



RESEARCH PAPER

March 2023

HSI Volatility Index - A Useful Tool to Measure Market Volatility

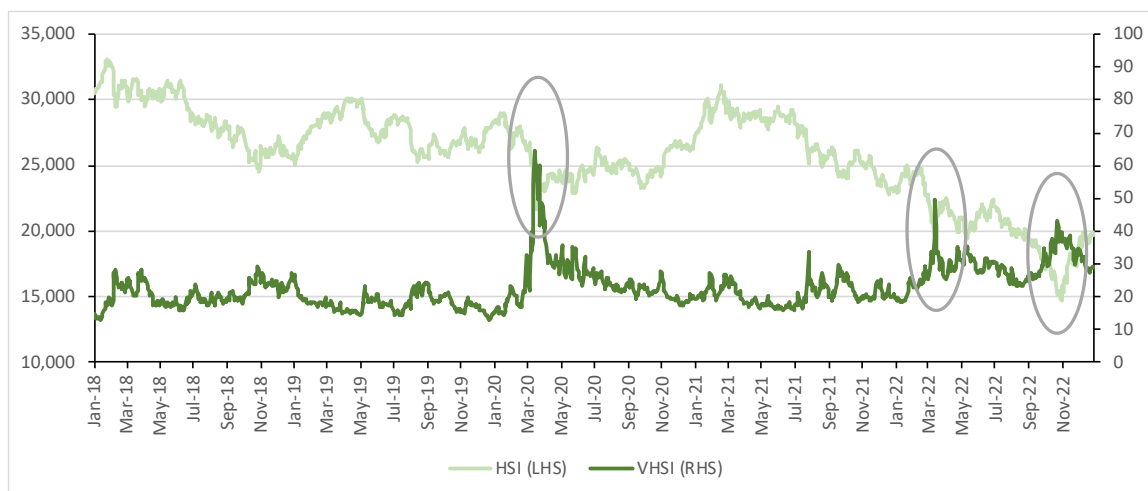
Investors can Hedge and Manage Volatility Exposure

With an objective to measure the 30-calendar-day expected volatility of the Hang Seng Index ('HSI'), the Hang Seng Indexes Company Limited ('Hang Seng Indexes Company') launched the HSI Volatility Index ('VHSI') in 2011. For a given value of HSI, we could translate the VHSI into a magnitude of volatility for the HSI over the next 30-calendar-day period. Conventionally, a higher VHSI value suggests investors are more panic about market outlook while a lower VHSI value suggests investors are less panic about market outlook.

The Hong Kong Exchanges and Clearing Limited ('HKEX') has launched the HSI Volatility Index Futures in 2012. Investors can make use of such derivative product to hedge and manage volatility exposure. Such derivative product could attract interest from investors and complement the existing options related investment products both in exchange traded and OTC markets.

We believe a sharp uptick of VHSI is a good indication that the HSI will head into a sharp decline soon.

Exhibit 1: HSI Volatility Index ('VHSI') over the most recent 5 years (2018-now)



Source: Hang Seng Indexes Company.

Date: 30 December 2022



Table of Contents

Table of Contents	2
Executive Summary.....	3
Volatility Index Launched to Measure Expected Volatility	5
Investors are Looking for Indicators of Market Volatility	6
Methodology for Computation of HSI Volatility Index	10
How to Interpret the Values of the HSI Volatility Index and the HSCEI Volatility Index	11



Executive Summary

VHSI and VHSCEI can be used to measure expected volatility of respective indexes

Back then, Hang Seng Indexes Company launched the VHSI with the objective to measure the 30-calendar-day expected volatility of the HSI. Similarly, Hang Seng Indexes Company launched the HSCEI Volatility Index ('VHSCEI') to measure the 30-calendar-day expected volatility of the Hang Seng China Enterprises Index ('HSCEI'). Both the VHSI and VHSCEI are calculated based on the Chicago Board of Options Exchange's Volatility Index (VIX) methodology.

Volatility Index Futures available for investors to hedge and manage volatility exposure

Since early 2012, the HSI Volatility Index Futures contracts have been made available on HKEX. Investors can make use of such derivative product to hedge and manage volatility exposure. Such derivative product could attract interest from investors and complement the existing options related investment products both in exchange traded and OTC markets. As the HSI is widely followed by investors around the globe, we believe the HSI Volatility Index Futures provides a useful investment tool for investors.

How VHSI can help investors to position themselves for market volatility?

For investors, they often look for informative indicators of market volatility. Ideally, investors would like the indicators suggesting when the market will peak. In that case, investors could take profits by selling their investments beforehand. On the other hand, investors would like the indicators suggesting when the market will bottom out. In that case, investors could start buying stocks ahead of market rally.

VHSI is derived from the HSI option prices traded on HKEX

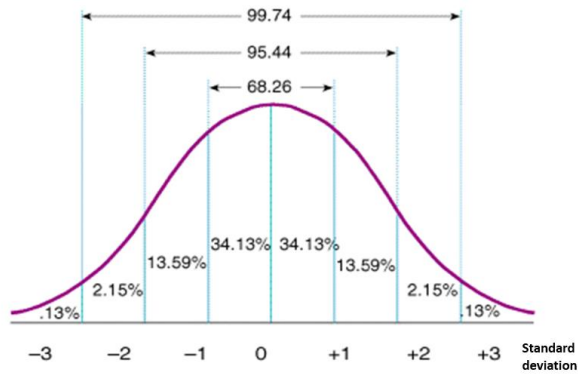
As the VHSI is derived from the HSI option prices (call options, put options) traded on HKEX, a pickup in the values of VHSI is a reflection of investors' raised concern with market volatility potentially ahead. Historically, we have seen multiple occasions in which the VHSI spiked up ahead of market volatility.

How to interpret values of VHSI and utilize information to make investment decisions

Based on normal distribution, there is 68% that data points will fall within one standard deviation of the average value (for entire set of data points). If HSI is 20,000pts and VHSI is "20", then VHSI suggests over the next 30 days, HSI is likely to trade one standard deviation or 5.77% ($= (20/100) \div \sqrt{12}$) above/below 20,000 pts, i.e., $\pm 1,155$ pts with 68% probability. Investors could make use of such information to position themselves ahead of market volatility. (More thorough explanation for the computations involving VHSI can be found in later section of this report.)



Exhibit 2: Normal distribution with corresponding probability



Source: Hang Seng Indexes Company.
Date: 28 March 2023



Volatility Index Launched to Measure Expected Volatility

Back in February 2011, Hang Seng Indexes Company launched the VHSI with the objective to measure the 30-calendar-day expected volatility of the HSI implicit in the prices of near-term and next-term Hang Seng Index Options which are currently traded on HKEX's derivatives market.

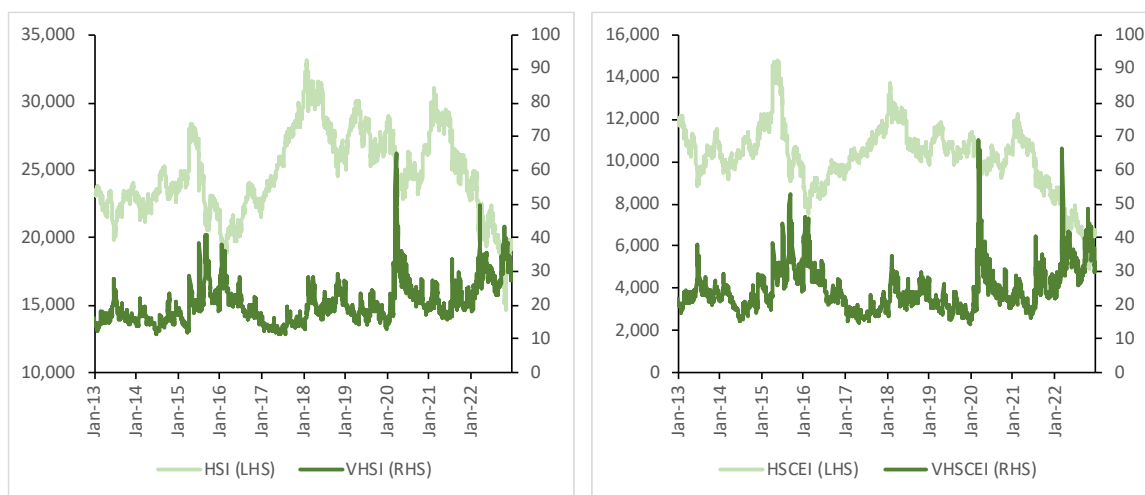
Since early 2012, the HSI Volatility Index Futures contracts have been made available on HKEX. With the launch of this derivative product, investors can use it for: (1) investment purpose, as investors may think the HSI is going to move up or move down; (2) arbitrage purpose, as investors may be holding other investment products which form the underlying bullish or bearish view of the investors.

After the successful launch of the VHSI, in December 2018, Hang Seng Indexes Company launched the VHSCEI to measure the 30-calendar-day expected volatility of the HSCEI.

The index methodology follows the Chicago Board Options Exchange's Volatility Index (VIX) in the US market. However, modifications are being made to take into account of the trading characteristic of Hang Seng Index Options.

Based on our observation, there seems to be a negative relationship between the returns of the HSI and the HSCEI with their expected volatility indexes, the VHSI and the VHSCEI respectively.

Exhibit 3: The HSI vs. VHSI and the HSCEI vs. VHSCEI



Source: Hang Seng Indexes Company.

Date: 30 December 2022

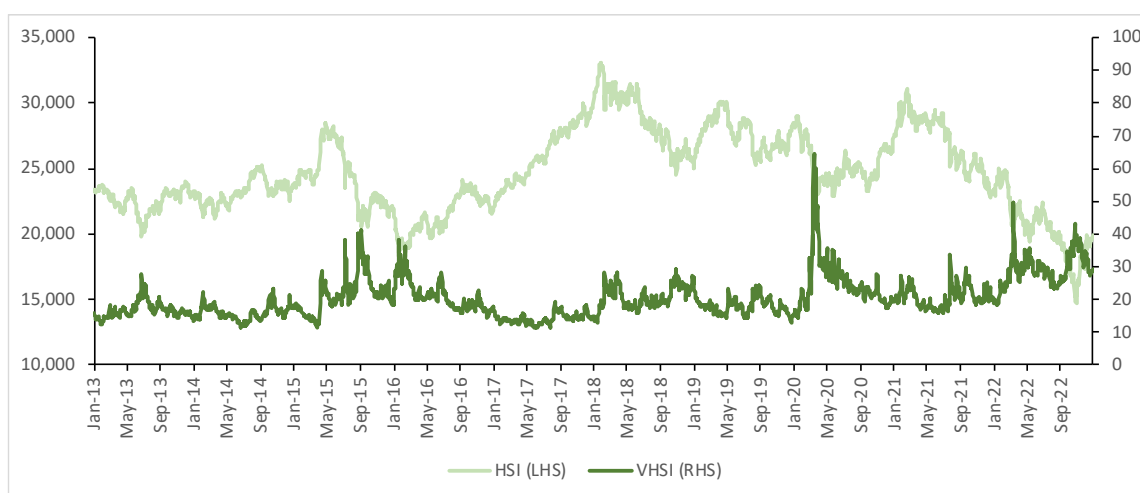


Investors are Looking for Indicators of Market Volatility

For investors, they often look for informative indicators of market volatility. Ideally, investors would like the indicators suggesting when the market will peak. In that case, investors could take profits by selling their investments beforehand. On the other hand, investors would like the indicators suggesting when the market will bottom out. In that case, investors could start buying stocks ahead of market rally.

In Exhibit 4, the light green colored line represents the historical performance of the HSI. The dark green colored line represents the historical index value of the VHSI. In this exhibit, when the dark green colored line (VHSI) starts to rise, investors know it is time to be “risk-off.” In the opposite case, when the dark green colored line starts to decline, investors know it is time to be “risk-on.”

Exhibit 4: HSI and HSI Volatility Index



Source: Hang Seng Indexes Company.

Date: 30 December 2022

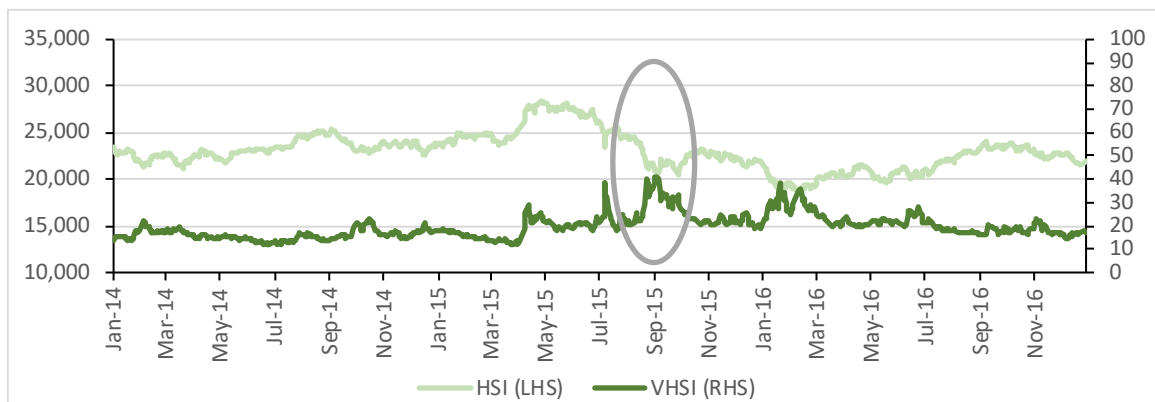
As we examine Exhibit 4, assume investors follow the abovementioned strategy (i.e., using VHSI as an indicator to decide on timing of trading), investors could have avoided several sharp market corrections and capitalized upon a number of notable market upticks.



Here is a sample list of significant market events which we witness the VHSI moved up sharply within a short period of time:

- In August 2015, with a surprise devaluation of the Renminbi, VHSI began to move up steadily from the low 20s' level. By late August, the HSI has fallen by 11% when compared to early August.

Exhibit 5: VHSI shot up as the market was surprised by the sudden devaluation of CNY

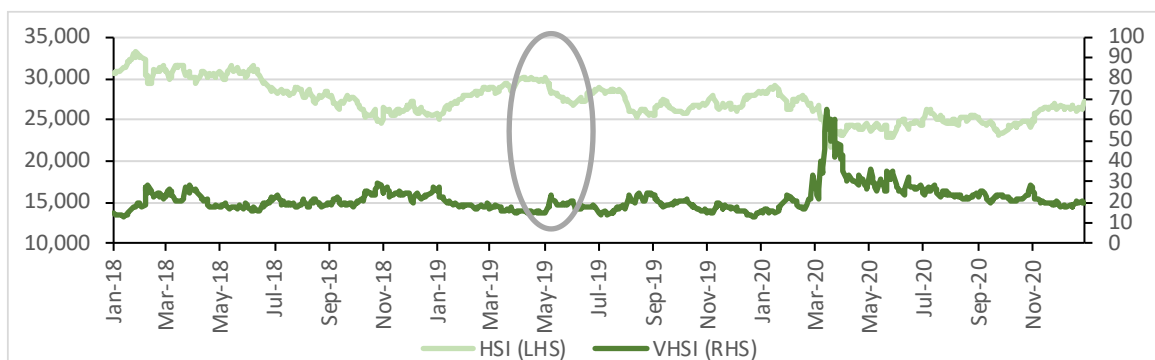


Source: Hang Seng Indexes Company.

Date: 30 December 2022

- In early May 2019, the US government announced that it would proceed to raise tariffs from 10% to 25% upon USD200 billion Chinese goods. In early May, VHSI began to move up from low 10s' level. By early June, the HSI has fallen by about 10% when compared to early June.

Exhibit 6: VHSI shot up as the US government proposed to raise tariffs upon Chinese goods



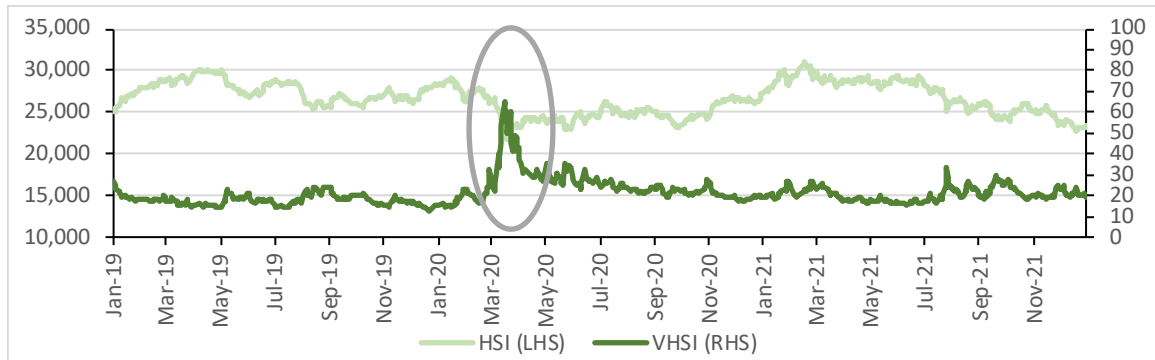
Source: Hang Seng Indexes Company.

Date: 30 December 2022



- In March 2020, the COVID-19 began to spread throughout the world. In late February, VHSI moved up from high 20s' level. By mid-March, the HSI has fallen by close to 20%.

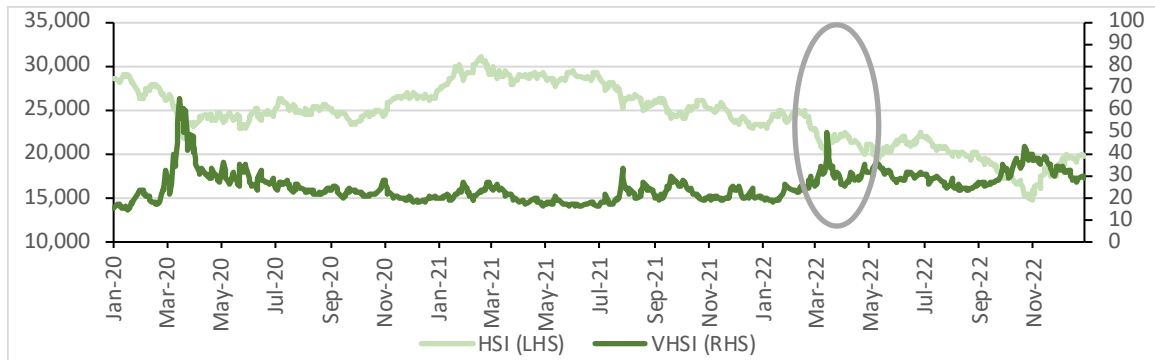
Exhibit 7: The VHSI moved up as the world was surprised by the quick spread of COVID-19



Source: Hang Seng Indexes Company.
Date: 30 December 2022

- In March 2022, the political tension between Russia and Ukraine escalated to higher level. In early February, VHSI began to move up from the low 20s' level. By mid-March, the HSI has fallen by close to 20% when compared to early March.

Exhibit 8: VHSI shot up as the political tension between Russia and Ukraine escalated

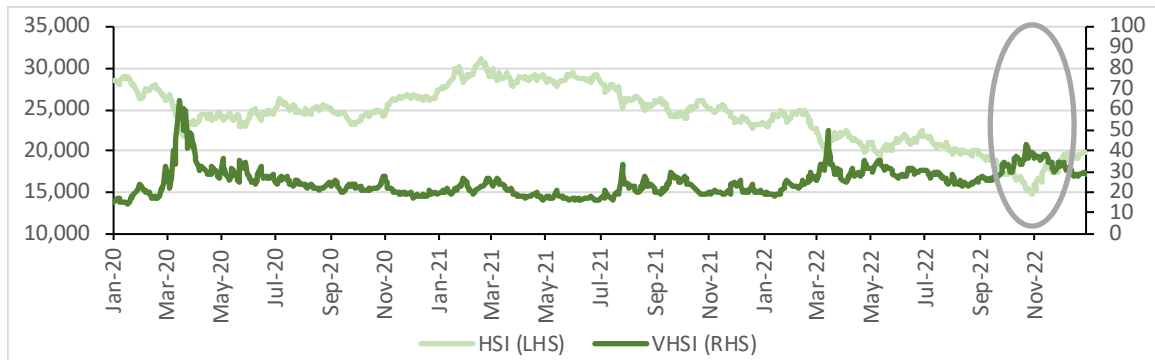


Source: Hang Seng Indexes Company.
Date: 30 December 2022



- In October 2022, the number of COVID-19 infections within China moved from hundreds of cases in early October to thousands of cases in mid-October. In September, VHSI began to move up from the mid-20s' level. By mid-October, the HSI has fallen by more than 10% within one month.

Exhibit 9: The VHSI shot up as the number of COVID-19 infections jumped within China

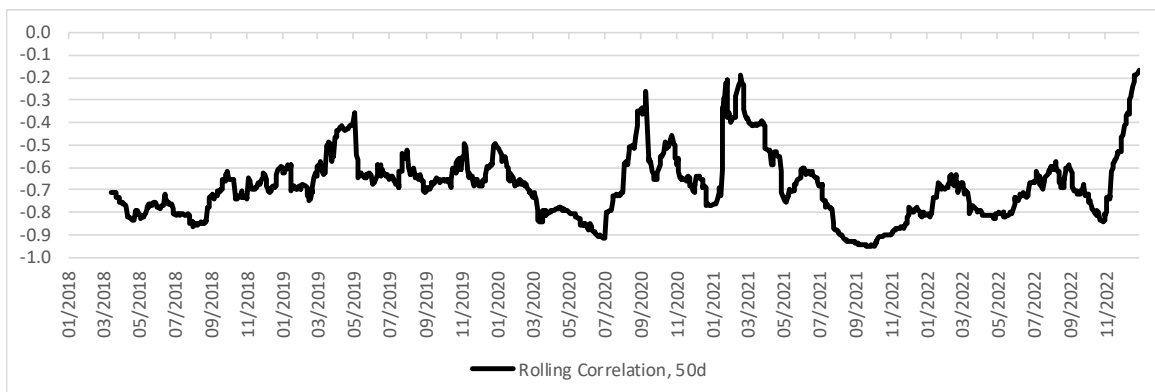


Source: Hang Seng Indexes Company.

Date: 30 December 2022

Also, we look into the rolling correlation between the HSI daily return against the VHSI daily change. Exhibit 10 below calculates the 50-day rolling correlation, which was in the negative zone, being -0.68 on average during the period. In general, the HSI and the VHSI move in opposite direction.

Exhibit 10: Rolling Correlation between the HSI and the VHSI



Source: Hang Seng Indexes Company.

Date: 30 December 2022



Methodology for Computation of HSI Volatility Index

The VHSI measures the 30-calendar-day expected volatility of the HSI. The expected volatility calculated is derived from the HSI option prices traded on HKEX.

The methodology of the VHSI is based on the Chicago Board Options Exchange's Volatility Index (VIX) in the US market. Modifications have been made to account for trading characteristics of the HSI options in Hong Kong.

The VHSI is derived from HSI put options and HSI call options in the two nearest-term expiration months in order to bracket a 30-calendar-day period. Similarly, VHSCEI is derived using the same methodology using HSCEI options.

In order to minimize pricing anomalies of expiring options, options are rolled from the 1st and 2nd contract months to the 2nd and 3rd contract months on the 3rd trading day prior to the expiration of the near-term options.

Exhibit 11: Calculation of the VHSI

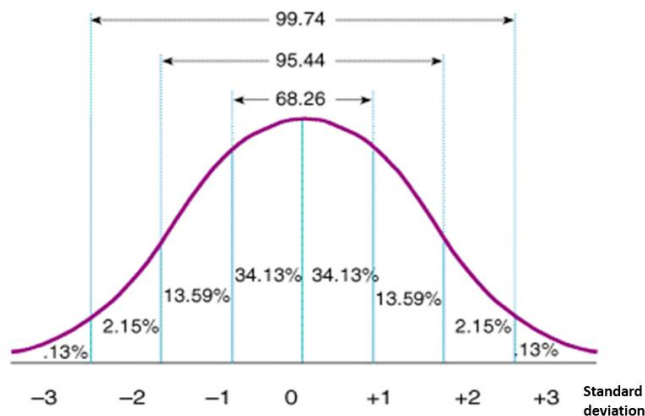


Source: Hang Seng Indexes Company
Date: 28 March 2023



How to Interpret the Values of the HSI Volatility Index and the HSCEI Volatility Index

Exhibit 12: Normal distribution with corresponding probability



Source: Hang Seng Indexes Company.
Date: 28 March 2023

Statistically, the value of the VHSI and VHSCEI suggests the expected volatility range of the HSI and HSCEI in the coming 30 days. For our computation purpose, one standard deviation is equal to $VHSI \div \sqrt{12}$. As an illustrative example, say the HSI is currently at 20,000pts and VHSI is 20. Given one standard deviation is $VHSI \div \sqrt{12}$, based on VHSI is at 20, that implies one standard deviation is equivalent to 5.8% (equals $20\% \div \sqrt{12}$). If VHSI is at 30 instead, that would imply one standard deviation is equivalent to 8.7% (equals $30\% \div \sqrt{12}$). Since we pick HSI at 20,000pts for our illustrative example, according to statistics, there is 68% probability that the HSI would trade within \pm one standard deviation of 20,000pts. One standard deviation (5.8% when VHSI at 20) of 20,000pts is equivalent to 1,155pts. See below table for more details. In other words, VHSI suggests over the next 30 days, the HSI is likely trade within 20,000pts \pm 1,155pts. Investors could make use of such information to position themselves.



Exhibit 13: Calculation of index points volatility based on different values of VHSI and HSI closing value (values within boxed area indicates \pm range)

VHSI	Within 1 SD	HSI = 16,000 Index pts	HSI = 18,000 Index pts	HSI = 20,000 Index pts	HSI = 22,000 Index pts	HSI = 24,000 Index pts
15	4.3%	693	779	866	953	1,039
20	5.8%	924	1,039	1,155	1,270	1,386
25	7.2%	1,155	1,299	1,443	1,588	1,732
30	8.7%	1,386	1,559	1,732	1,905	2,078
35	10.1%	1,617	1,819	2,021	2,223	2,425
40	11.5%	1,848	2,078	2,309	2,540	2,771
45	13.0%	2,078	2,338	2,598	2,858	3,118
50	14.4%	2,309	2,598	2,887	3,175	3,464

Source: Hang Seng Indexes Company.
Date: 30 December 2022

In the following exhibit, we perform a similar computation by assuming different values of the HSCEI and different values of VHSCEI. For example, if current value of HSCEI is 7,000 and VHSCEI is 30, that would imply over the next 30 days, there is a 68% chance that the HSCEI will trade within \pm one standard deviation of 7,000pts. One standard deviation (8.7% (equals $30\% \div \sqrt{12}$) when VHSCEI at 30) of 7,000pts is equivalent to 606pts. In other words, VHSCEI suggests over the next 30 days, the HSCEI is likely to trade within 7,000pts \pm 606pts.

Exhibit 14: Calculation of index points volatility based on different values of the VHSCEI and the HSCEI closing value (values within boxed area indicates \pm range)

VHSCEI	Within 1 SD	HSCEI = 5,000 Index pts	HSCEI = 6,000 Index pts	HSCEI = 7,000 Index pts	HSCEI = 8,000 Index pts	HSCEI = 9,000 Index pts
15	4.3%	217	260	303	346	390
20	5.8%	289	346	404	462	520
25	7.2%	361	433	505	577	650
30	8.7%	433	520	606	693	779
35	10.1%	505	606	707	808	909
40	11.5%	577	693	808	924	1,039
45	13.0%	650	779	909	1,039	1,169
50	14.4%	722	866	1,010	1,155	1,299

Source: Hang Seng Indexes Company.
Date: 28 March 2023



Disclaimer

All information contained herein is for reference only. Hang Seng Indexes Company Limited ("HSIL") ensures the accuracy and reliability of the information contained herein to the best of its endeavours. However, HSIL makes no warranty or representation as to the accuracy, completeness or reliability of any of the information contained herein and accepts no liability (whether in tort or contract or otherwise) whatsoever to any person for any damage or loss of any nature arising from or as a result of reliance on any of the contents of this document, or any errors or omissions in its contents and such contents may change from time to time without notice.

HSI Volatility Index (the "Index") is published by HSIL, which has contracted with S&P Opco, LLC ("S&P") to maintain and calculate the Index. "Standard & Poor's" and "S&P" are trademarks of S&P and have been licensed for use by HSIL. "VIX®" is a trademark of Cboe Global Markets, Inc ("CBOE") and S&P has granted a license to HSIL, with permission from CBOE, to use such mark for purposes relating to the Index. The Index is not owned, sponsored, endorsed or promoted by S&P or CBOE and neither S&P nor CBOE makes any representation regarding the advisability of investing in products that are based on such Index or otherwise relying on such Index for any purpose and neither S&P, CBOE nor HSIL shall have any liability for any errors or omissions in the Index or any values thereof.

All information contained herein does not constitute any express or implied advice or recommendation by HSIL for any investments. Investment involves risks. Prospective investors should seek independent investment advice to ensure that any of their decisions is made with regard to their own investment objectives, financial circumstances and other particular needs. Prospective investors should also note that value of securities and investments can go down as well as up and past performance is not necessarily indicative of future performance.

© Hang Seng Indexes Company Limited 2023. All rights reserved.