

Regional Relevancy of S&P 500[®] and Dow Jones Industrial Average[®] Futures in Asia

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Global markets are increasingly integrated, driven by the diversified global supply chain, deregulation of capital markets, and technological advances. The interconnection of global markets has been the key driver for co-movement of market returns, especially during periods of crisis. This has important consequences in terms of portfolio hedging and risk management.

Meanwhile, with the continued growth in exchange-traded derivatives supported by the need for increased price transparency and liquidity, investors have sought to efficiently integrate listed derivatives into their portfolios.

This paper presents the regional relevancy of [S&P 500](#) and [Dow Jones Industrial Average \(DJIA\)](#) futures for hedging and risk management use by Asian investors. While the ecosystem around the S&P 500 and DJIA covers multiple areas, including trading of options, ETFs, mutual funds, etc., we are only capturing part of the complexity of Asian trading by limiting the study scope to futures. We evaluate the usefulness of those instruments through the following metrics.

- **Liquidity:** As shown by aggregate U.S. dollar notional total value traded for the futures contracts on the two U.S. benchmarks during Asian trading hours.¹
- **Co-movements of markets:** As measured by correlations between the two U.S. benchmarks and seven major Asian market benchmarks, based on daily returns of the futures prices at Asian end of day.
- **Flexibility:** As indicated by contract size and trading hours of the futures on the two U.S. benchmarks versus other major Asian market benchmarks.

The results suggested certain benefits of trading U.S. benchmarks in Asia, providing a new perspective on the use of index derivatives to meet the needs of Asian investors.

¹ For the purposes of this paper, Asian trading hours are defined as 8:00 a.m. to 5:00 p.m. Singapore/Hong Kong time.

A potential advantage of having U.S. benchmark futures trade during Asian trading hours is for investors to transact in local time zones.

LIQUIDITY

About USD 25.7 billion in S&P 500 and DJIA futures were traded daily² during Asian hours as of May 31, 2021.

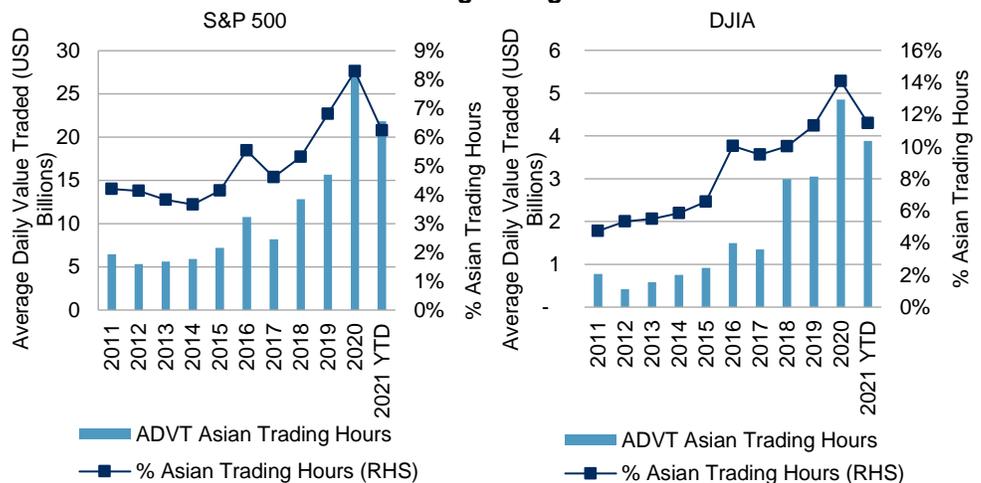
The key potential advantage of having U.S. benchmark futures trade during Asian trading hours is for market participants to transact in local time zones. This includes being able to react globally to major market news as it happens, hedge against geopolitical uncertainties, and adjust accordingly ahead of economic releases and announcements. To achieve these potential benefits, high liquidity and tight bid-ask spreads during Asian trading hours are key.

Exhibit 1 shows the notional average daily value traded (ADVT) of S&P 500 and DJIA futures in each calendar year from January 2011 to May 2021. Looking at front-month contracts of all sizes, the ADVT of S&P 500 futures during Asian trading hours has increased significantly at a CAGR of 13%, higher than the 8% seen globally. DJIA futures experienced an even higher CAGR of 17% for their ADVT during Asian trading hours.

In terms of their share of Asian trading hours, S&P 500 and DJIA futures steadily grew, representing an increasingly important portion of global trading. DJIA futures' share of Asian trading hours climbed from 5% in 2011 to 11% in May 2021. During the same period, S&P 500 futures' share grew from 4.7% to 6.2%. When the global pandemic hit in 2020, notional ADVT during Asian trading hours hit a record high, representing about 8% and 14% of the average liquidity around the clock for the S&P 500 and DJIA, respectively.

The notional value traded of the S&P 500 and DJIA during Asian trading hours represented about 6% and 11% of the average liquidity around the clock, respectively.

Exhibit 1: ADVT and Share of Trading during Asian Hours



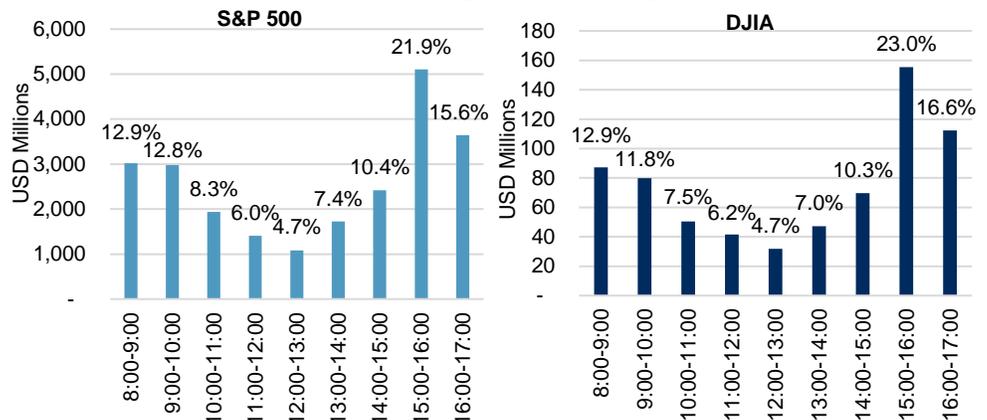
Source: CME. Data from Jan. 1, 2011, to May 31, 2021. S&P 500 futures contracts include E-mini S&P 500 Futures and Micro E-mini S&P 500 traded on CME. DJIA futures contracts include E-mini Dow Futures and Micro E-mini Dow Futures traded on CME. Charts are provided for illustrative purposes.

² The notional daily value traded associated with each futures trade is calculated as the number of contracts traded per day times the futures settlement price per day times the contract size. The volume data covers all venues available for trading including Globex, Open Outcry, and PNT/Clearport.

S&P 500 and DJIA futures trading is widely spread out during Asian trading hours.

S&P 500 and DJIA futures trading is widely spread out during Asian trading hours. Exhibit 2 illustrates the average value traded during the month of May 2021 for each Asian trading hour. Together, the first two hours after the open of the European market (3:00 p.m. Singapore/Hong Kong time) and after the open of Asian markets at 8:00 a.m. attracted about 63% of trades during Asian trading hours, while the remaining five hours made up 37% of trades.

Exhibit 2: Hourly Value Traded during Asian Trading Hours



Together, the first two hours after the open of the European and Asian markets attracted about 63% of trades during Asian trading hours...

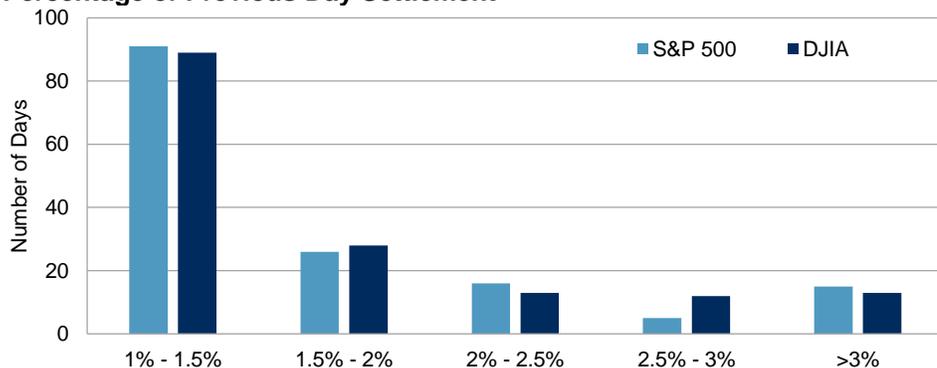
Source: CME. Data from May 1, 2021, to May 31, 2021. S&P 500 futures contract represented by E-mini S&P 500 Futures traded on CME. DJIA futures contract represented by E-mini Dow Futures traded on CME. Charts are provided for illustrative purposes.

About 63 days per year, on average, S&P 500 and DJIA futures maximum price movement in Asian hours exceeded 1% from 2018 to May 2021.

Maximum price movement is another indicator of market activity. Large moves in futures prices allow strategies to be executed in real time. Exhibit 3 shows the distribution of maximum price movement as a percentage of previous day settlement from Jan. 1, 2018, to May 31, 2021. On average, there were about 63 days out of 252 trading days per year when the maximum price movement for S&P 500 and DJIA futures exceeded 1%.

...while the remaining five hours made up 37% of trades.

Exhibit 3: Distribution of S&P 500 and DJIA Maximum Price Movement as a Percentage of Previous Day Settlement

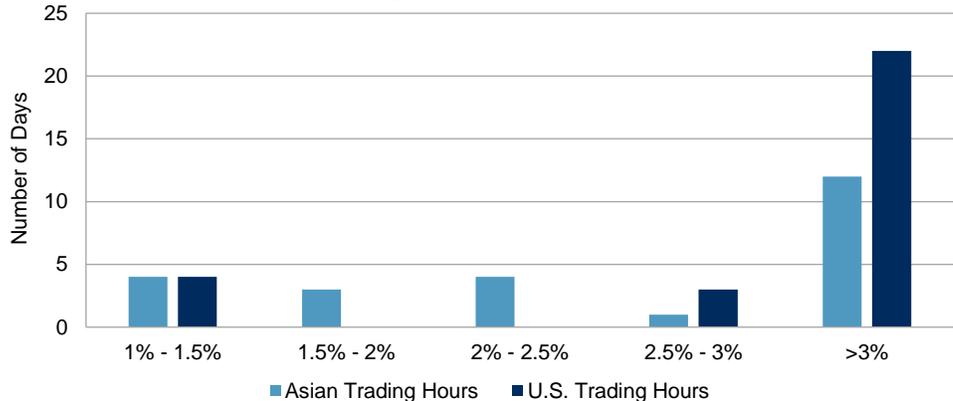


Source: CME. Data from Jan. 1, 2018, to May 31, 2021. S&P 500 futures contract represented by E-mini S&P 500 Futures traded on CME. DJIA futures contract represented by E-mini Dow Futures traded on CME. Chart is provided for illustrative purposes.

Despite U.S. influence on global markets being well documented...

In volatile times, maximum movement during Asian hours could increase significantly. During the COVID-19 sell-off (Feb. 1-March 31, 2020), the maximum movement of S&P 500 futures exceeded 1% 24 times during the 40 trading days, which is comparable to 29 times during U.S. trading hours³ (see Exhibit 4).

Exhibit 4: Distribution of S&P 500 Maximum Movement as a Percentage of Previous Day Settlement during COVID-19 Sell-off



Source: CME. Data from Feb. 1, 2020, to March 31, 2020. S&P 500 futures contract represented by E-mini S&P 500 Futures traded on CME. Chart is provided for illustrative purposes.

...correlation between U.S. and Asian markets may be underestimated when calculated based on local market end-of-day prices, as one market is always behind the other.

CO-MOVEMENTS OF MARKETS

Correlations between U.S. and Asian markets tend to be as high as intraregional correlations in Asia, and they tend to increase during periods of high volatility.

The U.S. influence on global financial markets has been well documented (Kose et al. 2017). However, the use of close-to-close returns underestimates return correlations between the U.S. and Asian markets due to different trading hours (Martens and Poon, 2001). With futures on the S&P 500 and DJIA trading almost 24 hours a day, price discovery on these instruments can instantaneously reflect market information.

Based on Asian end-of-day futures prices, these correlations were meaningfully high, while that was not the case based on each market's local settlement prices.

Exhibit 5 illustrates the correlation from September 2018 to May 2021 between the S&P 500, DJIA, and seven major Asian market benchmarks, based on daily returns of the select futures prices and index levels⁴ in U.S. dollars both at local settlement and Asian end of day (5:00 p.m. Singapore/Hong Kong time).⁵

There are four points to note. First, correlations between U.S. and Asian market benchmarks were meaningfully high—generally above 0.5—based

³ For the purposes of this paper, U.S. trading hours are defined as 9:00 p.m. to 5:00 a.m. HKT.

⁴ E-mini S&P 500 Futures and E-mini Dow Futures listed on CME were used for correlation calculation. Index levels were used for all the Asian market benchmarks.

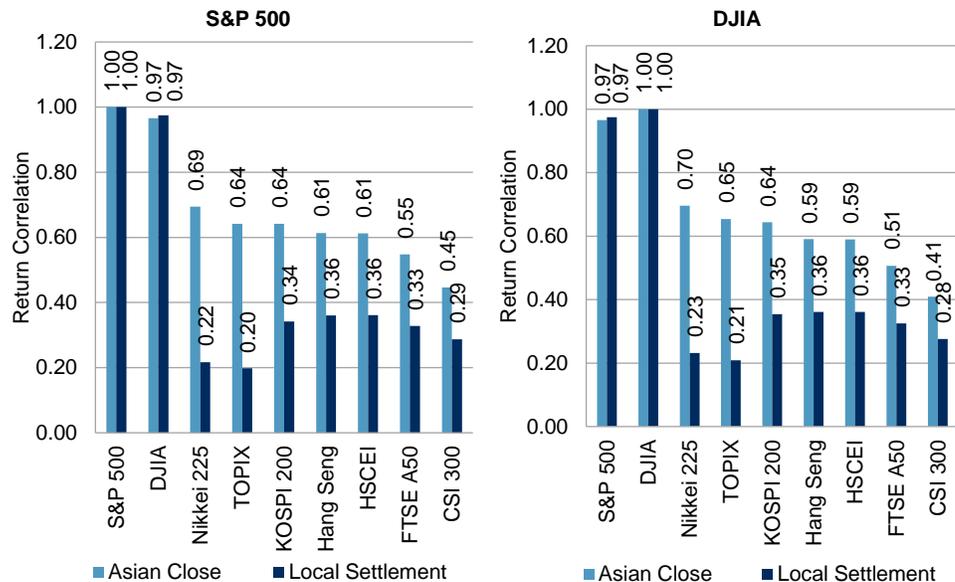
⁵ A one-minute volume-weighted average price (VWAP) from 4:59 p.m. to 5:00 p.m. Singapore/Hong Kong time is used. In some rare cases where one-minute VWAP was not available, the last five-minute or fifteen-minute VWAP leading up to 5:00pm Singapore/Hong Kong time was used.

on Asian end-of-day futures prices, while that was not the case when the calculation was based on each market’s local end-of-day settlement prices.

Second, among the four Asian markets, Japan was most closely correlated to the U.S. market, followed by Korea and Hong Kong; while mainland China was the least, with a below 0.5 average correlation.

Among the Asian markets, Japan was most closely correlated to the U.S., followed by Korea and Hong Kong, while mainland China was the least.

Exhibit 5: Correlation between Select S&P 500 Futures and DJIA Futures and Asian Market Index Futures



Source: CME, FactSet. Data from Sept. 18, 2018, to May 31, 2021. Correlation is calculated based on daily return in USD. Past performance is no guarantee of future results. Charts are provided for illustrative purposes.

Intraregional correlation within Asia and interregional correlation between the U.S. and Asian markets were at about the same level.

Third, compared with the intraregional correlation within Asia, the interregional correlation between the U.S. and Asian markets was at about the same level (see Exhibit 6).

Exhibit 6: Pairwise Correlation Based on Asian End of Day

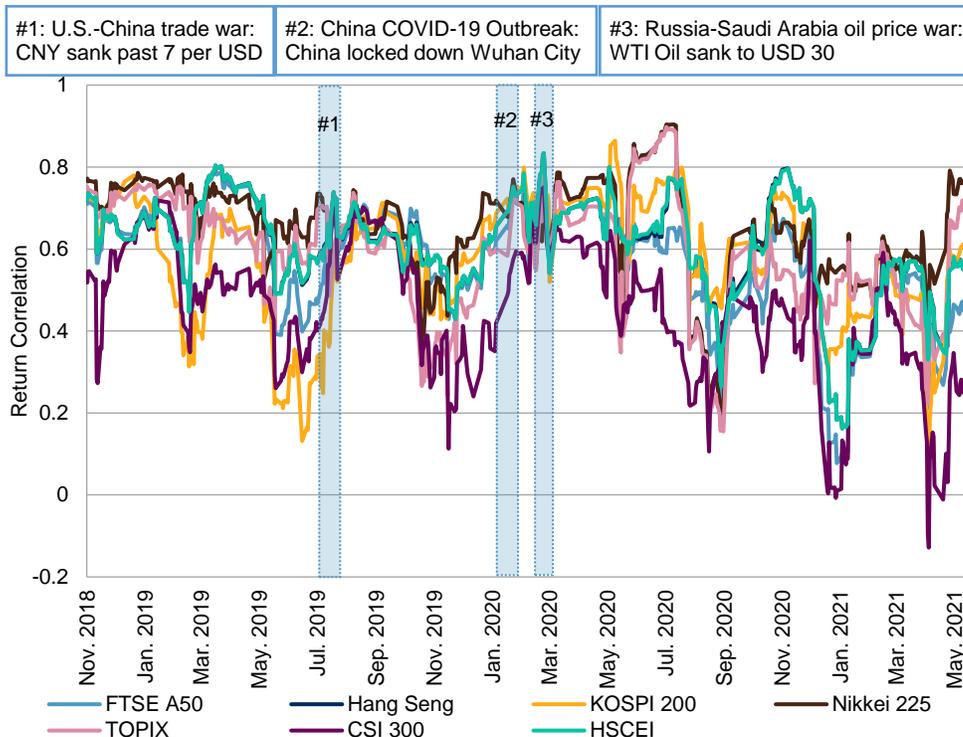
INDEX	S&P 500	DJIA	NIKKEI 225	TOPIX	KOSPI 200	HANG SENG	HSCEI	FTSE CHINA A50	CSI 300
S&P 500	1.00	0.98	0.81	0.77	0.71	0.69	0.68	0.55	0.47
DJIA	0.97	1.00	0.79	0.74	0.71	0.66	0.66	0.52	0.45
NIKKEI 225	0.69	0.79	1.00	0.95	0.75	0.68	0.68	0.56	0.51
TOPIX	0.64	0.74	0.95	1.00	0.65	0.61	0.61	0.51	0.47
KOSPI 200	0.64	0.71	0.75	0.65	1.00	0.79	0.80	0.60	0.54
HANG SENG	0.61	0.66	0.68	0.61	0.79	1.00	0.97	0.77	0.67
HSCEI	0.61	0.66	0.68	0.61	0.80	0.97	1.00	0.82	0.72
FTSE CHINA A50	0.55	0.52	0.56	0.51	0.60	0.77	0.82	1.00	0.89
CSI 300	0.45	0.45	0.51	0.47	0.54	0.67	0.72	0.89	1.00

Source: CME, FactSet. Data from Sept. 18, 2018, to May 31, 2021. Past performance is no guarantee of future results. Table is provided for illustrative purposes.

Correlations between markets tended to increase during periods of high market volatility.

Fourth, correlations between markets tended to increase during periods of high market volatility. In response to three events that happened from September 2018 to May 2021, there was a clear increase in correlation between the S&P 500 and key Asian index futures prices (see Exhibit 7). The recent decrease in correlation was a result of the differing post-pandemic economic situations worldwide.

Exhibit 7: Rolling 30-Day Return Correlation between Select S&P 500 Futures and Asian Market Index Futures



Such changes in correlations imply that the S&P 500 or DJIA can potentially be an instrument for market participants to hedge exposure against major market events.

Source: CME, FactSet. Data from Sept. 18, 2018, to May 31, 2021. Past performance is no guarantee of future results. Chart is provided for illustrative purposes.

The S&P 500, DJIA, Nikkei 225, and TOPIX had the longest trading hour coverage, from 6 a.m. to 5 a.m. Singapore/Hong Kong Time.

Such changes in correlations imply that the S&P 500 or DJIA can potentially be an instrument for market participants to hedge exposure to multiple Asian stock markets against major market events, in and out of Asian time zones.

FLEXIBILITY

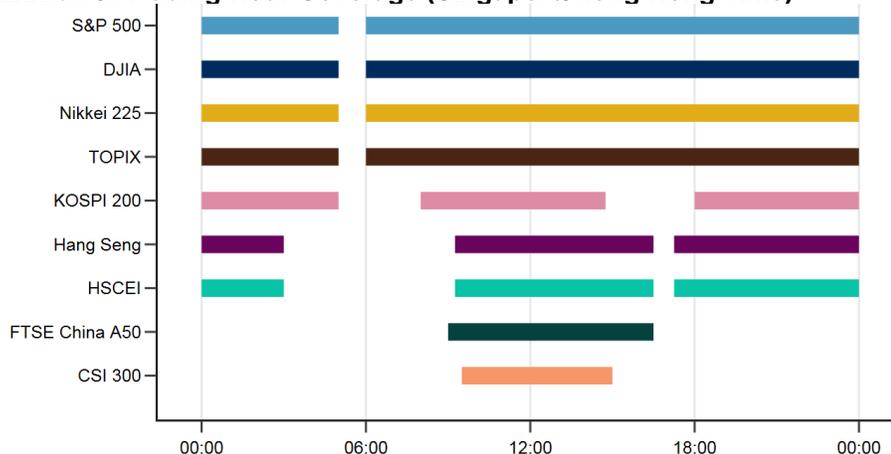
Nearly 24-hour trading and a wide variety of contract sizes allow for precise exposure adjustment at any time.

Among all the indices compared here, the S&P 500, DJIA, Nikkei 225, and TOPIX had the longest trading hour coverage, from 6:00 a.m. to 5:00 a.m. Singapore/Hong Kong Time (see Exhibit 8).

S&P 500 futures offer a wide variety of contract sizes at USD 250, USD 50, and USD 5...

...which could help market participants to precisely scale index exposure up or down.

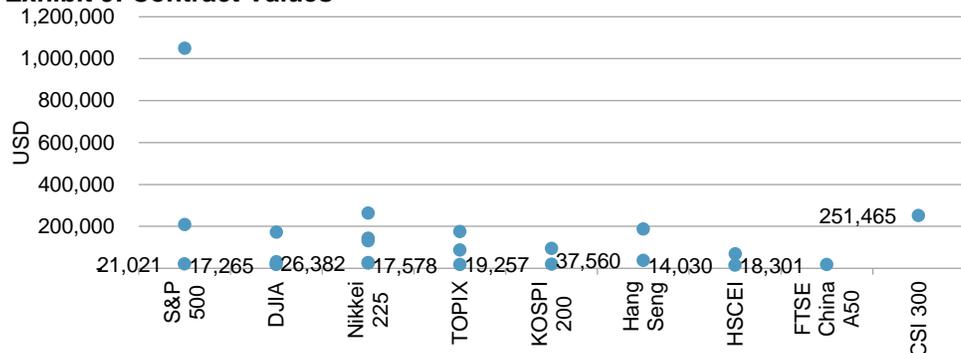
Exhibit 8: Trading Hour Coverage (Singapore/Hong Kong Time)



Source: CME, JPX, KRX, EUREX, HKFE, SGX, CFFEX. In case of index futures traded at multiple exchanges, the union of all trading hours is used. Chart is provided for illustrative purposes.

Exhibit 9 illustrates the distribution of available contract values.⁶ S&P 500 futures offer a wide variety of contract sizes at USD 250,⁷ USD 50, and USD 5, which could help market participants to precisely scale index exposure up or down.

Exhibit 9: Contract Values



Source: CME, JPX, KRX, HKFE, SGX, and CFFEX. Data as of May 31, 2021. Chart is provided for illustrative purposes.

Derivatives linked to the S&P 500 and DJIA form one of the world's most liquid ecosystems...

...covering nearly 24-hour trading, providing a wide variety of contract sizes, and showing deep liquidity during and outside of Asian trading hours.

Derivatives linked to the S&P 500 and DJIA form one of the world's most liquid ecosystems.⁸ It covers trading nearly 24 hours a day, provides a wide variety of contract sizes, and shows deep liquidity during and outside of Asian trading hours.

Notably, when returns were measured in a common time period, futures on U.S. benchmarks had meaningful correlation with Asian benchmarks. Because correlation tends to decline during bull markets and increase during bear markets (Ang and Bekaert, 2002), market participants in Asia can potentially hedge and manage risk effectively using a single liquid U.S. index derivative instrument during bear markets.

⁶ Index equivalent contract value is calculated as contract size times index level as of May 31, 2021.

⁷ S&P 500 Futures (SP) will be delisted following the expiration of the September 2021 contracts on Sept. 17, 2021.

⁸ For more information, see Bennett, C., C. Lazzara, and S. Issifu, "A Window on Index Liquidity," S&P Dow Jones Indices, August 2019.

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