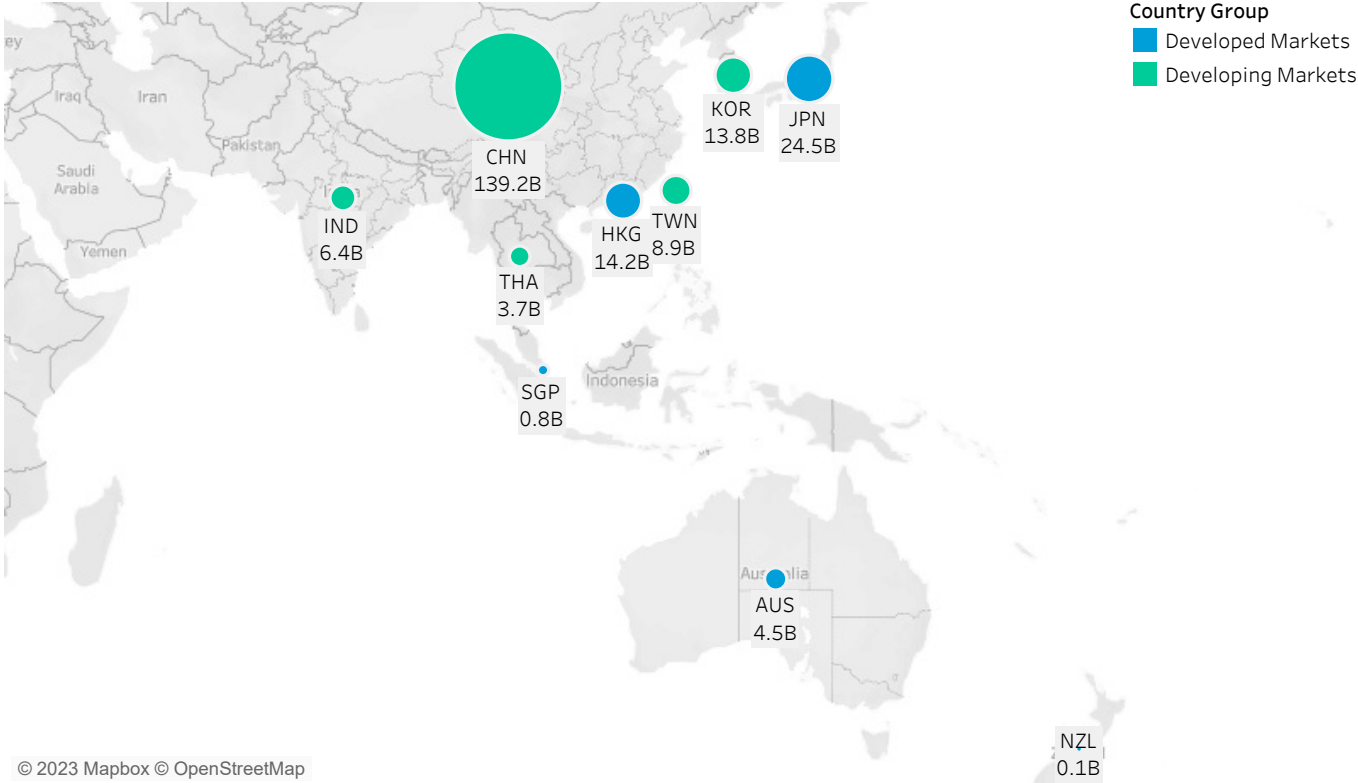


February 2023 APAC Market Structure Monthly

Average Daily Turnover (Notional USD)



© 2023 Mapbox © OpenStreetMap

Country Breakdowns

Hong Kong

China

Japan

Australia

South Korea

Taiwan

India

Thailand

New Zealand

Singapore

Feb 2023

AP Market Structure Monthly

MICROSTRUCTURE OBSERVATIONS

- 6 out of 10 countries in our APAC equities universe saw higher average daily value traded (ADT) month-over-month (MoM).
- ADT in Australia and South Korea saw +23% and +28% increase, contrasted by a -18% and -12% decrease in Hong Kong and Thailand respectively.
- Intraday spreads and volatility remained at similar levels MoM.

AP MARKET STRUCTURE NEWS

Cboe Australia Announced the Migration to the New Cboe Technology Platform and the Launch of Cboe BIDS Australia to be on 27 March 2023

Cboe Australia announced that it has completed the internal milestones for the migration of its trading platform. Following consultation with participants and vendors, Cboe Australia has revised the Cboe Tech go-live date (with the launch of Cboe BIDS Australia) to Monday 27 March 2023. This date will be supported by additional weekend testing opportunities on Saturday 25 February and Saturday 11 March, with a migration cutover on Saturday 25 March 2023.

<https://cxa.cboe.com/> (CXA Migration Timeline)

<https://www.cboe.com.au/wp-content/uploads/2023/02/Market-Operations-Notice-0004-23.pdf>

Hong Kong and Mainland China Exchanges Enhanced Stock Connect Trading Calendar

On 24 February 2023, Hong Kong Exchange and Clearing Limited (HKEX) and Mainland China stock exchanges issued press releases to announce the launch of trading calendar enhancement for Stock Connect to take effect on Monday, 24 April 2023.

Currently, Stock Connect Northbound is not available on the trading day before a Hong Kong public holiday (H-1) because banking services are not available in the Hong Kong market on public holidays. After the enhancement, Northbound trading under Stock Connect will be available on all trading days that are mutual to the Hong Kong and Mainland China markets. Similar adjustments will also be made to the Southbound arrangements of Stock Connect. After the enhancement, there will be 3 additional Northbound trading days and 6 additional Southbound trading days in 2023.

https://www.hkex.com.hk/News/News-Release/2023/2302243news?sc_lang=en

<http://english.sse.com.cn/news/newsrelease/c/5717102.shtml>

http://www.szse.cn/English/about/news/szse/t20230301_599023.html

Hong Kong Exchange and Clearing Limited Organizes Practice Sessions in Preparation for Hong Kong Investor Identification Regime Go-Live on 20 March 2023

On 10 February 2023, HKEX announced that a practice session will be organized on 25 February 2023 (Saturday) for Exchange Participants (EPs) to test their Broker-to-Client Assigned Number (BCAN) tagging

setup, in preparation for the 20 March 2023 (Monday) go-live of Hong Kong Investor Identification Regime (HKIDR).

<https://www.hkex.com.hk/-/media/HKEX-Market/Services/Trading/Securities/Overview/Trading-Mechanism/HKIDR/CT02223E.pdf>

China Stock Exchanges Announced the Full Implementation of Stock Issuance Registration System

On 17 February 2023, Shanghai Stock Exchange (SSE) released 26 business rules, guidelines and business handbooks supporting the full implementation of the stock issuance registration system "in accordance with the unified deployment of the China Securities Regulatory Commission (CSRC)". On the same day, Shenzhen Stock Exchange (SZSE) announced 30 supporting business rules and guidelines for the implementation of the across-the-board registration-based IPO system. According to SZSE, the registration-based IPO system (the "System") is a major reform concerning the overall capital market. The introduction and implementation of the rules for the System marks the basic finalization of the institutional arrangement for the System and the extension of the System to the whole A-share market and all public stock offerings.

<http://english.sse.com.cn/news/newsrelease/c/5716488.shtml>

http://www.szse.cn/English/about/news/szse/t20230221_598862.html

Japan Exchange Group Published Results of Survey on Exchange Traded Fund Usage by Individual Investors

The Tokyo Stock Exchange, Inc. (TSE), in cooperation with securities firms, conducted a survey of individual investors on Exchange Traded Fund (ETF) Usage. According to TSE, ETF usage by individual investors continues to grow. The Net Asset Under Management (AUM) of TSE-listed ETFs grew to 10 Trillion Yen (US\$73.5 Billion) by 2022, 1.3 Trillion Yen (US\$9.6 Billion) of which are held by individual investors. The number of holders (number of beneficiaries) has exceeded 1.17 million and is continuously increasing, especially in ETFs for foreign equities, Japanese equities, REITs, etc.

<https://www.jpx.co.jp/english/corporate/news/news-releases/0060/20230216-01.html>

https://www.jpx.co.jp/english/corporate/news/news-releases/0060/dreu25000000112k-att/press2_20230216-01e.pdf

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APAC +852.2846.3592 | **CAN** +1.416.874.0800 | **EMEA** +44.20.7670.4066 | **US** +1.646.682.6199

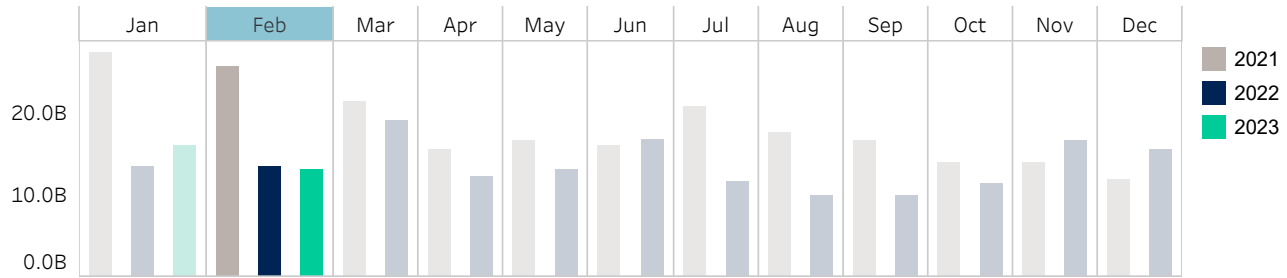
info@virtu.com | www.virtu.com

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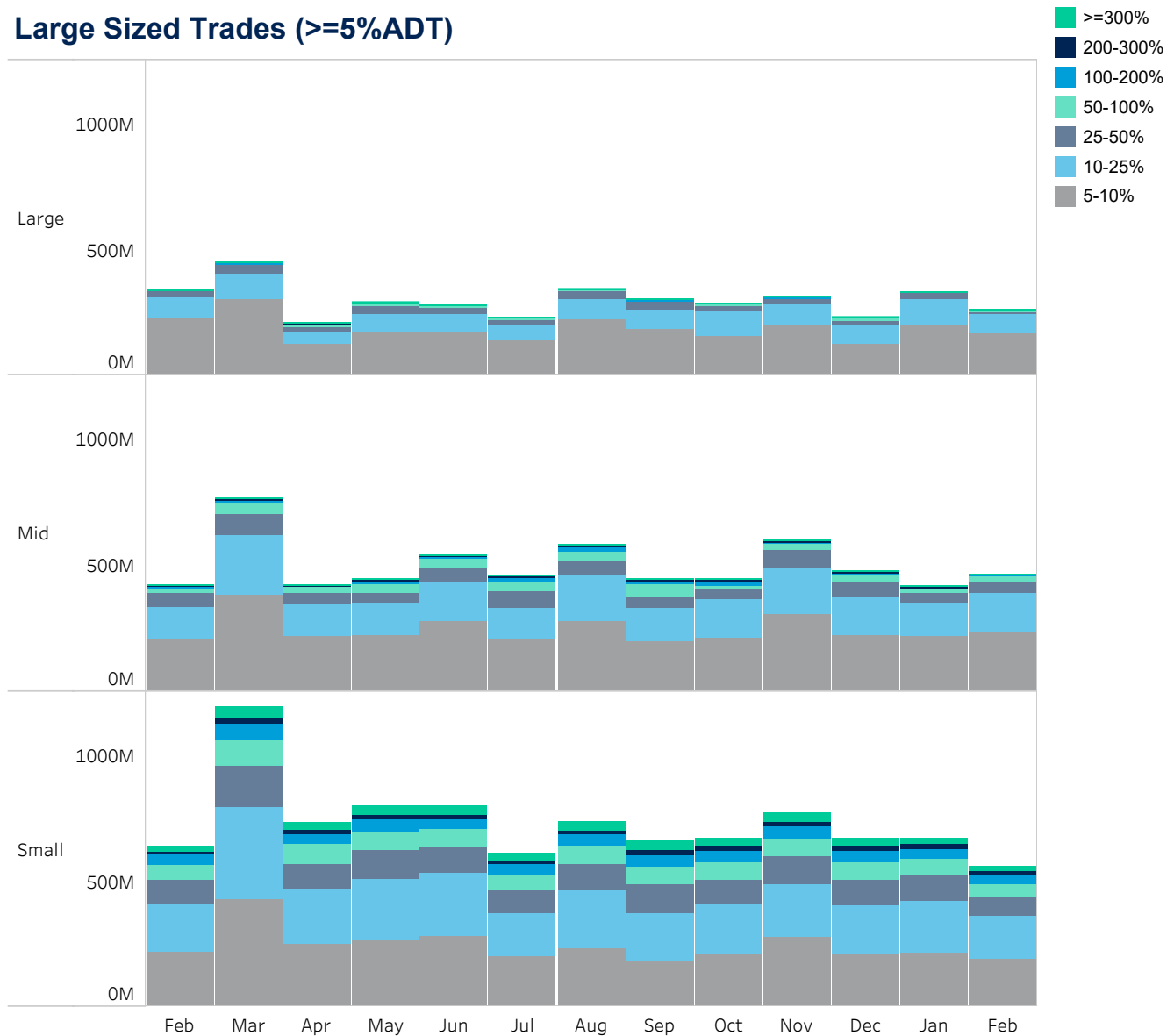
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Hong Kong

Average Daily Turnover (Notional USD)



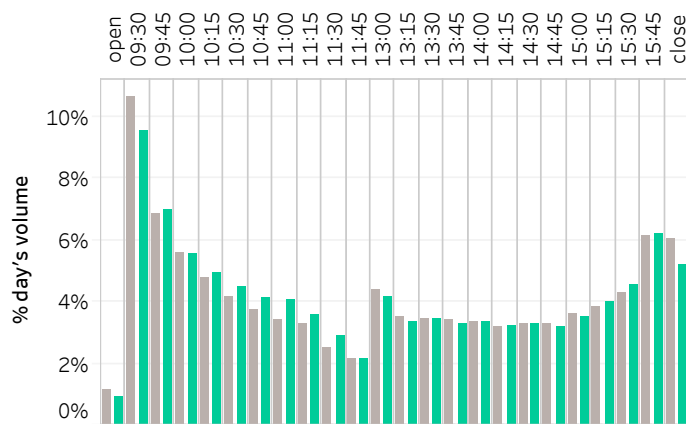
Large Sized Trades (>=5%ADT)



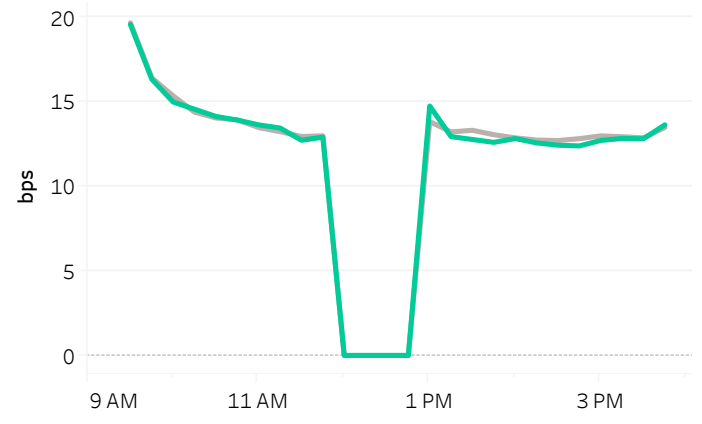
Source data: Virtu Financial

Hong Kong

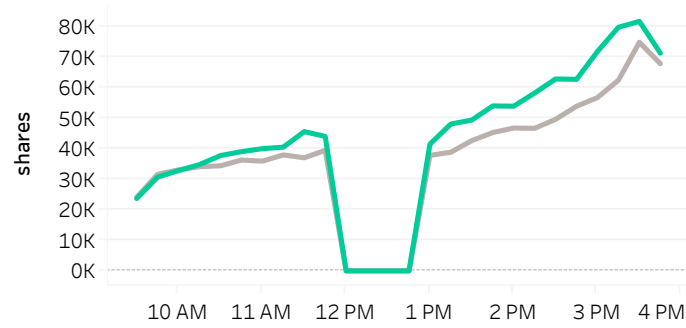
Volume Curve



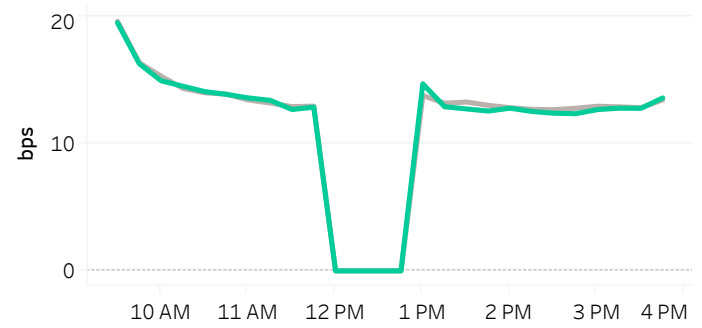
Intraday Spread (bps)



Intraday Quotesize (Shares)



Intraday Volatility (bps)



Rolling 12 Months Avg February 2023

Spread Bps

	2022						2023	
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
FirstHalfHour	17.5	17.3	18.3	19.2	20.4	19.7	18.3	18.0
MidDay	12.3	12.4	13.1	14.0	14.6	14.0	13.1	12.8
LastHalfHour	12.3	12.4	13.3	13.7	14.0	14.0	13.0	13.2

One Minute Volatility Bps

FirstHalfHour	25.4	25.5	25.9	30.5	33.8	29.1	26.4	25.3
MidDay	15.6	14.3	15.1	18.5	20.1	18.3	17.0	15.9
LastHalfHour	15.0	14.6	15.7	18.0	19.1	18.6	16.5	16.7

Quotesize (shares)

FirstHalfHour	25,729	24,854	26,974	27,135	28,857	29,077	29,622	27,296
MidDay	38,254	36,313	45,633	39,201	38,664	40,980	46,105	44,622
LastHalfHour	69,882	68,441	79,907	71,053	67,304	66,542	78,406	74,936

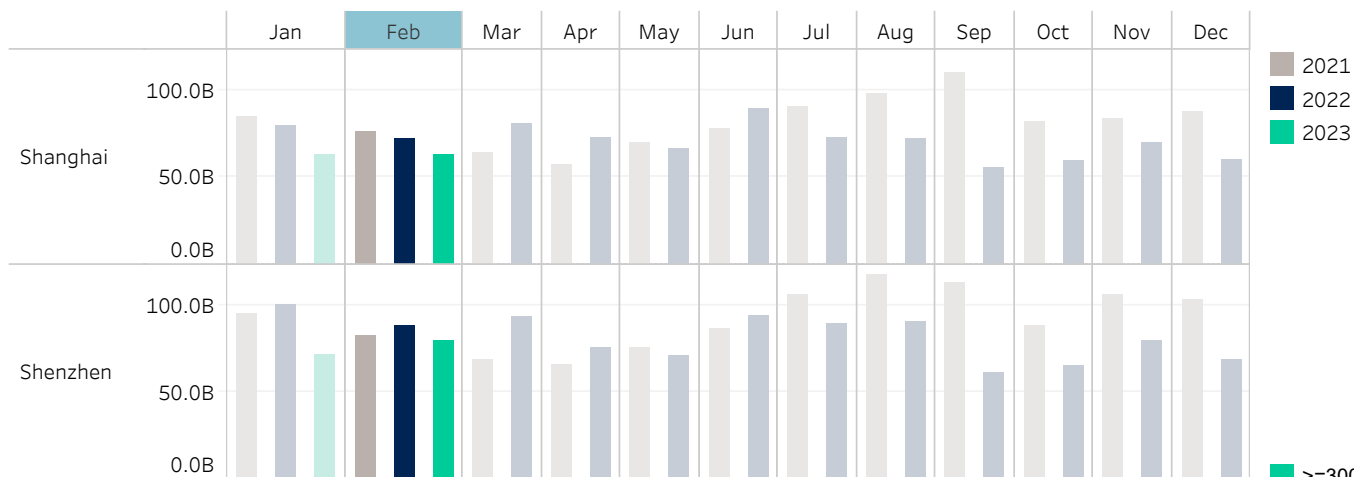
Median used for all metrics

One minute volatility is calculated using the difference between the high and low price within a one minute time bin, divided by that bin's VWAP

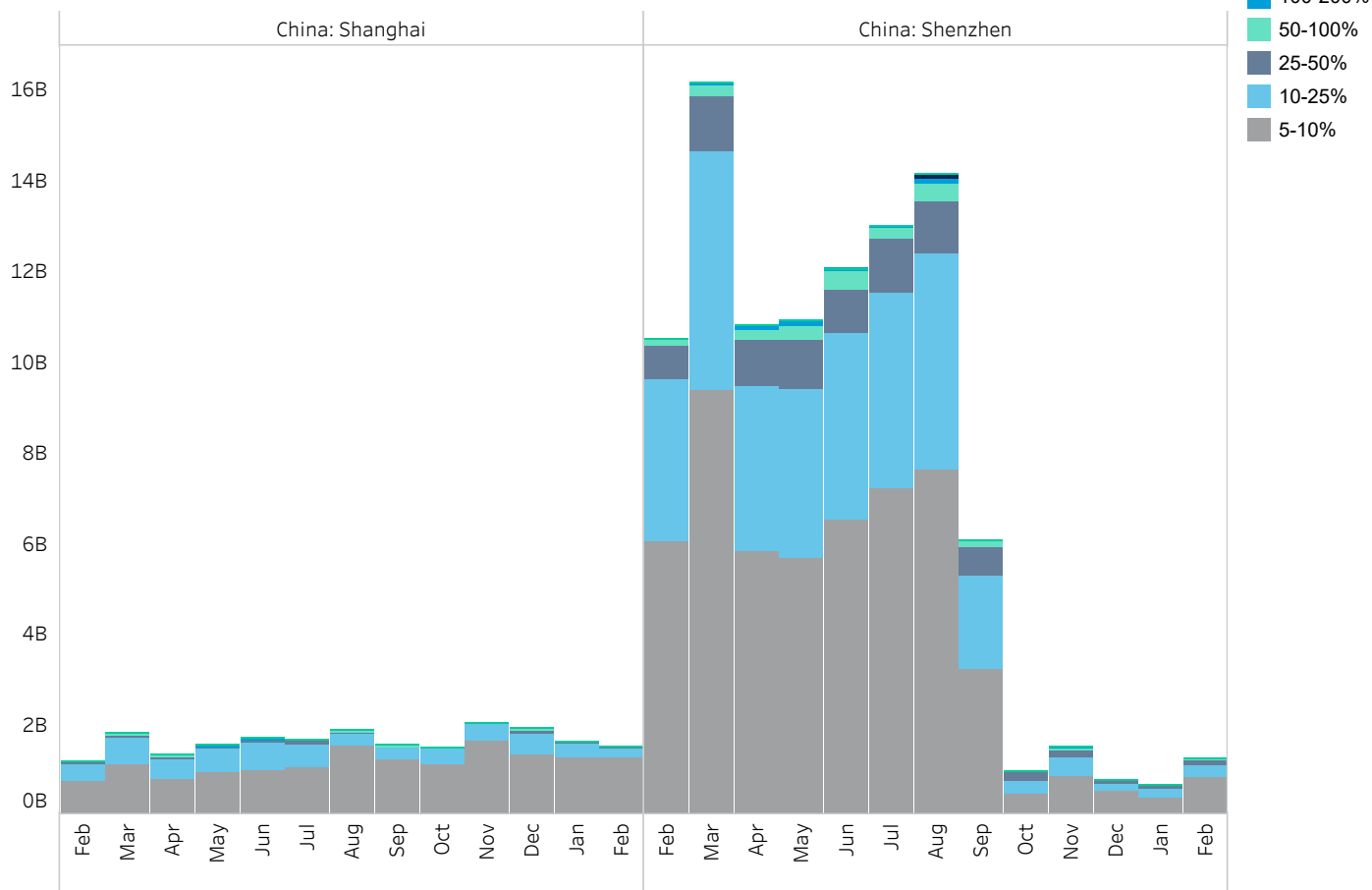
Source data: Virtu Financial

China

Average Daily Turnover (Notional USD)



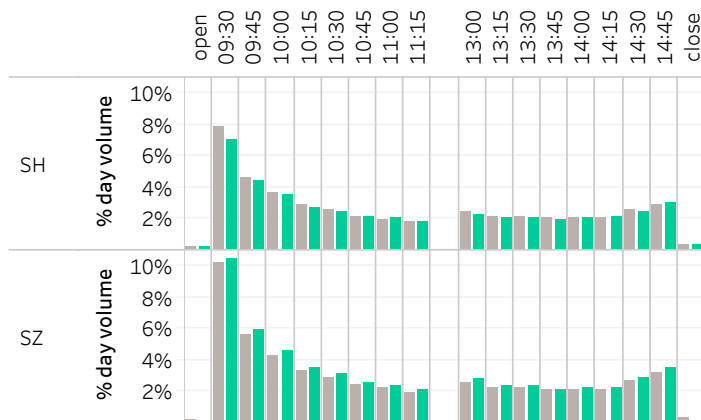
Large Sized Trades (>=5%ADT)



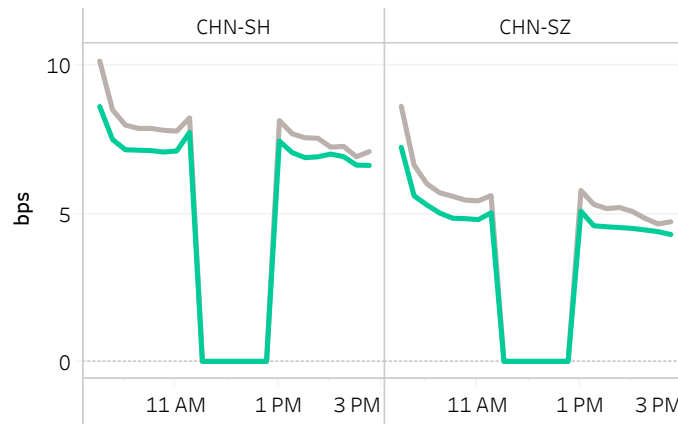
Source data: Virtu Financial

China

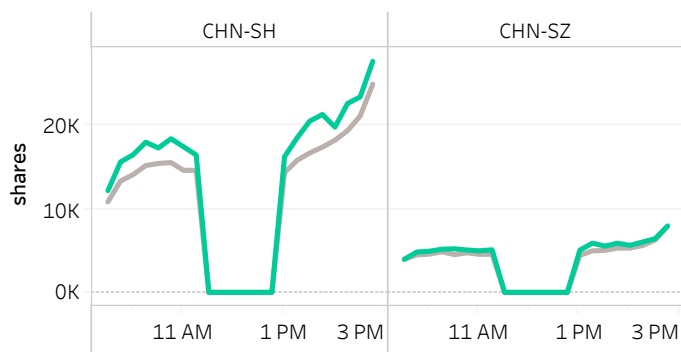
Volume Curve



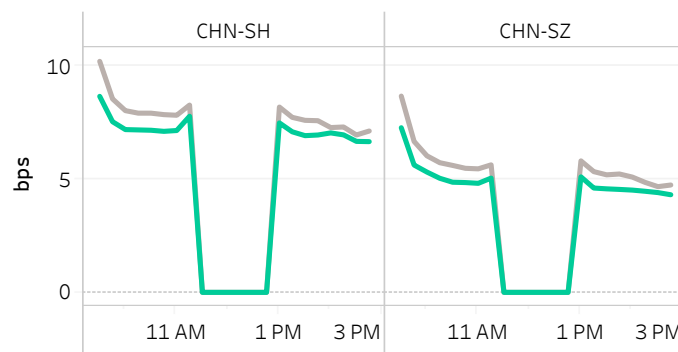
Intraday Spread (bps)



Intraday Quotesize (Shares)



Intraday Volatility (bps)



■ Rolling 12 Months Avg ■ February 2023

Spread Bps

	CHN-SH						CHN-SZ									
	2022			2023			2022			2023						
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
FirstHalfHo..	9.2	9.1	9.7	10.1	9.6	9.4	8.9	8.1	7.6	7.5	8.0	8.6	8.0	7.6	7.4	6.6
MidDay	7.4	7.5	8.1	8.5	8.3	8.0	7.4	7.2	5.4	5.4	5.7	6.3	5.9	5.6	5.2	4.9
LastHalfHo..	6.9	6.9	7.4	7.7	7.4	7.2	6.7	6.6	4.6	4.5	4.9	5.1	4.9	4.8	4.4	4.3

One Minute Volatility Bps

FirstHalfHo..	28.5	27.8	29.7	32.5	30.2	28.6	26.9	22.9	27.3	26.1	28.6	37.5	32.7	28.9	27.9	24.9
MidDay	16.0	15.6	15.9	17.8	17.3	16.1	15.1	14.3	13.6	12.7	13.1	16.8	15.2	14.1	14.0	12.2
LastHalfHo..	15.2	14.5	15.5	16.6	15.5	15.1	13.9	13.7	11.4	10.5	11.9	14.6	12.9	11.9	11.1	11.1

Quotesize (shares)

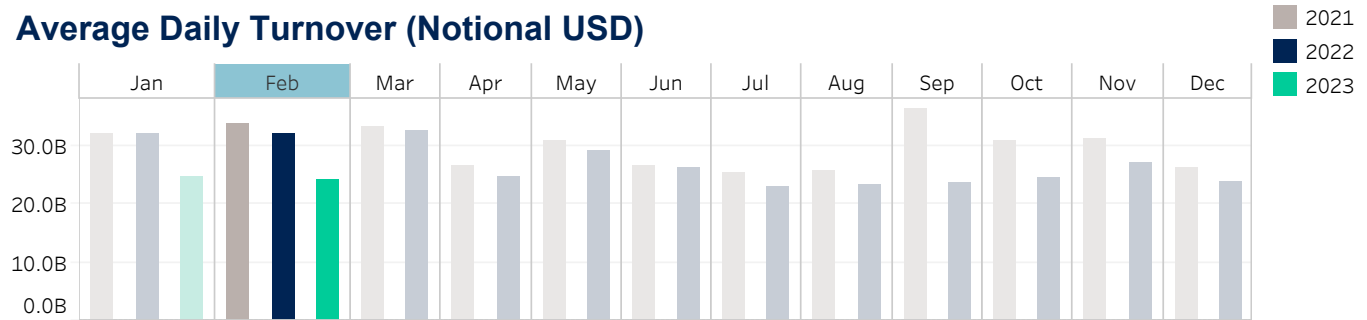
FirstHalfHo..	12,842	12,969	11,207	11,703	13,524	10,302	11,776	13,865	4,205	4,280	3,853	4,175	4,523	3,794	4,051	4,423
MidDay	15,220	15,717	13,698	14,484	15,699	12,904	15,847	17,474	4,636	4,799	4,346	4,539	5,072	4,328	5,045	5,182
LastHalfHo..	22,527	25,879	20,933	22,349	25,496	19,414	26,563	26,960	6,415	7,388	6,537	6,815	8,062	6,496	7,804	7,344

Median used for all metrics

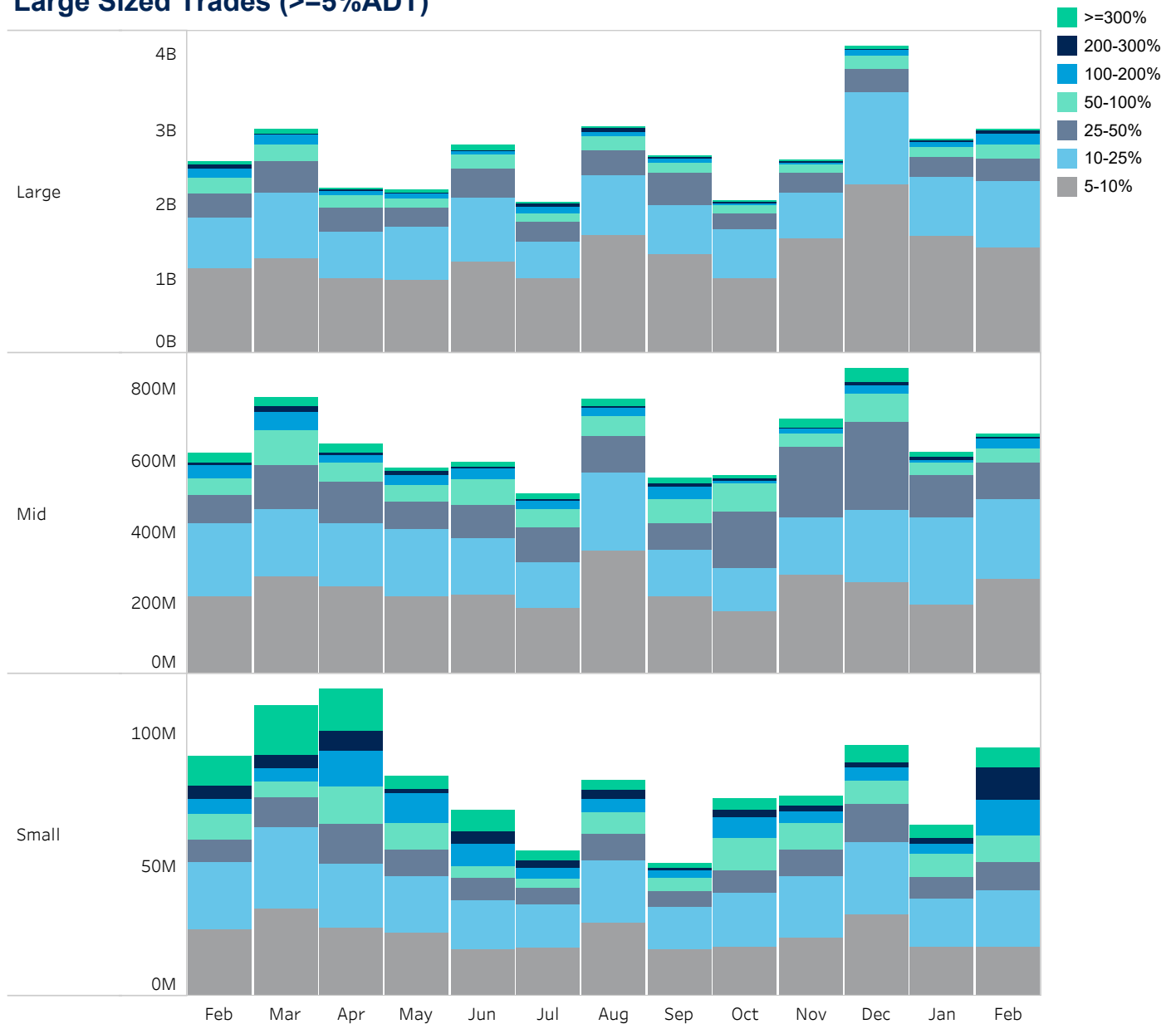
One minute volatility is calculated using the difference between the high and low price within a one minute time bin, divided by that bin's VWAP..

Japan

Average Daily Turnover (Notional USD)



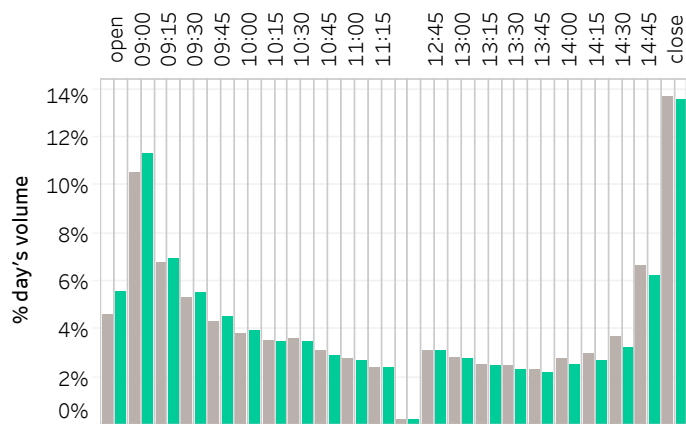
Large Sized Trades (>=5%ADT)



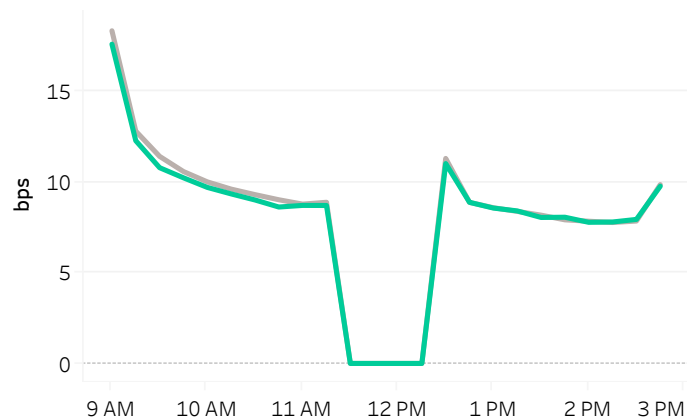
Source data: Virtu Financial

Japan

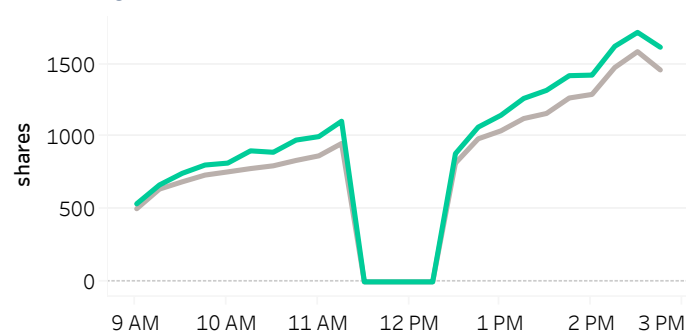
Volume Curve



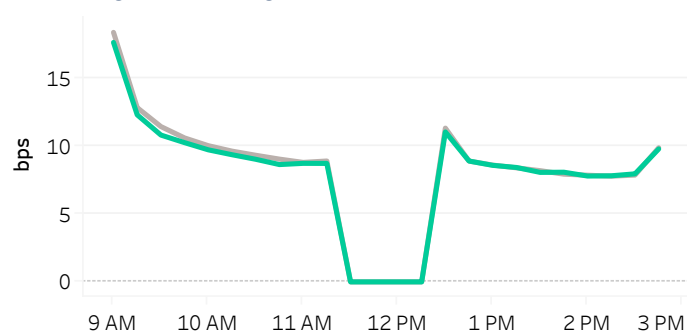
Intraday Spread (bps)



Intraday Quotesize (Shares)



Intraday Volatility (bps)



Rolling 12 Months Avg February 2023

Spread Bps

	2022					2023	
	Aug	Sep	Oct	Nov	Dec	Jan	Feb
FirstHalfHour	15.6	15.7	16.4	16.2	15.9	15.6	15.3
MidDay	9.1	9.4	9.3	9.3	9.0	8.6	8.8
LastHalfHour	9.2	9.3	9.6	9.4	9.4	9.1	9.1

One Minute Volatility Bps

FirstHalfHour	16.8	16.4	17.6	17.7	16.1	16.2	16.1
MidDay	8.2	8.6	8.5	8.7	8.4	8.0	8.3
LastHalfHour	9.3	9.4	9.7	9.7	9.5	9.3	9.3

Quotesize (shares)

FirstHalfHour	539	551	531	563	561	550	593
MidDay	883	839	809	927	902	897	1,012
LastHalfHour	1,539	1,370	1,375	1,572	1,441	1,414	1,620

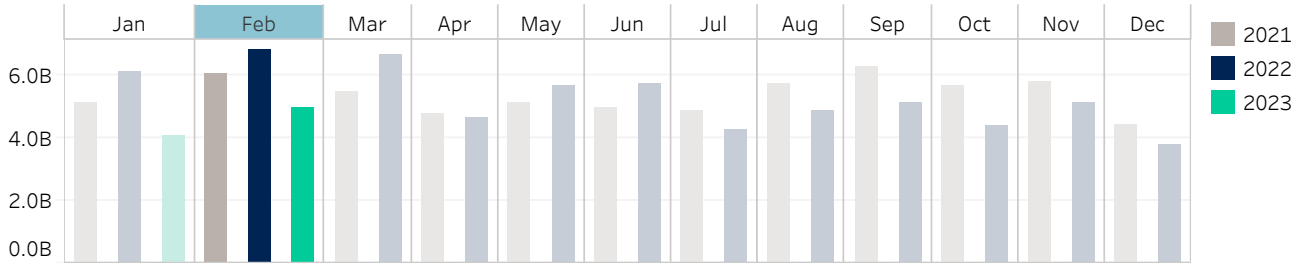
Median used for all metrics

One minute volatility is calculated using the difference between the high and low price within a one minute time bin, divided by that bin's VWAP

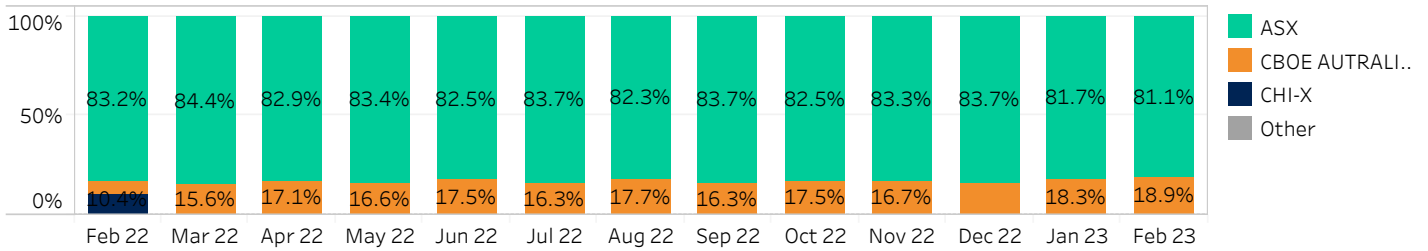
Source data: Virtu Financial

Australia

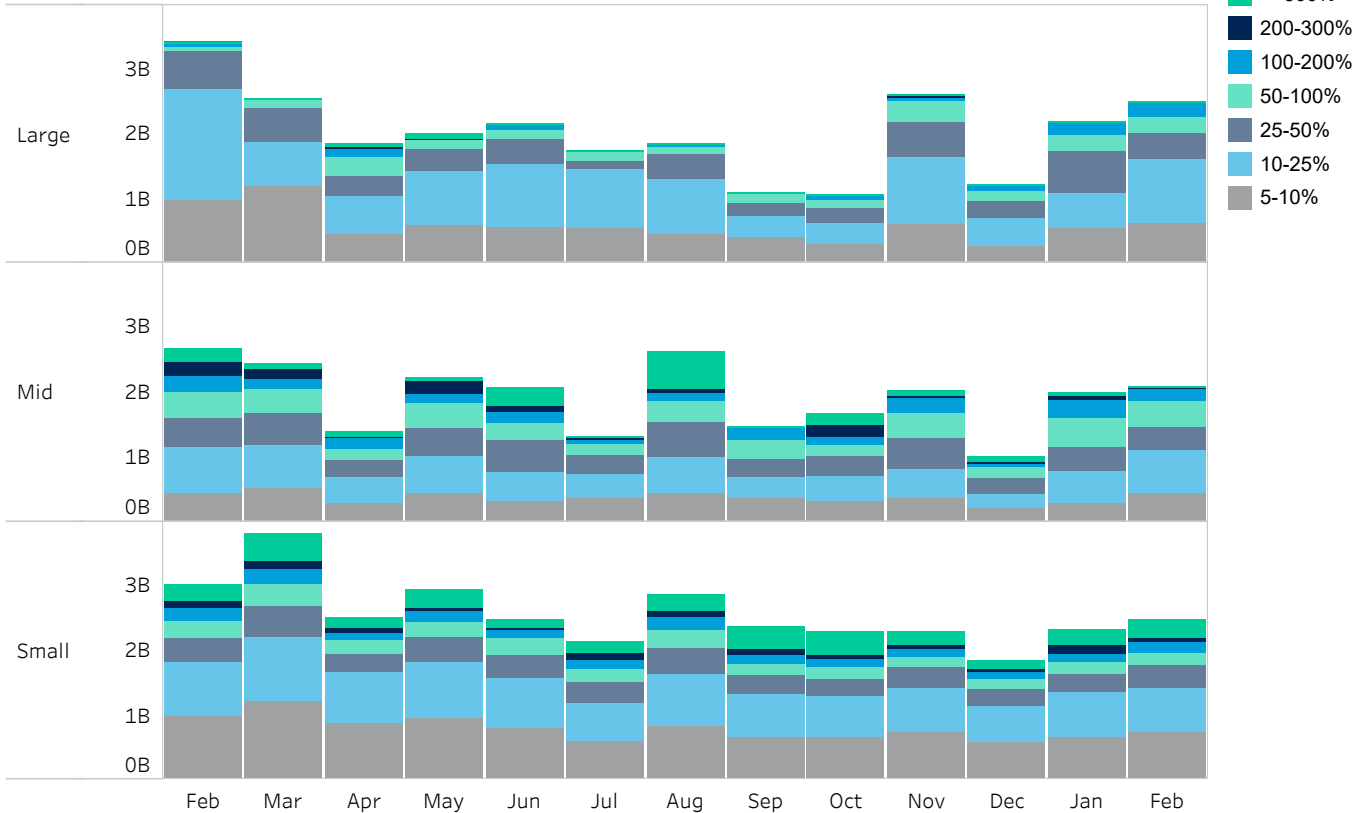
Average Daily Turnover (Notional USD)



Venue Market Share (Notional USD)



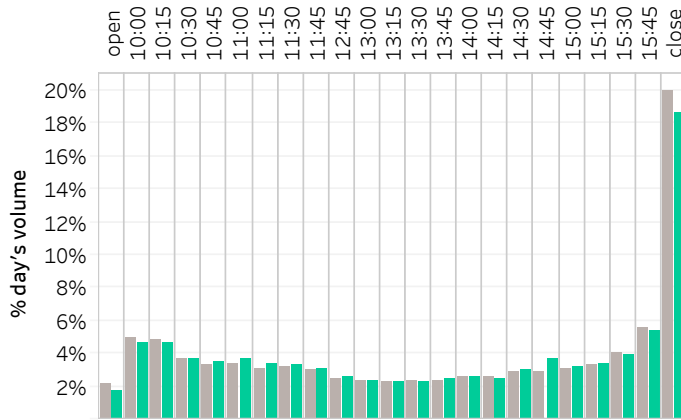
Large Sized Trades (>=5%ADT)



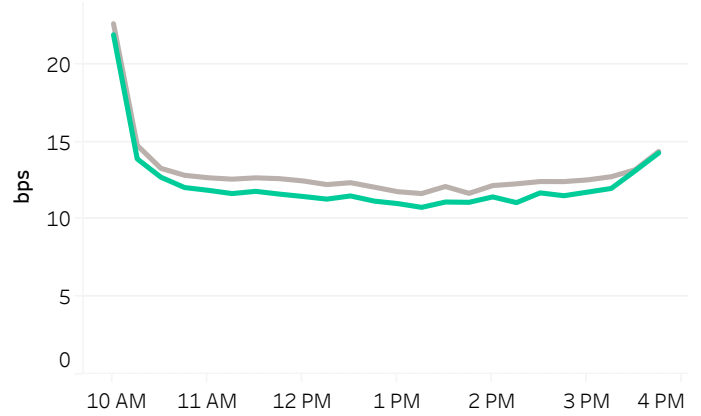
Source data: Virtu Financial

Australia

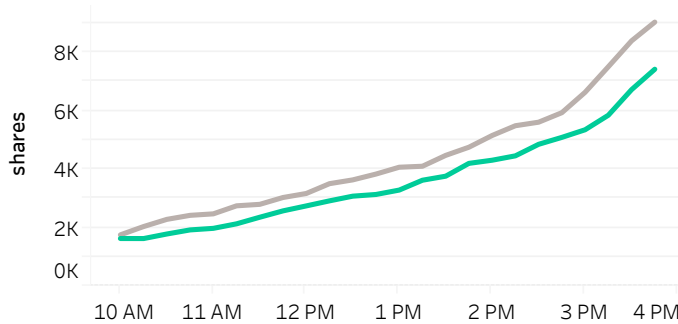
Volume Curve



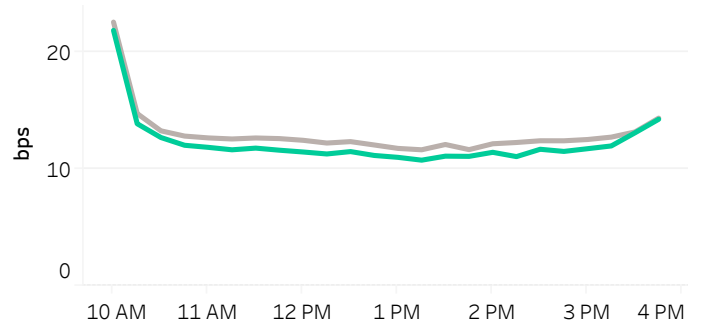
Intraday Spread (bps)



Intraday Quotesize (Shares)



Intraday Volatility (bps)



Rolling 12 Months Avg February 2023

Spread Bps

	2022						2023	
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
FirstHalfHour	19.3	18.6	19.1	18.9	17.5	16.6	15.9	16.8
MidDay	12.5	11.8	12.9	13.0	12.5	12.1	11.1	11.6
LastHalfHour	14.4	13.4	14.7	14.9	13.9	13.7	13.1	13.8

One Minute Volatility Bps

FirstHalfHour	24.6	24.0	24.8	22.9	21.5	20.4	19.1	21.3
MidDay	12.0	11.1	11.8	12.3	11.4	10.5	9.9	10.3
LastHalfHour	13.6	12.8	13.6	13.8	12.9	12.6	12.2	12.5

Quotesize (shares)

FirstHalfHour	1,825	1,837	2,216	1,938	2,000	1,772	1,629	1,640
MidDay	3,880	3,873	4,723	4,056	4,453	3,558	3,279	3,260
LastHalfHour	8,852	8,511	9,473	9,008	9,111	7,705	6,643	7,185

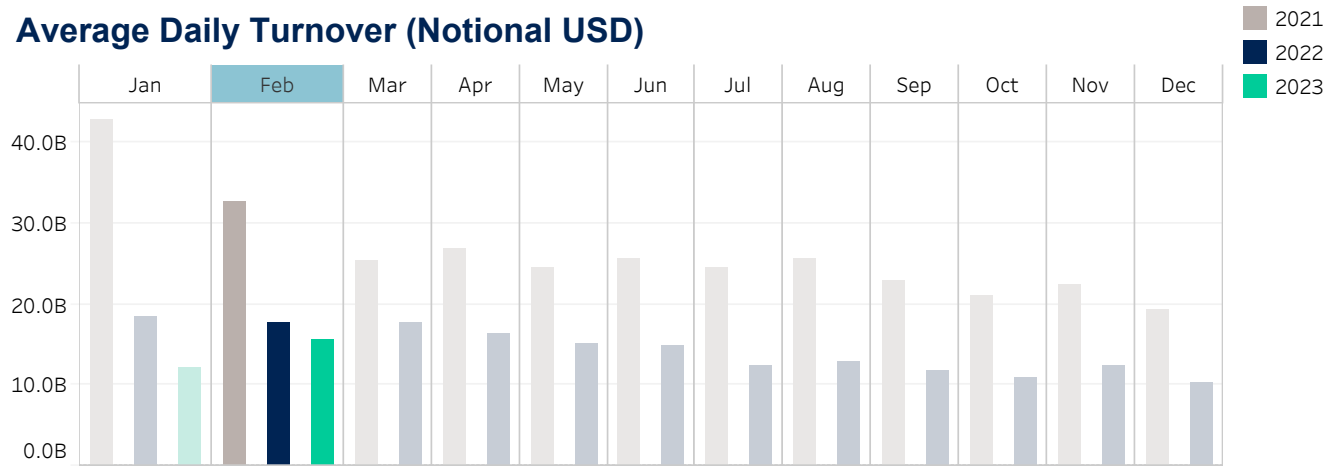
Median used for all metrics

One minute volatility is calculated using the difference between the high and low price within a one minute time bin, divided by that bin's VWAP

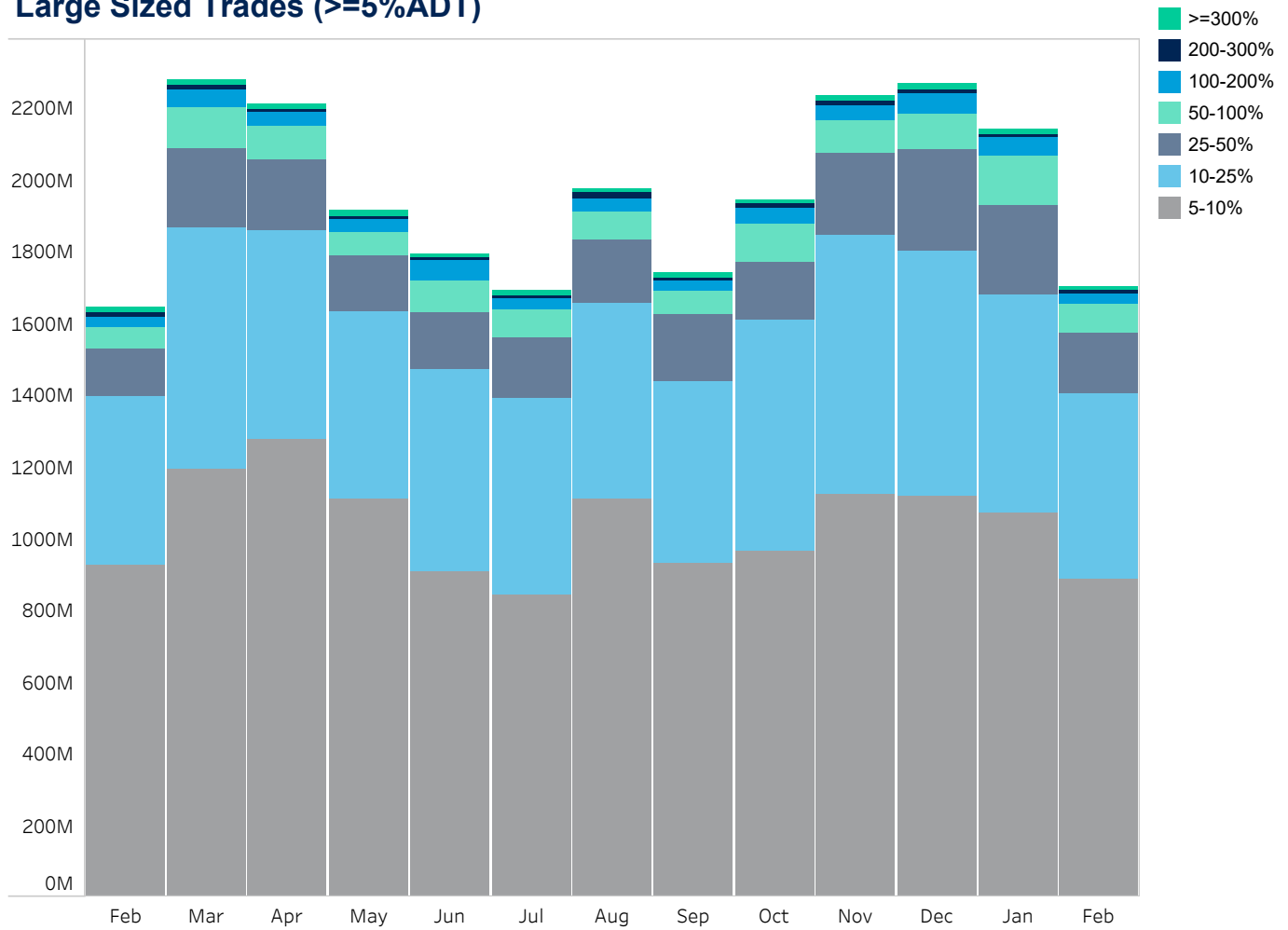
Source data: Virtu Financial

South Korea

Average Daily Turnover (Notional USD)



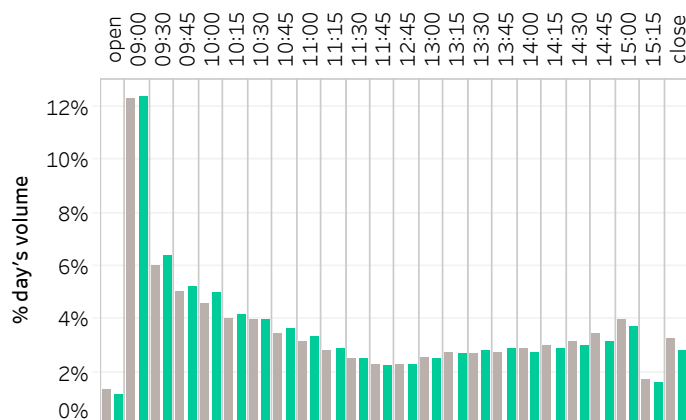
Large Sized Trades (>=5%ADT)



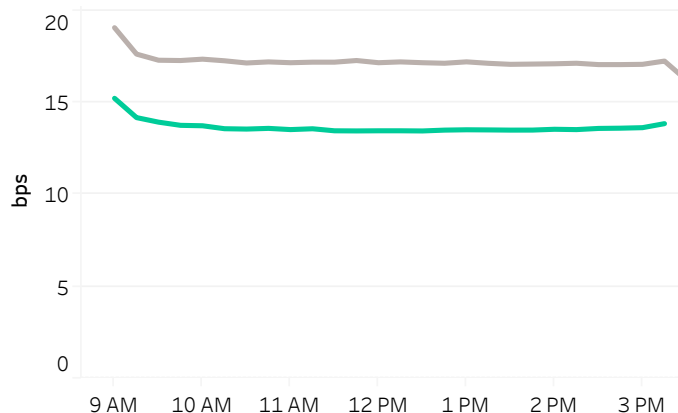
Source data: Virtu Financial

Korea

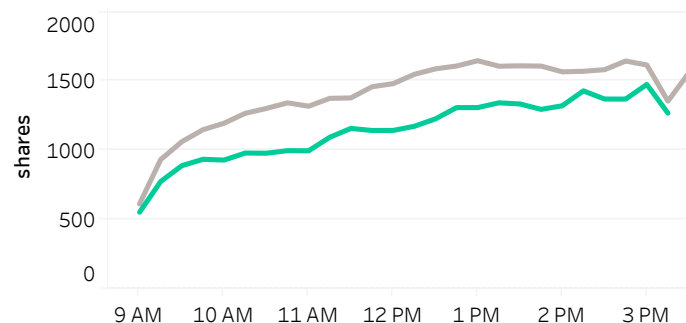
Volume Curve



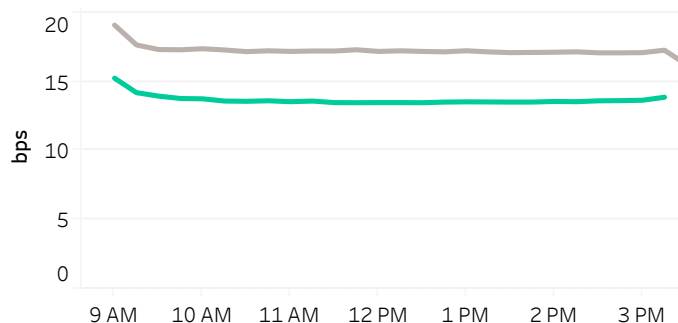
Intraday Spread (bps)



Intraday Quotesize (Shares)



Intraday Volatility (bps)



■ Rolling 12 Months Avg ■ February 2023

Spread Bps

	2022						2023	
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
FirstHalfHour	18.7	18.0	18.9	19.1	18.1	18.1	17.4	14.7
MidDay	17.3	17.0	17.5	17.5	16.7	17.1	16.5	13.5
LastHalfHour	17.3	16.9	17.6	17.5	16.2	17.1	16.5	13.7

One Minute Volatility Bps

FirstHalfHour	32.0	28.9	31.5	32.7	31.4	29.5	29.4	23.6
MidDay	19.5	18.6	19.3	19.6	18.7	18.7	18.1	14.9
LastHalfHour	20.8	19.7	21.3	20.8	19.7	20.6	18.9	15.6

Quotesize (shares)

FirstHalfHour	789	912	753	704	716	803	727	655
MidDay	1,478	1,978	1,511	1,415	1,541	1,721	1,396	1,188
LastHalfHour	1,496	1,928	1,580	1,529	1,360	1,628	1,506	1,447

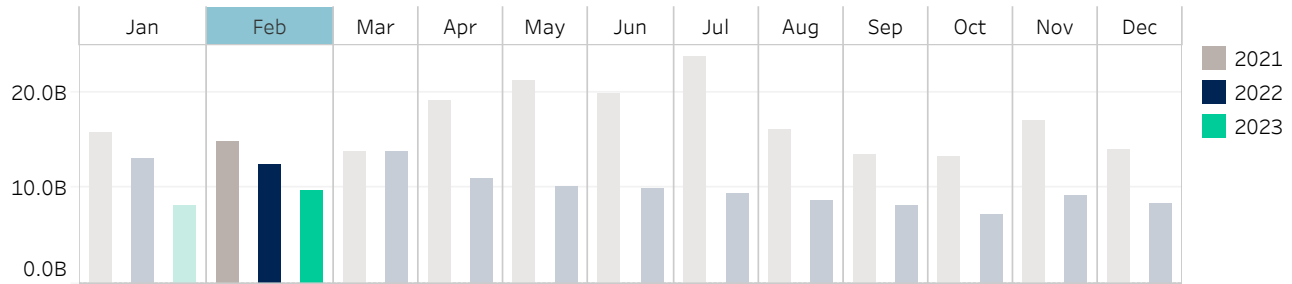
Median used for all metrics

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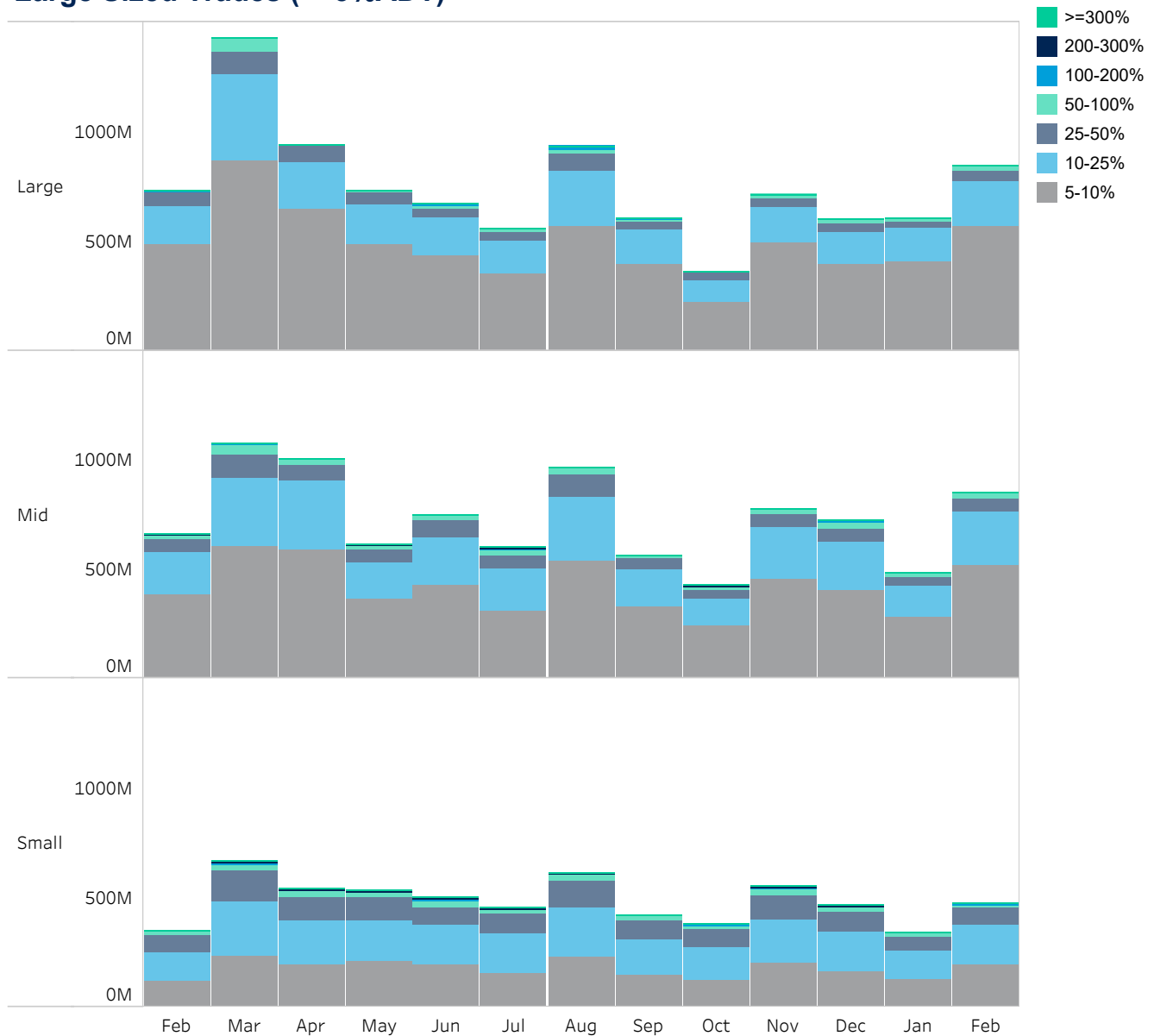
Source data: Virtu Financial

Taiwan

Average Daily Turnover (Notional USD)



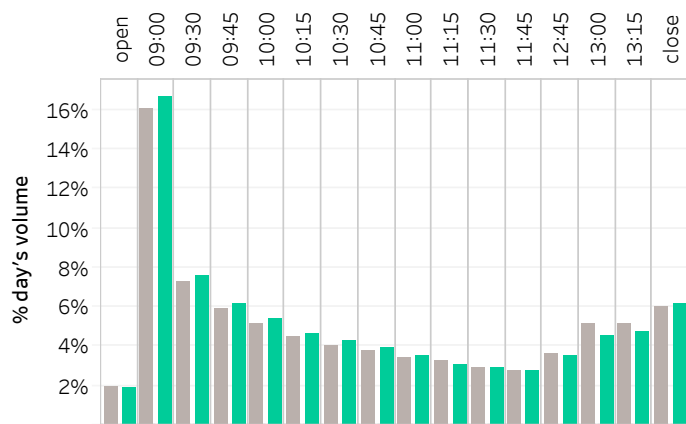
Large Sized Trades (>=5%ADT)



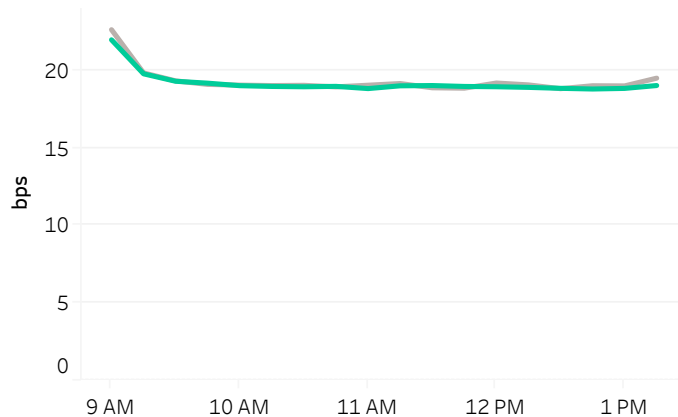
Source data: Virtu Financial

Taiwan

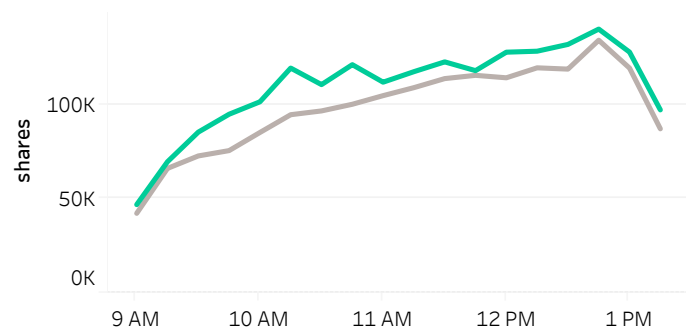
Volume Curve



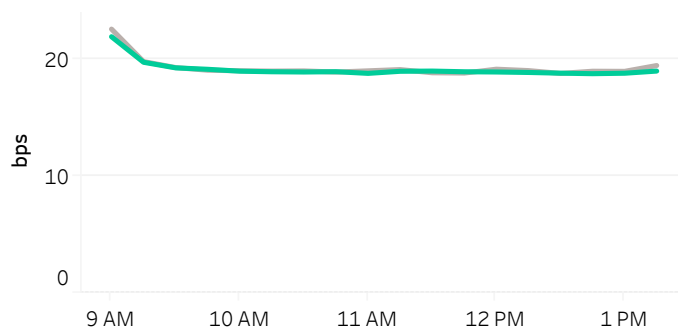
Intraday Spread (bps)



Intraday Quotesize (Shares)



Intraday Volatility (bps)



Rolling 12 Months Avg February 2023

Spread Bps

	2022						2023	
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
FirstHalfHour	21.8	21.0	21.7	24.0	21.5	20.9	20.2	20.6
MidDay	19.5	19.0	19.0	20.9	19.1	19.2	18.5	18.9
LastHalfHour	19.9	19.3	19.4	21.2	19.2	19.2	18.7	18.9

One Minute Volatility Bps

FirstHalfHour	32.7	29.3	30.4	34.5	30.8	31.0	31.1	31.3
MidDay	25.3	23.0	24.6	25.8	23.4	28.6	28.9	28.9
LastHalfHour	26.8	23.8	25.4	26.7	23.6	28.9	29.0	28.9

Quotesize (shares)

FirstHalfHour	44,467	53,141	46,405	42,999	52,487	55,849	59,008	57,971
MidDay	82,086	121,550	98,380	77,390	113,736	109,432	118,834	117,559
LastHalfHour	81,639	101,505	84,157	81,045	112,549	102,743	113,870	116,979

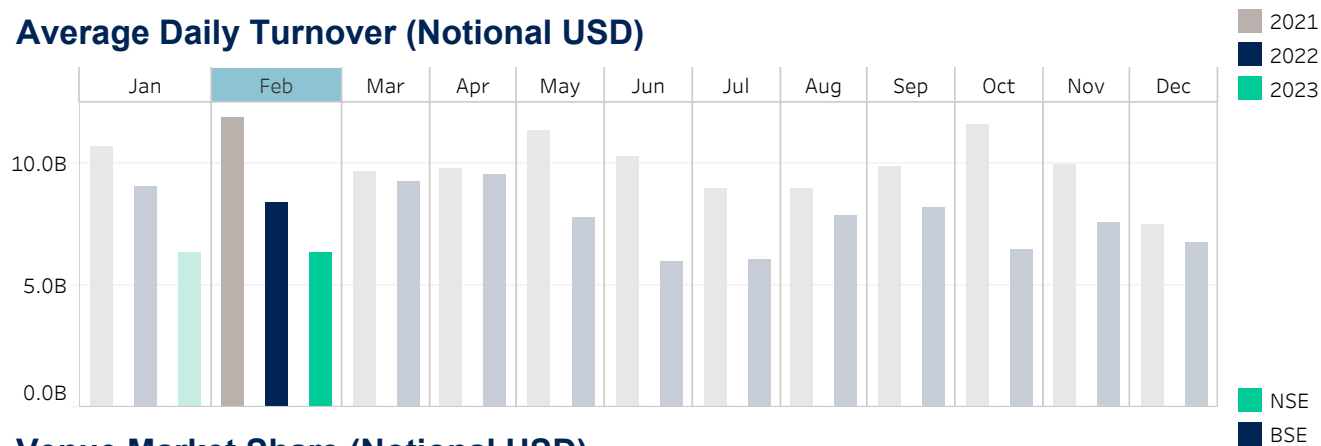
Median used for all metrics

One minute volatility is calculated using the difference between the high and low price within a one minute time bin, divided by that bin's VWAP

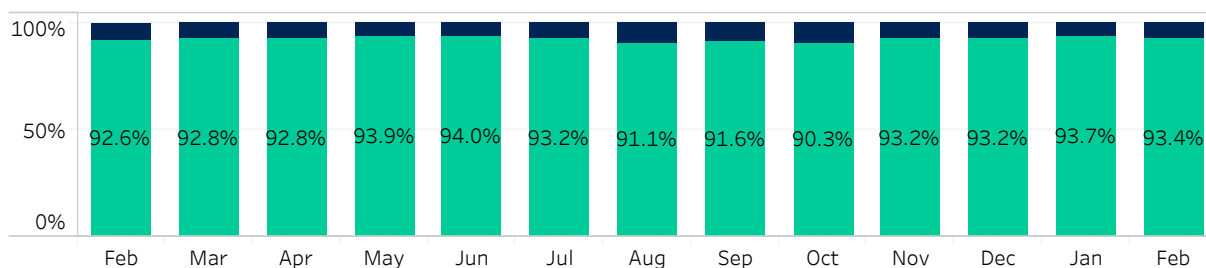
Source data: Virtu Financial

India

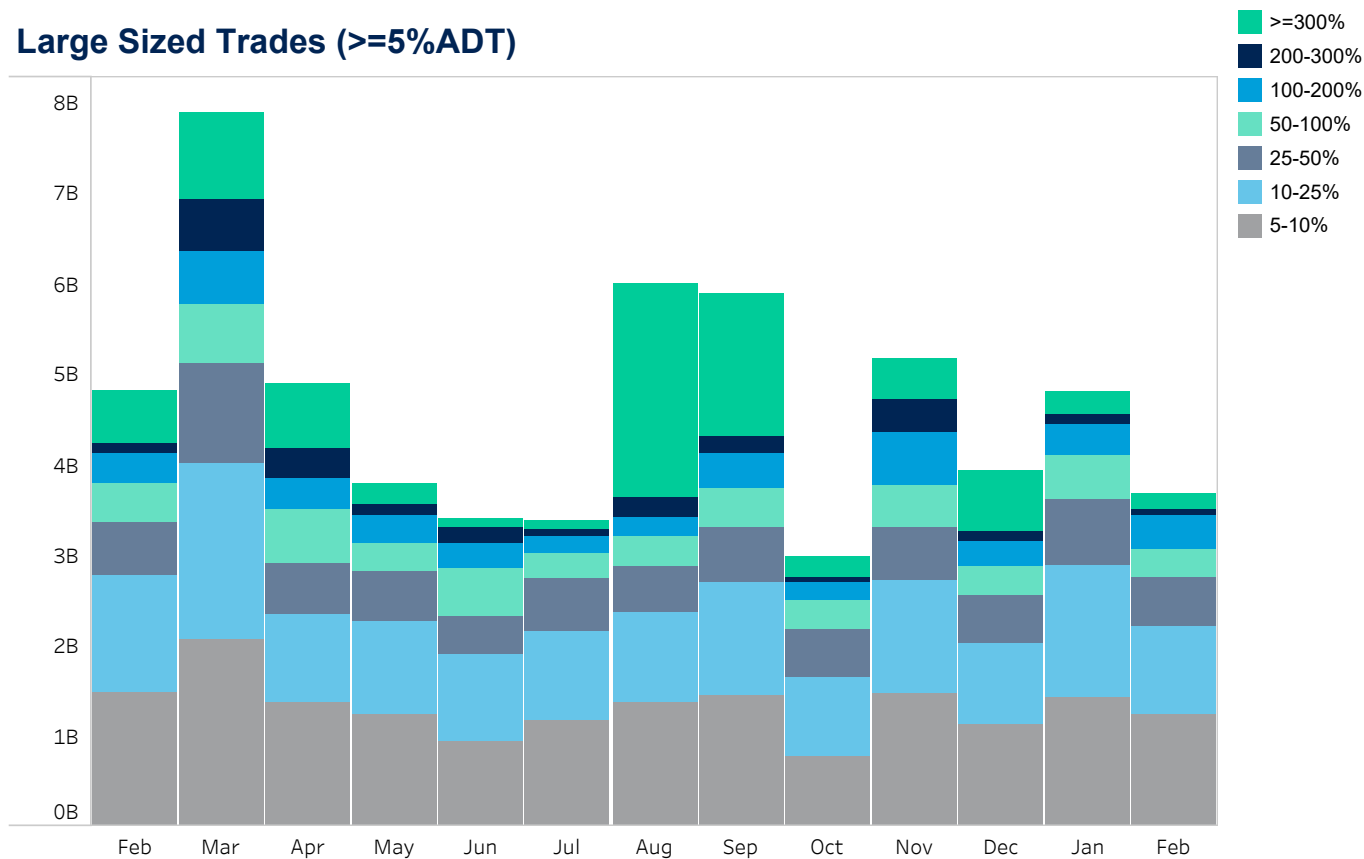
Average Daily Turnover (Notional USD)



Venue Market Share (Notional USD)



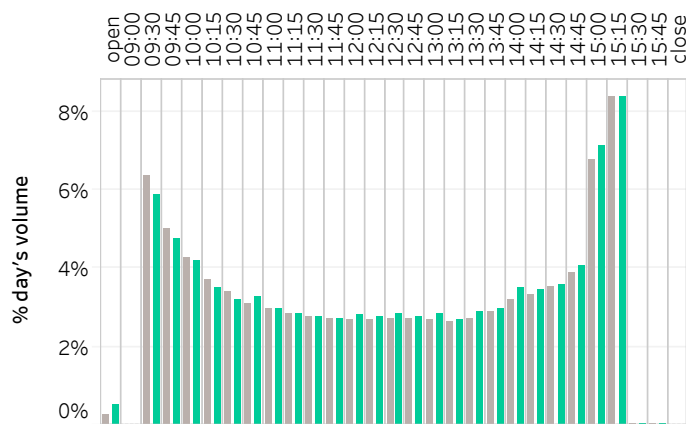
Large Sized Trades (>=5%ADT)



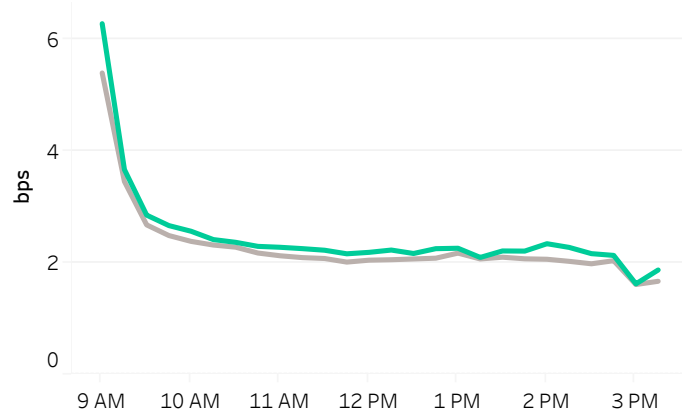
Source data: Virtu Financial

India

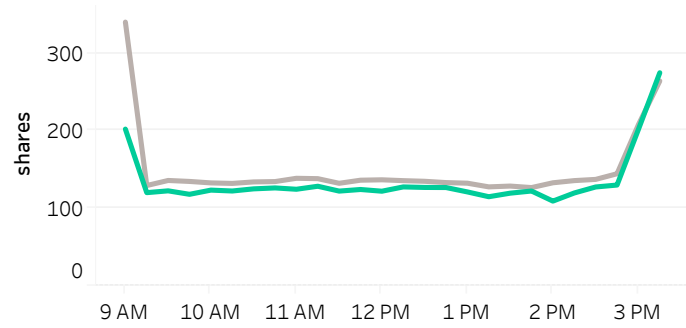
Volume Curve



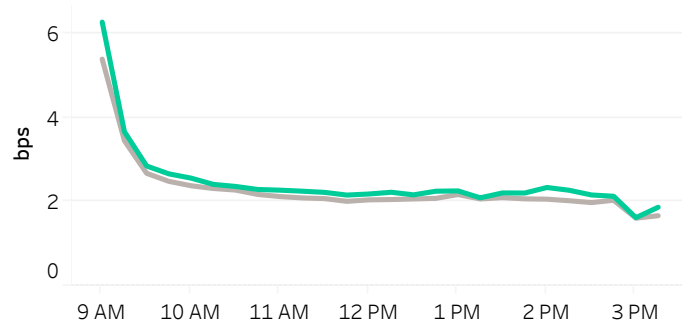
Intraday Spread (bps)



Intraday Quotesize (Shares)



Intraday Volatility (bps)



■ Rolling 12 Months Avg ■ February 2023

Spread Bps

	2022						2023	
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
FirstHalfHour	3.7	3.7	3.6	3.5	3.3	3.4	3.5	3.7
MidDay	2.2	2.1	2.1	2.1	1.9	2.0	2.1	2.2
LastHalfHour	1.8	1.7	1.7	1.6	1.6	1.6	1.7	1.8

One Minute Volatility Bps

FirstHalfHour	20.0	20.3	21.6	20.3	18.4	18.0	18.8	19.7
MidDay	8.3	8.2	8.9	8.2	7.4	7.7	8.2	8.4
LastHalfHour	10.8	10.5	11.0	10.2	9.7	10.2	10.1	10.3

Quotesize (shares)

FirstHalfHour	132.5	133.9	134.1	125.4	138.7	120.1	121.8	119.8
MidDay	142.5	139.0	133.5	131.3	143.8	122.4	128.7	124.1
LastHalfHour	239.8	229.6	242.2	243.8	257.7	257.9	228.8	249.5

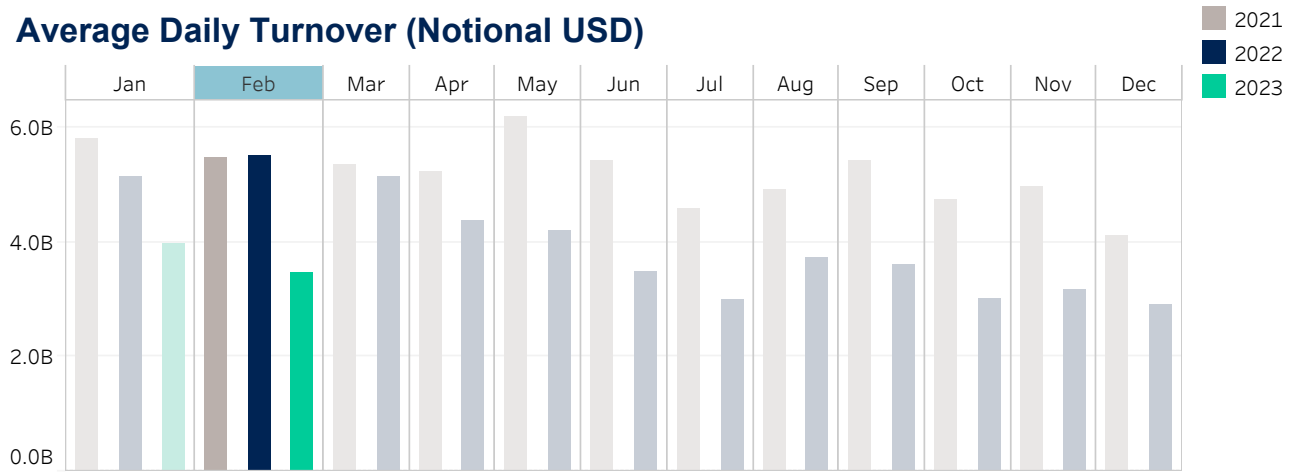
Median used for all metrics

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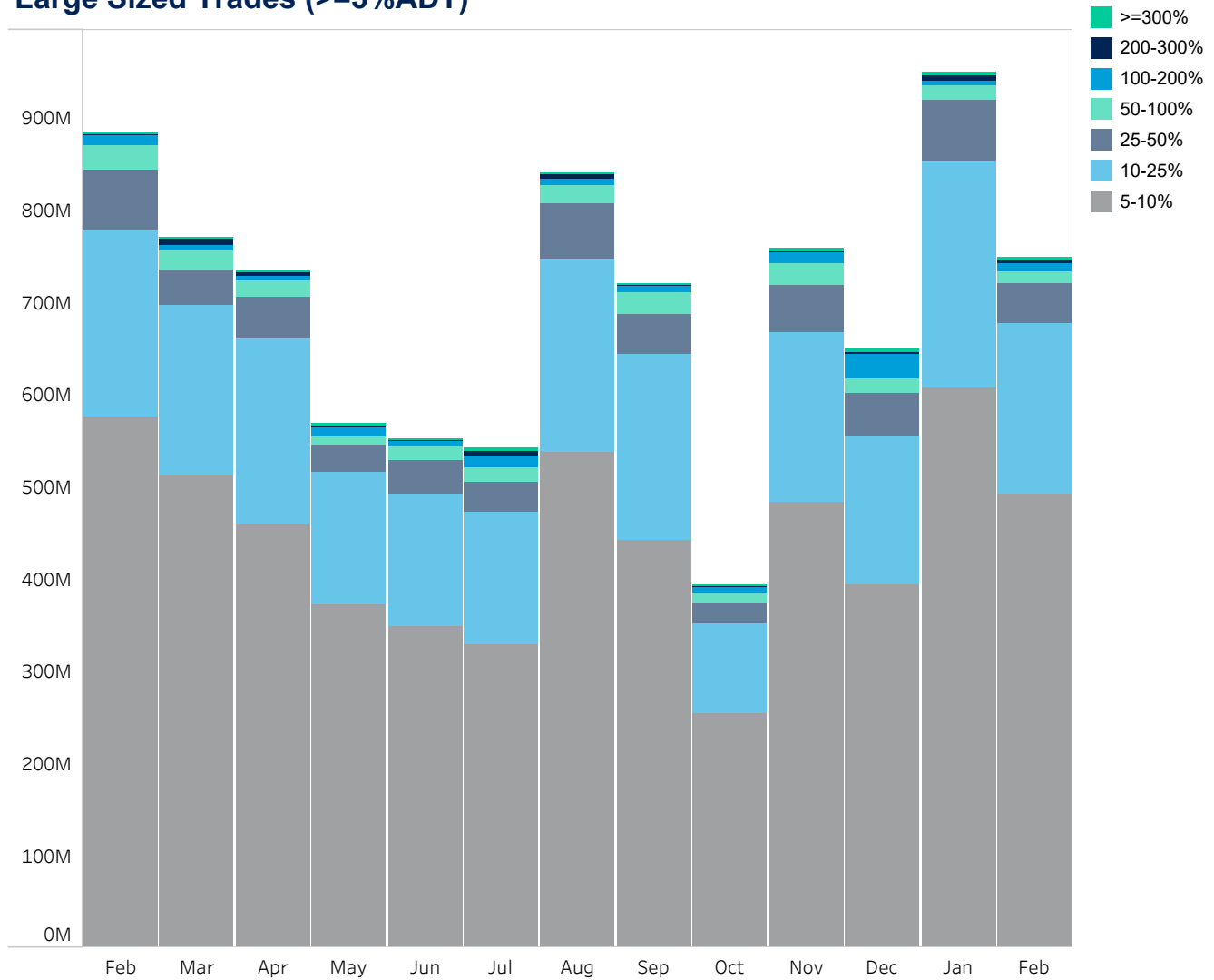
Source data: Virtu Financial

Thailand

Average Daily Turnover (Notional USD)



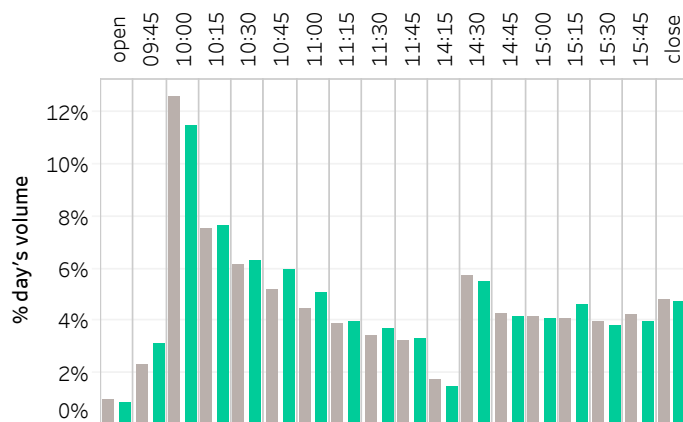
Large Sized Trades (>=5%ADT)



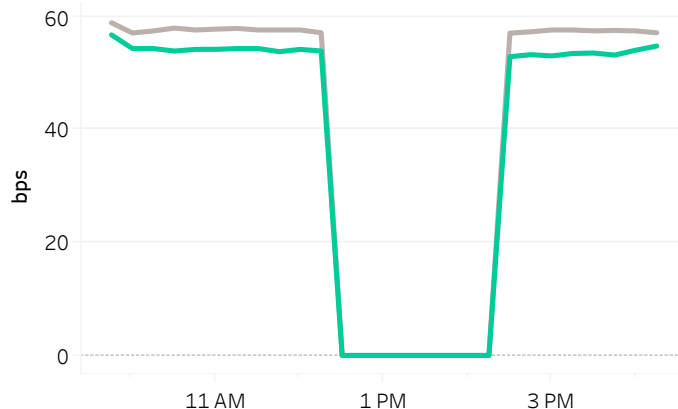
Source data: Virtu Financial

Thailand

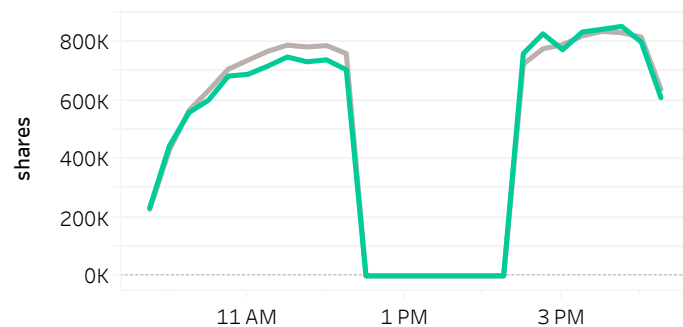
Volume Curve



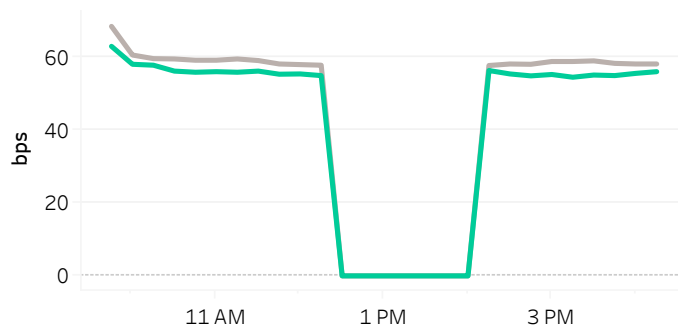
Intraday Spread (bps)



Intraday Quotesize (Shares)



Intraday Volatility (bps)



Rolling 12 Months Avg February 2023

Spread Bps

	2022						2023	
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
FirstHalfHour	61.3	58.3	59.0	61.2	61.0	58.1	58.0	56.4
MidDay	58.8	57.0	57.6	59.2	57.6	55.9	54.1	54.1
LastHalfHour	59.0	57.3	57.6	59.7	57.3	55.7	54.2	54.8

One Minute Volatility Bps

FirstHalfHour	64.1	69.7	67.3	74.9	71.7	74.1	64.3	61.9
MidDay	60.4	58.0	59.0	60.8	58.3	56.7	55.4	55.4
LastHalfHour	60.4	58.0	59.0	60.4	58.0	56.7	56.0	56.0

Quotesize (shares)

FirstHalfHour	148,947	219,738	278,619	217,331	227,211	245,311	284,548	236,082
MidDay	564,119	759,699	785,511	691,861	760,712	805,102	865,107	737,967
LastHalfHour	528,163	729,764	713,965	620,002	675,335	738,049	812,231	679,491

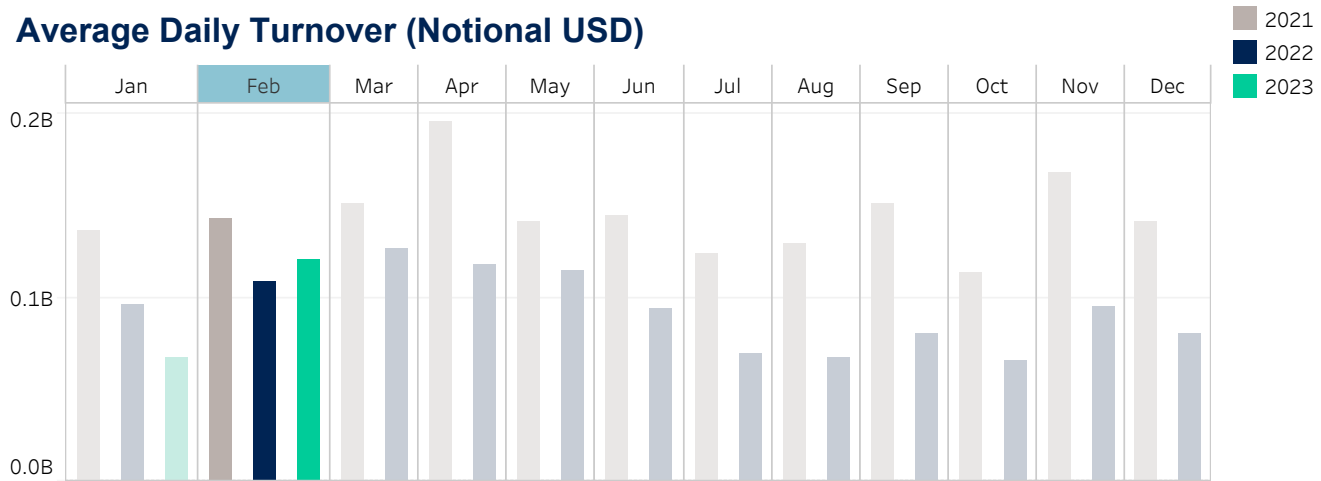
Median used for all metrics

One minute volatility is calculated using the difference between the high and low price within a one minute time bin, divided by that bin's VWAP

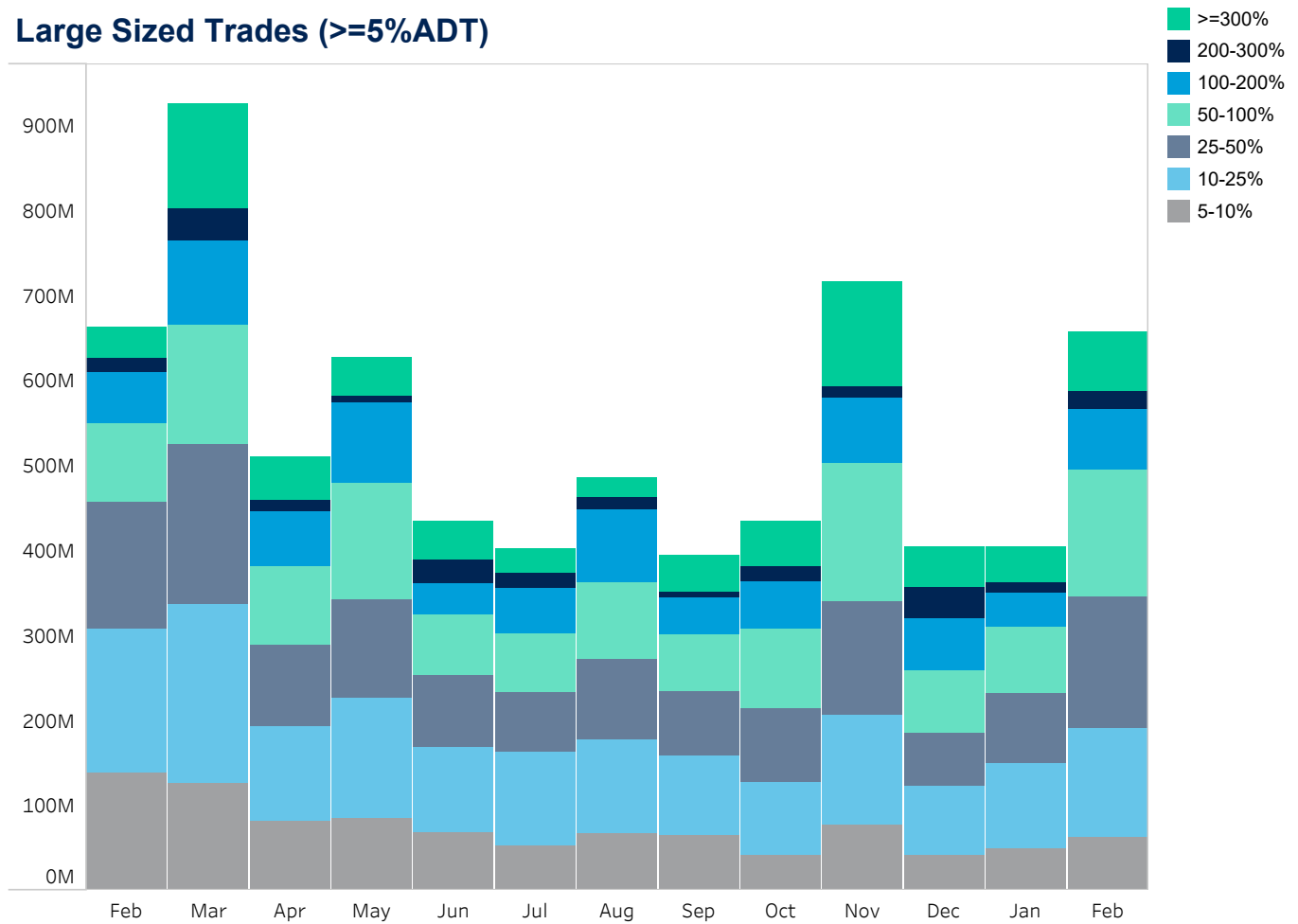
Source data: Virtu Financial

New Zealand

Average Daily Turnover (Notional USD)



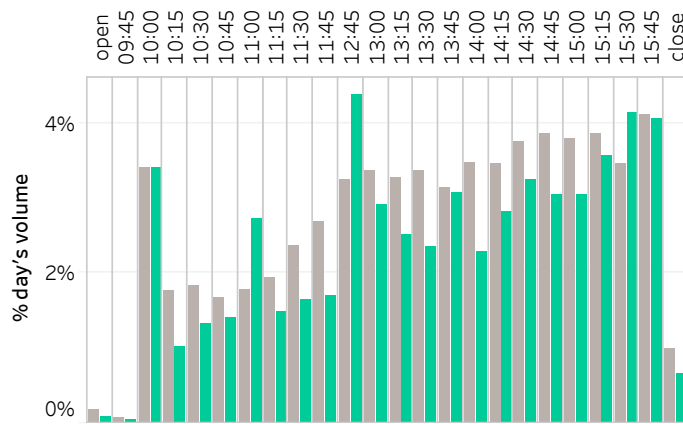
Large Sized Trades (>=5%ADT)



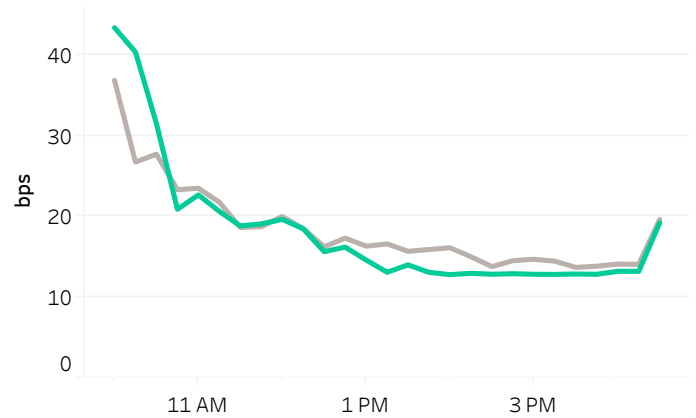
Source data: Virtu Financial

New Zealand

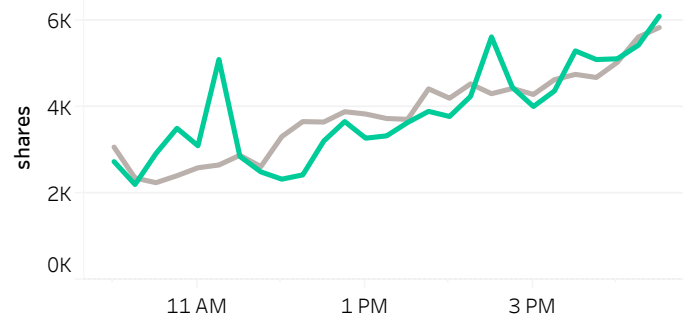
Volume Curve



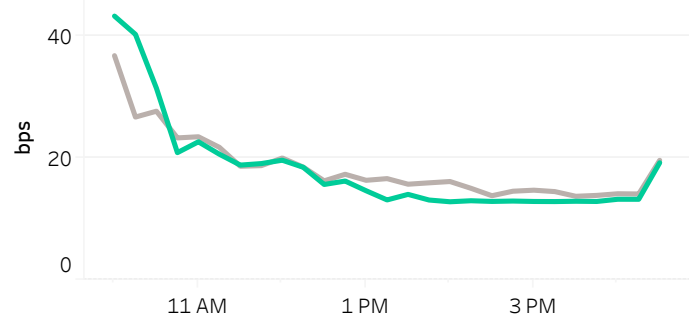
Intraday Spread (bps)



Intraday Quotesize (Shares)



Intraday Volatility (bps)



■ Rolling 12 Months Avg ■ February 2023

Spread Bps

	2022						2023	
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
FirstHalfHour	30.4	30.2	30.5	34.5	38.8	33.0	28.6	36.2
MidDay	16.8	16.9	16.9	17.2	17.4	14.4	13.0	14.2
LastHalfHour	20.0	18.7	18.5	20.3	19.7	19.9	17.6	19.1

One Minute Volatility Bps

FirstHalfHour	20.9	19.5	19.5	25.5	25.6	20.2	19.2	20.9
MidDay	18.9	17.2	16.9	17.7	17.3	14.7	12.9	15.1
LastHalfHour	20.8	20.0	20.2	21.5	22.0	21.1	18.7	23.1

Quotesize (shares)

FirstHalfHour	3,025	2,728	2,703	2,695	2,859	2,800	2,352	2,572
LastHalfHour	6,439	5,802	6,190	5,615	5,396	6,890	5,554	6,137
MidDay	4,189	4,606	5,264	3,955	3,593	3,663	2,964	3,634

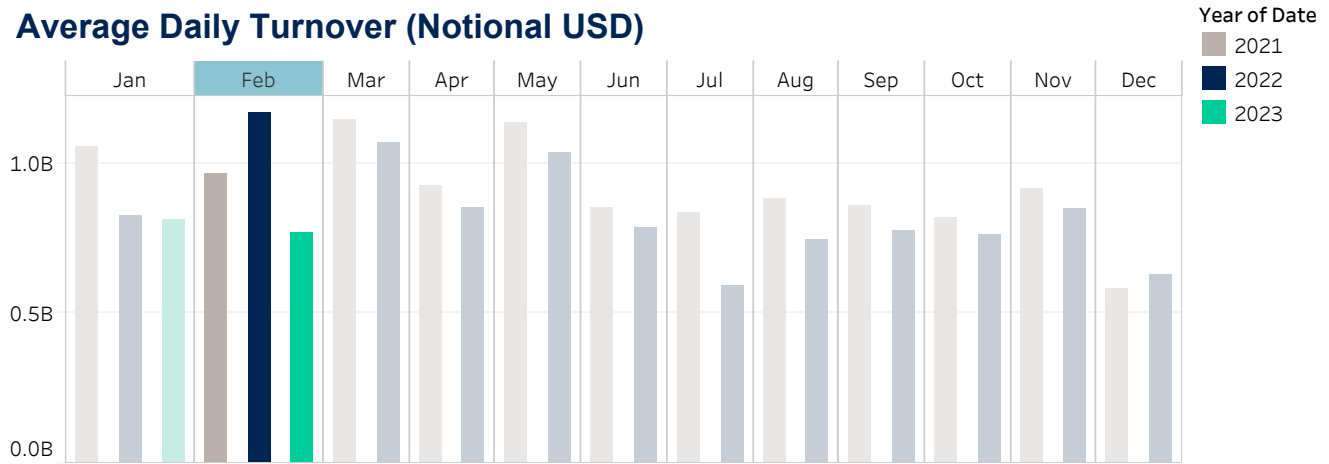
Median used for all metrics

One minute volatility is calculated using the difference between the high and low price within a one minute time bin, divided by that bin's VWAP

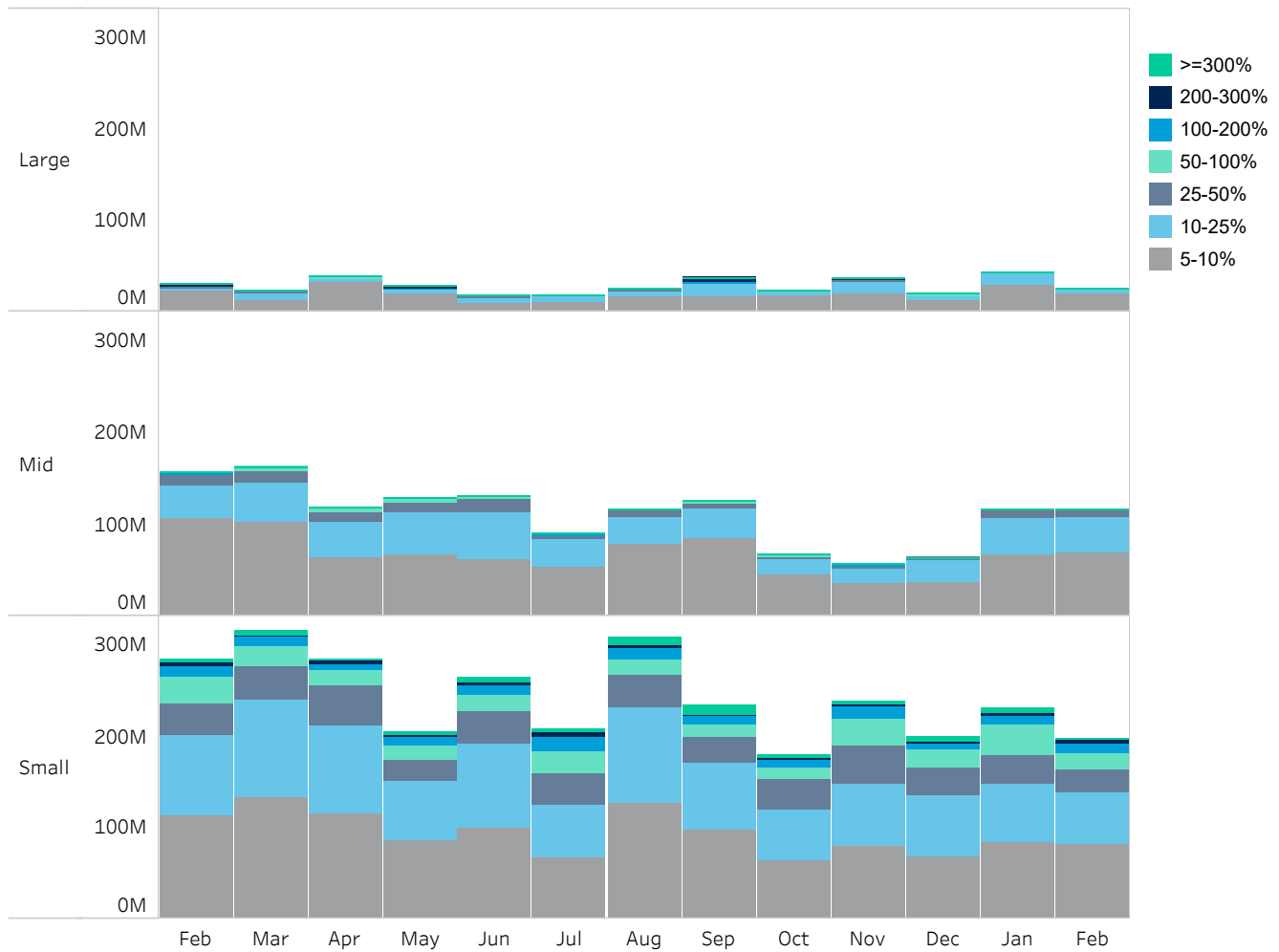
Source data: Virtu Financial

Singapore

Average Daily Turnover (Notional USD)



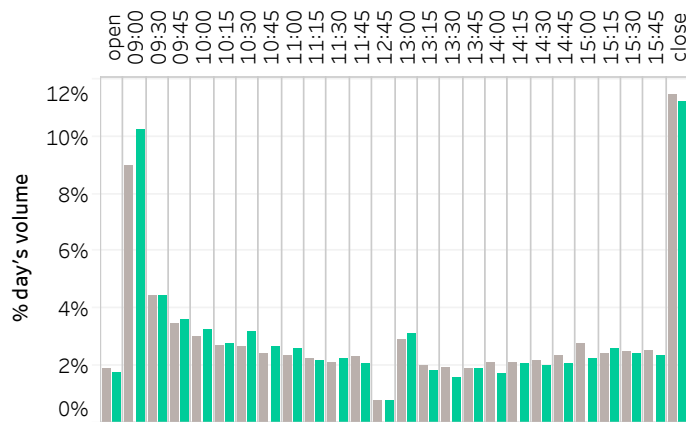
Large Sized Trades (>=5%ADT)



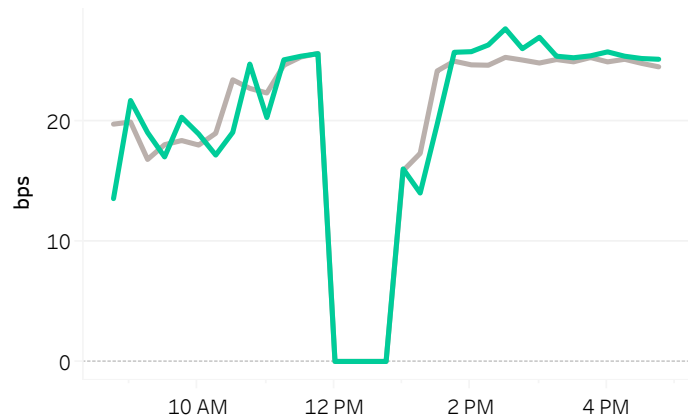
Source data: Virtu Financial

Singapore

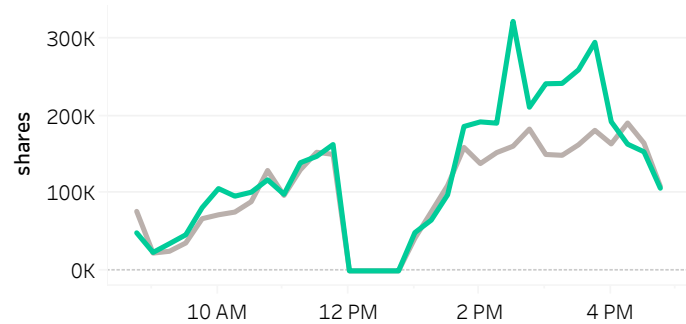
Volume Curve



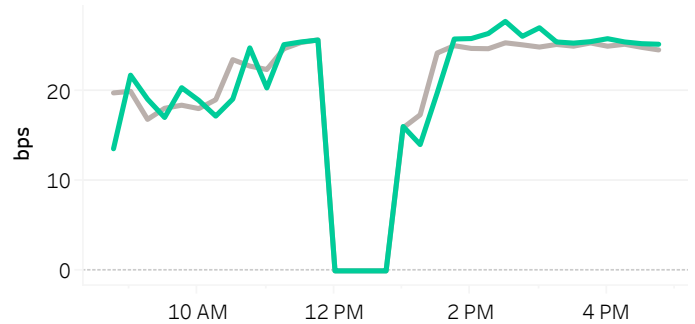
Intraday Spread (bps)



Intraday Quotesize (Shares)



Intraday Volatility (bps)



■ Rolling 12 Months Avg ■ February 2023

Spread Bps

	2022						2023	
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
FirstHalfHour	15.8	18.1	19.4	19.2	16.5	18.0	19.8	14.5
MidDay	24.7	24.5	26.6	22.8	22.3	24.2	24.3	25.0
LastHalfHour	24.7	24.5	25.3	27.8	20.3	24.4	24.2	25.1

One Minute Volatility Bps

FirstHalfHour	47.3	45.5	37.0	66.4	44.0	34.5	37.7	43.5
MidDay	24.9	24.6	26.8	26.6	25.3	24.6	25.2	25.4
LastHalfHour	24.8	24.6	26.6	28.5	24.7	27.1	24.8	25.5

Quotesize (shares)

FirstHalfHour	59,946	52,201	76,276	41,303	59,495	65,760	55,481	49,035
MidDay	147,637	241,175	283,930	89,492	106,664	123,584	140,704	159,315
LastHalfHour	124,848	183,469	212,063	121,825	94,969	128,454	109,921	138,744

Median used for all metrics

One minute volatility is calculated using the difference between the high and low price within a one minute time bin, divided by that bin's VWAP

Source data: Virtu Financial

Glossary

Volume curve - average of value traded during the month, per 15-minute time bin.

Intraday volatility - Median of difference between the high and low price within a one minute time bin, divided by that bin's VWAP

Spread - median of bid-ask spread of the index.

Quotesize - Median bid and ask size of all stocks in the index.

Average daily turnover - average daily value traded in the market.

Indices used:

Australia: ASX 200

Japan: TOPIX

China: CSI 300

Hong Kong: Hang Seng Index

Taiwan: TWSE

India: NIFTY 50

Korea: MSCI Korea 25/50 Index

New Zealand: MSCI New Zealand IMI 25/50 Index

Singapore: MSCI Singapore Index

Thailand: MSCI Thailand IMI 25/50 Index

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