

A Market Volatility Analysis of the Shanghai-Hong Kong Stock Connect Program

Tung-Zong (Donald) Chang

College of Business, Metropolitan State University of Denver, U.S.A.

Su-Jane Chen *

College of Business, Metropolitan State University of Denver, U.S.A.

Hongmei Gu

*Center for China Public Sector Economy Research & School of Economics,
Jilin University, China*

Aijie Jiang

School of Economics, Jilin University, China

Abstract

The Shanghai-Hong Kong Stock Connect Program is a major development in China's overall financial reform effort, making its capital markets more accessible to global investment communities. The program utilizes the well-established Hong Kong Stock Exchange (HKEX) as a means to make Shanghai Stock Exchange (SSE) more accessible to foreign investors via the link to HKEX and in the process gives SSE more international exposure, though potentially at the expense of HKEX. We examine the impact of the Connect Program on the overall market volatility before and after two main dates: announcement date and launch date. The results show a positive market anticipation effect for both exchanges after the announcement, with their respective market risks declining significantly even before its official launch. However, the results also detect a negative effect in that both exchanges endured a significant surge in their respective volatility after program launch. Overall, the volatility risk of HKEX after launch was significantly below its pre-announcement level while SSE exhibited a completely opposite result.

Key words: Hong Kong stock exchange; Shanghai stock exchange; Shanghai-Hong Kong stock connect; risk analysis; GARCH model

JEL classification: G14; G15; G23

* Correspondence to: College of Business, Metropolitan State University of Denver, Campus Box 75, P.O. Box 173362, Denver, CO 80217-3362, U.S.A. Tel.: + 1 (303) 615-0189; Fax: +1 (303) 556-6173. E-mail: chens@msudenver.edu. This research is partially funded by the General Program of National Social Science Foundation of China (12JBY160).

1. Introduction

There are two major security exchanges in China, the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE), in addition to the Hong Kong Stock Exchange (HKEX) in Hong Kong SAR. While SSE and SZSE are not conveniently accessible to foreign investors, both are known for their relatively high vitality and heavy influence from unpredictable small individual investors as some wealthy Chinese investors are able to trade through accounts outside of China. SSE is the largest stock exchange in China with a market capitalization of US\$4.0 trillion and annual turnover of US\$7.2 trillion from more than 1,000 listings. In comparison, HKEX has a market capitalization of US\$3.89 trillion and annual turnover of US\$3.3 trillion with more than 2,000 listings. Unlike HKEX, which is open to international institutional as well as individual investors, SSE is an exchange mostly closed to international investors and under tight control, close monitoring, and if necessary, intervention by the Chinese authorities. Because of these factors, SSE is much more volatile. This should not come as a surprise since SSE's high market concentration could have a negative impact on market stability (e.g., Mirzaei, 2013) and would make it more susceptible to policy influences than its counterpart, HKEX.

To internationalize its capital markets, the China government has carried out many policies to accelerate the financial market reform process, hoping that a more liberalized market could potentially attract further international investment (e.g., Goel and Saradhi, 2015). On April 10, 2014, Chinese authorities announced the Shanghai-Hong Kong Stock Connect (SHKSC) Pilot Policy, a cross-border investment channel arrangement that connects SSE with HKEX to allow investors to trade shares in both markets, with selected stock and capital constraints, using respective local brokers and clearing houses. This is the first attempt to make SSE more accessible to global investors via HKEX. Chinese authorities hope that such a scheme will help internationalize SSE, which was mostly a domestic, closed exchange prior to the official launch of SHKSC on November 17, 2014. Before the launch, foreign investors had to invest indirectly through select Chinese authority-approved financial institutions based outside China. The Connect Program essentially allows international investors to directly trade select SSE-listed stocks via HKEX as Hong Kong has a much more open financial market. The Program has been considered an integral part of China's ongoing financial reform campaign.

The Connect Program presents an opportunity to examine the effectiveness of the China government's attempt in controlling market volatility by partially linking an emerging, yet volatile exchange to a mature and more stable exchange without yielding significant changes in government control and intervention. As a volatile stock market could lead to social unrest as evident from past events in China, lowering market volatility could alleviate discontent among small individual investors and help legitimize the China government's influence in the financial market. The success of such a program could lead to future expansion of the Connect Program, such as more eligible listings, higher quotas, etc. The aim of this paper is thus to empirically examine the effectiveness of the Connect Program in

controlling volatility. We look to provide invaluable insight into how partially linking a closed exchange to an open exchange affects volatility in both markets.

2. Literature Review

The Connect Program is widely regarded as a key element in China's financial reform agenda, which includes modernizing the state-owned banking system, internationalizing its currency market, and making the capital markets more accessible to foreign investors. There are potential pros and cons associated with SHKSC, a scheme using the mature HKEX as leverage to make SSE more accessible to international investors via HKEX. In the process, it could give SSE more global exposure, though potentially at the expense of HKEX. As Ba (2014) suggests, SHKSC could contribute to the opening of China's capital markets. Moreover, Gui (2014) contends, from a strategic perspective, that the new scheme could help promote the domestic capital market by making it more in line with the international capital markets. Thus, by linking SSE to the well-respected HKEX, China could gain traction in promoting its capital reform.

In contrast to the optimism voiced by Ba (2014) and Gui (2014), others have pointed out some potential concerns pertaining to the program, such as investment risks associated with cross-border capital flows, revaluation effects of market risk, valuation differences, and an imperfect innovative mechanism itself (China Merchants Bank, 2014), to name a few. Cross trading is also not protected by Hong Kong's Investor Compensation Fund, making such trades potentially riskier for Hong Kong investors. Differences in trading days and hours and other trade restrictions as well as numerous technical issues present additional challenges.

Zhou (2014) states that this program is a positive development for SSE, but the effect might not be sustainable, because the overall financial reform faces difficulties. Others have focused on how to deal with the corresponding risks. Xiang (2014) discusses financial risks arising from the pilot policy to SSE and HKEX and proposes measures in managing these risks. One potential benefit for the Connect Program is the expected effect in reducing price differences between the two markets for dual-listed shares. Investors could potentially place orders with the more attractive venue, and as a result, price differences in dual-listed shares should decrease. However, early results have shown that the Connect Program has failed to close price gaps among dual-listed shares (Yiu, 2016). Empirically, Li (2015) also does not find any empirical support for a hypothesized effect that the Connect Program would eliminate price differences of cross-listed companies in both markets. Based on data from January 1, 2009 to September 30, 2015, the study actually indicates that price disparities increased. However, after controlling for company-specific factors, market performance, and investor preferences among 55 dual-listed companies from January 4, 2013 to December 31, 2015, Fan and Wang (2016) show that the program might help reduce the price gaps. In addition, they find that price differences are also affected by other factors such as corporate governance.

A major objective of the Connect Program is to reduce the overall market

volatility in SSE, while hoping HKEX's volatility remain, more or less, the same. This paper intends to fill the gap in the literature by empirically examining how the Connect Program affects volatility in both markets. We examine SSE and HKEX risk fluctuations resulting from the announcement and implementation of SHKSC by analyzing financial data over three periods: before announcement, between announcement and official launch, and after launch. Thus, two important dates are used for this event study, the SHKSC announcement date of April 10, 2014 and the SHKSC launch date of November 17, 2014.

We expect the announcement of SHKSC to lead to a market reaction and thus a market anticipation effect, as markets typically await the implementation of such programs. A positive market reaction, or lower market volatility, is expected, because internationalization is widely seen as a positive step forward. However, this significant initiative, as with most new major market developments, requires the market to adapt to new resulting market forces. Initial responses upon the program launch then are likely to be volatile, especially if the actual results do not conform to what the market has anticipated. Thus, for both SSE and HKEX we conjecture (1) a positive market anticipation effect as reflected in the presumably lowered risk level prevailing over the period of post-announcement date to pre-launch date and (2) a negative implementation effect as evidenced in the rising risk level immediately following the program launch. The establishment of a relatively lower pre-program launch market risk, lower than the risk prevailing not only before the program's announcement but also after the program's launch, is essential to validating both the positive market anticipation and negative event launch effects.

3. Data and Methodology

In this paper we examine the market risk exposure in terms of stock price volatility. We employ data of SSE 180 Index and Hang Seng Index (HSI) from April 1, 2006 to April 16, 2015, using a GARCH model (Engel, 1982; Bollerslev, 1986; Bollerslev et al., 1986; Nelson, 1991) to estimate the market risk. There are various approaches in measuring financial market risks, including nominal values, sensitivity, volatility, value at risk (*VaR*), stress testing, the extreme value method, etc. Among them, *VaR* has been widely used by academic researchers, major international banks, non-bank financial institutions, corporations, and financial regulatory agencies (e.g., Lai, 2008; Moore, 2011). Developed by JP Morgan in 1994 to measure the maximum possible loss of a portfolio in the next specific period at a given confidence level, *VaR* compensates for a lack of sensitivity and volatility (Guldimann, 2000) and can be used to determine internal economic capital requirements and to set risk limits, performance evaluation standards, and financial regulations, to name a few. In the present study, we use the widely adopted daily relative *VaR* to measure market volatility, with SSE 180 and HSI data over the first 100 immediate trading days before and after the two dates of the announcement and the launch of the SHKSC program. Data are obtained from NETEASE Finance and Yahoo Finance.

To keep the empirical findings relevant, we limit the study period to the first 100 trading days to avoid confounding effects due to numerous uncontrollable market events and public policy factors. We scanned both markets during the study period to make sure that there were no dramatic incidents that could significantly affect the financial market locally, regionally, and globally. Given the tight observation window, the empirical results are short term in nature. While a longer-term result would be more appealing, extending the study period could potentially incur undesirable confounding impacts. The public policy makers could also make modifications if the desired results were not accomplished, further muddling the real effect of the Connect Program. The choice of the limited number of trading days was motivated by limiting the likely influence from external factors. While minimizing potential confounding effects, the employed examination period inherently limits the scope of this research to be short term in nature.

4. Results

We calculate daily SSE and HSI *VaR* values that are adjusted for autocorrelation, a common practice for time-series data, using the normal GARCH(1,1) model. The smaller the *VaR* value is, the less volatile the market is. We also test the validity of the *VaR* measurement by back-testing the *VaR* estimates, using the unconditional coverage method. The approach compares the actual loss with corresponding *VaR* projections during the test periods and counts the frequency when actual losses exceed respective *VaR* forecasts. Test results indicate that the fitting is valid at the 95% confidence level.

Table 1 presents statistics associated with *VaR* values calculated for both stock markets, SSE and HKEX, surrounding the two event dates. We note several observations. Significant risk changes resulting from the two events took place in both SSE and HKEX. The *VaR* levels in both markets decreased significantly after the policy was announced, but then increased significantly after the program was implemented. The empirical evidence supports our hypothesized positive market anticipation effect in terms of risk reduction upon the announcement of SHKSC and a negative event launch effect in the realization of higher risk immediately following the program's launch.

The validation should not come as a surprise. Market players viewed the SHKSC announcement as positive news, signaling the China government's willingness to move one step closer to liberalizing and internationalizing its financial markets, which should further benefit market participants with broader investment choices and enhanced risk diversification. However, as with other financial markets in response to major market developments, both SSE and HKEX must evolve and adapt to new market forces arising from this important market initiative. Naturally, initial market responses upon the program's launch are most likely going to be volatile as investors start to face market realities. The Connect Program is also only a first step in China's long-range financial reform effort. This argument holds true especially if the actual results do not conform to what the

market has anticipated.

Table 1 further reveals that while SSE's post-launch risk rose and surpassed its pre-announcement level, HKEX witnessed an overall drop in its post-launch risk from its corresponding pre-SHKSC announcement risk. Both of the noted increase and decrease are significant at the 1% significance level. Thus, it appears that the program might have benefitted HKEX participants, presumably international investors, more than SSE participants, mainly Chinese investors, at least in terms of market volatility reduction in the short run and has presented a steeper learning curve for the latter. Table 2 further highlights the asymmetric impact of SHKSC on the risk levels of the two stock exchanges.

Table 1. Mean VaR Values and t-test Results

| Exchange | Event | 100 days | Difference | | | |
|--------------|--------------|---------------|---------------|----------------|---------|--------|
| | | | μ | (After-Before) | p-value | |
| Shanghai | Announcement | <i>before</i> | 2.353 | -0.474 | < 0.01 | |
| | | <i>after</i> | 1.879 | | | |
| | Launch | <i>before</i> | 1.807 | +1.434 | < 0.01 | |
| | | <i>after</i> | 3.241 | | | |
| | Announcement | <i>before</i> | 2.353 | +0.888 | < 0.01 | |
| | | <i>after</i> | 3.241 | | | |
| | Hong Kong | Announcement | <i>before</i> | 1.229 | -0.021 | < 0.01 |
| | | | <i>after</i> | 1.207 | | |
| Launch | | <i>before</i> | 1.197 | +0.032 | < 0.01 | |
| | | <i>after</i> | 1.229 | | | |
| Announcement | | <i>before</i> | 1.229 | -0.051 | < 0.01 | |
| | | <i>after</i> | 1.177 | | | |

Notes: Actual μ values are 1/100 of those shown under column μ for result presentation purpose. A higher mean VaR value implies a higher volatility. Overall, the Shanghai Stock Exchange was significantly more volatile (at the 1% significance level) than the Hong Kong Stock Exchange for all study periods.

Table 2 contains cross-exchange comparison results for respective risk changes experienced by SSE and HKEX before and after the two event dates. The table shows that, after the announcement of SHKSC, SSE experienced a significantly deeper drop in market risk than HKEX. However, once the program was officially launched, SSE's market risk surged significantly more than HKEX's. Moreover, by comparing the pre-policy announcement period and the post-policy launch period, we observe an increase in market volatility for SSE and a decline for HKEX over the entire study period. Thus, as far as market volatility is concerned, the

introduction of SHKSC has had an adverse impact on SSE, but a positive effect on HKEX, at least for the period immediately following the policy launch. Until the announcement and implementation of SHKSC, HSI returns mainly reflected common market factors prevailing outside China. Thus, the asymmetric risk influence exerted by SHKSC on the two stock markets may be attributed exclusively to systematic factors pertaining to China. Future research is needed to shed additional light on the potential cause for this documented differential effect on risk.

Table 2. Comparisons of Changes in SSE and HKEX

| Shanghai vs. Hong Kong | Exchange | D | $D_{SSE} - D_{HKEX}$ | p-value |
|----------------------------------|-----------|--------|----------------------|---------|
| Before/After Announcement | Shanghai | -0.474 | -0.452 | <0.01 |
| | Hong Kong | -0.021 | | |
| Before/After Launch | Shanghai | +1.434 | 1.402 | <0.01 |
| | Hong Kong | +0.032 | | |
| Before Announcement/After Launch | Shanghai | +0.888 | 0.939 | <0.01 |
| | Hong Kong | -0.051 | | |

Notes: Actual D values are 1/100 of the values shown under column D for result presentation purpose. D_{SSE} and D_{HKEX} denote the respective before/after differences for Shanghai Stock Exchange and Hong Kong Stock Exchange.

5. Conclusions

This research calculates daily *VaR* values of the SSE 180 Index and Hang Seng Index for 100 trading days both before and after the SHKSC announcement date as well as before and after its launch date, using the normal distribution-based GARCH model. The results show that there are significant changes in market volatility in both SSE and HKEX before and after both event dates. Specifically, the *VaR* values in SSE decreased significantly after the policy was announced, but increased significantly after it was formally launched. For SSE, SHKSC has caused an overall increase in its risk since the magnitude of the increase after program implementation is greater than that of the decrease before the announcement of the program - that is, the negative program implementation effect outweighs the positive market anticipation effect for SSE. In contrast, the opposite is observed for HKEX.

In an effort to manage confounding factors in a highly volatile market and keep the empirical results relevant, we investigate the program's impact over a relatively short-term period. While the lack of significant events was verified, we recognize the possibility that potential, unobservable factors could have affected the results. By limiting the study period, the results are short term in nature. The long-term outcome of the program remains undetermined. Follow-up investigations into the program's longer-term effect present a worthwhile future research avenue. However, any long-term effect is likely to be confounded by many potential third factors, such as

major financial market developments, key government policy, regulation overhauls, etc. Thus, striking a balance between the need for controlling for potential confounding effects and the desire for a long-term finding presents a challenge when studying time-series data, especially in a volatile market environment. The high volatility that SSE experienced a few months afterwards due to significant events that occurred after the end of the study period in 2015 manifests the difficulties in gauging the long-term effect of the Connect Program.

Future research could analyze other SHKSC-related effects. For example, HKEX participants could potentially benefit from SHKSC, most likely due to enriched investment selections and improved diversification prospects. However, the same might not be available to small individual Chinese investors, because of asset size and other requirements. SHKSC, by enabling international investors to gain access to SSE and obligating the China government to loosen its grip on its leading stock market, could have added an extra layer of uncertainty to SSE that was not present previously. For example, foreign investors might enter and exit the market for reasons not applicable to Chinese investors, such as portfolio rebalancing by mutual fund managers who window-dress their funds' annual reports, thus heightening the risk exposure of small domestic individual SSE investors. These empirical results shall provide Chinese regulators additional insights into how to better formulate and fine-tune relevant financial legislation and policies.

References

- Ba, S., (2014), "The Policy of Joint Listing between Shanghai and Hong Kong Exchange Promotes the Opening of China's Capital," [In Chinese], *Economy*, 9, 9.
- Bollerslev, T., (1986), "Generalized Autoregressive Conditional Heteroskedasticity," *Journal of Econometrics*, 31(3), 307-327.
- Bollerslev, T., R. Y. Chou, and K. F. Kroner, (1992), "ARCH Modeling in Finance: A Review of the Theory and Empirical Evidence," *Journal of Econometrics*, 52 (1-2), 5-59.
- CASS, China Merchants Bank, (2014), "Risks under the Joint Listing Policy between Hong Kong and Shanghai Exchange," [In Chinese], *Capital Markets*, 10, 42-46.
- Engle, R. F., (1982), "Autoregressive Conditional Heteroscedasticity with Estimates of the Variance of United Kingdom Inflation," *Econometrica*, 50(4), 987-1007.
- Fan, Q. and T. Wang, (2016), "The Impact of Shanghai-Hong Kong Stock Connect Policy on A-H Share Price Premium," *Finance Research Letters*, 21, 222-227.
- Goel, S. and V. R. Saradhi, (2015), "Capital Flow Components and the Real Exchange Rate: Implications for India," *International Journal of Business and Economics*, 14(2), 179-194.
- Gui, M., (2014), "The Strategic Significance of Joint Listing Policy between Shanghai and Hong Kong Exchange," [In Chinese], *Economics of Shanghai and Hong Kong Exchange*, 12, 62-63.

- Guldimann, T., (2000), "The Story of Risk Metrics," *Risk*, 13(1), 56-58.
- Lai, Y., (2008), "Does Asymmetric Dependence Structure Matter? A Value-at-Risk View," *International Journal of Business and Economics*, 7(3), 249-268.
- Li, Q., (2015), "Does the Stock Connect Program Eliminate the Price Disparities of Cross-listed Companies?" Unpublished Paper.
- Mirzaei, A., (2013), "Bank Performance during the Financial Crisis 2007–2010," *International Journal of Business and Economics*, 12(1), 27-44.
- Moore, T., (2011), "The Volatility Spillover from the Market to Disaggregated Industry Stocks: The Case for the US and UK," *International Journal of Business and Economics*, 10(1), 61-68.
- Nelson, D. B., (1991), "Conditional Heteroskedasticity in Asset Returns: A New Approach," *Econometrica*, 59(2), 347-370.
- Xiang, B., (2014), "Market Impact and Financial Risks Brought by the Joint Listing Policy between Hong Kong and Shanghai Exchange," [In Chinese], *Oriental Enterprise Culture*, 23, 298.
- Yiu, E., (2016), "Price Gap between A and H Shares Expected to Remain, Even with the Arrival of Shenzhen-Hong Kong Trading Link," *South China Morning Post*, December 2, 2016.
- Zhou, J., (2014), "The Good News Effects of the Joint Listing Policy between Hong Kong and Shanghai Exchange," [In Chinese], *Financial Expo (Wealth)*, 9, 56-57.