

Research Report

The Functioning of Market Products During the 2020 Market Turmoil — Leveraged and Inverse (L&I) Products



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SUMMARY

During the market turmoil in the first quarter of 2020 (2020Q1), prices of major asset classes fell sharply. There were concerns that trading activities of certain market products led to an increase in the volatility of the underlying assets during market turmoils. The secondary market liquidity of exchange traded funds (ETFs), including leveraged and inverse (L&I) products, increased sharply in the US and Hong Kong during market turmoils. In respect of L&I products, there was the criticism that the heavy rebalancing activities of L&I products might have amplified the volatility of the underlying equity indices. This paper attempts to assess if this criticism is justified through empirical studies on the US and Hong Kong ETF markets during the market turmoil in 2020Q1.

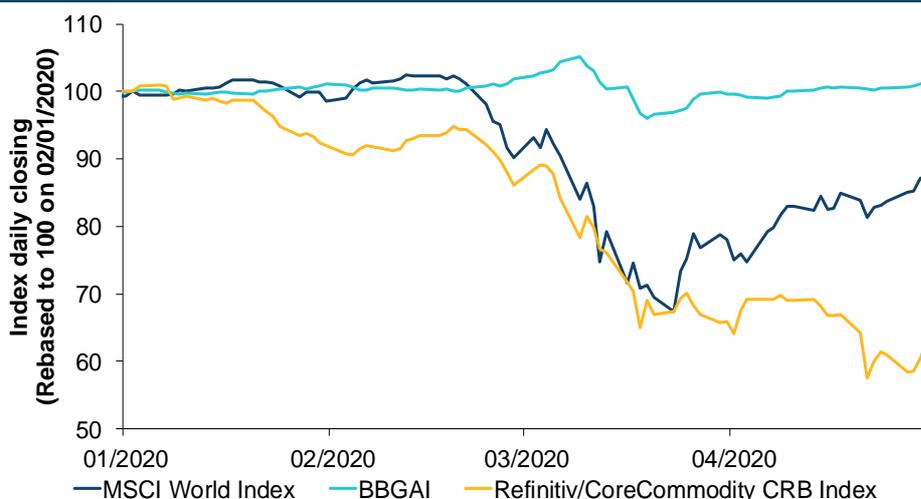
L&I products are a special type of ETFs that magnify daily returns of the underlying assets, to obtain a target level of exposure to a benchmark using less cash, or to overweigh a market segment without committing additional funds. Among L&I products, equity products dominated by number and value of assets under management (AUM). To maintain a constant leverage ratio (a certain positive or negative multiples of investment return on the underlying assets), the holdings of an L&I product are usually rebalanced on a daily basis. The rebalancing activities will increase exponentially with an increasing leverage ratio of the product and the change in the underlying asset price, adding/subtracting capital inflow/outflow as a result of units creation/redemption. These rebalancing activities of L&I products may affect the effectiveness of price discovery in the underlying market, particularly at times of high market volatility. Potentially, these may increase net selling pressure of the underlying derivatives in a down market and therefore may further increase market volatility.

Statistical analyses were conducted to examine if the rebalancing activities of L&I products in the US and Hong Kong markets had amplified the volatility of the underlying market during the market turmoil in 2020Q1. The findings indicate that the impact of the rebalancing activities on the turnover of the underlying securities and index futures was relatively low. The associated changes in the open interests of the underlying index futures were orderly absorbed by sufficient liquidity in the contracts without generating excessive selling pressure. Therefore, there was no evidence to support the criticism on the impact of rebalancing demand of L&I products amplifying the market volatility in the US and Hong Kong markets.

1. PERFORMANCE OF L&I PRODUCTS DURING THE MARKET TURMOIL IN 2020Q1

Prices of major asset classes fell sharply during the market turmoil in the first quarter of 2020 (2020Q1). The selling pressure spread across equities, fixed income and commodities. Representative global indices on equities (MSCI World Index) and fixed income (Bloomberg Barclays Global Aggregate Index, or BBGAI in short) reached a trough in March 2020 while that on commodities (Refinitiv/CoreCommodity CRB Index) reached a trough in April 2020 (see Figure 1). The peak-to-trough declines were about 34% for equities, 9% for fixed income and 43% for commodities¹.

Figure 1. Performance of global major indices of equities, fixed income and commodities (Jan-Apr 2020)



Source: Bloomberg.

Exchange traded funds (ETFs) have been popular investment tools for asset allocation and portfolio diversification, which include equity ETFs, fixed-income ETFs, commodity ETFs and leveraged and inverse (L&I) products on different asset classes. However, there were concerns that trading and redemption activities of ETFs led to an increase in market volatility during market turmoils. In fact, the trading of ETFs in the US and Hong Kong was more active during 24 February 2020 to 20 March 2020 (referred to as the “Volatile Period”) than in the year 2019 (referred to as the “Benchmark Period”). Nevertheless, it was found that the trading activities of equity and fixed income ETFs, including creation/redemption in the primary market and trading activities of the ETF units in the secondary market, did not amplify the market volatility during the Volatile Period².

There remains the question of whether the trading activities of L&I products would have impact on market volatility during market turmoils, given that their product characteristics are somewhat different from those of equity ETFs and fixed-income ETFs.

1.1 Product characteristics of L&I products

L&I products comprise leveraged products and inverse products and are a special type of ETFs that magnify daily returns of the underlying assets, to obtain a target level of exposure to a benchmark using less cash, or to overweigh a market segment without committing additional funds³. The price performance of leveraged products has a positive relationship, while that of inverse products has a negative relationship, with the price movement of the underlying asset.

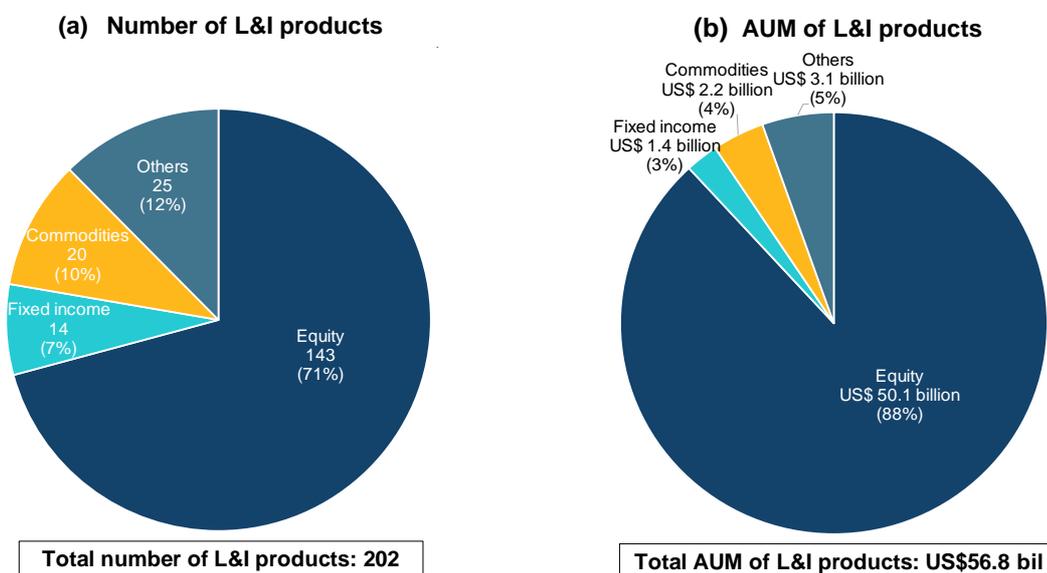
¹ Calculated based on the daily closings of the global indices on the respective asset classes.

² See HKEX research paper, “The functioning of market products during the 2020 market turmoil — Are ETFs volatility absorbers or amplifiers?”, published on HKEX’s website, 22 December 2020.

³ See “ETF Handbook: A practical guide to Exchange Traded Funds”, published on HKEX’s website, viewed on 6 October 2020.

An L&I product magnifies daily returns of an underlying asset (in the positive/negative direction described above) through the use of derivatives, typically futures or swaps. Among L&I products, equity products dominated by number and value of assets under management (AUM). In the US, equity L&I products accounted for 71% of the total number and 88% of the total AUM respectively as of end-2020 (see Figure 2).

Figure 2. Number and AUM of L&I products in the US (end-2020)

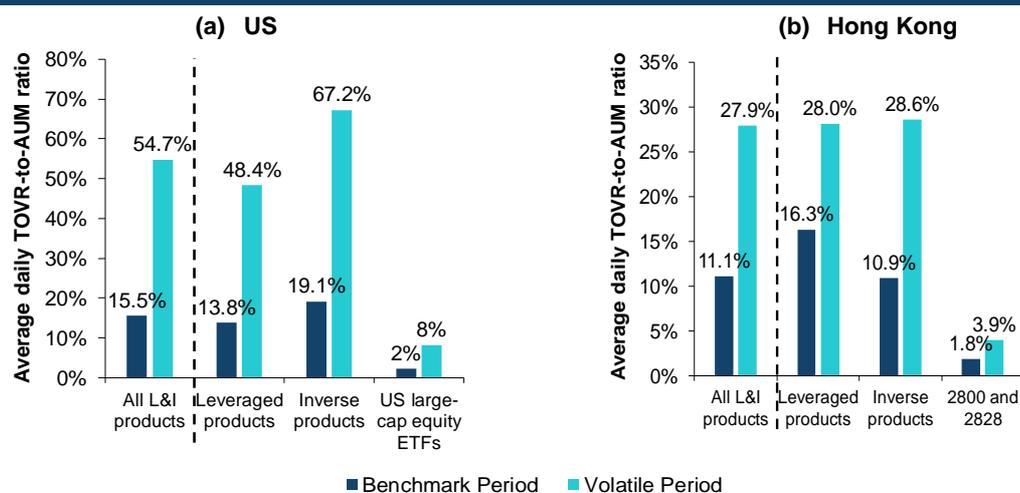


Source: Morningstar for the number of products and the AUM.

The secondary market liquidity of L&I products in relative terms, as measured by the average daily ratio of turnover value to AUM (TOVR-to-AUM ratio⁴), were higher than that of large-cap equity ETFs in the US and Hong Kong during the Benchmark Period and the Volatile Period. During the Benchmark Period, the average daily TOVR-to-AUM ratios of all L&I products in the US and in Hong Kong were 15% and 11% respectively, which were higher than 2% for US large-cap equity ETFs and 2% for the two largest Hong Kong equity ETFs — Tracker Fund (stock code: 2800) and Hang Seng China Enterprises Index ETF (stock code: 2828). During the Volatile Period, trading of both L&I products and equity ETFs became more active in both the US and Hong Kong and recorded an increase in their average daily TOVR-to-AUM ratios, with statistical significance. (See Figure 3.)

⁴ To calculate the average daily TOVR-to-AUM ratio of each set (or subset) of L&I or ETF products for a given period, the ratio of the aggregate turnover of the products in the set (or sub-set) to their aggregate AUM is calculated for each day, and the average of these daily ratios is then calculated across the given period.

Figure 3. Average daily TOVR-to-AUM ratios of L&I products and selected ETFs in the US and Hong Kong during the Benchmark Period and Volatile Period



Note: L&I products in the US are classified as such by Morningstar.

Source: Calculated based on the daily turnover value and AUM of individual products from Bloomberg.

The return offered by L&I products in multiples (i.e. the leverage ratio) can be up to 3 times in the US⁵ whereas in Hong Kong they are up to 2 times separately for leveraged products and inverse products⁶. To maintain the multiple of returns, the derivatives held by an L&I product is usually rebalanced on a daily basis in response to the index performance such that the holdings of an L&I product are changed in order to maintain a constant leverage ratio (see Section 2 for details). During the 2020Q1 market turmoil with sharp index price declines, it was alleged that the rebalancing activities of L&I products might have increased the selling pressure and therefore market volatility of the underlying assets during the market turmoil. This might have in turn driven up the volatility of L&I products and contributed to the closures⁷ or reverse splits⁸ of L&I products during the market turmoil. Among L&I products with closures, a majority of them were equity L&I products, which were followed by commodity L&I products tracking the price performance of crude oil futures (see Appendix).

Regarding the functioning of L&I products during the market turmoil in 2020Q1, there was a criticism on L&I products in that the heavy rebalancing activities of L&I products might have amplified the volatility of the underlying equity indices. This paper aims at assessing whether this criticism is justified based on the experience in the 2020Q1 market turmoil in the US and the Hong Kong ETF markets.

⁵ The US regulator has revised the rules in October 2020 to allow the issuance of new L&I products with a leverage ratio up to 2 times by issuers meeting certain requirements without seeking prior approval from the US Securities and Exchange Commission (SEC) and the new rules grandfathered the existing L&I products with 3-time leverage ratio. (See *Use of Derivatives by Registered Investment Companies and Business Development Companies*, issued by the US SEC, 28 October 2020 (replaced with a final version on 2 November 2020))

⁶ At the launch of L&I products in 2016, the Securities and Futures Commission (SFC) only allowed the issuance applications of two-time leveraged products and one-time inverse products. The SFC once allowed the issuance applications of two-time inverse products as per its circular issued in March 2019, but changed back to one-time inverse products for new issuance applications as per its circular issued in May 2020. See *Circular on Leveraged and Inverse Products*, issued by the SFC, 5 February 2016 and *Supplemental Circulars* issued by the SFC on 23 December 2016, 17 December 2018, 14 March 2019 and 22 May 2020.

⁷ Source: "Leveraged ETF closures piling up", *ETF.com*, 25 March 2020.

⁸ A reverse split entails an ETF issuer exchanging all the fund's units outstanding at a ratio that generally ranges from 1 for 2 to 1 for 10, or even higher. This means an investor holding 100 units of a \$10-a-unit ETF will own 10 units worth \$100 each after a 1:10 reverse split. Source: "Beware of ETF Reverse Splits", published on the website of *Wall Street Journal*, 3 February 2019; "What it means when ETFs reverse split", *ETF.com*, 17 April 2020.

2. REBALANCING ACTIVITIES OF L&I PRODUCTS DURING MARKET TURMOIL

The liquidity provision and price discovery processes of L&I products are similar to those of equity and fixed-income ETFs. The units of L&I products can be traded in the secondary market and can be created/redeemed in the primary market. The creation/redemption of L&I product units does not involve transaction in the underlying derivatives but is cash-settled only. Similar to equity and fixed income ETFs, the arbitrage activities between primary and secondary markets contribute to reducing the price premium/discount of L&I products over their net asset values (NAVs).

However, rebalancing activities of L&I products may affect the effectiveness of price discovery in the underlying market, particularly at times of high market volatility. Rebalancing of L&I products refers to the action of changing the holdings of an L&I product in order to maintain a constant leverage ratio (a certain positive or negative multiples of investment return on the underlying assets). The issuer of an L&I product is required to rebalance the underlying portfolio holdings (generally the derivatives of the underlying index) as the price of the underlying asset changes, usually on a daily basis⁹. When the underlying index rises, the L&I product will need to be rebalanced to increase its long positions, or to decrease its short positions, in the index derivatives. When the underlying index falls, the L&I product will need to be rebalanced to decrease its long positions, or to increase its short positions, in the index derivatives. If the holdings of an L&I product are not rebalanced, the performance of the L&I product may deviate from the agreed multiple of investment returns. The rebalancing demand, defined as the expected change in the value of AUM of the portfolio held by the L&I product to maintain the leverage ratio in response to a given change in the underlying index, will increase exponentially with an increasing leverage ratio of the product and the change in the underlying asset price, adding/subtracting capital inflow/outflow as a result of units creation/redemption¹⁰. Even if there is no additional inflow, the rebalancing demand in response to a given change in the underlying index can be about 6 times of the same change in AUM as the index for a 3-time leveraged product and about 12 times for a 3-time inverse product (it would be about 2 times for a 2-time leveraged product and 6 times for a 2-time inverse product)¹¹. Therefore, the magnitude of the rebalancing demand will increase significantly in a volatile market, particularly for L&I products with high leverage ratios.

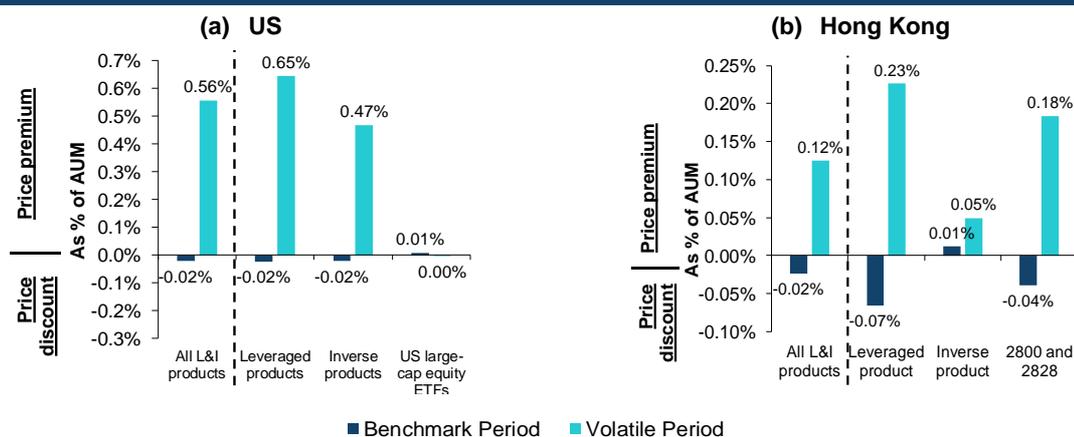
Moreover, the demand for L&I products also increase significantly during a volatile market and the funds flow into these products may increase more than the issuers' expectation. These would require more rebalancing activities in the underlying market, i.e. increasing long positions/decreasing short positions of index derivatives in bull markets or increasing short positions/decreasing long positions of index derivatives in bear markets. These rebalancing activities may increase net selling pressure of the underlying derivatives in a down market and therefore may further increase market volatility. With a strong market demand for L&I products, L&I products in the secondary market may be traded at higher prices than the net asset values of the underlying derivatives. In fact, L&I products were traded at relatively large average daily price premia (as % of AUM) in the US and Hong Kong markets during the Volatile Period than those during the Benchmark Period (see Figure 4). Besides, the average daily price premia/discounts of L&I products were much larger than that of large-cap equity ETFs in the US, which have no such rebalancing demand.

⁹ See "ETF Handbook: A practical guide to Exchange Traded Funds", published on HKEX's website, viewed on 6 October 2020.

¹⁰ See Ivanov, I.T. and S.L. Lenkey, "Are concerns about leveraged ETFs overblown?", *Finance and Economics Discussion Series (FEDS)* of US Federal Reserves, December 2014.

¹¹ Ditto.

Figure 4. Average daily price premia/discounts of L&I products in the US and Hong Kong during the Benchmark Period and Volatile Period



Note: The L&I products in the US are classified as such by Morningstar.

Source: Calculated based on the price premium and AUM of individual products from Bloomberg.

To maintain the leverage ratio in a market turmoil with sharp declines in the underlying indices, a leveraged product will need to reduce its long positions in the related index derivatives (e.g. futures or swaps) exponentially while an inverse product will need to increase its short positions in the related index derivatives to an even larger extent. These rebalancing activities might lead to an increase of net short positions in the underlying index derivatives and take away the market liquidity of index derivatives. In case these activities account for a large market share, the decrease of market liquidity may be significant and this might amplify the impact of net selling pressure in a market turmoil. Conversely, if these rebalancing activities account for a small market share, the impact on liquidity and hence the price volatility of index futures would be limited. To examine if the rebalancing activities of L&I products had amplified the volatility of the underlying market during the market turmoil in 2020Q1, the ratio of the rebalancing demand relative to the turnover of the underlying assets — the “rebalancing demand ratio” — was used as the measure in this study covering the US and the Hong Kong markets.

As equity L&I products are the dominating L&I product type in both markets, key products of this type in both markets were selected for the study. Pursuant to the different product characteristics and data availability in the US and Hong Kong, the measures of rebalancing demand were calculated in different ways:

(1) US market

Most of the L&I products in the US use total return swaps traded in the over-the-counter (OTC) market to replicate the multiple of returns of underlying index, while others use index futures traded on exchanges¹². The swap positions are collateralised by a basket of securities (which may or may not have the same composition of constituents of the underlying index)¹³. The rebalancing of L&I products will change the swap positions and hence the amount of securities as collateral. The issuers may buy or sell the underlying securities or index futures as a result of rebalancing activities. For L&I products using index futures for rebalancing, the rebalancing demand ratio shall use the related index futures turnover as the denominator. However, the granular data of the intraday turnover of index futures for rebalancing activities was not readily available. In this study, the

¹² Source: “Leveraged and Inverse ETPs: Going, Going, Gone?”, the website of Charles Schwab, 22 April 2020.

¹³ Source: Aramonte, S., C. Caglio and T. Tuzun, “Synthetic ETFs”, *FEDS Notes*, published on the US Federal Reserve’s website, 10 August 2017.

rebalancing demand ratio is calculated relative to the turnover of the underlying securities, instead of to that of index futures. According to a research study¹⁴, the rebalancing of L&I products in the US should start from the last 30 minutes to the market close during each trading day. It is assumed that the turnover in the last 30 minutes of a trading day accounted for about 25% of total turnover on that day¹⁵. Therefore, the relative degree of impact of rebalancing in the US market can be measured as the ratio of the gross rebalancing demand to the turnover of the underlying securities during the last 30 minutes of each trading day (referred to as the “**rebalancing demand ratio (securities)**”).

In the US, L&I products are dominated by equity asset class. The underlying derivatives on the S&P 500 Index are expected to have the largest impact on the price discovery of the underlying securities in the US. The L&I products on the S&P 500 Index can offer a leverage ratio of up to 3 times for both leveraged products and inverse products, which would have the largest potential rebalancing demand in a market turmoil than other L&I products on the S&P 500 Index with lower leverage ratios¹⁶. The rebalancing demand of the two largest 3-time leveraged products and two largest 3-time inverse products on S&P 500 Index by NAV¹⁷ were calculated for respectively the Benchmark Period and Volatile Period. To examine the potential market impact, the aggregate gross amount of daily rebalancing demand of these four products, irrespective of the direction in long/short positions, was used to calculate the daily rebalancing demand ratio (securities) — the ratio to the total turnover value of S&P 500 Index constituents in the last 30 minutes of the day.

(2) Hong Kong market

L&I products on Hong Kong equities mainly use futures to replicate the multiple of returns of the underlying index¹⁸. L&I products in Hong Kong are dominated by those issued on Hang Seng Index (HSI) and Hang Seng Chinese Enterprises Index (HSCEI). These products mainly used index futures to deliver the leverage ratio. To monitor the relative degree of impact of rebalancing in the Hong Kong market, the regulator has been using the ratio of the total gross rebalancing demand to the index futures turnover in the last 10 minutes of each trading day (referred to as the “**rebalancing demand ratio (index futures)**”). The aggregate daily rebalancing demand ratio (index futures) of all L&I products on HSI and HSCEI are monitored by the regulator on a daily basis respectively and the regulatory threshold is set at 25% of the index futures turnover in the last 10 minutes¹⁹.

The average daily rebalancing demand ratios as defined above for the US and Hong Kong markets during the Volatile Period were compared with those during the Benchmark Period to see if the rebalancing demand rose to a warning level.

¹⁴ Shum, P., W. Hejazi, E. Haryanto and A. Rodier. (2016) “Intraday share price volatility and leveraged ETF rebalancing”, *Review of Finance*, Vol. 20, pp.2379-2409.

¹⁵ See “The 30 minutes that have an outsized role in US stock trading”, *Financial Times*, 24 April 2018.

¹⁶ During the Volatile Period, 2 out of 6 leveraged products and 2 out of 5 inverse products on the S&P 500 Index had 3-time leverage ratios (classified as such by Morningstar). As of 20 March 2020, the 3-time leveraged products accounted for about 54% of total AUM of leveraged products on the S&P 500 Index and the 3-time inverse products accounted for about 27% of total AUM of inverse products on the S&P 500 Index. (Source: Calculated based on the AUM of individual L&I products from Bloomberg.)

¹⁷ As of end-2019, the largest two 3-time leveraged products on S&P 500 Index listed on the US market are Direxion Daily S&P 500 Bull 3X (ticker: SPXL) and ProShares UltraPro S&P500 (ticker: UPRO) while the largest two 3-time inverse products on S&P 500 Index are Direxion Daily S&P 500 Bear 3X (ticker: SPXS) and ProShares UltraPro Short S&P500 (ticker: SPXU). (Source: Bloomberg.)

¹⁸ There are some swap-based L&I products in Hong Kong. The first swap-based L&I products tracking Mainland A-share indices became available in Hong Kong in July 2020. Source: *Supplemental Circular on Leveraged and Inverse Products*, issued by the SFC, 22 May 2020; “HKEX welcomes Hong Kong’s first A-share L&I products”, news release published on HKEX’s website, 27 July 2020.

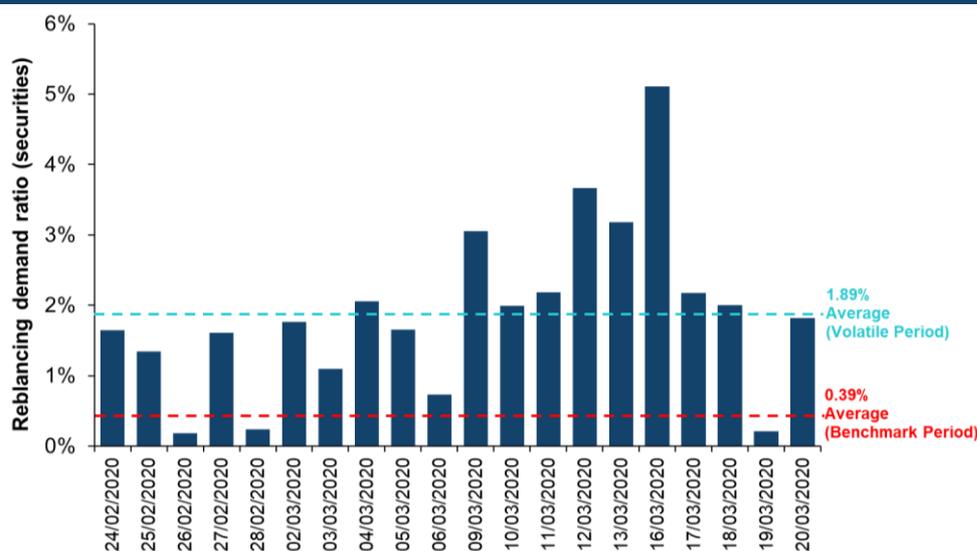
¹⁹ Source: HKEX.

The analysis and findings are presented in sub-sections below.

2.1 Rebalancing activities of L&I products in the US

During the Volatile Period, the rebalancing demand ratio (securities) of the largest four 3-time S&P 500 L&I products under study was higher in mid-March 2020 and recorded the highest level on 16 March 2020 at about 5% (see Figure 5). The average daily rebalancing demand ratio (securities) was 1.89% during the Volatile Period, which was higher than the 0.39% during the Benchmark Period. Although the increase in the rebalancing demand ratio was found to be statistically significant (at a 5% level), the impact on the turnover of the underlying securities was relatively low (given an average daily ratio of below 2%).

Figure 5. Daily rebalancing demand ratio (securities) of four largest 3-time L&I products on S&P 500 Index in the US during the Volatile Period

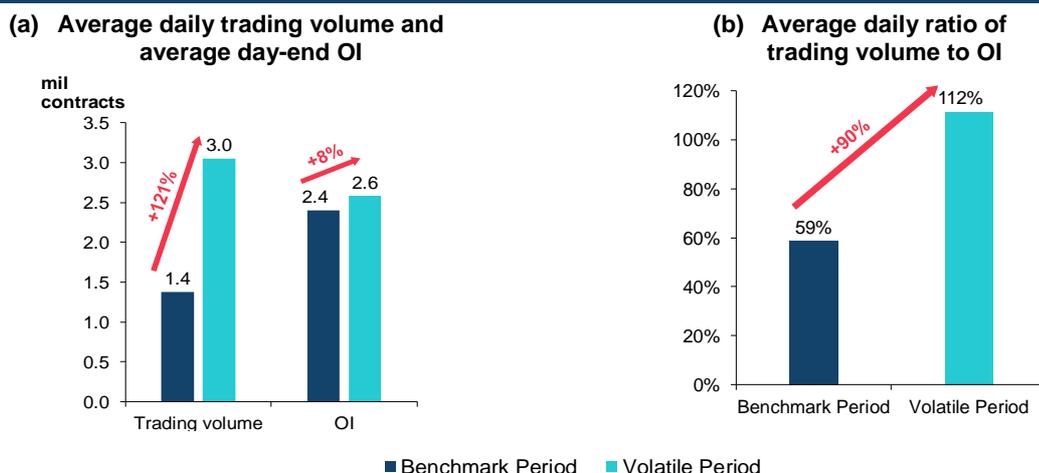


Note: The sample of L&I products comprise SPXL, UPRO, SPXS and SPXU. The rebalancing demand ratio (securities) is the ratio of the aggregate gross rebalancing demand (measured by the change in AUM) of the four products to the turnover value of the S&P 500 Index constituents during the last 30 minutes of each trading day.

Source: Calculated based on daily index returns and AUM of Individual L&I products from Bloomberg.

Alternative to using total return swaps in the OTC market in case the OTC liquidity in the products are insufficient to serve the needs, the increase in the rebalancing demand of L&I products on S&P 500 Index could be addressed by increasing long/short positions in the underlying index futures contracts. This would lead to the increase in the open interest (OI) of S&P 500 Index futures. If the rebalancing demand is too large relative to the index futures turnover, the excessive buy/sell demand for rebalancing may dry up the market liquidity. The S&P 500 index futures in the US was in fact sufficiently liquid during the 2020Q1 market turmoil — the increase in the average daily trading volume of E-mini S&P 500 futures on the CME (the most actively traded equity index futures in the US) during the Volatile Period relative to the Benchmark Period was found to be higher than the increase in average day-end OI (see Figure 6a) and the average daily ratio of trading volume to OI almost doubled from the level during the Benchmark Period (see Figure 6b). In evidence, the trading of index futures market was orderly during the Volatile Period to meet the rebalancing demand of L&I products.

Figure 6. Average daily trading volume and average day-end OI of spot-month E-mini S&P 500 Index futures on the CME during the Benchmark Period and Volatile Period



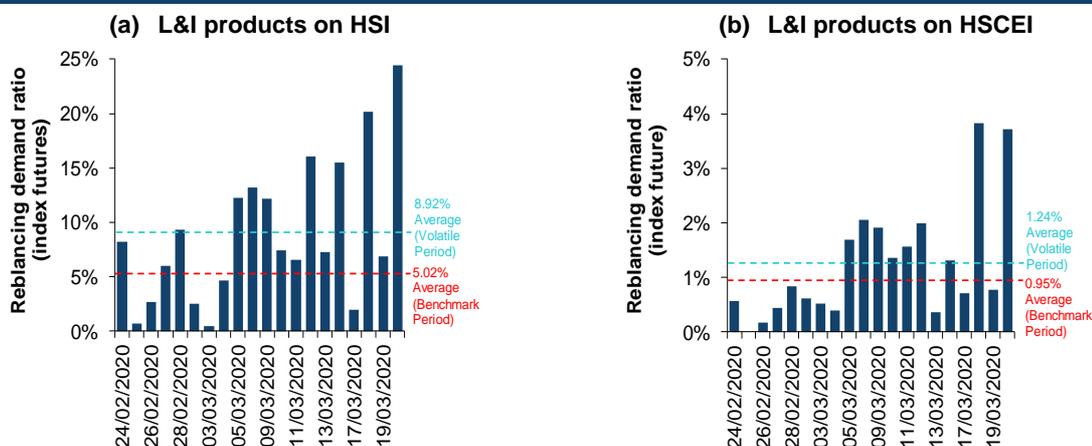
Source: Bloomberg for daily trading volume and day-end OI.

In summary, although the rebalancing demand of the largest 3-time L&I products on S&P 500 Index under study in the US increased significantly during the market turmoil, the impact on the turnover value of the underlying securities was found to be relatively low and the associated changes in the OI of the underlying index futures was orderly absorbed by sufficient liquidity in the contracts without generating excessive selling pressure. There is no evidence to support the criticism on the impact of rebalancing demand of L&I products amplifying the market volatility in the US market.

2.2 Rebalancing activities of L&I products in Hong Kong

During the Volatile Period, the rebalancing demand ratio (index futures) for L&I products on HSI and HSCEI in Hong Kong appeared to have trended up but remained below the 25% threshold for all trading days during the period (see Figure 7). The average daily rebalancing demand ratio of L&I products on HSI rose significantly from 5.02% during the Benchmark Period to 8.92% during the Volatile Period (with statistically significant difference at a 5% level) while that of L&I products on HSCEI stayed at a comparable level for both periods (about 0.95% and 1.24% respectively, without statistically significant difference).

Figure 7. Daily rebalancing demand ratio (index futures) for all L&I products on HSI and HSCEI in Hong Kong during the Volatile Period

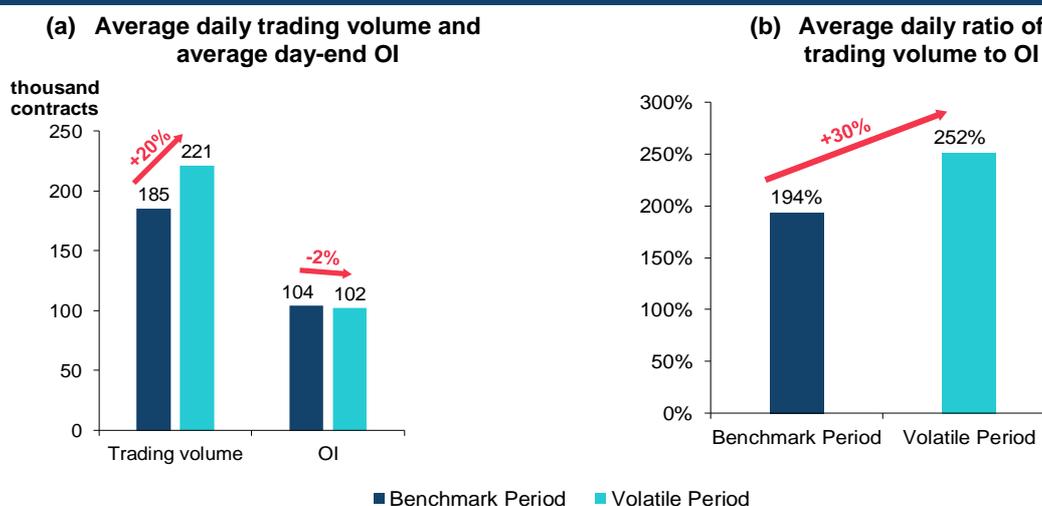


Note: The data for the Benchmark Period only covered July to December 2019.

Source: HKEX.

In respect of the HSI futures on HKEX during the Volatile Period, the average daily OI did not increase relative to the Benchmark Period as a result of an increase in the rebalancing demand of L&I products while the trading volume increased (see Figure 8a). A possible reason is that the impact of rebalancing activities of inverse products on the OI of HSI futures may be partly offset by that of leveraged products as the number of leveraged products and inverse products on HSI were comparable²⁰. Furthermore, the average daily ratio of trading volume to OI of HSI futures increased during the Volatile Period relative to the Benchmark Period (see Figure 8b), suggesting a better liquidity in the index futures market. Therefore, the rebalancing activities are considered not to have a significant impact on the liquidity in the index futures market and would not lead to a significant increase of net selling pressure that might have amplified market volatility.

Figure 8. Average daily trading volume and average day-end OI of spot-month HSI futures during the Benchmark Period and Volatile Period



Source: Bloomberg.

In summary, the impact of the rebalancing of L&I products on the trading activities of HSI and HSCEI futures was found to stay below the regulatory threshold. The HSI futures (which had a much higher rebalancing ratio of L&I products than HSCEI futures) suggested better liquidity during the market turmoil. There was no evidence to support the criticism that the rebalancing activities of L&I products in Hong Kong had significantly increased the net selling pressure of the underlying assets.

Therefore, the criticism of the impact of rebalancing demand of L&I products on market volatility did not hold for both the US and Hong Kong markets.

²⁰ There were 10 leveraged products and 14 inverse products listed on HKEX for both the Benchmark Period and the Volatile Period. Source: "Monthly bulletin (Main board)" for December 2019 and March 2020, HKEX's website, viewed on 17 December 2020.

3. CONCLUSION

Given the special characteristic of L&I products in magnifying the daily returns of underlying assets, the rebalancing demand of L&I products to maintain the leverage ratios increased exponentially during the market turmoil in 2020Q1. This has aroused market criticism that the heavy rebalancing activities of L&I products, which have a dominance on equities as the underlying assets, might have amplified the volatility of the underlying equity indices.

Empirical evidences, exemplified by the cases of ETFs in the US and Hong Kong in the current study, showed that the rebalancing activities of L&I products were relatively small compared to the turnover of underlying assets and that the underlying index futures remained liquid to absorb market shocks.

APPENDIX. LIST OF L&I PRODUCT CLOSURES IN THE US DURING THE MARKET TURMOIL IN 2020Q1 (BY ASSET CLASS)

Product ticker	Product name	Type of closure	Reason for closure	Settlement effective date (on or around)
Commodity				
WTID	ETRACS ProShares Daily 3x Inverse Crude ETN linked to the Bloomberg WTI Crude Oil Subindex ER	Elective redemption	Stop-loss acceleration	26/03/2020
OILD	ProShares UltraPro 3x Short Crude Oil ETF	Fund closure	Unspecified reason	03/04/2020
OILU	ProShares UltraPro 3x Crude Oil ETF	Fund closure	Unspecified reason	03/04/2020
UWT	VelocityShares 3x Long Crude Oil ETN	Elective redemption	Elective acceleration of redemption	03/04/2020
DWT	VelocityShares 3x Inverse Crude Oil ETN	Elective redemption	Elective acceleration of redemption	03/04/2020
WTIU	ETRACS ProShares Daily 3X Long Crude ETN linked to Bloomberg WTI Crude Oil Subindex ER	Elective redemption	Unspecified reason	06/04/2020
Equity				
AMJL	Credit Suisse X-Links Monthly Pay 2xLeveraged Alerian MLP Index ETN	Mandatory redemption	Indicative value fell below \$5	19/03/2020
MLPQ	ETRACS 2xMonthly Leveraged Alerian MLP Infrastructure Index ETN Series B	Mandatory redemption	Indicative value fell below \$5	19/03/2020
HOML	ETRACS Monthly Reset 2xLeveraged ISE Exclusively Homebuilders ETN	Mandatory redemption	Indicative value fell below 60% from previous monthly valuation	23/03/2020
SMHD	ETRACS Monthly Pay 2xLeveraged US Small Cap High Dividend ETN	Mandatory redemption	Indicative value fell below \$5	23/03/2020
MLPZ	ETRACS 2xMonthly Leveraged S&P MLP Index ETN Series B	Mandatory redemption	Indicative value fell below \$5	24/03/2020
HDLV	ETRACS Monthly Pay 2xLeveraged U.S. High Dividend Low Volatility ETN	Mandatory redemption	Indicative value fell below \$5	25/03/2020
LMLP	ETRACS Monthly Pay 2xLeveraged Wells Fargo MLP Ex-Energy ETN	Mandatory redemption	Indicative value fell below 60% from previous monthly valuation	25/03/2020
MORL	ETRACS Monthly Pay 2xLeveraged Mortgage REIT ETN	Mandatory redemption	Indicative value fell below \$5	25/03/2020
MRRL	ETRACS Monthly Pay 2xLeveraged Mortgage REIT ETN Series B	Mandatory redemption	Indicative value fell below \$5	25/03/2020
DVHL	ETRACS Monthly Pay 2xLeveraged Diversified High Income ETN	Mandatory redemption	Indicative value fell below 60% from previous monthly valuation	26/03/2020
LRET	ETRACS Monthly Pay 2xLeveraged MSCI US REIT INDEX ETN	Mandatory redemption	Indicative value fell below 60% from previous monthly valuation	27/03/2020
BDCL	ETRACS 2xLeveraged Long Wells Fargo Business Development Company Index ETN	Mandatory redemption	Indicative value fell below \$5	02/04/2020
LBDC	ETRACS 2xLeveraged Long Wells Fargo Business Development Company ETN Series B	Mandatory redemption	Indicative value fell below \$5	02/04/2020
FINU	ProShares UltraPro Financial Select Sector	Fund closure	Unspecified reason	03/04/2020
FINZ	ProShares UltraPro Short Financial Select Sector	Fund closure	Unspecified reason	03/04/2020
UBIO	ProShares UltraPro Nasdaq Biotechnology	Fund closure	Unspecified reason	03/04/2020
ZBIO	ProShares UltraPro Short Nasdaq Biotechnology	Fund closure	Unspecified reason	03/04/2020

APPENDIX. LIST OF L&I PRODUCT CLOSURES IN THE US DURING THE MARKET TURMOIL IN 2020Q1 (BY ASSET CLASS) (cont'd)

Product ticker	Product name	Type of closure	Reason for closure	Settlement effective date (on or around)
Fixed income				
DLBS	iPath US Treasury Long Bond Bear ETN	Delisting	Indicative value declined below minimum listing standard	n/a
DTYS	iPath US Treasury 10-year Bear ETN	Delisting	Indicative value declined below minimum listing standard	n/a
Others				
CEFL	ETRACS Monthly Pay 2xLeveraged Closed-End Fund ETN	Mandatory redemption	Indicative value fell below \$5	27/03/2020
CEFZ	ETRACS Monthly Pay 2xLeveraged Closed-End Fund ETN Series B	Mandatory redemption	Indicative value fell below \$5	27/03/2020
EVIX	VelocityShares 1X Long VSTOXX Futures ETN	Elective redemption	Unspecified reason	06/04/2020
EXIV	VelocityShares 1X Daily Inverse VSTOXX Futures ETN	Elective redemption	Unspecified reason	06/04/2020

Note: The closures of L&I products during 9-23 March 2020 were reported in the source.

Source: "Leveraged ETF closures piling up", *ETF.com*, 25 March 2020.

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