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January 2021 / Whitepaper

Forecasting ten year return and volatility for the CSI 300 index

A cautious and systematic assessment of potential returns over the next decade suggests that China A-Shares, represented by the CSI 300 Index throughout this paper, may still offer similar return potential as U.S. Equities, represented by the S&P 500 Index throughout this paper. Please note that this comparison refers to market forecasts created by consistently applying the DWS Long View forecasting methodology to China A-Shares and the S&P 500 Index framework in tandem. Furthermore, China A-Shares may act as a portfolio diversifier given their historically low correlation to U.S. equities.

When it comes to long-term investment in China A-Shares, global investors may want to consider thinking about the market using the framework outlined in the DWS Long View for calculating long run return and volatility assumptions. From a return perspective, the Long View uses an intricate build-up or pillar approach to forecast ten year total returns for various markets. The three pillars that the approach uses to derive long run return potential expectations are income, growth and valuation. For equities, these pillars are broken down further into the following sub-pillars: dividend yield, buybacks & dilutions, inflation, real earnings growth, and a valuation adjustment, as summarized in the box below.

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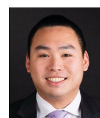

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Throughout this paper, the CSI 300 index is used as a proxy for China A shares. All data used to inform forward-looking next ten years September 30, 2020 through September 30, 2030 unless otherwise noted. Using as much historical data as available.

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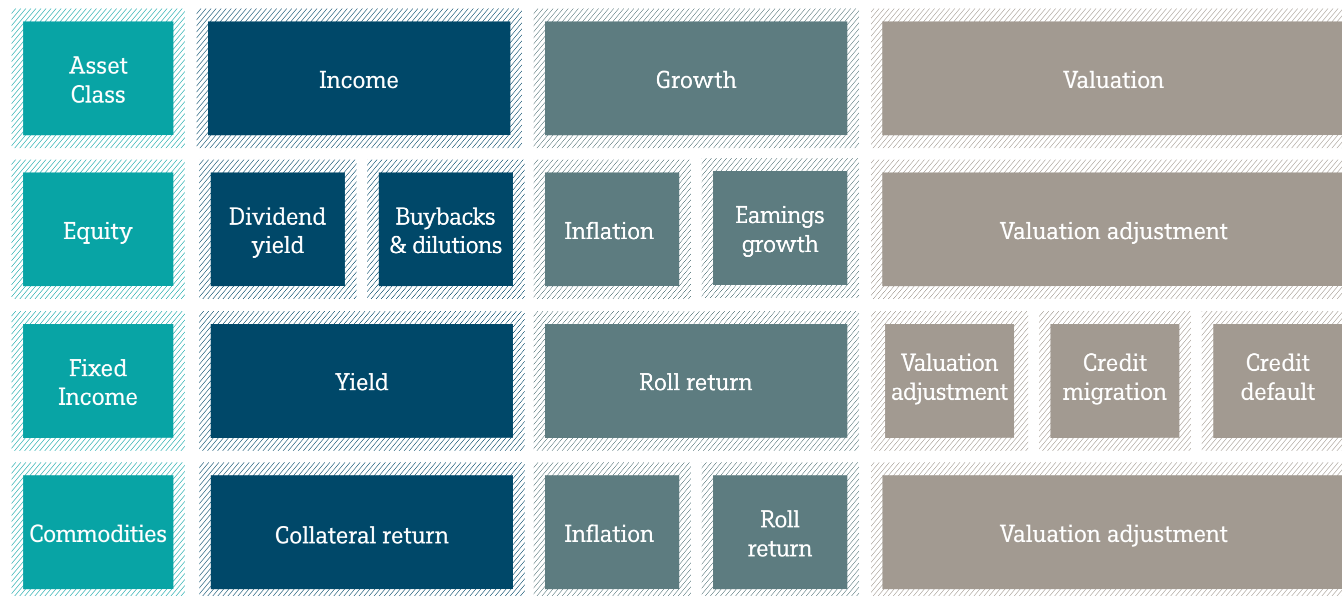
LONG VIEW FOR TRADITIONAL ASSET CLASSES: PILLAR DECOMPOSITION



Source: DWS Investments UK Limited. As of 12/31/19. (Latest data available)

Framework

We use the same building-block approach to forecasting returns irrespective of asset class. We believe this brings consistency and transparency to our analysis and also may help clients better understand the constituent sources of returns. The Long View framework breaks down returns into: income + growth + valuation, each with their own sub-components. The pillars and components for the traditional asset classes under our coverage (equities, fixed income and commodities) can be seen above. Meanwhile, alternative asset classes under our coverage (listed real estate, private real estate, private real estate debt, listed infrastructure and private infrastructure debt) are forecasted using exactly the same approach, sometimes with an added premium to account for specific features, such as liquidity.

Applying each sub-pillar to the CSI 300 Index, which represents the top 300 blue chip stocks in mainland China, we hope that investors may be able to get a better sense for long run return assumptions for this market. In this paper, we would like to provide approximations for each of these sub-pillars by looking to the Long View methodology for guidance but without following it precisely. Furthermore, we will discuss the Long View methodology's volatility calculation. Our goal is to provide investors with a more-informed sense of long run return and volatility assumptions for the China A-Share market, which have historically not been included in the DWS Long View methodology, but which will be incorporated in the Q1 2021 update. This paper aims to provide an approximation and general framework for investors

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to use when evaluating the China A-Share market, without delving too in depth on the nuances and rationales behind deriving long run return and volatility assumptions. For more detailed information on determining long run return and volatility assumptions, please reference the official DWS Long View annual publication on our website. All data presented in this paper is as of December 31, 2020, in line with the most recent published DWS Long View update.

Return perspective

To construct a long run return forecast, the DWS Long View methodology begins by estimating a value for each of the five sub-pillars mentioned above.

To estimate dividend yield, the Long View uses the trailing 12 month dividend yield. For this paper we use the trailing 12 month dividend yield as of the end of the fourth quarter on December 31, 2020. We then compare this value to the average dividend yield for all available history to make sure that it is reasonable and representative of the trending dividend yield for the China A-Share market.

For the dilution adjustment, we rely on the Long View team's estimate for the China A-Share market. This adjustment reflects the fact that a significant portion of real gross domestic product (GDP) growth in mainland China is likely financed not only by real earnings growth but also by net equity issuance.

For inflation, we will follow the same method that the DWS Long View methodology uses. The inflation figure is based in equal parts on a market-implied metric (the ten-year inflation swap breakeven rate), where available, and on a macroeconomic target. The macroeconomic target incorporates estimates from independent macroeconomic forecasts and stated central bank targets (where such targets exist) for long-term inflation.

In our Long View framework, long term real earnings growth of a single-country equity index is approximated by trend real GDP growth over the next decade for the corresponding country. The trend GDP growth estimates have historically come from supranational agencies and international think tanks, but we soon expect to replace these third-party estimates with a proprietary DWS model for next-decade trend GDP growth informed by our economists. (We also seek to incorporate a measure of export sensitivity to international growth for each equity index, but additional details on such changes will not be released until after Q1 2021). So, to be consistent with the December 31, 2020 DWS Long View update, this paper uses the third-party estimate for trend GDP growth in China over the next decade as the basis for the real earnings growth estimate for the CSI 300.

Lastly, the valuation adjustment is required to reflect a differing level of valuation today relative to a market's own history. The Long View uses the Shiller Cyclically Adjusted Price to Earnings, or "CAPE" ratio. The CAPE ratio is not available for every market, so this paper uses a close proxy for CAPE, the long term price to earnings ratio from Bloomberg, to calculate a valuation adjustment. More details on this approach will follow later in the paper. Let's now take a closer look at each sub-pillar in turn.

The dividend yield estimate is 1.7%

Next, let's take a look at the dividend yield for China A-Shares. As you can see, the latest trailing-twelve-month dividend yield figure, at the end of the fourth quarter of 2020 is 1.7%. Per the Long View methodology, we use this dividend yield as our forward-looking dividend yield assumption for the next ten years. Using history as a guide, 1.7% seems in line with the index's historical average trailing-twelve-month dividend yield of around 1.79% from 2005 to present, which represents all available dividend yield data for the CSI 300 index.

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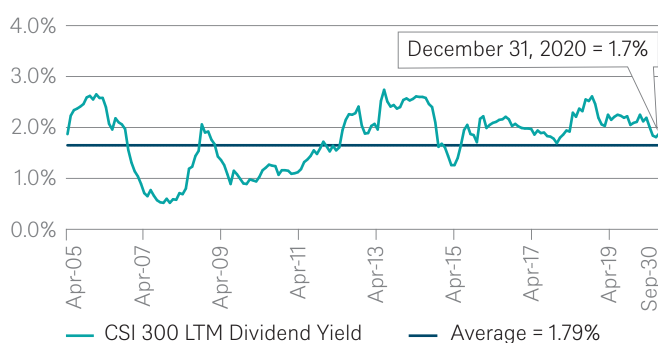
The dilution and buybacks adjustment is –2.0%

In many markets, earnings per share (EPS) and GDP growth do not necessarily equal one another. In fact, several factors may cause EPS growth to lag GDP growth. One reason for this is that GDP growth could be financed not only by real EPS growth but also by net equity issuance. The DWS Long View model assigns a dilution figure of –2.0% to China A-Shares. This figure is calculated by summing annual share repurchases and issuances each year, netting them against each other, and dividing that figure by the market capitalization of the index to determine a net buyback yield. The dilution figure represents the long term average of the net buyback yield. In fact, this net buyback yield is close to –3.5% per annum, net dilution, based on recent history for the CSI 300. But, since ongoing shareholder dilution in excess of –2.0% is very rarely sustainable, the Long View methodology caps this effect to –2.0%.[a]

CSI 300 LAST 12 MONTH DIVIDENT YIELD



* Source: Bloomberg for the date range April-05 to April-19. May not be indicative of future results.

Note that this effect refers only to new equity issuance by existing constituents of the CSI 300 and therefore reflects genuine dilution of investors in the existing constituents only. While net equity issuance by new firms (i.e. through initial public offerings-IPOs) has an important impact on the overall long-term discrepancy between earnings growth of listed equity and GDP growth, IPOs do not have a dilutive impact on investors in existing index constituents. If and when new firms are admitted as constituents to an index, it results in a rebalancing of the index. At that point, some assets shift from investments in existing constituents to new constituents. The DWS Long View regards the impact of such rebalancing as separate from the dilution that occurs when existing index constituents raise new equity capital.

The inflation estimate is 2.7%

The Long View methodology aims to use an inflation figure for each country that is based in equal parts on a market-implied metric (the ten-year inflation swap breakeven rate), and on a macroeconomic target that combines independent forecasts and stated central bank targets for long-term inflation. In the case of China, there is no sufficiently liquid tradeable inflation swaps market, which leaves us with the central bank inflation target of 3% and third-party forecasts of 2.3% per annum over the next decade. Averaging these, we arrive at an estimate of 2.7% per annum inflation.

If one takes a look at the last fifteen years of history from 2005 through 2019 as referenced in the below chart, the average CPI for all goods and services in China was 2.6%. This is close to, and therefore provides some context for, our forward-looking estimate of 2.7% for inflation in China, which we believe to be a reasonable forecast.

[a] See: Bernstein & Arnott, "Earnings Growth: The Two Percent Dilution", Fin Analysts Journal. September 2003.

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Real earnings growth for the CSI 300 is estimated at 3.8% per annum over the next 10 years

When estimating long run real earnings growth, the DWS Long View analysis has found that over the long term, there is a close relationship between real earnings growth of a national equity index and the economic growth of the corresponding home market. In this paper, we follow the same approach as of the latest update to the Long View, which leverages third-party estimates for trend GDP growth. However, it is important to note that in the case of China, and a few other emerging markets, the Long View framework has assumed that only 50% of a country's real GDP growth is likely to translate into real earnings growth for that country's equities. To be clear, this assumption applies to the MSCI China index (which is already part of the Long View framework), where historically, from 1995 to 2018, there was a significant divergence between the growth of real EPS for the MSCI China Index and the growth of China's real GDP.

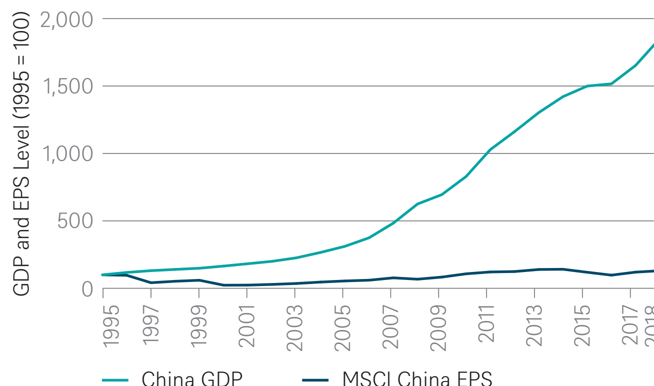
Year	China CPI
2005	1.8%
2006	1.6%
2007	4.8%
2008	5.9%
2009	–0.7%
2010	3.2%
2011	5.6%
2012	2.6%

Year	China CPI
2013	2.6%
2014	1.9%
2015	1.4%
2016	2.0%
2017	1.6%
2018	2.1%
2019	2.9%
Average	**2.6%**

* Consumer Price Index: All Items for China, Index 2015=100, Annual, Not Seasonally Adjusted. Source: Bloomberg as of 12/15/2020 Subject to change and may not be indicative of future results.

The DWS CROCI research team hypothesizes that China's part-socialization of corporate profitability could explain the slower pace of earnings growth relative to GDP growth. State Owned Enterprises (SOEs) in China may make investments that do not necessarily focus solely on profit maximization,

CHINA´S GDP VS. MSCI CHINA EPS



Source: DWS Calculation, Oxford Economics, Bloomberg as of December 15, 2020. Subject to change. May not be indicative of future results.

but in part also act as an investment vehicle for the government, particularly in times of economic stimulus. Furthermore, MSCI China has a significant exposure to Hong Kong, which has had a lower growth rate than broad China in recent years. As a result, the DWS Long View applies a 50% haircut to GDP growth when forecasting forward looking long run earnings growth for MSCI China.

However, when it comes to the China A-Shares specifically, growth in real EPS seems to align better with China's real GDP growth. Since 2005, earnings per share for the CSI 300 Index and China's real GDP rose at a similar cadence, while earnings per share for the MSCI China Index did not keep up. One possible reason for this could be that broad China equities, represented by MSCI China for example, have historically been dominated by capital intensive stocks such as energy, capital goods, shipping and telecom stocks. Whereas, China mainland equities, represented by the CSI 300, tend to have a higher share in Consumer Staples, Health Care and Technology Sectors. One may also consider the sector evolution of the CSI 300 from 2005 to 2020.

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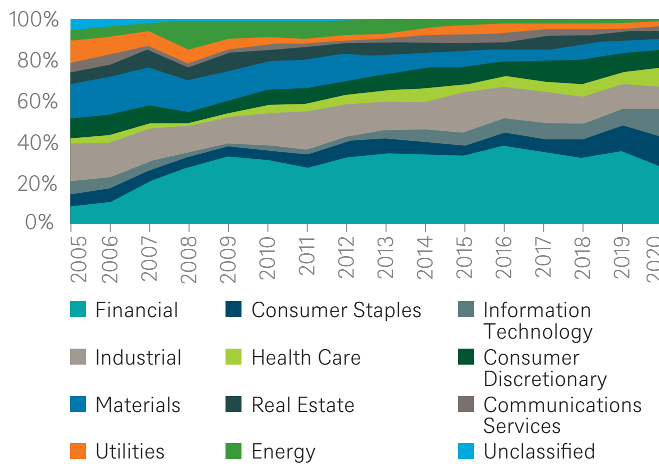
Growth occurred in health care and IT at the expense of capital intensive industries such as materials, utilities, and industrials. A slow and steady transition from manufacturing to services is evident. Materials and Utilities combined represented 27% of the market in 2005, but now represent 7% of the market, Health Care was 2.8% in 2005 but is now 9.5%, Information Technology was 6.5% in 2005 but is now 13.5%, and Industrials were 18% in 2005 but are now 10%. The observations could indicate that the share of intangible or intellectual capital may be higher in the CSI 300 than in MSCI China, which may in turn translate into higher earnings per share growth in the CSI 300 relative to MSCI China. However, this topic requires further investigation and falls beyond the scope of this paper.

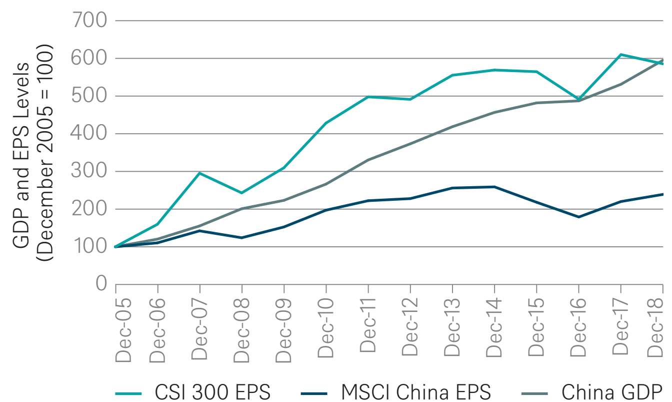
Considering that A-share EPS tracks GDP growth more closely than MSCI China EPS does, but also acknowledging the rationale behind applying a 50% haircut to GDP growth when forecasting EPS growth for the broader Chinese equity market, we assume that 75% of Chinese real GDP growth translates into real earnings growth for the CSI 300. This is more optimistic than for MSCI China, but still cautious relative to the data shown in the chart above (to account for the potential part-socialization of corporate profitability and reflecting weaker corporate governance). The ten year trend GDP forecast used by the Long View for China is 5.1% (as of December 31, 2020), so applying a 75% translation coefficient leads us to a 3.8% per annum forecast for real earnings per share growth for the CSI 300. This forecast is subject to change and certainly requires further analysis by the Long View and CROCI teams. However, we believe that it is a reasonable first estimate since it assumes real earnings growth for China A-Shares will not necessarily track GDP growth in the future as closely as it did historically.

CSI 300 SECTOR EVOLUTION 2005–2020



Source: DWS Calculation, Bloomberg as of December 15, 2020.

CHINA GDP VERSUS EPS FOR THE CSI 300 AND MSCI CHINA INDEXES



Source: DWS Calculation, Oxford Economics, Bloomberg as of December 15, 2020. Subject to change and may not be indicative of future results.

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The valuation adjustment is –1.3%

We use the long term price to earnings ratio from Bloomberg, which divides price by the ten year average real earnings per share to calculate the valuation adjustment component of our long term return forecast. The calculation follows the classic Shiller twenty-year approach, whereby the current level for the long term price to earnings ratio is assumed to revert over the course of twenty years to its last-ten-year median level. The median is used as the preferred measure of central tendency in order to better account for outliers that a price to earnings ratio time series may contain. In the case of the CSI 300, we assume that the latest price to earnings ratio of 25.7 (as of December 31, 2020) reverts to its last-ten-year median level of 19.8 over twenty years, which implies a return of –1.3% per annum. Mathematically:

–1 *[(25.7/19.8)^(1/20) –1] = –1.3%

Graphically, one can see that the current price to earnings ratio is relatively close to, but slightly higher than, its last-ten-year median level. As such, our negative valuation adjustment seems reasonable.

LONG TERM (10 Year) **PRICE TO EARNINGS RATIO**

Source: DWS Calculation, Bloomberg as of December 15, 2020. Subject to change and may not be indicative of future results.

The long run return assumption for the CSI 300 index is 4.9%

To conclude this section, summing the sub-pillars of dividend yield, dilution and buyback adjustment, inflation, real earnings growth, and valuation adjustment, our ten-year return forecast for the CSI 300 is 4.9% per annum in local currency terms. This figure is calculated as follows:

1.7% dividend yield –2.0% dilution and buyback adjustment +2.7% inflation +3.8% real earnings growth –1.3% valuation adjustment = 4.9%

This return forecast represents an informed approximation of what we believe investors could expect when using the DWS Long View methodology to forecast the long run return of the CSI 300. DWS constantly strives to improve its ability to create forecasts, and more work is required when it comes to developing a long run return forecast for the China A-Shares market. As such, the next update to the DWS Long View in early 2021 may revise the return forecast presented in this paper and will refresh it with updated data.

Volatility perspective

The Long View methodology also aims to derive long run volatility forecasts for a given market. Forecasting volatility is a challenge, so we prefer to rely on historical risk patterns based on very long-term observations. This allows for the mean reversion of excessively high or low volatility, but also recognizes that risk paradigms may sometimes change for many years. Therefore, we assign a higher weight to more recent observations and a lower weight to older observations by applying an exponentially weighted moving average (EWMA) approach to historical data. Now, considering this approach, let's take a closer look at how to approximate a forward-looking volatility expectation for the CSI 300, using empirical data.

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A SIMPLIFIED ILLUSTRATION OF AN EXPONENTIALLY WEIGHTED MOVING AVERAGE APPROACH

Volatility Analysis	Avg. 1Yr Rolling Vol. (CNY)	x	y = x^2	Percent Weight = y/ (sum of all y's)	Contribution Amount = Weight * Rolling Vol. (CNY)
2003	19%	1	1	0.0%	0.0%
2004	19%	2	4	0.2%	0.0%
2005	22%	3	9	0.4%	0.1%
2006	20%	4	16	0.8%	0.2%
2007	31%	5	25	1.2%	0.4%
2008	42%	6	36	1.7%	0.7%
2009	42%	7	49	2.3%	1.0%
2010	29%	8	64	3.0%	0.9%
2011	23%	9	81	3.8%	0.9%
2012	21%	10	100	4.7%	1.0%
2013	22%	11	121	5.7%	1.2%
2014	19%	12	144	6.8%	1.3%
2015	30%	13	169	8.0%	2.4%
2016	34%	14	196	9.3%	3.1%
2017	12%	15	225	10.7%	1.3%
2018	16%	16	256	12.1%	1.9%
2019	23%	17	289	13.7%	3.1%
2020	21%	18	324	15.4%	3.2%
Average	**25%**	–	–	**Exponentially Weighted Average (Higher Weight on Recent Data):**	**23%**

* Source: DWS Calculations, Bloomberg as of 12/15/2020. Average one year rolling volatilities represent annual averages for one year rolling volatility calculated using historical daily return data in both U.S. Dollar and Yuan terms.

The long run volatility assumption for the CSI 300 index is 26.8%

Given that the Long View EWMA methodology is quite complex and is beyond the scope of this paper, we would like to simulate and simplify the approach in the following example. The table below outlines how one could use a simple parabolic ($y = x^2$) weighting schema to underweight older historical volatility and overweight more recent historical volatility. This example provides a sense for what occurs when the DWS Long View uses the EWMA methodology to forecast long run volatility, however the volatility numbers shown in the table may not match the actual volatility numbers used in the long view.

As you can see, applying an exponentially weighted schema to historical volatility data for the CSI 300 in local currency terms, the 25% average volatility observed in China historically decreased to around 23% for local investors. Please note that this example does not use the exact method that the DWS Long View uses to forecast long run volatility, so the volatility numbers expressed in the tables may not match the volatility calculated by the Long View. Instead, this example is designed to give investors a sense of how the EWMA technique assigns a higher weight to more recent data and a lower weight to older data. The nuances of the EWMA

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approach and broader volatility calculation are explained in greater detail in the DWS Long View publication. However, based on available historical data, the DWS Long View model currently forecasts 26.8% for the long run annualized volatility of the CSI 300 in local currency terms. Considering the EWMA approach and that volatility in China's equity markets has been declining, this volatility figure likely falls below the simple average of historical long run volatility. More details about how the long run volatility number is calculated are expected in the upcoming 2021 revision of the DWS Long View.

Conclusion

We hope that this paper has provided investors with a stronger understanding of how to apply the DWS Long View methodology to construct long run return and volatility forecasts for the CSI 300 Index. Applying the DWS Long View methodology, we estimate that the ten year long-run expected return for the CSI 300 Index is 4.9% per annum in local currency terms. Furthermore, the DWS Long View model currently forecasts long run annualized volatility for the CSI 300 Index to be 26.8% in local currency terms. To put these numbers in perspective, the methodology forecasts 5.4% return with 15.6% volatility per annum for the S&P 500 Index, 4.9% return with 14.5% volatility per annum for the MSCI World Index, and 4.9% return with 16.2% volatility per annum for the MSCI Emerging Markets Index (all in local currency terms). Although the return forecast for the CSI 300 hovers near that of the S&P 500 with higher expected volatility, U.S. investors should keep in mind that China A-Share equities have historically exhibited a very low correlation to U.S. equities. The correlation between the CSI 300 and S&P 500 has averaged around 0.19 on a six month rolling basis from 2005 to 2020.[b] For additional details on the DWS Long View methodology please reference the official DWS Long View annual publication on the DWS website.

APPENDIX: PERFORMANCE OVER THE PAST FIVE YEARS (12-Month periods)

Annual Total Return	Currency	12/31/2015 – 12/30/2016	12/30/2016 – 12/29/2017	12/29/2017 – 12/31/2018	12/31/2018 – 12/31/2019	12/31/2019 – 12/31/2020
Shanghai Shenzhen CSI 300 Index	CNY	–9.25%	24.25%	–23.64%	39.19%	29.89%
MSCI China Index	HKD	1.15%	55.57%	–18.65%	23.04%	29.02%
S&P 500 Total Return Index	USD	11.96%	21.83%	–4.38%	31.49%	18.40%

Source: Bloomberg as of 1/6/2021

Annual Total Return	Currency	12/31/2015 – 12/30/2016	12/30/2016 – 12/29/2017	12/29/2017 – 12/31/2018	12/31/2018 – 12/31/2019	12/31/2019 – 12/31/2020
Shanghai Shenzhen CSI 300 Index	USD	–15.16%	32.52%	–27.76%	37.48%	38.57%
MSCI China Index	USD	1.10%	54.41%	–18.86%	23.72%	29.61%
S&P 500 Total Return Index	USD	11.96%	21.83%	–4.38%	31.49%	18.40%

Source: Bloomberg as of 1/6/2021

[b] Source: DWS Calculation, Bloomberg as of 1/25/2021. This figure using weekly return data represents the average six month rolling correlation between the CSI 300 Total Return Index and S&P 500 Total Return Index from 12/31/2004 to 12/31/2020.

Throughout this paper, the CSI 300 index is used as a proxy for China A shares. All data used to inform forward-looking next ten years September 30, 2020 through September 30, 2030 unless otherwise noted. Using as much historical data as available. No assurance can be given that any forecast, target or opinion will materialise. Past performance is not a reliable indicator of future returns. For institutional investors only. In the U.S. and Canada for Institutional Client and Registered Representative Use Only. Not for public viewing or distribution. Any hypothetical results presented in this report may have inherent limitations. Among them are the sharp differences which may exist between hypothetical and actual results which may be achieved through investment in a particular product or strategy. Hypothetical results are generally prepared with the benefit of hindsight and typically do not account for financial risk and other factors which may adversely affect actual results of a particular product or strategy. Any forward looking statements (forecasts) are based on but not limited to assumptions, estimates, projections, opinions, models and hypothetical performance analysis. All of which are subject to change at any time, based upon economic, market and other considerations and should not be construed as a recommendation. For Professional Clients (MiFID Directive 2014/65/EU Annex II) only. Not for public distribution.

Glossary
The CSI 300 Index includes the 300 largest companies of the Chinese mainland that is companies listed on the Shanghai and Shenzhen Stock Exchange (so called A-shares).

Correlation is a statistical measure of how two securities move in relation to each other.

Earnings per share (EPS) is calculated as a companies' net income minus dividends of preferred stock all divided by the total number of shares outstanding.

The **gross domestic product (GDP)** is the monetary value of all the finished goods and services produced within a country's borders in a specific time period.

Inflation is the rate at which the general level of prices for goods and services is rising and, subsequently, purchasing power is falling.

MSCI China Index is an index of small and large capitalization Chinese equities available to non-domestic investors.

The **price-to-earnings (P/E)** ratio or multiple measures a company's current share price relative to its per-share earnings.

The **S&P 500 Index** includes 500 leading U.S. companies capturing approximately 80% coverage of available U.S. market capitalization.

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