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EXECUTIVE SUMMARY Most of the world's institutional investors hold a long position on China across their multi-asset class portfolios. In the face of this long exposure, the greater than 30 percent decline in China's domestic equity market (A-shares) prices from June highs to early July lows raises some concerns but ought not inspire panic. Perhaps more concerning was the Chinese government's hyperactive response. Three brief historical case studies outline a range of potential outcomes from China's unconventional stockmarket intervention.

Inside:
Chinese Equity Market

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CHINESE EQUITY MARKET

EXPLICITLY OR IMPLICITLY, most of the world's institutional investors hold a long position on China across their multi-asset class portfolios. In the face of this long exposure, the greater than 30 percent decline in China's domestic equity market (A-shares) prices from June highs to early July lows raises some concerns but ought not inspire panic.[1] Developed market equities remain sensitive to the Chinese economy. For example, consumer discretionary and technology firms such as Apple derive nearly 30 percent of their current revenue, and nearly two-thirds of their annual growth, from Chinese consumers. Emerging market equity indices such as MSCI's EEM Index allocate nearly one quarter of their market capital to China-listed firms (excluding A-shares). China's seemingly insatiable demand for raw materials, including half of all global non-precious metals and ten percent of global oil consumption (50 percent of projected oil demand growth),[2] underpins commodity prices. Chinese foreign direct investment in real estate leads the world and props up the luxury housing and commercial (mostly tourism) markets from Australia to New York to Western Europe.[3] China's influence also extends to fixed income. The U.S. Treasury department estimates that mainland China holds more than twenty percent of U.S. Treasuries, second only to the U.S. Federal Reserve.

1 Prices from Bloomberg for the Shenzhen and Shanghai Composite Indices.

2 Data from the World Bank and International Energy Association.

3 Data from Knight Frank Research

While panic over the latest bout of volatility may seem unwarranted - equity prices in China are still up 70 percent year over year - the hyperactive response (e.g., lending money to brokerages to buy stocks, forbidding large shareholders from selling, allowing companies to suspend trading of their shares, speeding up infrastructure spending, and loosening monetary policy) seems more worrying. Global investors have experience managing the fallout from an equity bubble pop, but rarely do governments directly intervene in stock market crashes.

In the absence of a richer data set covering such events, three brief historical case studies outline a range of potential outcomes from China's unconventional stock market intervention. The first case study describes Hong Kong during August 1998, when the government sought to fend off the panic from a global financial crisis by propping up the Hang Seng Index via direct share purchases. The second case study describes Japan in August 1992, when the Japanese Ministry of Finance launched a "price keeping operation" to sustain a 17,000 floor underneath the falling Nikkei index. The third case study also describes Japan but occurred a few years earlier. In October 1987, Japan responded to the Black Tuesday (Black Monday in New York) rout of global equity prices by "encouraging" brokers and institutional fund managers not to sell equities. The Chinese government likely hopes the first case study proves the most analogous, while institutional investors likely dread the second scenario more. Yet along most dimensions, the third case study appears the most apropos.

CASE STUDY 1: HONG KONG DURING AUGUST 1998

Similar to mainland China and the euro crisis of today, Hong Kong's equity market during the Asian financial crisis of 1997-1998 abruptly turned from bullish to bearish amid the flaring of a currency crisis beyond its borders. From January 1996 until July 1997, the Hang Seng index gained 50 percent. The Hang Seng stood at 15,346 on July 2, 1997, the day that Thailand devalued the baht. During the month of July, the Hang Sang continued to gain another eight percent, but the economic contagion slowly emanating from Thailand afflicted other markets in Asia and globally. By August 14, 1998, the Hang Sang had fallen more than 50 percent to 7,767. To stem the tide, the Hong Kong government elected to directly purchase US$15

FIGURE 1

Notes: Data from Bloomberg

billion (HK$118 billion) worth of shares in the 33 constituent stocks then part of the Hang Sang index (Su, Yip, and Wong, 2002). Policy makers deemed infeasible more traditional levers like interest rate cuts by the central bank due to the pressure to support the foreign exchange rate (Granitsas and Sender, 1998).

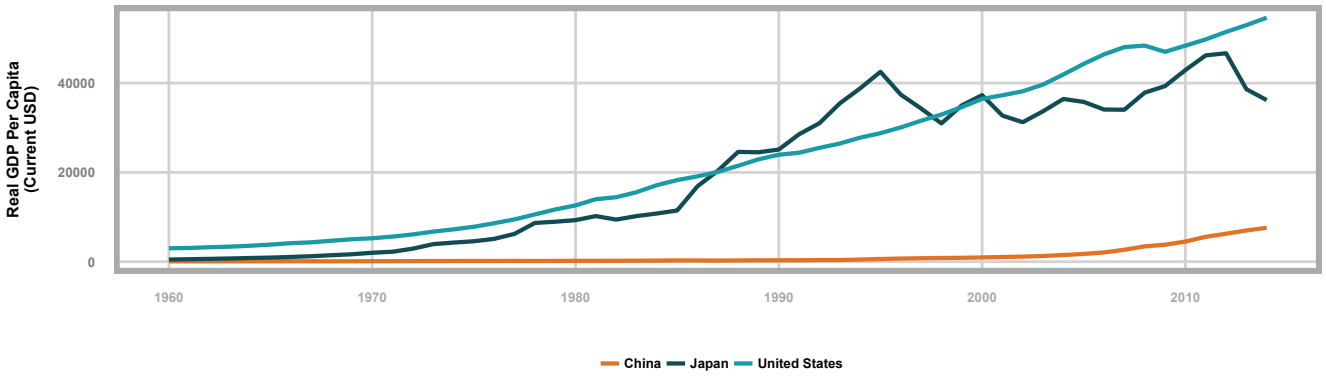
The long-term effects of the purchases remain controversial. Some empirical evidence (Su et al., 2002) suggests the Hong Kong government's actions lifted share prices for both the constituents of the Hang Sang and, to a lesser extent, non-Hang Seng stocks. Others worry about the long-term effects of Hong Kong's reputation as a market-based, laissez-faire economy. Less controversial - and perhaps the hopes of the modern Chinese government - are the longer-term data on Hang Sang equity prices. By January 2001, the Hang Sang reached a new high and the Hong Kong economy returned to positive economic growth.

An important difference between Hong Kong in 1998 and mainland China today lies in the maturity of their respective economic institutions. In 1998, Hong Kong worried somewhat academically that its relatively orthodox free market reputation would suffer from its non-conventional policy. In contrast, China's premier Xi Jinping promised as part of the Third Plenum earlier this year that market forces would play a "decisive role" in resource allocation. The Chinese government risks backsliding on that claim and further ingraining its dirigiste reputation in the minds of market participants.

CASE STUDY 2: JAPAN FROM AUGUST 1992 THROUGH NOVEMBER 1993

The similarities between China today and Japan from the 1990s run deep. Both countries respectively emerged after more than two decades of rapid economic growth that relied on exporting manufactured goods, transforming them into the world's second largest economy (a title Japan later lost). Large trade imbalances with the U.S. led to strains regarding undervalued exchange rates. The demographics of both countries shifted during their decades of growth as their populations aged and became more urbanized. The economic growth in both countries also benefited from rapid increases first in real estate and then equity prices. Japan's Nikkei 225 nearly doubled twice between December 1984 and December 1989, when it reached a high of 38,916. China's domestic equity prices doubled once in the past year. As it became apparent in Japan that the multi-decade trend of annual economic growth had reversed in the early 1990s, the Japanese government responded to the plummeting Nikkei index by adopting a "price keeping operation" (PKO) in August 1992. The government's goal was to prevent the index falling below the psychologically important level of ¥17,000. The Japanese government restricted some stock sales, bought

FIGURE 2



Notes: Data from the World Bank

equities with public funds, and limited or froze the release of state-owned shares. At the same time, the government encouraged trust banks, financial institutions, and asset management companies to buy stocks (Narita, 2002).

By most measures, the Japanese government's efforts fell short of hopes. Equity prices stabilized, but the economy never recovered. Japan's per capita real GDP growth since 1994 has averaged 0.05 percent.

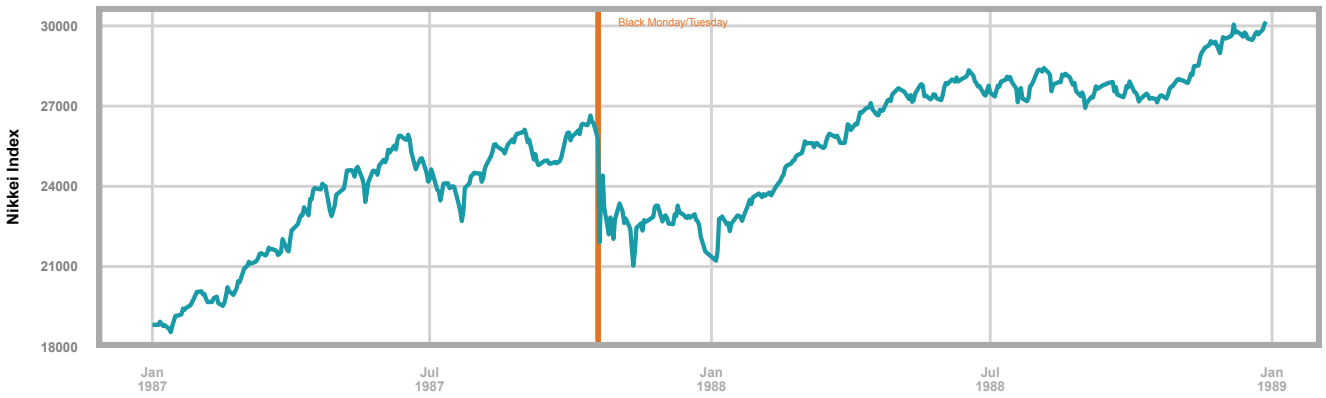
China today differs from Japan in 1992 along at least one important dimension. When the Nikkei peaked in 1989, Japan's real GDP per capita exceeded U.S. per capita GDP by six percent.[4] Today, China's real GDP per capita remains less than 1/5th the U.S. level, so the country still has opportunity to converge with more developed markets. In fact, China's strategy in intervening in its equity market may rest on the belief that medium-term economic growth will justify the market's current valuations, and all the government need do to avoid a more significant drawdown in the near-term to buy time and maintain political stability.

CASE STUDY 3: JAPAN DURING OCTOBER 1987

Japan offers another case study, albeit from a few years earlier. Between 1982 and October 1987, Japanese stocks gained nearly 350 percent in value while the country enjoyed real GDP growth of four percent per year. The economic good times threatened to end abruptly during the week of October 14, 1987, when the Nikkei fell 18 percent. Other global markets fell more sharply (e.g., the NYSE fell 30 percent that week), with the largest one-day declines occurring on October 19 in the U.S.

4 Data from the World Bank.

FIGURE 3



Notes: Data from Bloomberg

(Black Monday) and October 20 in Asia Pacific.

To stem the tide of panic, Japan's Ministry of Finance "advised" Japanese brokers and institutional fund managers to avoid selling shares. According to the Federal Reserve Board San Francisco (1989), such advice carried considerable pressure. The Bank of Japan also promised sufficient funds to reduce the risk of a liquidity shortage. The Nikkei recovered within five months, and economic growth continued at a more than four percent per year.

Unfortunately, Japan's short term policy support in October 1987 likely contributed to the asset price bubble that inflated Japan's real estate and equity markets (Bordo and Jeanne, 2002). Between January 1986 and December 1989, real estate prices rose 30 percent and equities increased by 200 percent. Japan's economy has since languished during its "lost decades" with successive governments attempting a myriad of approaches to reignite growth. Current Prime Minister Abe's "three arrows" policy represents the most recent hope.

China has many of the same concerns today as Japan did in 1987. China's economic growth has remained positive even thought it has slowed over recent years. It also appears to have space to continue growing to converge to developed market levels, in which case its asset prices might have more head room. Like Japan in 1987, its central bank may have set monetary policy too accommodative for market conditions, but the policy did not spur excessive consumer price inflation. China might hope that its current equity market intervention could similarly maintain steady economic growth and wealth accumulation, as Japan did in October 1987, but end with a softer landing.

IMPLICATIONS

Which of the three case studies described above prove most applicable to China's current financial situation, if any, remains an open question. The two case studies from Japan appear the most salient along important dimensions, with the earlier setting (Japan in 1987) being perhaps the most similar due to the potential for continued real GDP "catch-up" growth. Certainly other scenarios may evolve.

Unfortunately, asset allocators do not enjoy the option of waiting for the outcome to reveal itself and then plot a course of action. If China's intervention ends poorly - either through a hard landing today or a continued inflation of its asset price bubbles that not only delays but intensifies an adverse outcome in the future - few investors will find their multi-asset class portfolios well hedged to the Chinese economy, even if their direct exposure to Chinese equities remains limited.

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INTERESTING TECHNOLOGY-RELATED ARTICLES

Two Sigma is a technology company that applies a rigorous, scientific method-based approach to investment management. We draw upon a diverse set of fields to inspire our technology, including artificial intelligence and distributed computing. Occasionally, we read articles in the popular press that describe applications of technology that we find interesting, thought-provoking, and relevant for people thinking about improving the investment management process. Below is a subset of the articles we read this month. Please do not view the inclusion of these articles as an endorsement by Two Sigma of their viewpoints or the companies discussed therein. Two Sigma welcomes discussions (and contributions) about these and other such technology-related articles.

"IBM Announces Breakthrough In Chip Technology" by Scot Neuman, *NPR,* July 9, 2015 (http://www.npr.org/sections/thetwo-way/2015/07/09/421477061/ibm-announces-breakthrough-in-chip-technology).

Moore's law remains alive and well despite exaggerated rumors of its impending demise. "IBM says it has overcome a technological hurdle by producing a prototype chip with transistors that are just 7 nanometers wide, or about 1/10,000th the width of a human hair. The smallest transistors currently in use are twice as big." Limits imposed by physics--not engineering--will eventually become binding on chip manufacturers' ability to shrink transistor sizes using existing approaches. As a result, companies like IBM have explored replacing pure silicon with alternative materials such as silicon germanium.

"We made it to Pluto! What's next for new horizons?" *Popular Science*, July 14, 2015 (http://www.popsci.com/we-made-it-pluto-whats-next).

As exciting as the images from Pluto have been, scientists have barely begun to realize the ambitions of the New Horizons mission. Phoning home from Pluto takes a long time. "In the near term, it's going to take about 16 months for the spacecraft to beam back all the data it has collected around Pluto and its moons over the past few days. It takes that long because the spacecraft can only send information at about 2,000 bits per second, which makes dial-up AOL seem zippy by comparison." Scientists expect the mission's major discoveries to occur in late 2015 and early 2016.

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