a forecasting setting.

Their approach does not constrain the market or industry betas to be positive, and allows for cross-sectional variation in a firm's sensitivity to market and industry level information, which is in contrast to a more commonly adopted average approach that assumes the industry component of profitability is homogenous across all industry participants [6].

In determining whether the decomposition would potentially be useful for improving the ability to forecast future profitability, Jackson *et al.* (2018) first determine whether the three components exhibit differential persistence and rates of mean reversion. In short, they find that in regards to persisting into total RNOA, the market component is the most persistent, followed by the idiosyncratic component, with industry profitability the least persistent, with consistent results on the mean reversion. Overall, the significant differences in persistence and mean reversion provide a necessary attribute which would lead to the potential for improvements in forecasting future profitability by taking advantage of this decomposition.

Jackson *et al.* (2018) use total RNOA as the benchmark to compare against an approach that separately forecasts the changes in the three components. The initial results indicate that forecasting the three components of earnings results in the lowest signed and absolute mean and median forecast errors. Additionally, across the entire sample, this approach outperforms the baseline in 67.7% of cases, [7] with sub-samples having even higher performance – in the largest firms (74.3%), the highest market to book firms (77.7%), and firms with the largest amount of idiosyncratic news (75.6%). The implications for Jackson *et al.* (2018) confirm the importance of understanding macro-economic conditions, the industry, and a firm's strategy when beginning the forecasting process.

An important assumption within the Jackson *et al.* (2018) disaggregation is that firm's exposure to market and industry effects are heterogeneous. Their method relies heavily on the earnings co-movement developed by Jackson *et al.* (2017) in that it allows for cross-sectional variation in historical sensitivities to market and industry wide information. The more (less) a firm's earnings move with the market, the less (more) weight investors need to place on those earnings, thus rendering them less informative. However, managers will also have less opportunity to bias the earnings signal the more earnings co-move, making them more reliable. Using an industry-firm pairing correlational technique, Jackson *et al.* (2020) demonstrate that the degree of co-movement and the ordering of earnings announcements impacts on the informativeness of earnings. These papers further illustrate the importance of considering that firm's do not operate in an informational vacuum, and consideration of other firm's earnings are important in assessing expectations of a firm's future profitability. From a financial statement analysis perspective, the more a particular firm's earnings co-move with the market, the easier it is for investors to estimate the firm's earnings using the earnings of other firms, which should lead to more accurate forecasts of future profitability.

The identification of appropriate benchmarks that best capture mean reversion is key to improving profitability forecasts. Vorst and Yohn (2018) consider the role of firm life cycle on the rate with which growth and profitability mean revert. They find that by analysing firms by the stage of the life cycle improves out-of-sample forecast accuracy of both growth and profitability relative to analysing firms pooled across the economy and by industry. They further demonstrate that market participants do not appear to fully incorporate information about firm life cycle into their expectations.

It is not clear, however, whether firm life cycle is the direct mechanism which improves forecast accuracy, or whether it is a reflection of a firm's strategy more generally. Applying the Miles and Snow (1978) typology, there are strong correlations between prospector (defender) firms and those in the introduction and decline (mature and shake out) stages of the life cycle. From a fundamental analysis perspective, prospector (defender) firms with, on average, higher (lower) profit margins and lower (higher) asset turnovers is more appealing as a theoretical predictor for how mean reversion in profitability operates than firm life cycle where there is no clear relation between the components of profitability across stages.

A recent development to the forecasting literature is in the use of machine learning algorithms. Cao and You (2021) argue that machine learning techniques are able to overcome some limitations with the extant models to process financial statement information into forecasts more efficiently. Specifically, machine learning algorithms are able to handle high dimensional data, and they are able to accommodate more complex and subtle relationships between financial statement line items and future earnings. Any advantages, however, do come at the cost that more complex models are also more susceptible to in-sample overfitting that can lead to poor out-of-sample performance (Cao and You, 2021), and that there is often a lack of theory underlying the models.

Cao and You (2021) find that machine learning models, especially those accommodating non-linearities, generate significantly more accurate and informative forecasts than a number of earnings prediciotn models in the literature. Based on the analysis that suggests machine learning models uncover economically sensible relations between historical financial information and future earnings, they conclude that limiting forecasting to linear relationships and aggregated accounting numbers substantially understates the decision usefulness of financial statement information to investors.

In predicting the sign of future earnings changes, Hunt *et al.* (2021) utilise a variety of machine learning techniques to first predict the sign of future earnings changes, and to then develop trading strategies based on these forecasts. They find, consistent with Ou and Penman (1989), stepwise logit provides good out-of-sample predictions regarding the sign of future earnings changes, but a trading strategy based on these forecasts do not generate abnormal returns on average. Elastic net, a modification of stepwise logit, does not further improve forecast accuracy or the trading strategy. A non-parametric machine learning technique, random forest, however, does significantly improve forecast accuracy and the ability to generate abnormal returns.

Easton *et al.* (2021) then use a k-nearest neighbour model approach to forecast a firm's annual earnings. They approach that Easton *et al.* (2021) take is to match a firm's recent earnings to earnings histories of comparable firms, and then extrapolate the forecast from the comparable firms' lead earnings. They demonstrate this approach is able to generate out-of-sample forecasts that are more accurate than those generated by a random walk. An issue highlighted in Easton *et al.* (2021) that applies to the developing machine learning literature in general, is that the process of developing forecasts is devoid of theory. Other than allowing for a computer to identify historical trends, this approach does not inform practitioners or researchers how to improve the process of fundamental analysis.

3. Market inefficiencies

The second main role of financial statement analysis research is to identify market inefficiencies with respect to the use of financial statement information. After identifying the optimal use of financial statement information, one can then examine whether the market efficiently uses this information. A traditional approach in papers examining market inefficiencies will generally take the form of first documenting differential persistence in the components of earnings, then assess whether market participants appear to differentially price these components or fixate on total earnings, and then in the case of where the market does not appear to correctly price these components whether an out-of-sample trading strategy will be able to earn excess returns.

The research aimed at identifying market inefficiency has been heavily influenced by the consensus of beliefs regarding market efficiency. Often, it has been assumed that the market is semi-strong efficient, i.e. a firm's stock price equals the firm's fundamental value based on public information:

$$P_t = V_t \equiv \sum_{i=1}^{\infty} \frac{E_t(D_{t+1})}{(1+r)^i}. \quad (3)$$

This assumption of semi-strong market efficiency suggests that financial statement analysis research has little relevance to the market because the market efficiently uses all publicly available information. If all publicly available information has already been impounded into price, then information contained within publicly available financial statements will already be priced, and the implications from financial statement analysis will not be incrementally useful.

Over time, questions have been raised about the validity of this assumption. A number of market anomalies such as the glamour/value anomaly (Lakonishok *et al.*, 1994), the momentum anomaly (Jegadeesh and Titman, 1993), the post earnings announcement drift anomaly (Bernard and Thomas, 1990), and the closed end mutual fund puzzle (Lee *et al.*, 1990) have been documented that are based around easily observable publicly available information. The uncertainty regarding market efficiency allows for the potential for financial statement analysis research to be useful in terms of understanding the differences between observed price and fundamental value.

The potential for market inefficiencies suggest that a firm's stock price might not always equal fundamental value. Shiller (1984) provides a model of price that considers the potential for market inefficiencies, where price is a function of two components:

$$P_t = \sum_{k=0}^{\infty} \frac{E_t(D_{t+k}) + \phi E_t(Y_{t+k})}{(1 + \rho + \phi)^{k+1}}. \quad (4)$$

Fundamental value, $E_t(D_{t+k})$, is the value that is derived from publicly available information to estimate firm value. This component of price is driven by information traders who optimally use the public information to estimate firm value. Investor sentiment, $E_t(Y_{t+k})$, is driven by noise traders who have time varying demands and whose valuations are not based on the efficient use of public information. The noise traders have systematic and correlated investing biases that affect the market price for the stock (Yohn, 2020).

The influence of fundamental value versus investor sentiment on the firm's price is determined by the cost of arbitrage, ϕ. Information traders drive price to fundamental value, however, the cost of arbitrage affects their ability and willingness to do so. Therefore, if the cost of arbitrage is high, then investor sentiment will have a greater influence on the firm's price, while the lower the cost of arbitrage price will be close to fundamental value. At the extreme, where there is no cost of arbitrage, $\phi = 0$, then the Shiller (1984) model will collapse to Eqn (3).

Financial statement analysis research, on the other hand relies on the results from fundamental analysis and then compares estimated fundamental value to observed stock price. Alternatively, the research relies on the results from fundamental analysis research to determine the optimal use of accounting information for forecasting and valuation and then compares the forecasting implications of the accounting information to the market's valuation of the information [8].

3.1 Market inefficiency research

As the consensus of beliefs moved away from semi-strong market efficiency and allowed for the potential for market inefficiencies, financial statement analysis research became more relevant and useful for understanding the markets use of information. The research generally examines the optimal use of financial statement information and then examines whether the market appears to use the information in this optimal manner.

Sloan (1996) is probably the most well known study on financial analysis and market efficiency. He disaggregates return on assets (ROA) into accruals and operating cash flows, hypothesising that accruals are less persistent than cash flows because of the subjective nature of accruals. Consistent with this prediction, he finds that accrued earnings are significantly less persistent than operating cash flows. He then examines the market's valuation of the accrual and operating cash flow components of earnings. Using a Mishkin test, he finds that the valuation coefficient on accruals is significantly larger than the forecasting coefficient on accruals. In contrast, he finds that the valuation coefficient on operating cash flows is significantly smaller than the forecasting coefficient. Sloan (1996) concludes that the market overvalues (undervalues) accruals (operating cash flows) relative to their actual persistence. This finding has since been labelled as the 'accrual anomaly'.

Having demonstrated that investors appear not to understand the differential persistence in the accrual and cash flow components of earnings Sloan (1996) then examines whether this mispricing can lead to predictable hedge portfolio returns. To do this, he ranks firms on the magnitude of the accrual component of earnings and assigned in equal numbers to ten portfolios each year. A separate abnormal return is then computed for each portfolio for each of the 30 years in the sample. Table 6 (Sloan, 1996, p. 307) reports the average of the 30 annual returns for each portfolio, along with the *t*-statistic computed from the 30 year time-series. Hedge portfolio returns are then taken as the difference in the lowest and highest deciles, mimicking a trading strategy taking a long position in firms reporting low levels of accruals relative to cash flows and a short position in firms reporting high levels of accruals relative to cash flows.

The results document an almost monotonic relationship between the magnitude of the accruals component of earnings and size-adjusted stock returns. The return in the first year to a hedge portfolio is an average of 10.4% (*t*-statistic 4.71), reducing to 4.8% (*t*-statistic 3.15) in the second year after portfolio formation, and insignificant in the third year. The average of the 30 yearly returns corresponds to the hedge portfolio return of 10.4%. The hedge portfolio return is positive in 28 of the 30 years examined, illustrating that the relation is fairly stable over time. The only exceptions are 1966 when the return was −19.5%, and 1981 when the return was −2.2%. Sloan (1996, p. 308) argues that due to the returns being positive in over 90 percent of the 30 years examined helps rule out risk based explanations.

Public statements made by sophisticated practitioners suggest that the accruals anomaly documented by Sloan (1996) has not continued. Consistent with this, Green *et al.* (2011) find that the hedge returns to this trading strategy appears to have decayed in US stock markets to the point that they are, on average, no longer reliably positive. Green *et al.* (2011) explore some potential reasons for why this has occurred, and suggest that the anomaly's demise has stemmed in part from an increase in the amount of capital invested by hedge funds into exploiting it, as measured by hedge fund assets under management and trading volume in extreme accrual firms. A decline in the size of the accrual mispricing signal, as measured by the magnitude of extreme decile accruals and the relative persistence of accruals and cash flows, may also play a weaker role.

Fairfield *et al.* (2003) then considers whether the lower persistence of accruals relative to operating cash flows is part of a more general growth anomaly. They note that accruals are not only a component of profitability but also a component of growth in the balance sheet. That is, accruals is growth in working capital less depreciation. Therefore, just as ROA can be disaggregated into accruals and cash flows from operations, growth in net operating assets on the balance sheet (GrNOA) can be disaggregated into accruals and growth in long-term net operating assets (GrLTNOA). These observations raise the question as to whether accruals are less persistent than cash flows because of their role as a component of profitability or because of their role as a component of GrNOA.

They find that both GrLTNOA and accruals are less persistent than cash flows from operations for year-ahead ROA. Importantly, they also find that GrLTNOA and accruals have equivalent persistence for year-ahead ROA, suggesting that they have similar implications for future profitability. They additionally find that the valuation coefficients for both accruals and GrLTNOA are significantly larger than their forecasting coefficients, and that the difference between valuation and forecasting coefficients for accruals is equivalent to the difference in the valuation and forecasting coefficients for GrLTNOA. These findings suggest that the market generally misprices growth in net operating assets and provide additional insight into the source of the markets inefficiencies in using accounting information for forecasting and valuation.

Relatedly, Balachandran and Mohanram (2012) use residual income to disaggregate earnings growth into growth in residual income, growth in invested capital and other components to explain stock returns. They find that while the market values growth in residual income more than growth in invested capital, it still undervalues (overvalues) growth in residual income (invested capital). Further, earnings growth derived from the growth in residual income is more persistent, while the growth derived from the growth in invested capital is more likely to reverse. These results provide further evidence of the usefulness of accounting to investors for the purposes of valuation and trading strategies.

Using the DuPont analysis framework (see Figure 1), Soliman (2008) extends the finding in Fairfield and Yohn (2001) that ΔATO but not ΔPM is useful for forecasting profitability by examining whether the information in ΔATO is informative about future abnormal stock returns. If the market efficiently incorporates the information in ΔATO, then ΔATO should not be associated with future stock returns. Soliman (2008) finds a significant positive relation between ΔATO and year-ahead abnormal stock returns and finds no significant relation between ΔPM and year-ahead abnormal stock returns. These findings suggest that the market misprices the implications of ΔATO for future profitability and firm value.

A notable difference between Sloan (1996) and Soliman (2008) in the assessment of whether the market efficiently incorporates information is through their testing procedures. Sloan (1996) uses a Mishkin test to compare the persistence and valuation coefficients, while Soliman (2008) uses an OLS regression to determine whether the pricing coefficients are different from 0. Although the Mishkin test is highly reference in the literature testing market efficiency, Kraft *et al.* (2007) suggest using an ordinary least squares (OLS) test of market efficiency as it is easier to apply and is more straightforward and understandable than the Mishkin test. Kraft *et al.* (2007) also show in accounting research setting where samples are large ($N \approx 40,000$), results from OLS are equivalent to the Mishkin test.

Motivated by the improvement in forecasts based on the Jackson *et al.* (2018) disaggregation technique, Han *et al.* (2020) test whether the disaggregation leads to a profitable trading strategy. In doing so, they argue that the trading strategy they propose is not solely informed by statistical differences in persistence of the components, but based on an economic rationale. Specifically, they propose a strategy that takes a long (short) position on stocks in the highest (lowest) decile of idiosyncratic earnings. They argue that idiosyncratic earnings represent the outworking of a firm's strategic response to market and industry pressures, consistent with the steps within fundamental analysis. Firms with high idiosyncratic earnings are those who are able to successfully implement their strategies and

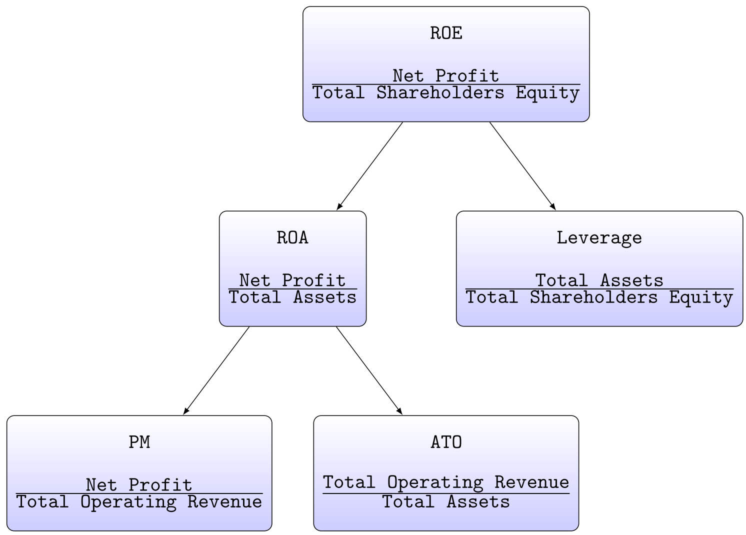

Figure 1.
DuPont analysis structure

earn higher accounting profits, while those with negative idiosyncratic earnings have their value reduced.

The hedge portfolio returns documented by this strategy are consistent with the arguments, with size-adjusted returns (six-factor alphas) in the first year after portfolio formation of 15.4% (8.8%). This result is persistent, with size-adjusted returns (six-factor alphas) being positive in 38 (42), and above 10% in 27 (13) of the 43 years in their sample. However, these returns do not persist with two-year size-adjusted returns (six-factor alphas) of −5.3% (−0.8%), consistent with strategic responses being difficult to maintain, on average. In further analysis, Han *et al.* (2020) show that these hedge portfolio returns remain after controlling for a plethora of known-risk factors and other anomalies documented in the literature. More so than in other papers in this stream which focus on the statistical difference in the persistence parameters of the financial statement components, and a reliance on the earnings fixation hypothesis, Han *et al.* (2020) appeal to more theoretical arguments for why a profitable trading strategy exists, and one which may be harder to trade away.

Another approach to identify market inefficiencies through financial statement analysis, as opposed to utilising improvements in forecasting future performance, is through the use of financial statement ratios. Mohanram (2005) combines traditional fundamentals, such as earnings and cash flows, with measures tailored for growth firms, such as earnings stability, growth stability, and the intensity of research and development and advertising expenditures to create a GSCORE index. He illustrates a long-short strategy based on GSCORE earns significant excess returns, though most of the returns come from the short side. Mohanram (2005) further concludes that a contextual analysis approach to fundamental analysis appears to work best, with traditional analysis appropriate for high book-to-market firms, and growth orientated fundamental analysis appropriate for low book-to-market stock. Li and Mohanram (2019) extend these results by combining fundamental analysis strategies based on quality, such as the GSCORE, with value strategies, such as the value-to-price ratio and the PEG ratio. They show that combining quality and value-driven approaches substantially improves the efficiency of fundamental analysis.

Often overlooked due to differences in accounting, or regulatory environment, the financial sector is often excluded from a number of studies [9]. Mohanram *et al.* (2018) focuses on the efficacy of a fundamental analysis approach to screen US bank stocks. Taking fourteen bank-specific valuation signals, they construct an index which they are then able to use to document a positive association with future profitability changes and one-year-ahead stock returns. The importance of Mohanram *et al.* (2018) is that they demonstrate the usefulness of fundamental analysis approaches that can be applied based on industry-specific information to capture information that markets are yet to impound.

4. Chinese evidence

From my review of the literature, there is a lack of FSA research conducted within the Chinese setting. This is despite there being many institutional differences between the US where the vast majority of FSA research has been conducted, and China. The limited ability to engage in short selling, for example, will limit the ability to execute hedge-portfolio trading strategies as required to take advantage of identified market inefficiencies [10]. The involvement of the Chinese government influencing the large proportion of "mom-and-pop" investors will also potentially impact on the efficiency of the market and potentially influence the degree to which fundamental information is impounded into price. More importantly from a fundamental analysis perspective, however, is the listing rule on the Shenzhen and Shanghai stock exchanges that will expel companies that post three years of consecutive losses. Such a listing rule will potentially impact on the degree of persistence and mean reversion in profitability and their components. It not only accelerates the reversion, but also smooth the profits as managers might be reluctant to report large profits. They might create cookie jar to revert possible losses in the future. In line with Hayn (1995), the threat of delisting after reporting a string of consecutive losses may also impact on the threshold with which the exercise of the liquidation option will be invoked, thus impacting on the valuation of firms.

To provide some introductory analysis, I collect data from the CSMAR database, specifically Total Assets ("A001000000"), Total Shareholders Equity ("A003000000"), Net Profit ("B002000000"), and Total Operating Revenue ("B001100000"). To ensure the annual data for the fiscal year, I ensure that I only retain those observations with an accounting period ("accper") ending in December, [11] and set "typrep" to be equal to "A". I winsorise all variables at the 1st and 99th percentiles.

I then estimate the persistence of profitability (*ROE* and *ROA*) and their components, *PM*, *ATO*, and leverage (*Leverage*), based on the DuPont analysis. The DuPont analysis defines return on equity to be equal to the return on assets multiplied be leverage, and further that return on assets can be specified as the product of the profit margin and asset turnover as shown in Figure 1.

Consistent with the approach in Nissim and Penman (2001), I sort the sample of firms by year into deciles based on total ROE, and then separately on the DuPont components and graph the median value of each decile over the following five years with the results presented in Figure 2. The patterns documented are remarkably similar to those of Nissim and Penman (2001), with the exception that the rate of reversion in the lowest deciles of *ROE*, *ROA* and *PM* appear to be sharper in the Chinese setting, quite possibly due to the heightened threats of delisting due to streams of reported losses. Mean reversion appears to be a robust finding in the profitability ratios (*ROE*, *ROA*, and *PM*), but *ATO* and leverage are much more persistent across all deciles.

I then provide results from estimating the persistence of return on equity, and its components from a DuPont analysis in Table 1 based on Eqn (1) where X is the ratio of interest. Based on the full sample, the persistence of *ROE* and *ROA* within China is generally lower than that presented in prior US based research. For example, the persistence of *ROE* (*ROA*) of 0.374 (0.546) is much lower than that provided by prior literature (Sloan, 1996; Fairfield *et al.*, 1996; Jackson *et al.*, 2018). Consistent with the graphical representations in Figure 2, the persistence of *ATO* and *Leverage* is much higher than the profitability ratios, 0.912 and 0.878, respectively.

When the sample is split into deciles based on the level of the ratio at time t, there are significant differences in the parameters. Again, consistent with the evidence presented in Figure 2, the persistence of the extreme deciles are much lower than the central deciles, consistent with the process of mean reversion. Of note, the persistence of the lowest decile of *ROE* and *ROA* is negative (−0.071 and −0.053, respectively) consistent with losses not persisting, on average, into the future.

Table 2 then replicates tests of mean reversion based on estimating an expansion of Eqn (2):

$$\begin{aligned} \Delta ROA_{i,t} &= \lambda_0 + \lambda_1 \Delta ROA_{i,t} + \lambda_2 \Delta Assets_{i,t} + \lambda_3 ROA_{i,t} + \\ &\quad \lambda_4 PM_{i,t} + \lambda_5 ATO_{i,t} + \epsilon_{i,t}. \end{aligned} \tag{5}$$

Consistent with prior literature, the change in the denominator is controlled for ($\Delta Assets$), along with the DuPont components of profitability - *PM* and *ATO*. On the full sample, the rate of mean reversion (ΔROA, −0.153) is qualitatively similar to that provided by Fairfield and Yohn (2001, −0.147). Again, when the sample is split into deciles of *ROA* at time t, there are significant difference, especially at the extremes. Overall, the preliminary analysis presented

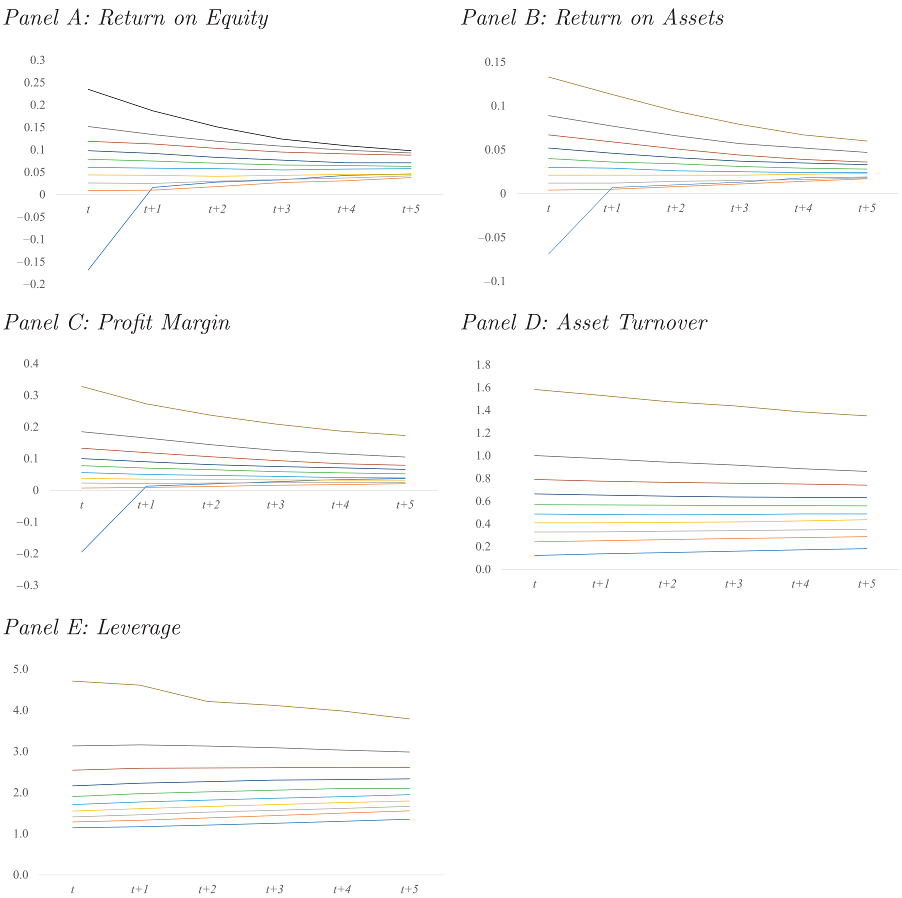

Figure 2.
Mean reversion in DuPont analysis variables

confirms in a alternate setting that the persistence and mean reversion in profitability is a robust phenomenon in financial statements.

4.1 Future research opportunities

The Chinese setting provides many opportunities for research in financial statement analysis. It is an empirical question whether factors such as delisting requirements for firms with repeated losses impacts on the way in which future earnings are persistent, and hence the ability to forecast future earnings. Similarly, the role of SOEs in China, and the extent to which government ownership influences business practices may also differentially affect the way in which financial statement analysis is able to be used in forecasting.

Over the past few decades, the Chinese economy has been rapidly expanding with GDP growth above 5% in all but three years since 1980 (including 2020 in which most of the world's economies were crippled by COVID-19 restrictions). Applying the disaggregation technique from Jackson *et al.* (2018) would be useful to examine how much of a firm's earnings grew due to firm-specific strategies as opposed to a generally growing economy, and what this means for forecasting future profitability.

Table 1.
Persistence of DuPont analysis variables

	Full Sample	Deciles 1	2	3	4	5	6	7	8	9	10
Panel A: Return on Equity											
ROE	0.374***	−0.071***	0.046	1.530***	1.484***	1.039***	0.755***	0.639***	0.887***	0.525***	0.189***
	(34.47)	(−3.20)	(0.33)	(4.31)	(4.00)	(3.57)	(2.62)	(2.99)	(5.16)	(4.10)	(3.71)
Constant	0.033***	−0.066***	−0.027***	−0.040***	−0.042**	−0.016	0.004	0.022	−0.001	0.046**	0.130***
	(37.99)	(−11.60)	(−11.32)	(−4.01)	(−2.42)	(−0.88)	(0.19)	(1.06)	(−0.03)	(2.34)	(11.13)
Observations	40,335	3,939	4,049	4,050	4,045	4,040	4,052	4,053	4,047	4,037	4,023
Adj. R^2	0.138	0.030	0.032	0.032	0.041	0.041	0.031	0.037	0.040	0.051	0.037
Panel B: Return on Assets											
ROA	0.546***	−0.053**	0.008	1.427***	1.280***	0.855***	0.860***	0.685***	0.902***	0.769***	0.559***
	(62.19)	(−2.21)	(0.06)	(5.15)	(4.70)	(3.41)	(4.30)	(3.95)	(7.52)	(10.38)	(15.57)
Constant	0.014***	−0.014***	−0.009***	−0.014***	−0.013**	−0.003	−0.002	0.006	−0.003	0.007	0.033***
	(43.77)	(−6.60)	(−8.70)	(−3.76)	(−2.08)	(−0.33)	(−0.22)	(0.71)	(−0.43)	(1.07)	(7.09)
Observations	40,335	3,942	4,043	4,047	4,048	4,044	4,047	4,044	4,050	4,045	4,025
Adj. R^2	0.290	0.033	0.031	0.042	0.043	0.048	0.039	0.030	0.044	0.050	0.144
Panel C: Profit Margin											
PM	0.369***	0.069***	0.155	1.928***	0.842*	1.185***	1.476***	0.532*	0.738***	0.941***	0.338***
	(25.41)	(3.16)	(0.81)	(3.18)	(1.69)	(2.84)	(4.30)	(1.83)	(3.53)	(6.88)	(5.10)
Constant	0.032***	−0.051***	−0.027***	−0.050***	−0.019	−0.034	−0.064**	0.021	0.000	−0.032	0.133***
	(25.95)	(−7.27)	(−9.27)	(−3.44)	(−0.98)	(−1.47)	(−2.35)	(0.72)	(0.00)	(−1.23)	(6.48)
Observations	40,335	3,945	4,039	4,049	4,049	4,042	4,062	4,037	4,041	4,045	4,026
Adj. R^2	0.131	0.048	0.027	0.017	0.015	0.025	0.021	0.018	0.029	0.042	0.030
Panel D: Asset Turnover											
ATO	0.912***	0.722***	0.930***	0.797***	0.731***	0.913***	0.809***	1.031***	0.892***	0.943***	0.878***
	(216.63)	(10.74)	(11.31)	(8.23)	(7.56)	(9.7 h)	(8.40)	(13.19)	(14.78)	(24.76)	(50.30)
Constant	0.053***	0.083***	0.046**	0.086***	0.125***	0.047	0.115**	−0.025	0.068	0.017	0.119***
	(21.95)	(8.67)	(2.29)	(2.66)	(3.12)	(1.02)	(2.07)	(−0.47)	(1.40)	(0.44)	(4.34)
Observations	40,335	3,977	4,027	4,039	4,039	4,048	4,051	4,052	4,033	4,044	4,025
Adj. R^2	0.833	0.045	0.043	0.066	0.095	0.133	0.177	0.214	0.248	0.318	0.634
Panel E: Leverage											
Leverage	0.878***	−0.950***	1.081***	1.166***	0.906***	0.956***	0.871***	1.033***	1.006***	1.075***	0.677***
	(121.04)	(−2.61)	(9.92)	(12.17)	(12.32)	(12.78)	(8.82)	(15.73)	(16.15)	(24.19)	(31.24)
Constant	0.327***	2.391***	−0.048	−0.179	0.209*	0.143	0.330*	−0.002	0.063	−0.119	1.578***
	(20.44)	(5.54)	(−0.33)	(−1.31)	(1.77)	(1.08)	(1.69)	(−0.01)	(0.40)	(−0.86)	(14.74)
Observations	40,335	4,029	4,045	4,050	4,050	4,039	4,047	4,041	4,039	4,026	3,969
Adj. R^2	0.732	0.013	0.154	0.160	0.200	0.192	0.141	0.233	0.172	0.190	0.392

Note(s): This table presents the persistence of return on equity (ROE), return on assets (ROA), profit margin (PM), asset turnover (ATO) and Leverage based on estimating Eqn (1) for the full sample and deciles of each ratio sorted in year t. Year fixed effects are included, and t-statistics in parentheses are clustered by firm. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2. Mean reversion in profitability

	Full Sample	Deciles 1	2	3	4	5	6	7	8	9	10
ΔROA	−0.153***	0.178***	−0.067**	−0.091***	−0.022	−0.070**	0.007	0.004	−0.039	−0.089***	−0.221***
	(−16.90)	(6.92)	(−2.47)	(−3.92)	(−0.77)	(−2.29)	(0.26)	(0.14)	(−1.31)	(−3.69)	(−11.58)
$\Delta Assets$	−0.000	0.000	0.000***	0.000***	0.000***	0.000	−0.000	−0.000**	−0.000**	−0.000***	−0.000***
	(−0.87)	(0.80)	(4.74)	(5.09)	(2.75)	(1.48)	(−0.04)	(−2.42)	(−2.10)	(−4.00)	(−4.25)
ROA	0.715***	−0.240***	0.170	1.386***	1.382***	0.876***	0.788***	0.708***	0.887***	0.845***	0.826***
	(59.40)	(−6.40)	(1.18)	(4.71)	(4.74)	(3.22)	(3.63)	(3.77)	(6.63)	(10.11)	(21.93)
PM	−0.047***	0.009	−0.023**	0.003	−0.006	−0.001	−0.002	−0.029***	−0.027**	−0.032***	−0.075***
	(−13.38)	(1.40)	(−2.05)	(0.21)	(−0.60)	(−0.10)	(−0.23)	(−2.64)	(−2.28)	(−2.67)	(−5.12)
ATO	0.004***	0.008**	0.006***	0.004**	0.004**	0.004***	0.004**	−0.000	0.000	−0.000	−0.006**
	(5.42)	(2.24)	(2.92)	(2.26)	(2.05)	(2.88)	(2.47)	(−0.14)	(0.04)	(−0.11)	(−2.08)
Constant	0.007***	−0.016***	−0.013***	−0.016***	−0.017**	−0.006	−0.001	0.009	0.002	0.007	0.026***
	(13.65)	(−5.69)	(−7.48)	(−3.95)	(−2.54)	(−0.64)	(−0.09)	(0.89)	(0.20)	(0.97)	(5.02)
Fixed effects	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year	Year
Cluster	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Observations	36,663	3,839	3,925	3,890	3,816	3,697	3,667	3,559	3,458	3,361	3,449
Adj. R^2	0.303	0.049	0.037	0.054	0.042	0.053	0.039	0.036	0.049	0.066	0.239

Note(s): This table presents the mean reversions of return on assets (ROA) based on estimating Eqn (5) for the full sample and deciles of each ratio sorted in year t, where ΔROA is the change in ROA, $\Delta Assets$ is the change in average total assets, ROA is return on assets in year t, PM is the profit margin in year t, and ATO is the asset turnover in year t. Year fixed effects are included, and t-statistics in parentheses are clustered by firm. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$

From the descriptive statistics, however, it would appear that the mean reversion in the components of a DuPont analysis do not provide sufficient motivation to simply replicate prior research in a different environment. Rather, it is the unique features of the Chinese business environment that needs to provide the motivation.

Likewise, the role of the stock market in Chinese investing portfolios may influence the role that financial statement analysis plays in the price formation process. Given that "mom-and-pop" investors are generally assumed to be naive, there is potentially greater opportunities to utilise the components of financial statements to engage in profitable trading strategies. However, the characterisation of participants in the Chinese market as gambling may limit the efficiency of such trades if prices are not formed based on fundamental information, but instead by the role of investor sentiment. Further, the limit on short-selling will fundamentally alter the way in which trading strategies need to be designed as hedge portfolios which involve shorting particular stocks are not implementable.

5. Conclusion

Within this paper I summarise the literature on financial statement analysis. This literature is generally concerned with two objectives. First, to improve fundamental analysis; and second, to identify market inefficiencies with respect to financial statement information. It was not until the residual income model was introduced (Ohlson, 1995) that accounting was viewed as useful for valuation, and this stream of research took flight. As illustrated, there has been relatively sparse research in this field. The advantage, however, is that there are vast opportunities for future research.

I specifically provide some preliminary descriptive results on Chinese data. From my survey of the literature, there has been little to no work in this field performed on Chinese data. However, there are many differences in both the reporting and investing environments compared to the US where the bulk of the research has been conducted. While there are vast opportunities to extend this developing stream of literature, any study focussing on China is advised to focus on the institutional differences that exist to inform the role that financial statement analysis can improve fundamental analysis, and then take advantage of those to identify market inefficiencies.

Notes

1. All journals publishing a significant amount of accounting papers are considered, including journals across multiple disciplines such as finance (e.g. *Journal of Business Finance and Accounting*) and broad management (e.g. *Management Science*). There are no restrictions placed on journal location or perceived quality.
2. The use of "forecast*" allows for various terms such as forecasting, forecasts, forecast, etc.
3. Inspection of the search results identified the initial results to be incomplete. Despite meeting all search criteria, some papers were not identified through Web of Science and were added manually.
4. The residual income model provided the impetus for how accounting information on the financial statements can be useful for valuation purposes. This is not to say, however, that there have not been extensions of the residual income model, such as Zhang (2000) and Chen and Zhang (2007). The development of these valuation models is outside the scope of this review, and is worthy of a fuller exploration in its own right.
5. In the earnings quality, or financial reporting quality literature, earnings that are more persistent are generally viewed as being of higher quality (Dechow *et al.*, 2010). The assumption is that more persistent earnings will yield better inputs to equity valuation models, and hence a more persistent earnings number is of higher quality.
6. This approach also assumes the market component of earnings is captured within industry earnings and do not separately consider this.

7. A forecast improvement of greater than 50% is viewed as a significant improvement.
8. Behaviorial finance research, on the other hand, attempts to understand investor sentiment by marrying psychology and finance to examine the cognitive errors and biases that systematically affect investment choices.
9. Jackson *et al.* (2018) is a notable exception in that they explicitly argue financial firms need to be kept within the sample to adequately capture the true market earnings. They also demonstrate that under their disaggregation model, the financial sector does not perform significantly differently to other sectors in terms of forecast accuracy.
10. In theory, it is possible to short shares, but the cost is prohibitively high.
11. An important consideration is that the Chinese data reports year-to-date accounting figures either on a quarterly or semi-annual basis so it is essential to ensure that the full fiscal period is captured. All Chinese firms are required to have a December fiscal year-end.

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