



Factor Investing in the China A-Share Market: Revelations from a Contextual Alpha Model

Rohit Shrivastava
PanAgora

Jaime H. Lee
PanAgora

George D. Mussalli
PanAgora

Due to its unique nature, capricious investment landscape and burdensome regulatory requirements, equity investment in the China A-share market has proven to be difficult to navigate. For quantitative investors who prefer to invest in a diversified, liquid investment strategy and need easy access to market, data and information, building a strategy for China A-shares has been a formidable task.

Through this paper we seek to simplify this perception. We find that with ongoing market reforms, the China A-share market is relatively more accessible to investors than it has previously been. Our research indicates that both market and fundamental data on the China A-share market are readily available and predictive of future returns. As compared to developed and emerging markets, the China A-share market offers a unique investment landscape and compelling risk/return opportunities. Our research also indicates that developing and implementing a successful active equity investment strategy in the China A-share market requires a strong grasp of the market and its history, an understanding of the collectivist investor behavior, and an in-depth knowledge of the scope and scale of government regulations, market-interventions, and China's corporate governance structures.

The foregoing quirks in the China A-share market change the behavior of several quantitative factors versus their observed characteristics in the rest of the world. Interestingly, we found that valuation-based factors work well due to overcrowded growth stocks, while pure price momentum does not appear to work well, likely due to collectivist investor behavior. Additionally, firm quality and profitability appear to have a muted but positive impact on performance due to what is arguably a less developed investment landscape. Accrual-based measures seem to work well due to

investor behavior and structural imperfections introduced in the market by the government, while sentiment-based factors have performed strongly and appear statistically independent of other factors.

Leveraging PanAgora's unique insights into the China A-share market, its decades of experience in alpha signal research and its proprietary contextual alpha modelling framework,¹ we have built a diversified, long-term active equity investment strategy focused on the China A-share market. We have found that our strategy has performed well in different market regimes. As we have observed in developed and emerging markets, a quantitative contextual alpha modelling technique can be utilized to harness better long-term performance versus a "one-size-fits-all"² approach in the China A-share market.

Market Introduction

China is the world's second largest and second most liquid equity market after the United States. With greater than \$8 trillion³ in market capitalization, China is an economic superpower to be reckoned with. The country has experienced aggressive economic growth and industrialization over the past several years and holds the title of the world's greatest contributor to economic growth^{4,5} and largest investor (Carpenter, Lu, and Whitelaw - March 2015). Given this, it is almost a surprise that China's equity markets are relatively new, having been established less than three decades ago.

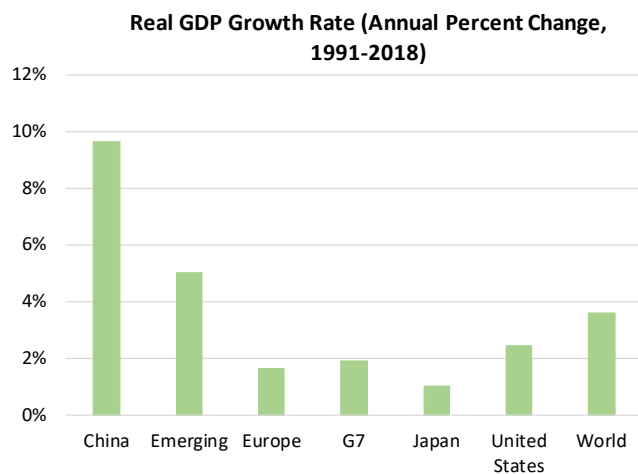


Exhibit 1

Source: International Monetary Fund

Privatizing China

Modern Chinese stock markets opened in 1990 in Shanghai and Shenzhen as part of state-sponsored economic reforms to provide complementary sources of funding to China's state-owned enterprises (SOEs). China's stock market, until recently, was a sideshow in a financial system dominated by a \$30 trillion banking system which finances centrally planned investment (Allen, Qian, and Qian – 2005).

As its policy indicates, the Chinese financial system will continue to be dominated by a strong banking sector. Still, the stock market has grown to have a significant impact on the economy. Going forward, we expect Chinese stock markets to serve as key entry points for domestic retail and corporate investors, the exit point for private equity investments, and a principal source of entry for

foreign investors. As Chinese stock markets become more efficient and transparent, they will undoubtedly continue to play a bigger role in the second largest economy in the world.

Given the sociopolitical landscape in China, it is no surprise that the stock markets are heavily regulated. Since becoming the chief regulator of Chinese markets in 1997, the China Securities Regulatory Commission (CSRC) has enjoyed broad authority in regulating, and, from time to time, intervening in Chinese equity markets to attain state-directed policy objectives.

Interestingly, only a third of SOE shares were tradable until 2005. This was due to the Split-Share Structure (SSS) model of firm ownership which was created by the Chinese state in order to maintain a controlling stake in the SOEs. Central or local governments owned non-tradable stocks, while private investors held tradable shares. This dual structure created agency problems since the state had all the reserved rights for non-tradable shares but was not exposed to any market risks. Moreover, SOE executives received rewards based on the book value of assets rather than the market price of the shares. This meant that they had no incentive to maximize stock price or add value to private investors' stakes (He, Mukherjee, and Baker – 2017). In 2005, Split-Share-Structure reform converted a majority of non-tradable shares to tradable shares. This reform made two things possible: it aligned government and private shareholders' interests toward the common goal of maximizing firm value, and it aligned the government-appointed SOE executives' performance directly with the SOE's market performance. These reforms made Chinese equity markets relatively more transparent and were a key initial step to privatizing China. As of the end of 2016, around 76% of total market capitalization was tradable. As of the end of 2017, the China A-share market had 3,500 listed firms with north of \$8.26 trillion⁶ of aggregate market capitalization.

As the Chinese stock markets have evolved over the years, the China A-share market has experienced repeated trading halts, market interventions, and IPO suspensions. Markets have been historically dominated by domestic retail investors and to protect the economic interests of its citizens, the government regularly applies regulatory interventions. In the past, the markets were referred to as casinos, exhibiting high levels of volatility and crowding behavior. Carpenter et al. (2015) found that even with these historical deleterious characteristics, the good news is that after the economic reforms undertaken a decade ago the Chinese stock market has become as informative about future corporate profits as in the US. Also, even though it is a segmented market, Chinese investors price risk and other stock characteristics like investors in other large economies.

Exchanges and Listings

Chinese firms incorporated in mainland China have to go through a stringent listing approval process by the CSRC. These firms have an option to list as an A-share or a B-share in either the Shanghai (SSE) or Shenzhen (SZSE) exchanges. They can also list as an H-share on the Stock Exchange of Hong Kong (SEHK). Companies avoid the stringent regulations of mainland China by incorporating externally and list as either red chips on SEHK, as N-chips in the US, as S-shares in Singapore, or as L-shares in the London LSE. Larger, more mature firms list on SSE and SZSE main boards. Smaller, more growth-oriented firms tend to list

with less exacting listing requirements on the SME or ChiNext boards, which are relatively newer entries on the SZSE. One key requirement for A-share listing is that China does not allow different classes of shares with different voting power, another reason why many firms may choose to list outside of China. The CSRC recently launched a new Chinese Depositary Receipt (CDR) program, which should make it easier for externally listed Chinese firms like Alibaba to list on the China A-share market for domestic investors.

The CSRC mandates that if the listed firm has three years of consecutive losses, it receives “Special Treatment” status.⁷ Further losses in following years can lead to stock suspensions and subsequent delisting. This rule can encourage firms to significantly manipulate earnings. Firms can also receive “Special Treatment” status due to other reasons, such as product-related issues. The CSRC recently revised delisting guidelines to make it clear that companies that have significant legal issues involving national security, public safety, ecological safety, production safety and public health will be forced to suspend shares or delist. Fraudulent listing and violations regarding key information releases will also trigger forced share suspension or delisting. For asset managers investing in China, this is a very important consideration in identifying a reliable investable universe given that their capital is at risk if companies get flagged and suspended.

Evolving Foreign Participation Landscape

China accounts for 8-10% of the world's aggregate total market capitalization.⁸ However, due to government controls, foreign investor participation in Chinese stock markets has been largely restricted. Quotas, products, accounts, and fund conversions are strictly monitored and regulated. Until 2001, A-shares could only be bought by domestic Chinese investors, while foreign investors could only own B-shares.

To attract a greater number of global investors, the Qualified Foreign Institutional Investors (QFII) program was introduced in 2002. This program significantly decreased B-share issuance. In 2011, to further ease foreign participation, the RMB Qualified Foreign Institutional Investor (RQFII) scheme was initiated. The RQFII program allowed for use of RMB funds raised in

Hong Kong by the subsidiaries of domestic fund management companies and securities companies domiciled in Hong Kong to invest in the domestic securities market. Both the QFII and the RQFII programs were very restrictive in terms of lockup periods and quotas, and were subject to strong capital controls. Investment quotas for both programs were approved by China's State Administration of Foreign Exchange (SAFE). In early 2016, SAFE further relaxed QFII rules to make it easier for foreign participants.

Foreign investments in the A-share market got another significant boost with the introduction of the Hong Kong-Shanghai and Hong Kong-Shenzhen Connect programs in 2014 and 2016, respectively. These programs allowed offshore investors to trade A-shares on the Shanghai and Shenzhen exchanges via the Hong Kong exchange. These programs drove the inclusion of A-shares in the MSCI Emerging Markets Index in June 2018 and currently allow for a 60 billion RMB daily quota of foreign investors to trade A-shares. The expectation is that these programs will further grow as MSCI raises the aggregate weight of A-shares in the Emerging Markets Index. PanAgora uses Connect to invest in the China A-share market for its active alpha strategies.

What makes China A-shares Unique?

Unique Risks

Retail Investor Participation and Behavioral Effects

Unlike in other developed and emerging markets, retail investors are major participants in the Chinese equity markets. According to the CSRC, retail investors account for 80% of aggregate trading volume. Compared to the US, Chinese retail investors trade almost four times more frequently (Chen, Kim, Nofsinger, and Rui - 2007). Chinese retail investors also hold around 58% of the aggregate market (Jia, Wang, and Xiong - 2015), which is amongst the highest in the world. A survey⁹ found that around 60% of new retail investors have less than a high school education. With their lack of formal education and experience, these investors seem to be investing based on faith, or conviction in the government or pure speculation. Academic journals have found a strong preference of collectivistic investment behavior in Chinese

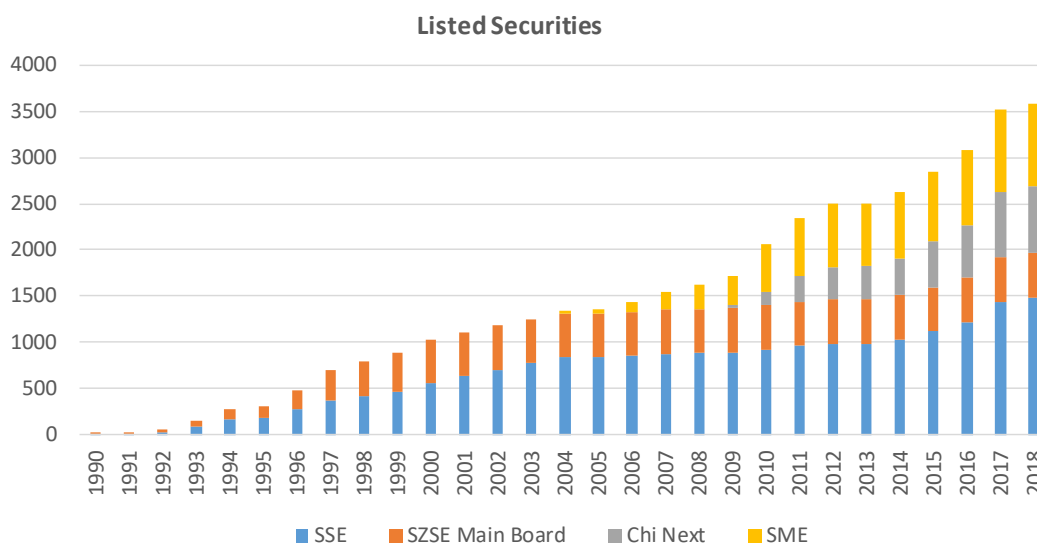


Exhibit 2

Source: Wind

investors. A good example of this occurred in 1992 when 500,000 Shenzhen investors lined up to invest in a new, hot IPO without any information on the company or its fundamentals (Mok, and Hui - 1998). Interestingly, for dual-listed stocks with both H and A lines, A-shares react more to revisions done by China mainland-based analysts vs. H-share prices, which are impacted more by offshore analysts (Jia, Wang, and Xiong,- 2015). All of these investor behaviors make the China A-share market a very interesting use case for testing asset pricing anomalies.

Government Control and Intervention

Chinese markets are heavily regulated by the CSRC – the chief market regulator. There are many direct and indirect ways the government can control markets. During May 2017, the government restricted share sales by large shareholders in order to boost investor confidence. During the summer of 2015, in order to stabilize the markets from an imminent plunge, regulators halted IPOs and suspended trading in shares accounting for 40% of market capitalization. The government can also use indirect methods like controlling the yuan level to respond to cash inflows and outflows.

The IPO process is also tightly controlled by the CSRC. Firms must go through extensive regulatory approvals and satisfy multiple criteria before being listed on the A-share market. Duration to list time is unpredictable and the government allocates an annual quota of new IPOs. Given this uncertainty, past research has shown that the IPO premium in the A-share market is several times higher than in other markets.

To avoid these strenuous requirements, several companies have chosen to list outside the China A-share market. Private firms in China which seek public capital have also been known to acquire zombie-listed companies – raising the implicit shell value of declining firms. With the “Made in China 2025” program in sight, the CSRC has relaxed IPO regulations for several advanced, next-generation technology and manufacturing firms.

Recently in order to reduce overall economic risks to the financial system, the Chinese government has made it a priority to deleverage balance sheets of publically listed firms. This is leading to sizable public policy controls and the forceful deleveraging of firms. These forced interventions have led to several structural anomalies which, in our opinion, can be capitalized on via a systematic, process-driven approach and harnessed as alphas.

Corporate Governance

There are two major factors which provide Chinese markets with a unique setting with respect to corporate governance: market dominance by SOEs and the existence of Split-Share Structure.

SOEs are a significant component of the Chinese A-share market. Government owned and controlled, they serve two purposes: they cater to a public policy mandate and provide value maximization to their shareholders. SOEs are run by state-appointed executives who need to align the firm's interest more with the state vs. the investors. This dynamic can lead to inefficient management, underutilization of resources and overall poor corporate performance.

China had 172 companies on the Forbes Global 2000 list, published in 2016. These firms, along with others are considered as “national

champions” for China. With the Chinese government's goal to become the dominant world player in key sectors, these “national champions” are empowered with the expectation to continue and ultimately change market competition globally. State-Owned Assets Supervision and Administration Commission (SASAC) was established in 2003 to oversee the management of China's SOEs, including appointing top executives and approving any mergers or sales of stock or assets, as well as drafting laws related to state-owned enterprises. One of SASAC's directives is to enact policies which can transform key SOEs into national champions.

Split-Share-Structure reform in 2005 was a major event in China. However, even today only around 20-25% of the market capitalization of SOEs is non-tradable. This continues to create problems in valuation for SOEs.

We believe that asset managers, quantitative and fundamental alike, should understand these corporate governance subtleties in China A-share market and pay important consideration while formulating their investment strategies.

Quantifying the China A-Share Market

With our research and analysis, we have come to believe that the unique risks and opportunities offered by the China A-share market can be harnessed via a quantitative, process-driven, and expandable investment approach.

Investable Universe

To manage a liquid, investable China A-share market investment strategy, it is important to have a stable investment universe. Even though the China A-share market is the second most liquid market in the world, it has an interesting stock level liquidity profile. As the investment universe has broadened from large-cap, high-liquidity names to mid-cap names, we observe an interesting, homogenous liquidity pattern. Among the top 1,000 names ranked by liquidity and size, the companies in the bottom five deciles tend to have a strikingly similar liquidity profile. These names also tend to frequently oscillate around these liquidity deciles and be relatively higher-growth, smaller-size names which attract higher participation from retail investors. Additional challenges involve closely monitoring the market for frequent stock suspensions, delistings, regulatory events, and liquidity events.

Average Median Volume by Volume Decile Groups



Above chart show average of 3 month median volume (in USD) from Dec 2007 - Dec 2017 for top 1000 China A-share stocks, as sorted by volume.

Exhibit 3

Source: PanAgora Asset Management and IDC

Given these characteristics, we built a liquidity-stabilized investment universe of over 1,000 names using our proprietary construction methodology. The universe emanating from our methodology provides desirable stability in names and as indicated by our research, provides sufficient breadth to fully express, and capitalize our alpha potential without taking any meaningful liquidity or delisting/suspension risk.

Quantitative Factors

Valuation

A valuation strategy of buying cheap and selling expensive companies is a well-known investment approach used by quantitative and fundamental investors across different geographical regions and asset classes. The good news is that this strategy works in the China A-share market as well, but not for the same reasons.

Unlike those in other markets, Chinese companies have a lower risk of default (Huang, Yang, and Zhang - 2013). This would suggest that value stocks should, if anything, perform worse in China. There are two possible reasons for this: first, their profits are closely monitored by regulators and failure to be profitable would lead to suspension or worse - delisting - or second, strong IPO regulations cause many close-to-default companies to have implicit shell value because they tend to be acquired by prospective firms that want to get their listing rights rather than waiting for their IPO request getting approved.

Having said that, China's being a strong growth-driven market means that growth stocks tend to be over-crowded by retail investors (Ng, and Wu - 2006). This results in value stocks being underpriced and under-appreciated due to lack of interest and/or attention by investors. Value premium is thus supported by the behavioral biases China A-share investors exhibit.

Firm Quality, Profitability and Accruals

Firm quality and profitability strategies have been successfully tested in developed and emerging markets. These strategies are designed to be stable, to exhibit low turnover, and to provide ample diversification benefits vis-a-vis other quantitative strategies, such as value and momentum.

In the China A-share market, these quality and profitability strategies show positive, but muted, performance. Profitability works better in countries with low political risk, where firms have easy access to capital and have fewer limits to arbitrage. The China A-share market, being more restrictive and regulated, tends to have lower return premia from quality-based measures (Sun, Wei, and Xie - 2014). However, given their low correlation with value, quality, and profitability, these strategies help investors avoid value traps where firms are cheap for a reason.

Historically, we have found that accruals-based signals have worked well in the China A-share market. Low-accrual firms tend to do better because investors tend to focus more on total earnings vs. differentiating between stable cash-based earnings and mean-reverting accrual-based earnings, hence missing the potential earnings management provided by firms (Richardson, Sloan, Soliman, and Tuna - 2005). We are aware of no reasons that investors in the China A-share market would be any different. If anything, given the amount of unsophisticated retail

participation in the China A-share market, this effect is more pronounced. Additionally, given the high degree of earnings management in the China A-share market, as identified by other researchers and as we saw through our own research, accrual effect becomes even stronger. Past research has indicated that earnings management is more pronounced in less developed markets (Leuz, Nanda, and Wysocki - 2003). Driven by regulations in China A-share market, Chinese firms in distress use earnings management as a tool to increase negative accrual income. When A-share firms go through two consecutive annual losses or show negative shareholder equity they receive a "special treatment" status. A third loss results in trading suspensions and a fourth leads to delisting. This motivates firms to use earnings management as a tool (Li, Niu, Zhang, and Largay -- 2011).

Momentum

Momentum is another well-known strategy which bets on buying past winners and selling past losers. This strategy has a good and stable track record across regions and different asset classes. Interestingly, we have found that traditional price-momentum-based strategies have not historically performed well in the China A-share market.

We think this is driven by collectivist investor behavior and by how retail investors participate in the China A-share market. Retail investors trade significantly more often than investors in other markets. This reduces the cycle of anchoring, disposition, and overreaction, which are the key behavioral ingredients for a successful momentum strategy. Additionally, research indicates that investors in the China A-share market tend to adapt faster to realized gains and losses vs. other markets (Arkes, Hirshleifer, Jiang, and Lim - 2010). If anything, the aforementioned theory is more supportive of reversals than momentum. Chui, Titman, and Wei [2010] further pointed out that individualism in a country's population is positively correlated with equity momentum returns and weakly associated with reversal returns. The majority of investors in China tend to show collectivist culture, hence momentum is less effective.

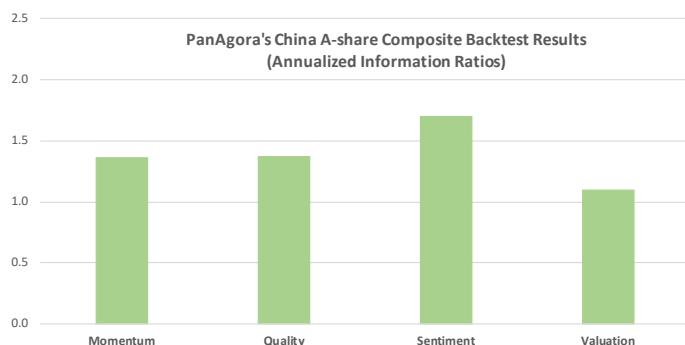
However, the momentum effect can be captured by alternate measures and China-specific data. Research indicates that leveraging China A-share-focused data and other alternate measures can help us capture non-price-based stock level momentum.

Sentiment

Sentiment refers to a set of orthogonal strategies which captures alpha via crowdsourcing different views from savvy investors. These strategies have a proven track record in developed and emerging markets. Managers and researchers have looked at various sources such as stock size, trading volume, stock-level shorting information, mutual fund manager behavior, biases from retail investor trading behavior, alternate data/information from social media, and chat groups to capture investor sentiment and create appropriate investment strategies. Such strategies not only capture smart or informed investor behavior, but also help quantitative managers systematically capture and leverage several inefficiencies in the aggregate stock market.

Our research indicates that an amalgamation of these alternative data strategies creates a very strong signal for forecasting future

returns in the China A-share market, especially with the observed high level of stock market inefficiency driven by retail investor participation and structural inefficiencies created by active interference by the regulators and markets. These strategies appear to offer uncorrelated alpha exposure to other strategies at a meaningful turnover.



Above table has annualized Sharpe Ratio's for major factor composites in PanAgora's China A-share liquidity stabilized 1000 stock universe. Period: Dec 2007 - May 2017. Each stock is ranked to aforementioned factors and the Annualized Sharpe Ratios were captured over the period.

Exhibit 4

Source: PanAgora Asset Management

Contextual Model

Contextual Modelling Framework

Our proprietary contextual alpha modeling technique seeks to maximize alpha capture by dynamically differentiating return drivers of each stock independently. Our alpha modeling approach can be contrasted with the one-size-fits-all approach in building alpha models in developed and emerging stock markets. The philosophy extends to the China A-share market and should outperform one-size-fits-all models by leveraging our contextual modelling framework. We believe that every company is unique and idiosyncratic by nature and one-size-fits-all is too general to be effective. Contextual models adapt to changes in company characteristics over time as the firm evolves through its life cycle.

Contexts

As Sorensen et al. (2005) mentioned in their work, linking a stock's ranking signal or factor to expected return and assigning it an appropriate weight is a matter of context. The application of a timely security selection criterion is conditional. For example, many researchers demonstrate that value as a selection variable is often conditional on the type of firm, other non-value factors, the investment horizon or some other dimension. Sloan (2001) as well as Beneish, Lee, and Tapely (2001) call this interdependency of security factors contextual. Seasoned active managers know that value investing focuses on discovering cheap stocks with a balance of quality; at the same time, growth investing often seeks to balance positive momentum with quality and cheapness. This anecdotal assertion finds substantiation in prior academic studies. For example, Daniel, and Titman (1999) find that momentum effects are stronger for growth stocks. Asness (1997) finds that value strategies work, in general, but less so for stocks with high momentum. In a particularly relevant study, Scott, Stumpp, and Xu (1999) focused on prospect theory and investor overconfidence. They provide empirical evidence that rational

value investors should emphasize cheapness, while growth investors should let winners run — with the prospect of future good news.

With the China A-share market in mind, a carefully crafted set of contexts was made with the most economic and fundamental sense. As mentioned before, Chinese state-owned enterprises (SOEs) are an integral part of the Chinese economy. Government owned and controlled, they serve two purposes: first, they cater to a public policy mandate, and second, and most especially, they provide value maximization for shareholders. SOEs are run by state-appointed executives who need to align a firm's interest more with the state versus the investors. This dynamic can lead to inefficient management, underutilization of resources, and overall poor corporate performance. Also, SOEs receive preferential support and attention from Government versus privately run firms — giving SOEs meaningful competitive advantage in certain sectors. Given this, it is imperative that we generate a separate alpha model for SOEs. Our contextual alpha modelling technique provides us with this handle to model SOE vs. non-SOE firms. Another good example is price momentum. As we discussed earlier, price momentum does not work in the China A-share market. However, research indicates that splitting a firm into high versus low price momentum stocks can help boost returns via applying our contextual framework.

One more differentiating characteristic in the China A-share market is participation from retail investors. As we mentioned earlier, historically, retail investors have shown very interesting and asymmetric market participation when it comes to trading specific stocks at different periods of time. Collectivist trading behavior displayed by Chinese domestic A-share investors further exacerbates this effect. We are able to capture this asymmetric trading behavior and model return drivers for these using our contextual methodology.

From our research, we find that the presence of the aforementioned contexts adds significant value to the contextual alpha modelling framework and helps us outperform the one-size-fit-all approach.

Model Performance: Factor Diversification and Contextualization

Driven by both “factor diversification” and “contextualization,” our contextual alpha model seeks to deliver performance benefits to a one-size-fits-all model. The model appears to weather the significant downturns of the MSCI China A-share standard index, strongly delivering positive performance in both up-markets and down-markets while displaying reasonable levels of market neutrality and robustness in performance. Observed performance from the strategy indicates downside protection and upside benefits.

Through understanding the China A-share market and its history and leveraging the data sources, both domestic to the China A-share market and global, accessing our deep alpha factor library and by utilizing the contextual framework, we are able to build a diversified, sustainable, long-term active equity investment strategy which appears to outperform the one-size-fit-all approach in the analysis period we tested. Additionally, driven by the contextual nature of our model and the uniqueness of the China

A-share market, the China A-share strategy appears to offer significant alpha diversification benefits over existing emerging and developed strategies.

Our contextual model has shown to deliver long-term alpha efficacy with ICs (information coefficient) not showing decay by half until at least nine months after signal formation.

Conclusion

As the China A-share market evolves and China opens its doors to foreign investors, it will become increasingly important to more fully understand the innate structure and history behind China's equity markets. Controlled by a command economy, this market behaves much differently compared to equity markets in the rest of the world.

We aim to simplify quantitative investment in the China A-share market. Building a successful, diversifiable, quantitative, and process-driven investment strategy in the China A-share market requires deep understanding of the current market and its history. Also essential is knowledge of investor constitution/preferences, the scope of government regulations and tools regulators employ to control the markets, and the dynamics of China's special corporate governance setup.

Based on our experience and diligent research, we identified several structural, risk and alpha opportunities which we believe can be harnessed via quantitative methods to help generate risk adjusted returns. Given the esoteric nature of the China A-share market and its participants, we believe, it is important that we build an investment strategy which leverages China-specific information. We leveraged our specialized knowledge to build a tradable investment universe, alpha signals, and overall model and investable portfolios.

Further, we built our China A-share alpha model using PanAgora's proprietary contextual alpha modelling technique and have found that our alpha modelling framework has historically been successful in outperforming the one-size-fits-all alpha model. Our contextual technique adapts to changes in a company's individual characteristics over time as it and the overall Chinese investment landscape evolve. The framework also provides us with the ability to model firms separately when they have markedly different attributes, such as when a firm is an SOE or a non-SOE.

Endnotes

1. PanAgora's 'contextual' active equity process for A-Share investing presented here is distinguished from PanAgora's 'defensive equity' process. For details on former refer Sorensen et al (2005, 2007). The latter utilizes a unique A-share weighting scheme that optimizes between well-known alpha factor attributes for each stock and the diversification value of each stock.
2. The "one-size-fits-all" model is created without any contextual partition, using the same procedure as contextual. For details on contextual alpha modelling refer Sorensen et al (2005, 2007).
3. Source: Bloomberg, end of 2017.

4. Source: <http://www.worldbank.org/en/country/china/overview#1>.
5. Source: IMF. Real GDP Growth Rate, Annual Percentage Change.
6. Source: Bloomberg, end of 2017.
7. Source: http://www.csrc.gov.cn/xinjiang/xxfw/tzzsyd/200711/t20071115_88780.htm and <https://www.caixinglobal.com/2018-07-28/regulator-targets-harm-to-public-health-in-delisting-rules-101309376.html>.
8. Source: Bloomberg.
9. China Household Finance Survey, Southwestern University of Finance and Economics. Bloomberg news: <https://www.bloomberg.com/news/articles/2015-03-31/china-s-big-stock-market-rally-is-being-fueled-by-high-school-dropouts>.
10. Source: Bloomberg.
11. China Household Finance Survey, Southwestern University of Finance and Economics. Bloomberg news: <https://www.bloomberg.com/news/articles/2015-03-31/china-s-big-stock-market-rally-is-being-fueled-by-high-school-dropouts>.

References

- Alford, Andrew W., and Alison W. Lau, (2014), "A Foreign Investor's Guide to Accessing the Chinese Equity Market," *The Journal of Portfolio Management* 41, no. 5, 31-40.
- Allen, Franklin, Jun Qian, and Meijun Qian, (2005), "Law, finance, and economic growth in China," *Journal of Financial Economics* 77, 57-116.
- Amihud, Yakov, (2002), "Illiquidity and stock returns: Cross-section and time-series effects," *Journal of Financial Markets* 5, 31-56.
- Ang, Andrew, Robert J. Hodrick, Yuhang Xing, and Xiaoyan Zhang, (2009), "High idiosyncratic volatility and low returns: International and further US evidence," *Journal of Financial Economics* 91, no. 1, 1-23.
- Arkes, Hal R., David Hirshleifer, Danling Jiang, and Sonya S. Lim, (2010), "A cross-cultural study of reference point adaptation: Evidence from China, Korea, and the US," *Organizational Behavior and Human Decision Processes* 112, no. 2, 99-111.
- Asness, Clifford S., (1997), "The Interaction of Value and Momentum Strategies," *Financial Analysts Journal*, March/April 1997, pp. 29-36.
- Bai, Chong-En, Qiao Liu, Joe Lu, Frank M. Song, and Junxi Zhang, (2004), "Corporate governance and market valuation in China," *Journal of Comparative Economics* 32, no. 4, 599-616.
- Beltratti, Andrea, Bernardo Bortolotti, and Marianna Caccavaio, (2012), "The stock market reaction to the 2005 split share structure reform in China," *Pacific-Basin Finance Journal* 20, no. 4, 543-560.

- Beneish, Messod D., Charles M. C. Lee, and Robin L. Tarpley, (2001), "Contextual Fundamental Analysis Through the Prediction of Extreme Returns," *Review of Accounting Studies*, Vol. 6, pp. 65-189.
- Carpenter, Jennifer N., Fangzhou Lu, and Robert F. Whitelaw, (2015), "The Real Value of China's Stock Market," NBER Working Paper, No. 20957.
- Carpenter, Jennifer N., and Robert F. Whitelaw, (2017), "The Development of China's Stock Market and Stakes for the Global Economy," *Annual Review of Financial Economics*, 9, 233-257.
- Chakravarty, Sugato, Asani Sarkar, and Lifan Wu, (1998), "Information asymmetry, market segmentation and the pricing of cross-listed shares: theory and evidence from Chinese A and B shares," *Journal of International Financial Markets, Institutions and Money* 8, 325-356.
- Chen, Gong-Meng, Kenneth A. Kim, John R. Nofsinger, and Oliver M. Rui, (2007), "Trading performance, disposition effect, overconfidence, representativeness bias, and experience of emerging market investors," *Journal of Behavioral Decision Making* 20, no. 4: 425-451.
- Cheung, Christopher, George Hogue, and Sunny Ng, (2014), "Value, Size, Momentum, Dividend Yield, and Volatility in China's A-Share Market," *The Journal of Portfolio Management* 41, no. 5, 57-70.
- Chui, Andy CW, Sheridan Titman, and KC John Wei, (2010), "Individualism and Momentum Around the World," *The Journal of Finance* 65, no. 1, 361-392.
- Daniel, Kent, and Sheridan Titman, (1999), "Market Efficiency in an Irrational World," *Financial Analysts Journal*, Nov/Dec 1999, pp. 28-40.
- Fama, Eugene F, and Kenneth R. French, (1992), "The cross-section of expected stock returns," *Journal of Finance* 47, 427-465.
- Huang, Yujia, Jiawen Yang, and Yongji Zhang, (2013), "Value premium in the Chinese stock market: free lunch or paid lunch?" *Applied Financial Economics* 23, no. 4, 315-324.
- He, Wei, Tarun K. Mukherjee, and H. Kent Baker, (2017), "The effect of the split share structure reform on working capital management of Chinese Companies," *Global Finance Journal* 33, Pages 27-37.
- Jia, Chunxin, Yaping Wang, and Wei Xiong, (2015), "Social Trust and Differential Reactions of Local and Foreign Investors to Public News," *NBER Working Paper*, No. 21075.
- Lakonishok, Josef, Andrei Shleifer, and Robert W. Vishny, (1994), "Contrarian Investment, Extrapolation, and Risk," *The Journal of Finance* 49, no. 5, 1541-1578.
- Leuz, Christian, Dhananjay Nanda, and Peter D. Wysocki, (2003), "Earnings Management and Investor Protection: an International Comparison," *Journal of Financial Economics* 69, no. 3: 505-527.
- Li, Yu Wai Vic, (2018), "China's Financial Opening: Coalition Politics and Policy Changes (Routledge Contemporary China Series)," *Routledge*, 1st edition, ISBN: 978-1138727540.
- Lo, Andrew W., (2002), "Bubble, Rubble, Finance in Trouble?" *Journal of Psychology and Financial Markets*, 3, pp. 76-86.
- Mok, Henry MK, and YV Hui, (1998), "Underpricing and Aftermarket Performance of IPOs in Shanghai, China," *Pacific-Basin Finance Journal* 6, 453-474.
- Ng, Lilian, and Fei Wu, (2006) "Revealed Stock Preferences of Individual Investors: Evidence from Chinese Equity Markets," *Pacific-Basin Finance Journal* 14, no. 2, 175-192.
- Novy-Marx, Robert, (2013), "The Other Side of Value: The Gross Profitability Premium," *Journal of Financial Economics* 108, no. 1, 1-28.
- Scott A. Richardson, Richard G. Sloan, Mark T. Soliman, and Irem Tuna, (2005), "Accrual Reliability, Earnings Persistence and Stock Prices," *Journal of Accounting and Economics*, 39, 437-485.
- Scott, James, Mark Stumpp, and Peter Xu, (1999), "Behavioral Bias, Valuation, and Active Management," *Financial Analysts Journal*, July/Aug 1999, pp. 49-57.
- Sloan, Richard G., (2001), "Discussion of: Contextual Fundamental Analysis Through the Prediction of Extreme Returns," *Review of Accounting Studies*, 6, pp. 1991-1995.
- Sloan, Richard G., (1996), "Do Stock Prices Fully Reflect Information in Accruals and Cash Flows About Future Earnings?" *The Accounting Review* 71, no. 3, 289-315.
- Sorensen, Eric H., Edward Qian, Ronald Hua, and Robert Schoen, (2004), "Multiple Alpha Sources and Active Management," *Journal of Portfolio Management*, Winter 2004, pp: 39-45.
- Sorensen, Eric H., Edward Qian, and Ronald Hua, (2007), "Quantitative Equity Portfolio Management: Modern Techniques and Applications," *Chapman and Hall/CRC Financial Mathematics Series*, ISBN: 978-1584885580.
- Sun, Lei, Kuo-Chiang John Wei, and Feixue Xie, (2014), "On the Explanations for the Gross Profitability Effect: Insights from International Equity Markets," Asian Finance Association (AsianFA) 2014 Conference Paper.
- Walter, Carl E., and Fraser J. T. Howie, (2006), *Privatizing China: Inside China's Stock Markets*, 2nd Edition, John Wiley & Sons (Asia) Pte. Ltd, ISBN: 978-0-470-82214-2.

Authors Bios'



Rohit Shrivastava, CQF
PanAgora

Mr. Shrivastava is a Director on the Dynamic Equity team at PanAgora Asset Management. His primary responsibilities include managing active equity strategies for the team, conducting and managing quantitative equity research to uncover new sources of alpha, and building quantitative stock selection models. Mr. Shrivastava is a key contributor to the innovative equity research used in the development of PanAgora's Dynamic Equity models. Mr. Shrivastava is the member of firms' Directors and Risk Committee's

Prior to joining Dynamic Equity team, Mr. Shrivastava was a Vice President-Research on the Global Stock Selection Team at AQR Capital Management. At AQR, he conducted research on new sources of alpha, model construction ideas, portfolio construction/optimization ideas and built AQR's proprietary equity risk prediction models. He was also responsible for researching and managing AQR's Emerging Market Neutral strategy, and served as Portfolio Manager for multiple quantitative equity strategies. He also helped tailor AQR's core quantitative investment strategies to clients' specific needs.

Prior to joining AQR, Mr. Shrivastava worked as a Senior Consultant with Indus Valley Partners where he consulted to hedge funds such as QVT Financial and FX Concepts.

Mr. Shrivastava holds a Certification in Quantitative Finance (CQF) and has close to 15 years of industry experience.



Jaime H. Lee, PhD
PanAgora

Dr. Lee is a Managing Director at PanAgora Asset Management and leads the Dynamic Equity Team. Her primary responsibilities include oversight and management of the team, conducting research to uncover new alpha sources, building quantitative stock selection models, and managing portfolios within the Dynamic Equity strategies. Dr. Lee is a key contributor to the innovative equity research used in the development of PanAgora's Dynamic Equity models. Dr. Lee is a member of the firm's Operating and Directors Committees.

Prior to joining PanAgora, Dr. Lee was a Managing Director of the Scientific Active Equity team at BlackRock, Inc. Dr. Lee joined Barclays Global Investors in 2007, which merged with BlackRock in 2009. While at BGI/BlackRock, she managed the Emerging Markets strategies and led the Emerging Markets portfolio management team, overseeing \$15Bn AUM across long-only, 130/30 and market neutral strategies. Her prior experience includes a role as a Senior Portfolio Manager at Barclays Global Investors as well as Research and Portfolio Management roles at Quantal Asset Management, managing International equity strategies.

Dr. Lee graduated from the University of California, Berkeley with a Ph.D. in Economics.



George D. Mussalli, CFA
PanAgora

Mr. Mussalli is Chief Investment Officer and Head of Research, Equity. He is responsible for oversight of the firm's Dynamic, Stock Selector, and Diversified Arbitrage strategies, as well as the Equity team's Data Infrastructure, Portfolio Construction, Portfolio Strategy and Trading teams. He is also a member of the firm's Investment, Operating, and Directors Committees.

As Chief Investment Officer and Head of Research, Equity, Mr. Mussalli directs innovative equity research used in the development of models used within PanAgora's equity strategies. Prior to becoming Chief Investment Officer and Head of Research, Equity, Mr. Mussalli served as Head of PanAgora's Stock Selector strategies. His work focuses on combining fundamental insights with sophisticated quantitative techniques to develop proprietary models designed to analyze companies across many dimensions. In addition to overseeing the management of the firm's Stock Selector strategies, he has significantly contributed to the proprietary pool of equity research leveraged across the entire firm during his tenure. The research he has conducted also led to the founding of the firm's Diversified Arbitrage hedge fund strategy in 2010.

Before joining PanAgora, he was a Portfolio Manager on the Putnam Investments Structured Equity team, where he was responsible for Structured Equity portfolios. He contributed to quantitative research and analysis that supported all equity strategies, including International and Global strategies.

Prior to joining Putnam, Mr. Mussalli worked as a Senior Investment Analyst at John Hancock Funds.