How to make long-term investments in a stock market?

A generic strategy for investors

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Abstract: Against the backdrop of increasingly fierce industrial competition nowadays, firms tend to have substantive business risk and/or information risk, increasing the estimation risk and limit of arbitrage for investors in their short-term investments in a stock market. It is thus important for investors to hold a long-term horizon for at least part of their investments in the stock market. This paper aims to introduce a long-term investment strategy that is practically feasible and potentially valuable to investors. To this end, we first develop a parsimonious model in which we identify the major determinants of a firm's value. This model is used to select high-value firms from each industry for further fundamental analysis and valuation. We next expatiate on how to perform strategy analysis, accounting analysis, financial analysis, and prospective analysis, and therein apply the residual operating income valuation model, in the best possible manner to further value the selected firms and their long-term investment potential. Lastly, we expound the strategy of forming and adjusting a long-term investment portfolio in a way that potentially maximizes long-term portfolio return.

Keywords: Long-term investments; parsimonious model; valuation process for an individual firm; investment portfolio formation and adjustments

1. Introduction

As industrial product market competition becomes more and more intense nowadays, firms tend to have substantial business risk and/or information risk. This not only increases the estimation risk that outside investors face in pricing and trading firm shares, but also raises the limit of arbitrage for sophisticated investors to arbitrage away any stock mispricing. It thus becomes difficult for investors to profit from short-term stock trades, underscoring the importance for investors of holding a long-term horizon for at least part of their investments in the stock market. The objective of this paper is to introduce a long-term investment strategy that is practically feasible and potentially valuable to investors.

Our strategy of long-term investments in a stock market involves a two-step procedure. Firstly, we develop a parsimonious model in which we identify the major determinants of a firm's value and long-term growth. A firm's marketing, innovation, and social responsibility are identified as the first-order, fundamental drivers of firm value, while firm size, growth, financial health, risks, past performance, internal governance, external monitoring, and audit quality are identified as other major determinants of firm value. We use the historical data on the population of listed firms to run an industry-specific, cross-sectional regression on the value drivers, and use the regression coefficients to estimate the fitted values of the regression, based on the value-driver data of listed firms for the most recent year – the year after which we form or adjust our long-term investment portfolio. The fitted values estimated from the regression model represent the raw proxy for the intrinsic values of firms, and are used to select high-value firms from each industry for further fundamental analysis and valuation. These firms are targeted for our initial stock screening, not only because they tend to have high values and be of low stock-investment risks associated with delisting or bankruptcy,[1] but also because their

[1] The stock-investment risk refers to the risk of investors losing money in the investments in the stocks. This risk is high even for long-term investors in the case when they hold stocks of a firm that is subject to a high risk of delisting or bankruptcy. Low-value firms are highly likely to go bankrupt because of poor financial

stocks are likely to be subject to low transaction costs. For the screened sample, we remove any firm whose daily stock return volatility for a year is ranked within the top decile among all listed companies, as these firms tend to have high risks and high transaction costs.

Secondly, we apply a residual operating income valuation model to further value the selected firms and appraise their long-term investment potential. After estimating their equity values per share via the valuation model, then based on funds available for long-term investments, we form or adjust our investment portfolio by buying (selling/short-selling) the stocks, of which the estimated equity values per share are higher (lower) than stock prices and are ranked the top (bottom) from each high-growth and non-highly-competitive industry. The following sections expatiate on the two-step procedure of the long-term investment strategy. It will be implemented periodically, with corresponding adjustments of the investment portfolio, right after the release of audited financial statements for each year for the purpose of maximizing the long-term portfolio return.

To the best of our knowledge, our study is the first among the existing literature to propose such a fundamental-based long-term investment strategy for investors. The prevailing literature on stock investments (e.g., McNichols and Trueman, 1994, Cremers and Pareek, 2015, Edelen *et al.*, 2016, He, 2021, Goodell *et al.*, 2023) focuses predominantly on examining stock investors' short-term trading or investments based on their exploitation of various stock market anomalies or private corporate information. Nonetheless, few published research papers explore value-oriented long-term investment strategies, and the existing studies on this topic

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health, or to be delisted compulsively from a stock exchange because they fail to meet the regulatory requirements for the listing. The listing requirements vary across different stock exchanges, and are often associated with the firm's ability to maintain a minimum level of stock price, sales, and/or financial ratios. For example, in the Chinese stock market, both the Shanghai Stock Exchange and Shenzhen Stock Exchange would delist a firm if (i) its stock price falls short of 1 RMB; (ii) its market value of equity is less than 300 million RMB for 20 consecutive trading days; or (iii) its net income is negative, and its revenue is below 100 million RMB, for 2 consecutive years. That said, our parsimonious model, which accounts for various fundamental-related characteristics of firms, is expected to help screen out the stocks with a high risk of bankruptcy and delisting.

are limited to analytical modeling (e.g., Fleming and Sheu, 2000, Pham, 2003). We fill this gap in the literature by showing a value-oriented long-term investment strategy that is potentially valuable to investors. Considering the heterogeneity of countries in terms of the developments of economics, regulations, culture, institutions, and markets, we claim that our investment strategy serves as a generic, other than "one-size-fits-all", guidance for long-term investments by investors in different stock markets. In formulating our investment strategy, we identify the main determinants of corporate risks and value based on our analysis and review of the related literature. However, the significance of the identified determinants might vary over time and across different countries, so the models as to the determinants of the risks and value of firms might need adjustments to fit the local stock market. Section 2 and Section 3 expatiate on the first-step and second-step processes, respectively, of the long-term investment strategy. Section 4 expounds the strategy of forming and adjusting the long-term investment portfolio. Section 5 concludes.

2. A Parsimonious Model on the Determinants of Firm Value

2.1 Fundamental drivers of firm value

It is of paramount importance for investors to understand the major drivers of the value and long-term sustainable growth of varied firms. We recognize marketing, innovation, and social responsibility as the fundamental drivers of firm value, and expatiate on them in this section. While firm management may strive to improve its performance in marketing, innovation, and social responsibility so as to maximize firm value, investors can assess a firm's ability and performance in each of these three areas and thereby form a preliminary view of the value and investment potential of the firm.

2.1.1 Marketing and firm value

Firms that are good at exploiting and enlarging potential market demand are more likely

to provide products or services that satisfy customers' needs, preferences, and tastes, and thereby generate more sales revenues (e.g., Narver and Slater, 1990, Jaworski and Kohli, 1993, Montoya-Weiss and Calantone, 1994, and Slater and Narver, 1994). More internal cash flows resulting from the increased sales would better meet the financing needs of the firm and reduce its financial risk (He *et al.*, 2023). Good marketing also facilitates firms to foster customer loyalty, which can enhance the stability of sales outlets and reduce the volatility of sales. Therefore, we expect that good marketing would create higher value for a firm by helping it increase sales and decrease the financial and marketing risk.

Strong marketing requires not only a good understanding and forecast of customer demand (Adner, 2002) but also a good development and promotion of products or services to widespread customers who may enjoy using them (Slater and Narver, 1994, Cao and Weerawardena, 2023). By marketing well in the new product category and embedding its brand image into the mindset and life of the consumers, the firm can generate a substantive amount of sales revenues and is less vulnerable to industrial competition as well as environmental shocks (Anderson and Sullivan, 1993, Narayandas, 1998). There is vast evidence that stronger marketing leads to product success (Von Hippel, 1988, Cooper and Kleinschmidt, 1993, Slater and Narver, 1994, and Sethi *et al.*, 2001), good financial health (Gruca and Rego, 2005), high sales growth (Slater and Narver, 1994, Appiah-Adu and Blankson, 1998), and high profitability (Narver and Slater, 1990, Slater and Narver, 1994, 2000) for a firm.

A market-oriented firm, which has a strategic focus on, and a strong capability of, identifying consumer needs to develop and promote products or services, is likely to attain customers' satisfaction and loyalty (Slater and Narver, 1998). These would help lower the transaction costs between the firm and its customers (e.g., Fornell, 1992, Rust and Zahorik, 1993, Reichheld and Sasser, 1996, and Anderson *et al.*, 2004) and reduce the volatility of sales and cash flows for the firm (Sivakumar and Raj, 1997, Gruca and Rego, 2005). As a result, its

business risk decreases, leading to higher firm value (Rappaport, 1986).

2.1.2 Innovation and firm value

Innovation is a critical success factor for a firm, and enables it to provide a variety of valuable, inimitable, and differentiated products or services, which will strengthen the firm's sustainable competitive advantage (e.g., Porter, 1985, Wolfe, 1994, Balkin *et al.*, 2000, Baker and Sinkula, 2002, Darroch and McNaughton, 2002, and Lyon and Ferrier, 2002). Innovative firms are more able to cope with market turbulence and technology turbulence, deal with business challenges, and exploit new products and market opportunities, compared with non-innovative firms (Miles *et al.*, 1978, Brown and Eisenhardt, 1995). Therefore, innovation is a key determinant of a firm's enduring commercial success and sustainable development, particularly in dynamic markets (Jiménez-Jiménez and Sanz-Valle, 2011). Innovation may also help a firm reduce production costs and enhance operational efficiency. Therefore, firms exhibiting a higher degree of innovation tend to be better-performing. Consistent with this view, a large body of literature shows that a higher level of innovation contributes to better performance for a firm (e.g., Rothwell, 1992, Wheelwright and Clark, 1992, Bierly and Chakrabarti, 1996, Hansen *et al.*, 1999, Schulz and Jobe, 2001, Bayus *et al.*, 2003, Pauwels *et al.*, 2004, Thornhill, 2006, and Weerawardena *et al.*, 2006).

On the other hand, innovation involves a long process that is fraught with uncertainty and a high risk of failure (Holmstrom, 1989, Neff, 2005). Whether innovation will add value for a firm depends crucially on whether the beneficial effect of innovation on firm performance would outstrip the associated costs and risks. To make the innovation value-enhancing, a firm needs to commercialize innovation in a way that makes its product/service outputs cater to the needs, tastes, and preferences of consumers (Lengnick-Hall, 1992, Slater and Narver, 1995, Han *et al.*, 1998, and Matear *et al.*, 2002). Consistent with this notion, prior studies provide evidence that good coordination of research & development (R&D) with marketing is likely to

lead to innovation success (Souder and Chakrabarti, 1978, Gupta *et al.*, 1986, and Moenaert and Souder, 1990), product success (Cooper, 1984, Hise *et al.*, 1990, and Ernst *et al.*, 2010), and commercial success (Souder and Chakrabarti, 1978, Moenaert *et al.*, 1994), thereby realizing high economic value for a firm (He *et al.*, 2023).

In a nutshell, firms that have a strong R&D team and ability, and a high potential of exploiting profitable and innovative products or services in a way that meets the market demand well, are likely to create superior shareholder value.

2.1.3 Corporate social responsibility and firm value

Corporate social responsibility (CSR) activities refer to corporate activities that increase social benefits and improve the welfare of various stakeholders, such as employees, customers, suppliers, creditors, and society at large. Superior CSR performance brings benefits to a firm. On the one hand, CSR enhances a firm's reputation (Fombrun and Shanley, 1990) and helps the firm win trust from its stakeholders (Rupp *et al.*, 2006, Hansen *et al.*, 2011). In consequence, the stakeholders are more willing to maintain a good contractual relationship, and/or tacit agreements, with the firm (Klein and Leffler, 1981, Shapiro, 1983, Choi and Wang, 2009, Cao *et al.*, 2015). For instance, a strong record of CSR will improve corporate image among customers, increase their satisfaction with, and loyalty of, a firm's products or services (Brown and Dacin, 1997, Sen and Bhattacharya, 2001, Gürhan-Canli and Batra, 2004, Iglesias *et al.*, 2020), and thereby promote its sales growth in the long term (Lev *et al.*, 2010). Good CSR reputation helps a firm establish a good, robust relationship with its suppliers, leading to lower costs, higher quality, and more stable supplies of goods for the firm (Terpend and Ashenbaum, 2012). Furthermore, firms with good CSR performance are likely to attract and retain talented, competent employees (Greening and Turban, 2000, Bhattacharya *et al.*, 2008), resulting in improved productivity and stronger innovation (Pasricha *et al.*, 2023). Besides, good CSR performance can mitigate the capital constraints of the firm (Cheng *et al.*, 2014) and

reduce its cost of capital (Sharfman and Fernando, 2008, Dhaliwal *et al.*, 2011, El Ghoul *et al.*, 2011, Goss and Roberts, 2011, Ye and Zhang, 2011, Chava, 2014, Oikonomou *et al.*, 2014, Ge and Liu, 2015, Shi and Sun, 2015, Lin *et al.*, 2017, Chen *et al.*, 2023a, 2023b).

On the other hand, performing CSR activities entails costs that may outweigh the benefits in some circumstances. For example, the priority of a start-up firm or a financially constrained/distressed firm is to develop or survive in the market. It might be value-destroying for such a firm to make a substantial contribution to the charity or to invest in projects aiming to benefit stakeholders who have no or little direct business relationship with the firm. The pursuit of CSR sacrifices resources which may be crucial for a firm's business expansion as well as the development of key capabilities, such as those of marketing and innovation (DiMaggio and Powell, 1983, Sen and Bhattacharya, 2001). Therefore, whether CSR increases the value of a firm rests on the trade-off between the benefits and costs of executing CSR initiatives. To ensure that CSR activities create value for a firm, it needs to develop its capabilities of marketing and innovation (Handelman and Arnold, 1999, Sen and Bhattacharya, 2001, Luo and Bhattacharya, 2006). Or rather, strong marketing and strong market-oriented innovation help a firm identify target customers, understand the potential market demand, and provide products or services that satisfy customers' needs. In such a circumstance, even if the firm is at the early stage of the business cycle or temporarily has low profitability and low cash adequacy, it will attract financial support from venture capitalists and develop sustainable competitive advantages. Given sufficient funds and competitive advantages, a socially conscious and responsible firm will be trusted and supported by stakeholders to a larger extent, such that the benefits of CSR are likely to outstrip the associated costs, leading to increased equity value for the firm. In line with this argument, some prior studies show that firms engaging actively in CSR tend to have better financial performance and higher value (Waddock and Graves, 1997, Roman *et al.*, 1999, Margolis and Walsh, 2003, Orlitzky *et al.*, 2003, Luo

and Bhattacharya, 2006, Starks, 2009). Table 1 summarizes the three fundamental drivers of firm value and their associated empirical measures.

[Insert Table 1 here]

2.2 Firm-specific characteristics that shape firm value

Aside from the foregoing three fundamental value drivers, we further identify a range of firm characteristics that are likely to be substantially correlated with firm value, and expound them as follows.

2.2.1 Firm size and firm value

Large firms tend to have more economic resources (e.g., human capital, funds, and other tangible or intangible assets) for their operations and business expansion than small firms do. These resources enable large firms to achieve economies of scale and/or innovate better for their products or services, thereby generating higher profits (e.g., Penrose, 1959, Hall and Weiss, 1967, and Scherer, 1973). Apart from possession of more economic resources, large firms are also more mature and experienced in their operations and investments, and are thus more able to withstand and manage business risks. As such, large firms tend to be more competitive in dynamic markets (e.g., Scherer, 1965) and be valued more highly by investors (e.g., Villalonga and Amit, 2006). There is a great deal of evidence that firm size is positively related to the performance and/or value of firms (e.g., Hall and Weiss, 1967, Scherer, 1973, Shalit and Sankar, 1977, Fiegenbaum and Karnani, 1991, Moini, 1995, and Lee, 2009).

2.2.2 Growth and firm value

High-growth firms tend to have more profitable investment opportunities (Kallapur and Trombley, 1999), in which the expansion of production capacity is likely to increase products or services that meet any increased market demand well, thereby achieving higher profitability (e.g., Jang and Park, 2011). MacMillan and Day (1987), Mendelson (2000), Capon *et al.* (1990),

and Cowling (2004) provide evidence that sales growth is positively associated with firm performance. On the other hand, growth in a firm's business involves risks associated with the business expansion and a consequential increase (decrease) in the organizational and management complexity (efficiency) (Goddard *et al.*, 2004, Jang and Park, 2011). Therefore, for business growth to grow value for firms, managers need to not only ensure the profitability of growth but also implement effective risk control on the expanded business.

2.2.3 Financial health and firm value

It is easier for financially healthy firms to raise external funds as they have lower costs for accessing both the equity and debt capital markets, compared with financially constrained or distressed firms (e.g., Baxter, 1967, Brown *et al.*, 1994). Hence, financially healthy firms could grab profitable investment opportunities on a timely basis, thereby creating higher firm value. On the contrary, financially constrained firms often have to forego potentially profitable investment opportunities due to cash inadequacies and the limited ability to secure external funds (Campello *et al.*, 2010, He *et al.*, 2021c). Also, financially constrained firms tend to have high financial risk, which is priced by investors (Whited and Wu, 2006). What is worse, when financially distressed, a firm may lose customers, suppliers, and even key employees (Koh *et al.*, 2014), and consequently, its performance deteriorates. Therefore, financial health is also a critical success factor for a firm in realizing the value of its business.

2.2.4 Risk and firm value

Firms with lower business risk or lower information risk have higher value since they have lower costs of capital and lower bankruptcy risk (e.g., Stulz, 1996). There is a vast body of evidence to suggest that investors price operational risk (Rountree *et al.*, 2008), financial risk (Whited and Wu, 2006), and information risk (Bhattacharya *et al.*, 2003, Francis *et al.*, 2005, Bharath *et al.*, 2008, and Bhattacharya *et al.*, 2011) to varying degrees, and charge a higher risk premium for investing in the risky firms, which will be consequentially subject to

higher costs of capital. Because the risks reduce the value of a firm, effective risk management is often associated with a high accounting rate of return and high firm value (e.g., Froot *et al.*, 1993, Allayannis and Weston, 2001, MacMinn, 2002, Mackay and Moeller, 2007, Gay *et al.*, 2011, Baxter *et al.*, 2013, Rampini *et al.*, 2014, and Barth *et al.*, 2023).

2.2.5 Performance and firm value

Firms that are well-performing in the past are likely to have good performance as well in the future. Firm performance tends to be autocorrelated positively in a time series. For instance, a firm better performing in recent years is more able to expand its current production capacity in a way that leads to lower per-unit costs of goods sold and higher profit margin for future years (Kraay, 2002). To the extent that investors value a firm based on its past performance (McGuire *et al.*, 1990), the foregoing auto-correlation in firm performance would at least partially explain the time-series correlation in stock returns, as evidenced by Jegadeesh and Titman (1993). Therefore, when valuing a firm, we need to review and assess the past firm performance, especially for the recent 3-5 years.

2.2.6 Corporate governance and firm value

Managers have incentives to expropriate corporate resources for themselves or to undertake risky projects, which could bring abnormal returns to their stocks and stock options holdings but put shareholders' wealth in a risky position (Jensen and Meckling, 1976, Fama and Jensen, 1983, and Shleifer and Vishny, 1997). Strong corporate governance would curb the managers' self-serving behavior and motivate them to work hard towards improving firm performance and maximizing shareholder interests (Shleifer and Vishny, 1997, Klapper and Love, 2004, and Bebchuk and Cohen, 2005). Strong corporate governance also involves effective risk management which can reduce the cost of capital for a firm (Kleffner *et al.*, 2003, Hoyt and Liebenberg, 2011). Therefore, better-governed firms tend to be more valuable (e.g., Yermack, 1996, Gompers *et al.*, 2003, Lang *et al.*, 2003, Cremers and Nair, 2005, Core *et al.*,

2006, and Bebchuk *et al.*, 2008).

2.2.7 External monitoring and firm value

External monitoring from stakeholders such as institutional investors, financial analysts, and creditors would help restrain managerial malpractice and/or malfeasance and thereby ameliorate firm performance (Jensen, 1986, Shleifer and Vishny, 1986, and Huang *et al.*, 2023). Consistent with this notion, prior studies provide evidence that large institutional stock ownership (McConnell and Servaes, 1990, Smith, 1996, Del Guercio and Hawkins, 1999, Cornett *et al.*, 2007, and Demiralp *et al.*, 2011), high analyst coverage (Haw *et al.*, 2004, Lang *et al.*, 2004, Boubaker and Labegorre, 2008, and Yu, 2010), and strong creditor control rights (Nini *et al.*, 2012) are associated with strong firm performance.

2.2.8 Audit quality and firm value

Auditors are regarded as the gatekeepers to investors, when protecting investors' interests by preventing financial misconduct of managers. In this regard, auditing is considered as an external governance mechanism that helps a firm enhance performance (Beasley, 1996, DeFond and Francis, 2005, and Fan and Wong, 2005). High-quality audits assure the quality of corporate reporting and disclosures, thereby not only facilitating effective monitoring and advising on managers by the board of directors as well as various stakeholders to improve long-term firm performance, but also reducing information risk borne by investors, who would in turn charge a lower cost of capital for investments in the stocks of the firm (Khurana and Raman, 2004, Mansi *et al.*, 2004, Pittman and Fortin, 2004, Fortin and Pittman, 2007, Azizkhani *et al.*, 2010, and Karjalainen, 2011). With the performance improved and risks reduced for the firm, investors will realize increased value of their stock investments.

Table 2 summarizes the foregoing value-drivers and their empirical measures. They constitute our parsimonious model used to estimate the raw value of a firm.

[Insert Table 2 here]

As economic, political, and social conditions as well as regulations vary from country to country, the determinants of firm value may differ across different stock markets. So it is advised that investors employ our parsimonious model in the context of the local financial market for the most recent sample period, and in specific, adjust the model in terms of the choice of value drivers after accounting for the current and local economic, information, and regulatory environments of firms.

2.3 Tests of the parsimony model in the Chinese and U.S. stock markets

We apply the parsimony model in the context of the Chinese (U.S.) stock market, as it is the largest developing (developed) stock market in the globe. Tobin's Q (*Tobin_Q*), measured by the sum of the market value of a firm's equity and the book value of total liabilities divided by the book value of total assets, is used as the dependent variable for the model. The independent variables are the proxies for value drivers, including marketing expenditures (*Marketing*), R&D expenditures (*Innovation*), CSR scores (*CSR*), firm size (*Size*), the market-to-book ratio (*Growth*), cash holdings (*Financial_health*), earnings volatility (*Risk*), return on assets (*Performance*), the portion of independent directors (*Internal_governance*), institutional shareholdings (*Institution*), analyst coverage (*Analyst_cover*), and audit fees (*Audit_quality*). Considering that it takes time for the stock market to react to value-relevant news, we seek to lag our independent variables by six months, on average, relative to the dependent variable which involves the market value of equity. To this end, we measure all the independent variables by the book value averaged over the beginning and ending book values in a fiscal year. We include year-fixed effects and industry-fixed effects in the regression, and cluster the standard errors by firm to control for time-series correlations of residuals within each firm.

The initial sample for the Chinese listed firms includes all those from the Shanghai Stock Exchange and Shenzhen Stock Exchange for the years 2011-2019. Data on CSR are

pulled from the Hexun CSR database, while the other data are taken from the China Stock Market and Accounting Research (CSMAR) database. We exclude financial firms since their financial characteristics are not comparable to those of non-financial firms. We remove firm-year observations, of which the transaction status is special treatment (ST), suspension from trading (*ST), or particular transfer (PT), as these firms are likely to be delisted from the stock exchanges. We further eliminate observations that have missing values in any of the variables. After the data screening, we get a sample of 19,401 firm-year observations for 3,413 Chinese listed firms.

Subject to the data availability on CSR and independent directors, the sample for U.S. listed firms covers the period 2007-2013. Data on CSR are extracted from MSCI and available for firms till the year 2013.[2] Data on the portion of independent directors are obtained from BroadEx and available only for a sample period starting from the year 2007. Data on institutional shareholdings are gathered from Thomson Reuters Institutional (13F) Holdings. Other data are taken from Compustat. We remove firms in financial industries and require that all firm-year observations have the necessary data to construct the variables of interest for our regression analysis. As a result, we get 8,397 firm-year observations, corresponding with 1,817 U.S. listed firms, to run the regression.

Panel A (Panel B) of Table 3 reports the descriptive statistics of all variables used in the regression analysis for the Chinese stock market (the U.S. stock market). All continuous variables are winsorized at the top and bottom 1 percentage points to mitigate potential outlier problems. Panel C reports the regression results. *Marketing*, *Innovation*, *CSR*, *Size*, *Growth*, *Financial_health*, *Risk*, *Performance*, and *Analyst_cover* take on statistically significant

[2] In line with previous research (e.g., Li *et al.*, 2021, Servaes and Tamayo, 2013), we take the following steps to construct CSR scores for the U.S. listed firms. First, we scale the number of strengths and concerns for each category (i.e., community, diversity, employee relations, environment, and human rights) by the maximum possible number of strengths and concerns in that category for each year. Second, we subtract the scaled concerns from the scaled strengths to obtain the scaled CSR score for each category in each year. Third, we add up all the scaled CSR scores across the five categories to create our CSR scores.

coefficients for both samples of Chinese and U.S. listed firms; one-standard-deviation increases in *Marketing*, *Innovation*, *CSR*, *Size*, *Growth*, *Financial_health*, *Risk*, *Performance*, and *Analyst_cover* for the Chinese (U.S.) listed firms are associated with the change of *Tobin_Q* by 2.23% (3.16%), 2.20% (9.61%), -0.73% (-2.70%), 3.45% (18.75%), 39.64% (19.96%), 3.01% (20.16%), -3.02% (-16.01%), 6.26% (5.64%), and -1.30% (-3.08%), respectively, relative to the full-sample mean of *Tobin_Q*. The coefficients on *Institution* and *Audit_quality* are positive and statistically significant for the Chinese listed firms; one-standard-deviation increases in *Institution* and *Audit_quality* lead to increases in *Tobin_Q* by 2.13% and 10.39%, respectively, of its full-sample mean. The adjusted R-square of our regression model is 0.652 (0.424) for the Chinese (U.S.) market, suggesting that the model fits well with the historical data on quantifiable value drivers.

It is worth noting that Tobin's Q is a market-based measure of firm value, and that the market perception of firm value can be different from our foregoing expectations on the value-drivers. For instance, the coefficients on *CSR* are significantly negative for both Chinese and U.S. samples, suggesting that the general investors in both markets might consider the costs of pursuing CSR activities to be higher than the benefits and therefore do not appreciate better CSR performance.[3] As stock prices tend to be inefficient in reflecting the intrinsic values of firms, the fitted values estimated from the parsimony model pertain to a rough, rather than precise, measure of firm value. Yet, this measure will be useful for shortlisting firms that are of potentially high value for long-term investments, thereby saving effort in our valuation

[3] In addition, the coefficients on *Analyst_cover* are significantly negative for both the Chinese and U.S. stock markets. This result implies that investors do not give substantive credit to firms with high analyst coverage, as managers of these firms might be under pressure to meet or beat analysts' forecasts and become myopic over corporate reporting, investments, and operations (e.g., Huang *et al.*, 2016, Irani and Oesch, 2016). The coefficients on *Internal_governance*, measured by the fraction of independent directors on the board of firms, are not statistically significant in the predicted sign. This result suggests that independent directors are not regarded as performing the roles well as monitors for firm management, probably because they might lack sufficient information and familiarity with corporate business, limiting their ability to oversee and monitor their firms effectively.

analysis and making it overall more efficient and accurate. We illuminate the stock screening procedure in the next section.

[Insert Table 3 here]

2.4 Use of the parsimonious model to short-list firms for long-term investments

Having identified the major drivers of firm value, we may use the historical data from the population of listed firms to estimate an industry-specific, cross-sectional regression of firm value on the identified determinants, where Tobin's Q is used as the empirical measure of firm value for the regression estimate. We then use the regression coefficients alongside the most recent year's value-driver data to estimate the fitted values of the regression. They will become our raw proxy for the firm value that is purged of noise or bias. Further, we select several high-growth yet non-highly-competitive industries, where the current and prospective market demand, relative to the supplies, is huge and of high growth potential, as our investment targets. Industrial growth can be empirically measured by the growth in total assets or sales of all firms in the industry, while industrial competition can be measured by the Herfindahl-Hirschman index on the sales of firms in an industry (Harris, 1998), or by the product substitutability, the market size of competing products, and entry costs as per Karuna (2007), He (2018), and He *et al.* (2019), among others. For each of the selected industries, firms that have the highest (e.g., the top-third highest) fitted values of the foregoing regression are chosen for further equity valuation. In Section 3, we expatiate on how to estimate the fundamental value of an individual firm. The number of firms selected for the individual-based valuation is contingent on the investor's resources and capability for timely valuation of individual firms. For instance, institutional investors with greater resources and ability to conduct timely, in-depth valuation analyses for individual firms might choose a larger proportion of firms than the illustrated top third of the population.

Building on the regression analyses in Section 2.3., we conduct further empirical analyses to illustrate how to select the industries and firms as discussed above. We first estimate the fitted values of regression for the sample of Chinese (U.S.) firms at the end of 2019 (2013). Then drawing on the industry data for 2019 (2013), we select our focal industries of which the industrial growth (competition) is ranked the first (last) third of the industry population. The industrial growth is measured by the sales growth of all firms in the industry; we do a common-factor analysis of product substitutability, the market size of competing products, and entry costs, and thereby construct a composite measure of the intensity of industrial competition. For the Chinese sample, the selected industries are agriculture (A01), service industry for agriculture, forestry, animal husbandry and fishery (A05), ferrous metal, ore mining and dressing (B08), non-metallic ore mining and dressing (B10), manufacturing of stationery, industrial arts, sports and entertainment supplies (C24), internet and related services (I64), research and experimental development (M73), professional and technical services (M74), and education (P82). For the U.S. sample, three industries are chosen: textiles (10), construction and construction materials (11), and wholesale (26).[4] For each selected industry, firms that have the top-third highest fitted values of regression based on our foregoing parsimonious model are chosen for further equity valuation, as these firms are likely to be not only of high value but also have relatively low transaction costs. We perform a two-sample t-test to compare the transaction costs of the selected high-fitted-value firms with those of the selected low-fitted-value firms in the focal industries. Per Fang *et al.* (2009) and Fang *et al.* (2014), we measure transaction costs by the daily effective bid-ask spreads averaged over a fiscal year for a firm. The results, presented in Panel D of Table 3, indicate that the selected high-fitted-value firms are subject to significantly lower transaction costs for stock trades than the low-fitted-value

[4] The codes following the name of industries are the industrial classification codes; for the U.S. (Chinese) sample, they correspond to the Fama-French 30 industrial classifications (the 2012 industrial classification guidance released by the China Securities Regulatory Commission).

firms.

3. The Application of the Residual Operating Income Model for Equity Valuation

The value and investment potential of the stocks of a firm are determined by the expected future payoffs that investors will earn from investing in the firm, and by the risk and uncertainty associated with the payoffs. The shareholder payoffs stem from the profits earned by a firm via operating activities (inclusive of investment activities) rather than financing activities. Accordingly, future operating profits should reasonably reflect the payoffs from, and the value of, investments in stocks of a firm, and, what is more, can be reasonably estimated on the basis of a firm's operational activities and performance. Thus, we use the residual operating income valuation model to value a firm or stock. Under this model, the fundamental value of a firm and stock is measured based on the book value of net operating assets (NOA) with any excess of required operating income (namely, abnormal operating profits (AOP)) added to the NOA, and is expressed as:

$$V_0 = NOA_0 + \sum_{t=1}^{\infty} \frac{AOP_t}{(1 + WACC)^t} \quad (1)$$

where V_0 is the intrinsic value of net operating assets of the firm; NOA_0 is the net operating assets at the point of doing the asset valuation; WACC is the weighted average cost of capital. The valuation process involving the use of the residual operating income valuation model consists of five steps: strategy analysis, accounting analysis, financial analysis, prospective analysis, and application of the valuation model. These analyses together provide a logical and powerful analytical framework for fundamental analysis and equity valuation. Below we set out to introduce each step of the valuation process.

3.1 Step 1 – Strategy analysis

Strategy analysis refers to the analysis of how and to what extent business strategies

could help create value for a firm. A reasonable business strategy should be tailored to fit a firm's current operational statuses and enable it to well defy industrial competitive forces that impair its profitability and competitive advantage. Therefore, to evaluate the value implications of business strategies, it is essential to first analyze the industrial competitive forces a firm confronts. Porter (1980) argues that there are five industrial competitive forces affecting a firm's ability to earn abnormal operating profits. Specifically, rivalries among existing firms, the threat of new entrants, and the threat of substitute products or services are the three competitive forces constituting the horizontal competition a firm faces in an industry; the other two forces stem from the increased bargaining power of customers and suppliers, respectively, which represent the vertical competition a firm confronts in its value chain.

Porter's model of five competitive forces helps a firm analyze the external environments where it operates and understand its current business position. Meanwhile, we need to also account for macroeconomic or regulatory events (e.g., Brexit, Covid-19 epidemic) that might impact a firm's business strategies and industry competitive forces. Building on the analysis of macro events, industrial competitive forces as well as internal business and resources for a firm, it may identify its strengths, weaknesses, opportunities, and threats (SWOT), and thereby set up feasible, profitable business strategies by which to create value. There are two generic operational strategies — cost leadership and differentiation, which a firm may adopt to establish and develop its competitive advantage. A cost-leadership strategy enables a firm to earn abnormal profits by lowering the costs incurred for supplying products or services and thereby competing on prices with rivalries in the industry. A differentiation strategy seeks to distinguish the firm from its competitors by offering unique products or services that well cater for customers. Either the cost-leadership or differentiation strategy needs to be implemented and sustained by a firm via its engagements in operating activities

along the entire value chain.[5] Meanwhile, the firm needs to finance, acquire, and employ sufficient resources, including economic assets and human resources, for the activities and implementation of the strategy.

In line with the growing market demand for products or services, a firm also needs to formulate good investment strategies to expand its business so as to enlarge sales of the products or services that are demanded by the market. The business expansion can be achieved via internal growth (e.g., opening a new branch, establishing a new division, increasing production capacity, or investing additional capital in current operations for the purpose of entering into new markets with existing or new products or services) or via mergers and acquisitions (M&As) (He *et al.*, 2019, He, 2023). When the firm's internal funds do not meet its investment needs for business expansion, it has to seek external financing via the equity or debt market.

The framework of strategy analysis is depicted in Figure 1. The analysis aims to infer how, and to what extent, the implementation of business strategies influences the value creation by a firm. A good implementation of high-quality business strategies helps a firm build up competitive advantages, produce abnormal operating profits, and attain sustainable development. Strategy analysis forms an essential basis for identifying a firm's profit drivers and key risks, assessing the sustainability of the firm's performance, and making realistic forecasts of future performance, and helps in our follow-up accounting analysis, financial analysis, prospective analysis, and valuation.

[Insert Figure 1 here]

[5] See Porter (1985) for the definition of value chain. It consists of primary activities, including inbound logistics (e.g., receiving, storing, and managing inventories), operations (e.g., converting raw materials into a finished good), outbound logistics (distribution of finished goods to customers), marketing and sales (e.g., advertising, promotion, and pricing), and services (e.g., customer services, maintenance, product warranty, repair, refunds, and exchange), and of support activities, including procurement, technological development, human resource management, and infrastructure.

3.2 Step 2 - Accounting analysis

Under the residual operating income valuation model, the expected shareholder payoffs, which determine equity value, are measured by future residual operating income generated from operating activities (inclusive of investing activities). Hence, we need to reformulate the financial statements in a way that distinguishes the operating activities (inclusive of investing activities) from financing activities. This reformulation helps us to identify the drivers of profitability and growth and to understand how value is created from operating activities.

The balance sheet in the standard form emphasizes a firm's liquidity in terms of current versus non-current items. However, corporate insiders and investors care mainly about a firm's value creation rather than its liquidity. Thus, for valuation purposes, it will be helpful to re-classify the balance sheet items into operating versus financing categories. A typical template of the reformulated balance sheet is shown in Table 4.

[Insert Table 4 here]

There are several points that warrant attention for the reformulated balance sheet: (i) The residual operating income valuation model values a firm based on the book value of net operating assets (NOA), which equals the book value of operating assets less non-interest-bearing operating liabilities. The book value of NOA presents itself in the reformulated balance sheet; (ii) The reformulated balance sheet maintains a fundamental equation: equity capital = net operating assets (NOA) – net debt (ND), where net debt (ND) (also named net financial obligation (NFO)) measures net borrowing (i.e., the borrowing net of cash and other financial assets) used by firms to finance NOA and equals financial obligation less financial assets; (iii) Either the operating items or financial items can be further categorized into long-term versus short-term items; (iv) Preference shares holders are paid a fixed amount of dividends periodically. Thus preference shares resemble debt and belong to the financial obligation category; (v) Dividends payable pertains to the wealth receivable by shareholders and is thus

included in the equity capital.

The residual operating income valuation model values a firm based on the net operating profits before interests and after taxes (NOPAT) as well. However, a standard-form income statement does not separate the operating income (or expense) from financing income (or expense). Therefore, we need to reformulate the income statement. A typical template of the reformulated income statement is presented in Table 5.

[Insert Table 5 here]

In the process of reformulating the income statement, it is noteworthy that: (i) Non-recurring operating income or expense should be separated out, as it has much weaker implications for a firm's future profitability; (ii) Income taxes on operations are taxes attributed to operations, not financing. Thus, a reduction (an increase) in corporate income taxes due to tax deductibility (addition) of net interest expense (income) needs to be added (subtracted), making corporate income taxes on operation higher (lower) than overall income taxes (i.e., the tax charges reported in the standard-form income statement) if interest expense is larger (smaller) than interest income. Or rather, income taxes on operation = overall income tax expense + (interest expense – interest income) * income tax rate; (iii) Tax relief on net interest expense is subtracted from net interest expense to give the number of after-tax net interests. Put differently, tax relief on net interest expense = (interest expense – interest income) * corporate income tax rate; (iv) Any gain (or loss) from pension liability adjustments and foreign currency exchanges, as arising from non-recurring operating activities, should be included in the category of non-recurring operating charges/income; (v) An unrealized gain (or loss) on marketable securities pertains to a financial item, as it is intended either for selling in a short run or for fulfilling debt obligations. Accordingly, it should be put after the NOPAT line item; (vii) An unrealized gain (or loss) on derivatives is also a financial item and thus should be placed after NOPAT.

Reformulating financial statements helps us to discover the driving forces of a firm's profits and growth and to identify the necessary figures (such as NOA and NOPAT) required by the residual operating income valuation model. However, a financial statement will not capture a firm's underlying business reality and performance well, if the figures therein are subject to distortions by managers (Myers and Majluf, 1984). As a matter of fact, they have incentives to manipulate accounting numbers for various opportunistic purposes (e.g., He, 2015, 2016). Therefore, it is crucial for us to evaluate the accounting quality, especially earnings quality, of a firm before proceeding with financial analysis and the remainder of valuation process for the firm (He *et al.*, 2021).[6]

3.3 Step 3 - Financial analysis

The value of a firm depends crucially on future profitability and risks. Analysis of past profitability helps investors estimate future profitability and the expected payoffs from investing in the firm. Assessing how well a firm manages various types of risks in the past constitutes a foundation on which to anticipate a firm's ability to manage these risks in the future. We normally choose the recent 3-5 years' period to analyze the profitability and risk management for a firm.

The analysis of past profitability involves the analysis of various financial ratios. The residual operating income valuation model breaks the intrinsic value of a firm down into two components: (i) the book value of net operating assets (NOA) and (ii) the present value of future residual operating income (also named abnormal operating profits (AOP)) (He *et al.*, 2021). The residual operating income refers to an incremental operating profit that exceeds the income required by investors for investing in operating assets, and is defined as:

[6] The assessment of accounting quality, and associated adjustments in equity valuation, are discussed in detail by He *et al.* (2021).

$$AOP_t = NOPAT_t - WACC * NOA_{t-1} \quad (2)$$

where NOPAT stands for net operating profits after taxes and before interests; NOA refers to net operating assets; WACC is the weighted-average cost of capital. As $NOPAT_t = RNOA_t * NOA_{t-1}$ (where RNOA is the return on net operating assets), the abnormal operating profits can be alternatively broken down into:

$$AOP_t = (RNOA_t - WACC) * NOA_{t-1} \quad (3)$$

In the context of this breakdown, RNOA is an essential driver of residual operating income and reflects a firm's ability to earn profits and create value. Value is added (deducted) to (from) the book value of NOA, if RNOA is greater (lower) than the required cost of capital. RNOA pertains to a summary measure of a firm's operating profitability, and can be expressed as a function of some value-oriented ratios as follows:

$$RNOA_t = \frac{NOPAT_t}{NOA_{t-1}} = \frac{NOPAT_t}{sales_t} * \frac{sales_t}{NOA_{t-1}} = NOPM_t * ATO_t \quad (4)$$

where NOPM is the net operating profit margin ratio, which equals $NOPAT_t/sales_t$; ATO refers to the operating assets turnover ratio, which equals $sales_t/NOA_{t-1}$. Formula (4) indicates that NOPM and ATO are two drivers of RNOA. Plugging formula (4) into formula (3), AOP can be expressed in more detail as:

$$AOP_t = NOPM_t * sales_t - WACC * \frac{sales_t}{ATO_t} \quad (5)$$

Formula (5) shows four fundamental determinants of AOP: sales, NOPM, ATO, and WACC, which reflect a firm's performance in sales, operation, investments, and financing, respectively. Some exceptional items such as restructuring charges, gains or losses from asset sales are of non-recurring nature and have relatively weak implications for a firm's future fundamentals and prospects. Hence, we often tease out, or put substantively less weight on, exceptional items when using current or past NOPM and ATO to predict the trend of future NOPM and ATO, respectively. Assuming that there is no non-recurring operating item, NOPAT will equal gross operating profits minus operating expenses. Therefore, RNOA can be further

decomposed as:

$$RNOA_t = NOPM_t * ATO_t = \frac{NOPM_t}{\frac{1}{ATO_t}}$$

$$= \frac{\left(\frac{gross\ operating\ profit}{sales}\right)_t - \left(\frac{operating\ expenses}{sales}\right)_t}{\left(\frac{operating\ working\ capital}{sales}\right)_t + \left(\frac{long-term\ NOA}{sales}\right)_t}$$

$$= \frac{f(\left(\frac{gross\ operating\ profit}{sales}\right)_{-n\sim0}) - f(\left(\frac{operating\ expenses}{sales}\right)_{-n\sim0})}{f(\left(\frac{operating\ working\ capital}{sales}\right)_{-n\sim0}) + f(\left(\frac{long-term\ NOA}{sales}\right)_{-n\sim0})} \quad (6)$$

NOPM equals the gross profit margin ratio less the ratio of various operating expenses to sales; the former ratio reflects the gross profitability of each dollar of sales, and the latter implies the firm's ability to control expenses. There are two main factors determining the gross profit margin ratio. One is the price premium that a firm's products or services command in the product marketplace. This premium depends on the degree of industrial competition and the extent to which the firm's products are unique in catering to customers. The other factor is the efficiency of a firm's procurement and production processes. Higher efficiency in procurement and production contributes to lower costs of sales, which can be achieved by the firm via purchasing input products/services at lower costs than rivals and running the production processes with lower costs, fewer wastes, and higher yields. NOPM as a whole reflects a firm's ability to manage its operation to generate profits. ATO measures a firm's ability to use NOA to generate sales; in specific, the ratio of operating working capital to sales and the ratio of long-term NOA to sales capture the efficiency with which the firm manages its operating working capital and long-term operating assets, respectively, to generate sales. We use the historical ratios or figures for the recent *n* years (often 3-5 years) as the basis to forecast the associated future ratios or figures.

Valuation also requires an estimation of the cost of capital, which is used to discount future AOPs to their present values. The cost of capital is the return required by investors for

investing in a firm, given the riskiness of the firm and the uncertainty of its future profitability. Under the residual operating income valuation model, the cost of capital is a weighted average of the cost of equity and the after-tax cost of debt, with the weights assigned by the relative values of equity versus debt. Thereby, the weighted-average cost of capital (namely, WACC) can be expressed as:

$$WACC = \frac{E}{E+D} * \rho_E - \frac{D}{E+D} * (1 - tax\ rate) * \rho_D \quad (7)$$

where E and D represent the values of equity and debt, respectively; ρ_E (ρ_D) is the cost of equity (debt), which is the return that shareholders (debtholders) require to compensate for equity (default) risk. The cost of debt may be proxied by NIE/ND, where NIE is net interest expense, and ND is net debt. In the situation when the value of financial assets (or interest income) is larger than that of financial obligations (or interest expense), the value of ND (or NIE) is negative and should not be used to calculate the cost of debt. Instead, the NIE/ND (with both NIE and ND greater than zero) of an industrial peer firm that has the same credit rating as the firm being valued may be used as the proxy for the expected cost of debt. Liquidity ratios such as the current ratio, quick ratio, and cash ratio reflect a firm's ability to pay off short-term debt. Solvency ratios such as debt-to-equity ratio, interest coverage ratio, and debt coverage ratio capture a firm's ability to fulfil long-term debt obligations. If the firm's liquidity and solvency positions deteriorate significantly, the expected cost of debt (ρ_D) would be higher than NIE/ND. Accordingly, a value higher than NIE/ND should be assigned to the cost of debt. On the other hand, the cost of equity can be estimated by the following capital assets pricing model (CAPM):

$$\rho_E = r_f + (r_m - r_f) * \beta \quad (8)$$

where r_f is the risk-free rate and typically takes on the value of the interest rate of a 10-year treasury bond; r_m is the expected market return, which is often measured by the annual return of the market indexes, such as S&P 500 index and NYSE Composite index; $r_m - r_f$ is

the market risk premium, which reflects the expected return from holding all risky equities instead of a risk-free asset.[7] β measures a firm's systematic risk, which cannot be diversified away by investors through investment portfolio diversifications. The firm-specific systematic risk can encompass operational risk, investment risk, financial risk, and information risk.[8] Under normal circumstances, firms prepare their financial statements on a going-concern basis and are expected to be financially stable to continue their operations for the foreseeable future. Hence, we do not account for financial risk when estimating the cost of equity.

The factor associated with operational (investment) risk that is priced by the stock market is firm size (book-to-market ratio). Accordingly, the Fama-French three-factor model (Fama and French, 1993) extends the CAPM model by including size factor and growth factor in the following way:

$$\rho_E = r_f + \beta_1 * (r_m - r_f) + \beta_2 * SMB + \beta_3 * HML \quad (9)$$

where $\beta_{i=1,2,3}$ are the factor coefficients, revealing the sensitivity of a firm's cost of equity to the risk factors, and estimated by time-series regressions on a monthly basis for a period that spans at least 5 years; *SMB* refers to the historical excess returns of small-cap firms over large-cap firms, and equals the value-weighted average of returns of small-cap stocks which are ranked in the bottom decile of market capitalization among all listed firms in a stock

[7] Market risk comes from unexpected changes in the macroenvironment, which increase the uncertainty a firm's operation, investments, and/or financing. For instance, uncertainty regarding the long-term economic impacts of Brexit might affect the future performance of not only British domestic firms but also those that have diversified geographic operations and sales in Europe; the outbreak of the Covid-19 pandemic engenders uncertainty of future corporate profitability.

[8] The operational risk and investment risk, referred to as the risk of a firm losing in operations and investments, are normally associated with changes in products and business expansion, and stem from (i) compliance threats associated with relevant policies, laws, regulations, or corporate governance; (ii) financial threats ascribed to volatility in the financial market and real economy; (iii) strategic threats related to customers, suppliers, competitors, and investors; (iv) operational threats that concern the processes, systems, people, and overall value chain of business; (v) uncertainty as to managerial ability to execute a firm's product or business expansion strategies, among others (He, 2023). Financial risk, also known as distress risk, credit risk, and default risk, of a firm is high if this firm is likely to default on payment for principal and interests to debtholders. Financial distress is conceptually different from financial constraint which refers to the situation where firms are constrained from funding their desired investments (Lamont *et al.*, 2001; He and Ren, 2023). Information risk originates from corporate reporting and disclosures being biased, unprecise, incomplete, or untimely.

market at the end of a fiscal year, minus the value-weighted average of returns of large-cap stocks which have the top decile rank of market capitalization; *HML* refers to the historical excess returns of value firms (featured by high book-to-market ratio) over growth firms (featured by low book-to-market ratio), and equals the value-weighted average of returns of stocks that have the book-to-market ratio ranked in the top decile among all listed companies in a stock market at the end of a fiscal year, minus the value-weighted average of returns of stocks that are ranked within the bottom decile of the book-to-market ratio. The rationale behind the Fama-French model is that small (low-growth) firms tend to have high operational (investment) risk and are thus charged by investors with a higher risk premium for investing in these firms.

The Pastor-Stambaugh model (Pastor and Stambaugh, 2003) expands on the Fama-French Model by adding another risk factor — stock liquidity. The model is presented as:

$$\rho_E = r_f + \beta_1 * (r_m - r_f) + \beta_2 * SMB + \beta_3 * HML + \beta_4 * LMH \quad (10)$$

where *LMH* refers to the historical excess returns of low-liquid firms (featured by large bid-ask spreads) over high-liquid firms (featured by small bid-ask spreads), and is equal to the value-weighted average of returns of stocks whose average daily bid-ask spread in a year is ranked within the top decile among all listed firms in a stock market, less the value-weighted average of returns of stocks which have the average daily bid-ask spread ranked within the bottom decile. The rationale underlying the Pastor-Stambaugh model adding the liquidity risk factor is that firms with low stock liquidity tend to have high information risk and are hence charged by investors with a higher risk premium for providing capital to these firms. However, bid-ask spreads capture the information asymmetry between informed (sophisticated) and uninformed (unsophisticated) investors, not necessarily the information risk as manifested in the information asymmetry between corporate insiders and outside investors (Easley and O'Hara, 2004; He *et al.*, 2022). If the quality of information disclosures is high, but the

disclosed information *per se* is of high complexity and of low readability, then sophisticated investors might be better at comprehending the information than unsophisticated investors, thereby enlarging the bid-ask spreads. Therefore, bid-ask spreads might not be a good measure of the information risk of a firm (e.g., Lambert *et al.*, 2012).

The quality of accruals, measured by the volatility of abnormal accruals of a firm, could be an alternative, good proxy for information risk (Francis *et al.*, 2005, He, 2021). Prior studies (e.g., Francis *et al.*, 2005, Kim and Qi, 2010, and Ogneva, 2012) provide evidence that firms with lower accruals quality are subject to higher costs of equity, suggesting that accruals quality is another risk factor priced by the stock market. In this context, the cost of equity of a firm can be estimated as:

$$\rho_E = r_f + \beta_1 * (r_m - r_f) + \beta_2 * SMB + \beta_3 * HML + \beta_4 * AQ \quad (11)$$

where AQ measures the historical excess returns of low-accruals-quality firms over high-accruals-quality firms, and equals the value-weighted average of returns of stocks whose accruals quality for a year is ranked within the bottom decile among all listed firms in a stock market, less the value-weighted average of returns of stocks which have the accruals quality ranked within the top decile.

Previous research provides various approaches to estimate the cost of equity of a firm. For the sake of parsimony, we only discuss three commonly used models – Models (9), (10), and (11). Given plausible differences in risk factors across different capital markets, investors need to use the most recent sample period for the local stock market to assess the power of the models before using them to estimate the costs of capital for a firm.

Under the going concern assumption, firms are supposed to have good ability to stay afloat, but they may, on some occasions, be subject to high financial risk, which needs to be factored into our estimation of the costs of capital. Existing studies develop various proxies for the financial risk of a firm. The implied distance-to-default, which is prevalently used to capture

the default probability of a firm, is measured by the difference between the asset value and debt value of the firm, relative to the volatility of the asset value. Or rather, the implied distance to default is typically computed based on the two-equation contingent-claim method of Ronn and Verma (1986). The first equation is based on Merton (1974) and utilizes the Black and Scholes (1973) formula to express the equity value of a firm as the value of a European call option written on the firm's assets:

$$V_E = V_A N(d_1) - V_D e^{-rT} N(d_2) \tag{12}$$

where V_E represents the market value of equity; V_A refers to the total asset value; $N(*)$ is the cumulative function of a standard normal distribution; V_D is the book value of debt; r is the risk-free rate, which is typically proxied by the one-year treasury rate; T is debt maturity that is assumed to be one year or less for all firms; $d_1 = [\,ln(V_A/V_D) + (r + \sigma_A^2/2)T]/\sigma_A\sqrt{T}$; $d_2 = d_1 - \sigma_A\sqrt{T}$; σ_A is the asset volatility.

The second equation reflects the relation between equity volatility (σ_E) and asset volatility (σ_A):

$$\sigma_E = \frac{[V_A N(d_1)\sigma_A]}{V_E} \tag{13}$$

where σ_E can be approximated by the annualized standard deviation of monthly returns in the previous year.

Given that the asset value (V_A) and asset volatility (σ_A) are not directly observable, we need to solve the above two equations simultaneously for each firm for every month to get the values of these two variables. The distance to default is then computed as follows:

$$Distance\ to\ default = \frac{ln\frac{V_A}{V_D} + \mu - \frac{1}{2}\sigma_A^2}{\sigma_A} \tag{14}$$

where μ is assigned different values in different studies. For instance, Eisdorfer *et al.* (2018) measure μ by the one-year treasury rate. Campbell *et al.* (2008) propose $\mu = 0.06 + r$, where 0.06 is an empirical proxy for the equity premium. Vassalou and Xing (2004) compute

μ as the mean of the change in lnV_A. Hillegeist *et al.* (2004) calculate μ as the continuously compounded expected return on assets.

Another measure of financial risk is the Altman Z-score (Altman, 1968), which accounts for the ratios of profitability, leverage, liquidity, solvency, and efficiency of asset use, and is expressed as follows:

$$Z-score = 1.2 * \frac{working\ capital}{total\ assets} + 1.4 * \frac{retained\ earnings}{total\ assets} + 3.3 * \frac{earnings\ before\ interest\ and\ tax}{total\ assets} + 0.6 * \frac{market\ value\ of\ equity}{total\ liabilities} + \frac{sales}{total\ assets} \quad (15)$$

An Altman Z-score being higher than 3 implies that a firm is in a solid financial position, whereas a score below 1.8 suggests that a firm might be heading towards bankruptcy. If the financial risk of a firm is high, we need to adjust upwards the cost of capital estimated based on Models (8), (9), (10), and (11), since they do not account for the financial risk. As for firms with considerably high financial risk, investors should consider prudently whether to include such firms in their investment portfolios.

In sum, financial analysis involves using various historical financial ratios and risk factors to assess a firm's profitability and risks. It aids investors in appraising the firm's ability to earn abnormal operating profits and manage risks in the long run.

3.4 Step 4 - Prospective analysis

The intrinsic value of a firm or stock is a function of its expected future payoffs conditional on the risks inherent in these payoffs. Therefore, the critical step of valuation under the residual operating income valuation model is to forecast future abnormal operating profits (AOP) discounted at the risk-based WACC.

Previous strategy analysis, accounting analysis, financial analysis and associated risk analysis provide an essential foundation for forecasting AOP. Assessing a firm's business

strategies helps investors identify competitive advantages established by the firm to withstand industrial competitive threats. Competitive advantages achieved via differentiation or cost-leadership strategies enable a firm to perform superiorly over its competitors and to generate abnormal operating profits. Evaluating industrial and macro environments helps investors infer not only a firm's competitive forces but also the industrial growth that indicates the growing market demand for products or services. A good accounting analysis ensures to investors the reliability and informativeness of accounting numbers in implying a firm's value and prospects. Appraising the historical profitability and risks via time-series and cross-sectional analyses of various financial ratios or figures helps investors estimate future payoffs to them and determine the rate of required return. The required return will be reduced if the uncertainty of future payoffs in terms of business risk, information risk, and market risk decreases.[9]

As displayed in Formula (5), AOP can be decomposed into its four determinant factors, which are NOPM, sales, ATO, and WACC. Hence, forecasting AOP can be regarded as equivalent to forecasting or estimating these four ratios or figures.

$$AOP_t = NOPM_t * sales_t - WACC * \frac{sales_t}{ATO_t} \quad (5)$$

Unlike the valuation of a bond or a project, the valuation of a firm or stock is based on the "going concern" assumption that the firm will operate indefinitely. However, it is unrealistic to forecast specific AOP numbers on the infinite horizon; the further we look into the future, the more uncertain and speculative our forecasts are. To allay this concern, we choose a short-term finite horizon (say, 5-10 years) within which we forecast the specific AOP numbers for each year. Yet, for AOP beyond the endpoint of the short-term forecast horizon, we may simplify our long-term forecasts by assuming AOP to be constant at a certain amount, or grow

[9] Information risk can be reduced if a firm increases the quality of its financial reporting and disclosures; business risk will decrease if a firm implements effective risk management by virtue of, e.g., using derivatives to efficaciously hedge away business risk. Nonetheless, market risk is normally out of the control by a firm.

at a constant rate, in perpetuity. Regarding the short-term forecasts on the chosen horizon, we need to first forecast the specific numbers of short-term sales, NOPM, and ATO, and then use Formula (5) to estimate the specific numbers of short-term AOP. For the long-term forecasts, we may make some assumptions to simplify the long-term trends of sales, NOPM, and ATO (to be discussed in Section 3.5), such that the long-term sales would have the same trend as the long-term AOP, and then we forecast the former. As such, our prospective analysis involves essentially forecasts of short-term sales, short-term ATO, short-term NOPM, and long-term sales. Below we set forth how to reasonably make each of the four forecasts.

The historical track record of a firm's sales, which reflects its ability to generate sales, is utilized as a typical benchmark to forecast future sales on a finite horizon. The industrial sales growth, which represents the industry's sales performance and reflects, to some extent, the existing market demand for products or services, is used as the cross-sectional benchmark for the sales forecast. Say, if the sales growth rate of a firm for the recent period is positive (negative) and significantly higher (lower) than the industrial average of sales growth rate, *ceteris paribus*, the firm would stand a good chance of having continually high sales growth for the future period. On top of these two benchmarks, we also need to account for the firm's business strategies and industrial competitive forces, which may have substantive influences on its future sales as well. For instance, if a firm provides unique products or services, of which the design and functionality cater for customers, or if a firm manages to establish a competitive brand via good advertisements and propaganda, then the firm should have a good potential to maintain and enlarge its sales in future years. The existing rivalries' fierce competition for customers and the threats of substitute products or services might shrink the market share of a firm, diminishing its sales volume. The increasing bargaining power of customers might compel a firm to cut down on the prices of its products or services, thus reducing its sales revenues. Besides, changes in customers' tastes, preferences, and needs for products or services

also influence corporate sales, and the influences depend on whether and to what extent the firm will (dis)satisfy the customers.

Time-series track record of net operating profit margin (NOPM) can be used as the benchmark for forecasting future NOPM on a short horizon. Since NOPM is defined as net operating profits after taxes and before interests (NOPAT) divided by sales, the forecasts of NOPM should consider factors affecting both sales and operating costs. So, apart from the foregoing determinants of sales that compose NOPM, we need to further account for a firm's business strategies and industrial competitive forces that influence its operating costs. Specifically, if a firm takes a strategy of cost-leadership, it will be seeking to purchase input products/services at lower costs, or run the production processes more cost-efficiently, than its competitors do. [10] These activities lead to the reduction of operational costs and the improvement of profit margin. On the other hand, intense industrial competition will increase operating costs and reduce NOPM. For example, increased competition for the products from suppliers or increased bargaining power of suppliers will raise the prices of supplies, resulting in a cost rise and a profit shrink for the firm. Comparison of the gross profit margin ratio as well as other expense-to-sales ratios of a firm with those of its industrial competitors is a means to obtain insight into the firm's competitive advantage with regard to operation management. Yet, such a comparative analysis is less important, if the overall market demand for products and services, relative to the supplies, is large and will keep growing significantly, which makes industrial product market competition low for the firm. In such a situation, its business strategies, activities, and resources would instead become the predominant determinant of its NOPM and abnormal operating profits in future years.

Aside from the foregoing qualitative factors that influence the future NOPM, we may

[10] Regarding the cost-leadership strategy, costs associated with the services, outbound logistic, marketing and sales in the value chain cannot be substantially saved, as these costs are vital for a firm's sales performance and value creation.

also conduct a quantitative analysis of the firm's operational efficiency to better predict how the future trend in NOPM will deviate from the historical trend record. The operational efficiency can be calculated as the ratio of outputs to inputs for the firm's production, where the outputs are the sales revenues, and the inputs are the revenue-generating resources, including the cost of goods sold, selling, general, and administrative expenses, capitalized operating leases, net property, plant, and equipment, capitalized R&D costs, acquired goodwill, and other intangible assets (Baik *et al.*, 2013, Cheng *et al.*, 2018, and Demerjian *et al.*, 2012). The higher the output-to-input ratio of the firm, the higher efficiency of its operation. This measure of operational efficiency has a stronger forward-looking implication for the future NOPM than the past NOPM, since the former considers both the short-term and long-term inputs and the latter only accounts for the short-term ones. For instance, in a case when the historical trend of NOPM of a firm is steady but its operational efficiency in the current year increases, *ceteris paribus*, we may expect an increasing future NOPM. By contrast, in another case where there is a growing trend in the past NOPM of the firm but its recent operational efficiency is relatively low, we cannot simply affirm a rising trend in future NOPM that is estimated from the linear time series analysis of the past NOPM. Rather, we need to adjust this estimated NOPM lower.

Operating assets turnover ratio (ATO) reflects the efficiency of a firm using net operating assets (NOA) to generate revenues. Time-series track record of ATO provides a benchmark by which to forecast future ATO. Its values rest on investment strategies and industrial competitive forces. Firms making investment strategies aim to take advantage of investment opportunities, while good (bad) investment opportunities would help (make) a firm attain (experience) a rise (decline) in future ATO. Success in investments by a firm is further determined by its ability to execute investment strategies. Therefore, it is crucial to assess not only the profitability of investment strategies but also the quality of the firm implementing the

strategies. The assessment can be done via an empirical analysis of the firm's investment efficiency. To this end, we run the following ordinary least squares (OLS) regression based on a pooled sample of all the non-financial firms listed on a stock exchange for recent years (e.g., Biddle *et al.*, 2009, Gomariz and Ballesta, 2014):

$$Investment_{i,t} = \alpha_0 + \alpha_1 growth_{i,t} + yeardummies + industrydummies + \varepsilon_{i,t} \quad (16)$$

where $Investment_{i,t}$ equals the total investment expenditures less those necessary to maintain assets in place, or equals an increase in the net long-term assets; $growth_{i,t}$ is equal to the sales growth of firm i at year t, or to the market value of a firm's equity divided by the book value of the firm's equity. Under normal circumstances, a higher-growth prospect is associated with more corporate investments. Thus, we expect α_1 to be positive and statistically significant at a conventional level. The fitted value estimated from the regression model represents the optimal level of the firm's investment. The residual value reflects the extent to which the firm's investment departs from the optimal level. A positive (negative) residual value denotes the degree of overinvestments (under-investments), while a lower absolute value of residual signifies higher investment efficiency. The assumption underlying the model is that the normal, optimal level of corporate investments is innately determined by the growth of market demand for the firm's products and/or services, and that an upwards (a downwards) deviation from such optimality is attributed to the firm's overinvestments (under-investments) in the product/ service market. On top of the market demand, other factors that potentially determine the firm's optimal investment level, such as firm size, financial leverage, financial health, stock returns, firm age, and prior investments (e.g., Richardson, 2006, He and Lin, 2022), may be added to Model (16) for assessing the efficiency of the firm's investments.The investment efficiency has implications for the future ATO. For instance, provided that the current investment efficiency is relatively high, and that the past ATO exhibit a growing trend, we may expect future ATO to

grow at an even higher rate; yet, if there are severe overinvestment or under-investment problems, the future ATO is likely to decrease.

On the other hand, industrial competitive forces also impact ATO. For example, threats of new entrants might induce a firm to make additional inefficient investments. Rivalries among existing firms competing for the limited resources required for investments might make the firm miss out on some good investment opportunities. In an extreme case when NOA that composes ATO is negative, we had better not forecast the ATO as a whole; rather, we may make forecasts of NOA and sales separately and then divide our forecasted sales by forecasted NOA to reach the ATO number. The NOA used to divide the sales should stand at the beginning of a year, since our valuers care about the sales generated by investments in operating assets from the outset. Since NOA encompasses inventories, accounts receivable, accounts payable, and long-term operating assets, we may forecast the turnover ratios of these four operating assets or liabilities, respectively, and thereby make a better forecast of ATO. Comparison of these asset turnover ratios of a firm with those of its industrial competitors helps investors assess the firm's competitive advantage in terms of inventory management, credit management, and investment management. Nonetheless, it is less important to perform this comparative analysis for a firm in an uncompetitive industrial market where the overall market demand for products or services, relative to the supplies, is large and will keep growing substantially.

For the long-term forecasts of sales, three benchmarks can be utilized. First is the real GDP (i.e., gross domestic product) growth rate. We use this benchmark in the case when a firm has its main business and sales outlets in a country of which the economy (e.g., that of the United States and the United Kingdom) is primarily demand-driven. Second, the industrial sales growth rate can be employed as another benchmark to forecast the long-term sales of either domestic firms or multinational firms. The last yet most important benchmark we should use to project the long-term growth in sales is our forecasted sales growth on the short-term

horizon. Whether and to what degree a firm can achieve high sales growth beyond the short run is largely determined by its performance in innovation, marketing, and CSR. Innovation outputs, such as advanced technologies, the invention of new products or services, which are protected by patents, trademarks, copyrights, and franchises, will enable a firm to differentiate itself from its competitors and to maintain sustainable competitive advantages in the long run. Further, good advertisements and propaganda on innovative products or services help the firm win recognition, satisfaction, and loyalty from widespread consumers, thereby boosting its long-term sales growth.[11] If the firm is also socially responsible and cares about stakeholder interests, customers are likely to have long-term trust in the firm and be happy to patronize its products or services. In addition, it is noteworthy that long-term sales growth is likely to be underestimated if a firm adopts conservative accounting policies. So, we might need to adjust our forecast of long-term sales growth upwards for a firm that shows a high degree of accounting conservatism.

If a firm has diversified business run by different segments, we need to make segmental forecasts of short-term sales, short-term NOPM, short-term NOA-to-sales ratio (i.e., the reciprocal of ATO), and long-term sales growth, respectively. Then, we (i) sum our segmental forecasts of short-term sales, (ii) sales-weighted average our segmental forecasts of short-term NOPM, (iii) take the reciprocal of the sales-weighted average of our segmental forecasts of the ratios of NOA to sales, and (iv) use the sales in the final year of our short-term forecast horizon to sales-weighted average our segmental forecasts of long-term sales growth rates. We cannot estimate equity value for each segment and then sum all the segments' equity values, because the costs of capital for different segments are actually different and cannot be estimated in

[11] Good advertisements and propaganda should genuinely show the products'/services' utilities, strengths, and functionalities that meet the real needs of customers. If advertisement and propaganda exaggerate or distort the utilities, strengths, and functionalities of the products or services for customers, any high sales growth resulting from the exaggeration or distortion would be unlikely to persist in the long run.

isolation; only the overall cost of capital can be estimated by us, because it is the firm as a whole, rather than its individual segments, that raises funds from the equity and debt markets.

If a firm has its sales outlet, and associated investments and operations, in different countries or regions (e.g., East Asia, Southeast Asia, Middle East, Oceania, North America), we need to make country- or region-level forecasts of short-term sales, short-term NOPM, short-term NOA-to-sales ratio (i.e., the reciprocal of ATO), and long-term sales growth, respectively, for the firm. We then (i) sum our country- or region-level forecasts of short-term sales, (ii) sales-weighted average our country- or region-level forecasts of short-term NOPM, (iii) take the reciprocal of the sales-weighted average of our country- or region-level forecasts of the ratios of NOA to sales, and (iv) use the sales in the final year of our short-term forecast horizon to sales-weighted average our country- or region-level forecasts of long-term sales growth rates. A firm may have sales outlets in different countries or regions while maintaining operations and investments mainly in its home country. In such an instance, we need to (i) sum our country- or region-level forecasts of short-term sales, (ii) use the sales in the final year of our short-term forecast horizon to sales-weighted average our country- or region-level forecasts of long-term sales growth rates, (iii) yet make the overall forecasts of aggregate NOPM and ATO, for the firm.

In addition, some major business activities such as share issuances or share repurchases, dividend payout, management turnover, mergers and acquisitions (M&A), and socially responsible investments and operations could have a significant influence on our forecasts or estimation of sales, NOPM, ATO, and WACC. For instance, share issuances and share repurchases could impact our estimated WACC and forecasted ATO. If the market overvalues the shares issued by a firm, it will raise external funds at a lower cost, suggesting a lower value for WACC. If the external funds raised via equity issuance do not meet the firm's demand for its business expansion, ATO may decline, and the decline can be more pronounced when the

firm confronts intense industrial product market competition. If a firm with adequate cash opts to repurchase its shares from the open stock market rather than invest in new projects, the firm may lack good investment opportunities, denoting that its future ATO may decrease. Financial leverage of a firm will decrease (increase) as a result of the share issuances (repurchases). If the changed leverage deviates further from the optimal leverage for the firm, WACC will be likely to increase. A firm's optimal leverage can be measured by the fitted value estimated from a regression of financial leverage on its typical determinants, which include firm size, growth, asset tangibility, financial flexibility, risk, and profitability. The absolute value of residual represents the degree of deviation from the optimal leverage and of associated financing inefficiency.

Dividend policies might affect the estimation of the cost of equity and the forecasts of ATO and NOPM. The optimal dividend policy of a firm should cater to the investors' preferences for dividend payouts and be consistent with the firm's investment opportunities as well as its need of internal funds for the investment (e.g., Baker and Wurgler, 2004, and Rozeff, 1982). If a firm pays dividends in excess of the optimal level, the firm will have fewer funds available for investments in high-return projects. On the contrary, if the firm has a low dividend payout and keeps a high level of free cash flows, managers might have a tendency to use the excessive cash for their own benefits or for investments in high-risk projects (e.g., Gaver and Gaver, 1993, and Jensen, 1986). Therefore, a significant deviation from the optimal level of dividend payout might reduce the future ATO and NOPM and increase WACC. The optimality of dividend payout can be determined based on the fitted value of a cross-sectional regression of the dividend payout ratio on its typical determinants, which include cash holdings, growth prospect, firm size, profitability, share price, and business risk. More dividends are expected to pay to shareholders in cases when the firm has more cash flows, larger size, lower growth prospects, higher profitability, higher share price, or higher business risk (e.g., Rozeff, 1982).

The absolute value of residual estimated from the regression reflects the degree of deviation from the optimal dividend payout ratio.

Turnover or step-down of managers will be beneficial to a firm in respect of sales, NOPM, or ATO, if the managers are incompetent or have committed misconduct; but will be detrimental to a firm if its competent, well-performing managers are headhunted by its competitors. Also, mergers and acquisitions may boost or lower the sales, NOPM, and ATO of acquirers. Value-enhancing M&As generally fulfil three objectives. First is to secure the target firm's advanced technologies that are essential for the acquirer to enlarge its sales and profits. Second is to improve the supply chain by acquiring important suppliers or customers (vertical M&As). Third, to increase investment and/or operational efficiency and to enlarge the economies of scale and market share of products or services, a firm acquires another firm operating in the same industry (horizontal M&As). However, M&As are likely to be value-destroying if aimed at empire-building assets to fulfil managers' personal prestige and desire for controls of more resources (Jensen, 1986, Roll, 1986, and Hughes *et al.*, 2003), or if targeted at acquiring a firm whose business has little bearing with the acquirer (e.g., Healy *et al.*, 1997).

Another major event we need to consider when making the forecasts or estimates of sales, NOPM, ATO, and WACC is corporate social responsibility (CSR) activities. Conventional wisdom recognizes the benefits of CSR to a firm from various perspectives. In specific, CSR could reduce cost of equity (Sharfman and Fernando, 2008, Dhaliwal *et al.*, 2011, El Ghoul *et al.*, 2011, and Chava, 2014) and cost of debt (Goss and Roberts, 2011, Cheng *et al.*, 2014, Ge and Liu, 2015, Shi and Sun, 2015, and Lin *et al.*, 2017), leading to a lower value of overall WACC. Moreover, CSR helps a firm enhance its reputation, maintain a good relationship with its customers and suppliers, and win their trust as well as goodwill in doing business with the firm. This results in improved sales performance (Lev *et al.*, 2010) as well as lower-costs, higher-quality, and more-stable supplies (Terpend and Ashenbaum, 2012). In such

a circumstance, NOPM of the socially responsible firm will become higher. CSR also helps reduce employee turnover, attract new talented employees, increase existing employees' morale, dedication, and creativity, and thereby increases productivity for the firm. In consequence, its future sales, NOPM, and ATO are likely to rise. As discussed in Section 2.1.3, although pursuing CSR activities entails costs for a firm, the benefits of CSR are likely to outweigh the associated costs if the firm is capable and well-performing enough in marketing and innovation.

Since the future is fraught with uncertainty, forecasting sales, ATO, and NOPM specifically for each future year is inevitably subject to speculation and errors. That said, we still need to strive for reasonable forecasts of the future trends of sales, ATO, and NOPM, and identify the main economic forces which will drive the future trends to go different from the ones predicted by the past trends. For example, if we believe that a firm has new business expansion plans that are more promising than the currently implemented ones, or that a firm will implement the existing plans more efficiently, then we may predict an increasing trend of ATO for the firm, *ceteris paribus*. Nonetheless, for a pharmaceutical firm, it often takes time for its business expansion to be recognized by the market, and the expansion will bring abnormal operating profits to the firm only beyond the near future. In such a case, we may predict that ATO will decrease in the first few years since the initial business expansion, and then increase after the market starts realizing the profit potential of the business expansion.

3.5 Step 5 – Estimation of a firm's equity value via residual operating income valuation model

Under the residual operating income valuation model, the value of net operating assets is composed of three parts: (i) the initial book value of net operating assets (NOA), (ii) the short-term value added to the NOA, and (iii) the long-term continuing value created. The short-

term value is measured as the present value of the abnormal operating profits (AOP), estimated via Formula (5), within a short-term forecast horizon, while the long-term continuing value is measured as the present value of AOP beyond the short-term forecast horizon. As such, the intrinsic value of NOA is expressed as:

$$V_0^{NOA} = NOA_0 + \frac{AOP_1}{1+WACC} + \frac{AOP_2}{(1+WACC)^2} + \cdots + \frac{AOP_T}{(1+WACC)^T} + \frac{CV_T}{(1+WACC)^T} \quad (17)$$

where V_0^{NOA} is the intrinsic value of NOA; T is the number of years over a short-term horizon we choose for the forecasting of short-term AOP; NOA_0 is the initial book value of net operating assets; $[AOP_1/(1 + WACC)] + [AOP_2/(1 + WACC)^2] + \ldots + [AOP_T/(1 + WACC)^T]$ is the sum of the present value of the AOP estimated on the chosen forecast horizon; and $CV_T/(1 + WACC)^T$ represents the present value of the continuing value created beyond the endpoint of the short-term forecast horizon. The continuing value can be estimated based on three assumptions. First is that AOP will grow permanently at a rate of g after year T, and thus that $CV_T = AOP_{T+1}/(WACC - g) = AOP_T * (1 + g)/(WACC - g)$. We make this assumption in the case when the industrial market demand for products or services will keep growing substantively in the long run, and/or when a firm can maintain and develop its sustainable competitive advantage beyond the short run. Second, AOP for the years after the end of the forecast horizon is assumed to be constant and equal to that for the year T. In such a case, $CV_T = AOP_{T+1}/WACC = AOP_T/WACC$. Third, AOP is assumed to be zero after the endpoint of the forecast horizon, such that $CV_T = 0$. For most listed companies, we may make the first assumption, especially during an economic boom, for their long-term trend of AOP, because firms eligible for getting listed on a stock exchange are generally well-performing and/or of good growth prospects, compared to private firms. If we further assume that, after the end of the short-term forecast horizon, (i) NOPM and ATO are constant, and (ii) sales grow at a constant rate of g, then AOP will be the linear function of sales as displayed in Formula (18). As such, the rate of long-term growth in AOP will be equal to that of long-term

growth in sales, and thus the key for getting the continuing value is to estimate the long-term sales growth rate.

$$AOP = sales * NOPM - WACC * \frac{SALES}{ATO}$$
$$= sales * (NOPM - \frac{WACC}{ATO}) \quad (18)$$

Since the intrinsic value of NOA estimated by Formula (17) represents the value of a firm's operating assets for both debtholders and shareholders, the intrinsic value of net financial obligation (NFO), which approximates its book value due to the interest income/expense being normally fixed as per debt contracts, needs to be subtracted from the estimated value of NOA to get the fundamental value of equity. Finally, we divide the equity value by the firm's total shares outstanding to get the equity value per share. If it is higher (lower) than the stock price, the stocks are undervalued (overvalued) by the market, and investors are advised to buy (sell) them.

4. Formation and Adjustments of the Long-term Investment Portfolio

The equity value we estimate might not only be biased but also sensitive to changes in forecast parameters, causing us to make wrong investment decisions. To ease this concern, we rule out firms that involve high estimation risk for equity valuation. The volatility of daily stock returns of a firm in a year, which reflects the variance in investors' opinions about firm fundamentals, may be used as the proxy for estimation risk. High stock return volatility is not only associated with high estimation risk but also high transaction costs (e.g., Johns and Seguin, 1997). We thus remove firms, of which the stock return volatility is ranked the top decile among the population of listed companies, in the portfolio formation year. That said, investors are of differential risk aversion and may vary on the level of estimation risk they are willing to accept for their investments. Hence, investors can opt by themselves for the portion of volatile firms to exclude from their investment portfolio, based on their risk appetites, when adopting our

investment strategy. Further, in forming our long-term investment portfolio, we buy (short-sell) the stocks of firms, of which our estimated equity values per share minus stock prices are positive (negative) and ranked the highest (lowest), from each high-growth and non-highly-competitive industry. We invest in multiple industries to alleviate the impact of industry risk on our investments. How many stocks to buy depends on the funds available for long-term stock investments. It is noteworthy that the profits earned from the long-term investment portfolio rest on the degree to which the valuation of individual firms is accurate and timely following the release of the firms' audited financial statements.[12]

The values of firms keep changing over time. To maximize the returns on the investment portfolio, we may adjust it as soon as possible after the announcements of audited financial statements each year. To this end, we repeat the foregoing two-step valuation procedure, and then buy (sell or short-sell) the stocks of firms, of which the estimated equity values per share minus stock prices are ranked high (low), from the high-growth and non-highly-competitive industries, based on the new pool of funds available for the long-term investment.

5. Conclusion

To lower the costs of stock investments, investors need to react promptly to the announcements of the firms' audited financial statements to form or update their long-term investment portfolios. Meanwhile, to realize a higher gain from the portfiolios, it is crucial for the investors to ensure the relative accuracy of their valuation on individual firms. However, it is fairly hard to relatively accurately value all individual firms in a stock market within a short

[12] A series of qualitative factors play a substantial role in shaping the equity valuation of individual firms, so the results of the valuation, and the associated profits of the long-short portfolio, would differ across different investors, valuers, or academic researchers. Therefore, we do not conduct an empirical test of the actual profits of the long-term investment portfolio.

period of time, as the valuation of each firm involves analyses of a considerable amount of qualitative information and thereby requires significant effort and time not least to ensure the relative accuracy of valuation. Therefore, our long-term investment strategy involves a two-step procedure. Firstly, we rank listed firms in terms of their intrinsic values based on a parsimonious model covered in Section 2, and pick the firms, which are ranked the top (e.g., the top third) among all listed firms, from the high-growth yet non-highly-competitive industries for further equity valuation. These firms are selected not only because they are likely to be of higher value but also because they tend to have relatively low transaction costs. Secondly, we use the residual operating income valuation model to estimate the intrinsic value of each selected firm. Then, based on the funds available for long-term investments, we form or adjust our investment portfolio by buying (selling/short-selling) the stocks, of which the estimated equity values per share are higher (lower) than their stock prices and are top-(bottom-) ranked in each of our chosen high-growth and non-highly-competitive industries. To alleviate the concern of high estimation risk, stocks with high return volatility are excluded from the investment portfolio. We perform this two-step procedure, and adjust the investment portfolio, on a yearly basis right after the public release of audited financial statements.

Our study offers a roadmap for investors to make long-term investments in a stock market. The parsimonious model used in the first stage of our investment strategy accounts for the main drivers of firm value, while the valuation models employed in the second stage of our investment strategy involve major risk factors of firms. Given the heterogeneity of stock markets across different countries, investors may need to adjust the variables of value-drivers and risk factors to fit the local settings when referring to our strategy for making long-term investments in a stock market.

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TABLE 1
Fundamental drivers of firm value

Fundamental drivers of firm value	Empirical measures
Firms have strong marketing team and ability, and are good at exploiting and enlarging potential market demand.	Advertising expenditures (scaled by sales revenue); The portion of executives that have marketing experience and/or education background; The average length of marketing experience of the marketing-experienced executives or of all executives
Firms have strong R&D team and ability, and have good potential of exploiting profitable, innovative products or services in a successful way that highly caters to the changing needs, preferences, and tastes of customers.	R&D expenditures (scaled by sales revenues); The number of patents applied or granted: (i) for a new product, a new process, or an improvement, which have new unique functions or utilities for consumers; (ii) for a new technical solution relating to the shape and/or structure of a product; and (iii) for new product design in respect of the shape, color, and/or pattern of a product, which are aesthetically appealing to customers; The number of citations of patents; The portion of R&D-experienced executives, defined as those having R&D experience and holding a natural science or engineering degree; The average length of R&D experience of the R&D-experienced executives or of all executives
Firms are socially responsible, caring about social benefits and the interests of various stakeholders (e.g., employees, customers, suppliers, creditors, and the society at large).	The number of negative ESG incidents; The degree of CSR in the firm's business activities

TABLE 2 Firm-specific characteristics that shape firm value	
Main features of high-value firms	Empirical measures
Large firms	The book (or market) value of assets or equity of a firm
High-growth firms	Sales growth; assets growth; market-to-book ratio
Financially healthy firms	Various solvency and liquidity ratios; cash and cash equivalent relative to total assets
Low-risk firms	Business risk (e.g., length of operating cycle; variance in cash flows, earnings, sales, stock returns, return on assets (ROA), return on equity (ROE), return on sales (ROS), return on investments (ROI), or gross profit margin ratio) and information risk (e.g., low accruals quality as manifested by the volatility of abnormal accruals)
Well-performing firms	Various profitability ratios or figures (e.g., ROA, ROE, ROS, ROI, sales, or gross profit margin ratio)
Firms with strong governance	Board independence (e.g., the portion of outside independent directors on the board of firms; stock ownership of the independent directors); Long-term compensation incentives for executives and employees
Firms with strong external monitoring	Dedicated institutional investors' stock ownership; Analyst coverage; Debt holdings
Firms that are subject to high audit quality	The ratio of audit fees to sales revenues; The total audit revenues of an audit firm; the presence of big-4 audits for a firm; the presence of an internal audit committee in a firm; auditor tenure; auditor switches; auditor industrial specialization

TABLE 3

The application of the parsimony model in the Chinese and U.S. stock markets

Panel A: Summary statistics for firms listed on the Chinese stock market

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	N	Mean	Std. dev	Min.	25%	Median	75%	Max.
Tobin_Q	19,401	2.030	1.299	0.878	1.232	1.605	2.325	9.741
Marketing	19,401	0.0725	0.0840	0	0.0221	0.0439	0.0884	0.513
Innovation	19,401	0.00823	0.0201	0	0	0	0.00112	0.13
CSR	19,401	25.01	14.90	-2.075	16.20	22.24	28.59	75.78
Size	19,401	22.82	1.078	20.56	22.07	22.67	23.42	26.33
Growth	19,401	3.514	2.884	0.505	1.795	2.731	4.239	32.07
Financial_health	19,401	0.178	0.118	0.0188	0.0959	0.147	0.226	0.696
Risk	19,401	224.5	484.1	3.599	28.72	70.37	190.5	4382
Performance	19,401	0.0528	0.0573	-0.332	0.0279	0.0498	0.0792	0.233
Internal_governance	19,401	0.375	0.0509	0.310	0.333	0.354	0.417	0.571
Institution	19,401	44.60	23.77	0.302	25.77	46.94	63.46	91.48
Analyst_cover	19,401	1.589	1.100	0	0.693	1.609	2.485	3.839
Audit_quality	19,401	0.0758	0.104	0.00325	0.0230	0.0459	0.0876	1.200

Notes: Panel A tabulates descriptive statistics of the variables used in the regression analysis for the Chinese listed firms. The sample consists of 19,401 firm-years observations and covers the years 2011-2019. *Marketing* equals the average sale expenditures scaled by average sales revenue for a fiscal year; *Innovation* equals the average R&D expenditures scaled by the average sales revenue for a fiscal year; *CSR* for the Chinese listed firms equals the average CSR score for a year provided by the Hexun CSR database, while *CSR* for the U.S. listed firms is constructed based on previous research (e.g., Servaes and Tamayo, 2013, Li *et al.*, 2021); *Size* equals the natural logarithm of a firm's average market value of equity of a fiscal year; *Growth* equals the average market value of equity divided by the average book value of equity of a fiscal year; *Financial_health* equals the average cash and cash equivalents divided by the average total assets of the fiscal year; *Risk* equals the standard deviation of a firm's average net income before extraordinary items (in millions) for the current and previous four fiscal years; *Performance* equals the average earnings before interests and taxes over a fiscal year, divided by the average total assets of the fiscal year; *Internal_governance* equals the average number of independent directors as a fraction of the average total directors on the board of a firm of a fiscal year; *Institution* equals the average shares held by institutional investors, divided by the firm's average total shares outstanding of a fiscal year; *Analyst_cover* equals the natural logarithm of one plus the average number of analysts who issue at least one annual earnings forecast for a firm in a fiscal year; *Audit_quality* equals the ratio of average audit fees to average sales revenues for a fiscal year. All the continuous variables are winsorized at the 1% and 99% levels, respectively.

Panel B: Summary statistics for firms listed on the U.S. stock market

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variables	N	Mean	Std. dev	Min.	25%	Median	75%	Max.
Tobin_Q	8,397	1.971	1.297	0.753	1.181	1.533	2.234	8.010
Marketing	8,397	0.010	0.026	0	0	0	0.006	0.161
Innovation	8,397	0.172	0.770	0	0	0.003	0.069	6.528
CSR	8,397	-0.219	0.522	-1.440	-0.583	-0.300	0	1.721
Size	8,397	7.210	1.566	4.340	6.065	6.999	8.171	11.650
Growth	8,397	2.903	4.231	-16.650	1.405	2.147	3.488	24.071
Financial_health	8,397	0.140	0.137	0.001	0.037	0.100	0.198	0.652
Risk	8,397	125.316	315.474	1.244	9.101	24.878	83.760	2256.440
Performance	8,397	0.065	0.136	-0.596	0.040	0.080	0.125	0.362
Internal_governance	8,397	0.401	0.381	0	0	0.409	0.800	0.917
Institution	8,397	0.703	0.295	0	0.570	0.789	0.914	1.156
Analyst_cover	8,397	3.454	0.994	0	2.943	3.545	4.108	5.497
Audit_quality	8,397	0.004	0.011	0.0001	0.0007	0.001	0.003	0.098

Notes: Panel B reports descriptive statistics of all variables used in the regression analysis for the U.S. listed firms. The sample consists of 8,397 firm-years observations and covers the years 2007-2013. The variables are defined as previously in the notes of Panel A. All the continuous variables are winsorized at the 1% and 99% levels, respectively.

Panel C: Regression results for the parsimonious model

Variables	Dependent variable = *Tobin_Q*	
	(1) Sample of Chinese firms	(2) Sample of U.S. firms
Marketing	0.539***	2.395***
	(3.11)	(3.00)
Innovation	2.219***	0.246***
	(4.77)	(2.86)
CSR	-0.001*	-0.102***
	(-1.93)	(-3.27)
Size	0.065***	0.236***
	(4.12)	(9.67)
Growth	0.279***	0.093***
	(27.92)	(9.38)
Financial_health	0.518***	2.901***
	(5.83)	(13.12)
Risk	-0.000***	-0.001***
	(-5.30)	(-10.24)
Performance	2.217***	0.818**
	(9.41)	(2.00)
Internal_governance	0.202	-0.304***
	(1.18)	(-5.31)
Institution	0.002***	-0.087
	(4.28)	(-1.10)
Analyst_cover	-0.024**	-0.061**
	(-2.35)	(-2.12)
Audit_quality	2.029***	-0.584
	(10.14)	(-0.11)
Constant	-0.867**	0.142
	(-2.12)	(0.77)
No. of obs.	19,401	8,397
Adj. R^2	0.652	0.424
Year-fixed effects	Included	Included
Industry-fixed effects	Included	Included

Notes: Panel C displays the OLS regression results for the parsimony model. Coloum (1) (Column (2)) reports the results of the regression that is based on the sample of Chinese listed firms (U.S. listed firms) for the period 2011-2019 (2007-2013). The dependent variable is *Tobin_Q*, measured by the market value of equity plus the book value of total liabilities, divided by the book value of total assets, at the end of a fiscal year. The independent variables are defined as previously in the notes of Panel A. Industry dummies and year dummies are included in the regression, but their results are not reported for brevity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel D: Two sample t-tests on transaction costs

	Transaction costs					
	Low-value firms (the last-third of fitted values)		High-value firms (the top-third of fitted values)			
	Obs.	Mean	Obs.	Mean	Mean diff.	t-stat.
Chinese firms	46	0.192	45	0.123	0.069***	4.543
U.S. firms	34	0.0011	33	0.0007	0.0004**	2.576

Notes: Panel D reports the results of the two-sample t-test comparing the transaction costs between the high-value firms and the low-value firms for the Chinese firms and U.S firms, respectively. Transaction costs are measured, per Fang *et al.* (2009) and Fang *et al.* (2014), by the daily relative effective spreads averaged over a year for a firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

TABLE 4 A typical template of the reformulated balance sheet	
Operating Assets • Long-term operating assets (e.g., property, plant, and equipment, intangible assets) • Short-term operating assets (e.g., accounts receivable, prepayments, inventories)	Financial Assets • (e.g., cash, marketable securities)
Operating Liabilities • Long-term operating liabilities (e.g., pension, deferred compensation, deferred taxes) • Short-term operating liabilities (e.g., accounts payable, deferred revenues)	Financial Obligations • (e.g., debt, preference stocks)
	Net Financial Obligations (NFO) / Net Debt (ND)
	Common Shareholders' Equity (CSE) • (e.g., common stocks, dividends payable, retained earnings) Minority Interests (MI)
Net Operating Assets (NOA)	Investment Capital (NFO + CSE + MI)

TABLE 5: A typical template of the reformulated income statement
Sales
- Cost of Goods Sold
Gross Profits
- Selling, General, and Administrative Expenses and Other Expenses
Operating Profits from Core Business Activities
- /+ Non-recurring Operating Charges/Income (including Pension Interests)
- Taxes on Operations (i.e., Reported Tax Charges + Income Tax Rate * Net Interest Expense)
Net Operating Profits After Taxes (NOPAT)
- Net Interest Expense (excluding Pension Interests)
+ Tax Relief on Net Interest Expense (i.e., Income Tax Rate * Net Interest Expense)
Profits After Taxes (NI)

Figure 1

The framework of strategy analysis