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Richard C. K. Burdekin,
Claremont McKenna College

and

Pierre Siklos
Balsillie School of International Affairs and
Department of Economics, Wilfrid Laurier University,

Quantifying the Impact of the November 2014 Shanghai-Hong Kong Stock Connect*

RICHARD C. K. BURDEKIN and PIERRE L. SIKLOS

Claremont McKenna College, Claremont, California

and Wilfrid Laurier University, Waterloo, Ontario, Canada

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Abstract

The November 2014 Shanghai-Hong Kong Stock Connect represented an important step in China's capital account liberalization, allowing relatively free movement of investor funds between the two markets for the first time. We offer a quantification of the effects of the new program, examining Northbound and Southbound flows of funds over the first two years of the Stock Connect. While controlling for other sentiment and liquidity effects, we test how these flows may have affected the extent of the premium seen for local A-share listings in Shanghai relative to the prices accruing to the same companies in Hong Kong market trading.

Keywords: Capital account liberalization; Stock returns; Sentiment; Shanghai; Hong Kong

JEL classification: G15

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1. Introduction

Renminbi liberalization has been accelerating rapidly in recent years. Although China's currency was not even fully convertible for current account transactions until 1996, a growing array of bilateral currency swaps and offshore renminbi centers have expanded renminbi usage as far as Europe, Africa and South America. The largest offshore trading is in Hong Kong, where renminbi-based transactions soared after the offshore market was formally established in July 2010. Whereas the offshore renminbi rate in Hong Kong has fluctuated in value relative to the onshore rate in Shanghai since 2010, the launch of the Hong Kong-Shanghai Stock Connect on November 17, 2014 was accompanied by a major surge in the offshore premium. The spread between the offshore rate and onshore rate has itself been found to be influenced by relative sentiment levels in Shanghai and Hong Kong, as reflected in the spread between A-shares listed in Shanghai and H-shares listed in Hong Kong (Burdekin and Tao, 2017).

The November 2014 Stock Connect program not only significantly added to the linkages between Shanghai and Hong Kong but also provided a gateway into China for international investors utilizing the Hong Kong market. As with the offshore renminbi market, investment flows are influenced by both the availability of funds and investor sentiment towards the relative prospects of the Shanghai and Hong Kong markets. In this paper we test the relationship between the Northbound and Southbound flows and an array of variables proxying for sentiment and liquidity effects. We focus especially on the relationship with the A-H Share premium that has already been seen to be significant with respect to the spread between the offshore renminbi rate in Hong Kong and the onshore rate in Shanghai.

A major factor limiting the potential impact of the Stock Connect program has been the restrictions imposed on capital movements between the two markets. Southbound investors from Shanghai had to have a minimum account balance of half a million renminbi and aggregate southbound flows to Hong Kong were subject to a daily quota of RMB 10.5 billion and aggregate quota of RMB 250 billion.[1] Northbound trade faced slightly higher limits of RMB 13 billion and RMB 300 billion, respectively. Moreover, only large capitalization stocks were eligible to be traded via the new Stock Connect, with less than 600 Shanghai-listed companies initially being eligible. The exclusion of smaller firms may have been one factor dampening investor enthusiasm for the new scheme from Shanghai investors. For example, Gui Haoming of Shenyinwanguo Securities argues that southbound investment remained relatively small not only because mainland investors were unused to foreign investment opportunities but also because many enjoy chasing hot stocks based on market enthusiasm.[2] A 2015 research report from Oriental Patron, a Hong Kong based investment services firm, further argues that mainland China investors focus more upon policy direction, market sentiment and growth potential as opposed to a more western-based focus upon profit growth, valuation metrics, and dividend returns.[3]

In addition to the available Hong Kong shares not being attractive to mainland investors, quota restrictions further explained why the opening up of Shanghai-Hong Kong Stock Connect did not immediately eradicate the price differential between the two markets. Enthusiasm for an additional Shenzhen-Hong Kong market link from the mainland China side stemmed, in large

[1] For full details of the Stock Connect agreement, see Hong Kong Exchanges and Clearing Limited (2014).
[2] See “Shanghai-Hong Kong Link Expert Interview” (2015).
[3] See “Shanghai-Hong Kong Link Anniversary” (2015).

part, from the expectation that this would include start-ups and smaller stocks (Yiu, 2016). Ironically, the actual launch of the Shenzhen-Hong Kong Stock Connect in December 2016 appeared to draw only muted interest initially (Wildau, 2017).[4] This may have been more a reflection of the timing of the launch than indicative of its long-run potential, however -- with the June 2016 MSCI decision to keep Chinese shares out of its global indexes being followed by the post-election rally in US shares that may have further reduced interest in mainland Chinese shares.

There was certainly no sign of a narrowing of the A-H Share premium in the first year of operation of the Shanghai-Hong Kong Stock Connect. On the contrary, the average premium rose substantially from a little under 100% when the program was launched to nearly 150% in early 2016. This rise in the premium continued even in the face of a sharp decline in the Shanghai market index, which encouraged mainland Chinese investors to use the Stock Connect to find shelter in Hong Kong (Hunter, 2016). One consideration is that the volume of trading facilitated by the Stock Connect remained small, accounting for less than 5% of total Hong Kong stock market turnover in early 2016. Southbound quota usage did accelerate during 2016, however, standing at 34.9% at the end of the third quarter – and totalling RMB 279.5 billion since the inception of the program in November 2014 (Hong Kong Exchanges and Clearing, 2016). This was accompanied by continued weakness of the Shanghai market during 2016 and underperformance relative to Hong Kong.

[4] In a further effort to attract capital inflows, a new Bond Connect between Shanghai and Hong Kong was planned for July 2017 – but with only Northbound flows being allowed initially (Herrero, 2017).

The A-H Share premium was actually entirely eliminated during 2016, with an A-Share discount developing in July 2016 and remaining in place over the remainder of the year. Although this may have been driven by reduced investor appetite for mainland China shares owing to concerns over a growth slowdown as well as the aforementioned June 2016 MSCI decision, the Stock Connect helped facilitate flows of funds from Shanghai to Hong Kong that went hand in hand with the ending of the prior A-H Share premium. High frequency analysis using minute-by-minute data suggests the Stock Connect significantly strengthened volatility spillover between the two markets (Zhang and Jaffry, 2015; Huo and Ahmed, 2017). Meanwhile, Wang and Tsai (2016) find significant effects of the Stock Connect launch on both Shanghai and Shenzhen stock market volatility using daily data, but little evidence of an impact on the Hong Kong market. Similarly, Bai and Chow's (2017) event study approach reveals significant short-run effects of the Stock Connect on the Shanghai and Shenzhen markets, but not Hong Kong – with the asymmetric effects attributed primarily to the different levels of market maturity. Huang and Lin (2016) also apply an event study approach, but utilize individual company data on cross-listed shares. They find evidence of significant abnormal returns in both the Shanghai and Hong Kong markets around the implementation date of the Stock Connect. None of these studies focuses directly on the A-H Share Premium, however.

Jiang and Sohn's (2016) analysis of the A-H Share premium suggests that the Stock Connect contributed to price discovery, albeit with the major influence arising from the more established Hong Kong market. But their findings of overall price convergence rely upon the use of the cross-listed Shenzhen-Hong Kong shares as a "treatment" group, which seems questionable given that the Shenzhen-listed companies are typically smaller, as well as being more tech-focused, than those listed in Shanghai – leaving the book values of Jiang and Sohn's Shanghai-Hong Kong pairs substantially higher than the book values of their Shenzhen-Hong Kong pairs. Chan and Kwok (2016) directly test for cointegration between A-shares and H-share based on the prices of 61 cross-listed shares. Initially focusing upon the effects of the April 10, 2014 announcement of the pilot program (as opposed to the actual implementation date), Chan and Kwok find evidence of less price disparity, and more cointegration, over the post-announcement period between April 2014 and July 2014. Analysis of the period following the actual implementation of the Stock Connect provided further support for substantial price co-movements across the two markets despite the fact that the A-H Share premium was rising over their November 17, 2014 – February 25, 2015 post-implementation sample.

Unlike the extant work, our analysis of the A-H Share premium incorporates data on the daily fluctuations in actual Northbound and Southbound flows. These observations were not used previously. The relationship between these flows and the A-H Share premium, as well as other sentiment and liquidity variables, is modelled via a two regime Markov process over an extended sample of daily data from the Stock Connect's launch in November 2014 through early January 2017. We chose this methodology in large part because, as we shall see, in the sample considered there are clearly identifiable periods of high and low uncertainty. This suggests that a model with two regimes ought to fit the data reasonably well and permits us to explore differences in the determinants of the A-H premium over the two regimes.

2. Sentiment, the A-H Share Premium and the November 2014 Stock Connect

Sentiment effects are naturally hard to quantify. Nevertheless, whether using direct survey based sentiment measures from the People's Bank of China (Burdekin and Redfern, 2009) or indirect sentiment measures as represented by relative price-earnings ratios and firm specific factors (Arquette, Brown and Burdekin, 2008), more positive sentiment on the part of local Chinese investors seems to have been significant in accounting for the premium of domestic A-share listings over offshore listings in the past. Many other factors besides sentiment could play a role in explaining such discounts, however. With the different share listings being denominated in different currencies, changing exchange rate expectations also appear to have played a significant role (Arquette, Brown and Burdekin, 2008). The sharp difference between A-share valuations in Shanghai and H-share valuations in Hong Kong persisted after the 2004-2005 joint IPOs of large Chinese state-owned banks (Burdekin and Yang, 2013), with sentiment effects continuing to remain significant in helping explain the price differentials.

A significant role for sentiment, even after controlling for observed stock market trends and other macroeconomic and financial conditions, implies a departure from traditional finance models in which "unemotional investors always force capital market prices to equal the rational present value of expected future cash flows" (Baker and Wurgler, 2007, p. 129). However, a major complication prior to November 2014 concerned the limitations on flows of funds between the Hong Kong and Shanghai markets that left little scope for arbitraging away any price discrepancies not justified by more fundamental factors.[5] Whereas the relaxation of capital controls makes it possible for inflows and outflows of funds to reduce the price differentials, actual equality of A-share and H-share prices could still not be expected so long as Shanghai and Hong Kong investors continue to evaluate stocks differently.

Outperformance of the Shanghai market through the first half of 2015 (Figure 1) was accompanied by a sharp rise in the A-H Share premium in the early months following the launch of the Stock Connect. Although the A-H Share premium remained at elevated levels through early 2016, there was some tendency for the flow of funds under the Stock Connect program to swing away from the Shanghai market (Figure 2). Indeed, an initial surge in net Northbound trading when the Stock Connect was launched in November 2014 reverses towards a more neutral pattern in early 2015, even though the Shanghai market was still advancing strongly at this time. This could well reflect a tendency by investors participating in the Stock Connect scheme to diversify away from the rising A-share market even as local investors were pushing shares to new heights in the first half of 2015. The sharp downward break in the Shanghai market during the summer of 2015 is accompanied by extreme volatility in the flows of funds, with spikes in both directions being evident. The subsequent underperformance of the Shanghai market in 2016 was accompanied by a move from an A-H Share premium to a discount by the middle of the year. The Shanghai market's reduced volatility levels in 2016 compared to 2015 seems to be reflected in reduced volatility in the flows of funds as well – but with most remaining shifts being in favor of the Southbound trade.

[5]It is debatable how great a barrier capital controls posed in practice and Girardin and Liu (2007, p. 368), for example, argue that even back before the global financial crisis: "Capital flight is already used by Chinese residents to buy shares in Hong Kong …"

In order to quantify the effects of the Stock Connect, we examine the relationship between the A-H Share premium and the Northbound and Southbound flows using daily time series data from the November 17, 2014 opening date through the end of December 2016.[6] We control for Hong Kong and Shanghai market returns, the US S&P 500, the RMB exchange rate, and short-term interest rates (Shanghai interbank offer rate and Hong Kong interbank rate). The unconditional correlations between the Northbound and Southbound cash flows, the A-H Share premium, and Shanghai and Hong Kong stock market indices are depicted in Table 1. Table 1 reveals that the A-H Share premium is considerably more correlated with Nothbound trade than with Southbound trade. The significant negative correlation coefficient of approximately -0.4 with respect to Northbound trade suggests that either Northbound trade declines when Shanghai shares are relatively more expensive, Shanghai shares become relatively cheaper as Northbound trade increases, or quite possibly both of these things. There is no significant correlation between the A-H Share premium and the strength of the two markets but significant overall correlation between the Shanghai and Hong Kong markets of 0.53 over our sample period.

3. Econometric Methodology

In this section we lay out some of the issues involved in modelling the A-H Share premium, henceforth denoted as $AH_{t.}$ This premium is hypothesized to be affected by both Northbound and Southbound cash inflows under the November 2014 Stock Connect program

[6]The data on the flows of funds under the Stock Connect program are from http://data.eastmoney.com/bkzj/hgt.html. The remaining series are drawn from the Bloomberg terminal.

(denoted as NF_t and SF_t, respectively). The simplest estimated relationship can be written as follows:

$$AH_t = \lambda_0 + \lambda_1(L)NF_t + \lambda_2(L)SF_t + \boldsymbol{\theta}_1(L)\mathbf{D}_t^k + \boldsymbol{\theta}(L)\mathbf{F}_t + \varepsilon_t \quad (1)$$

where $\lambda_i(L),\ \theta_i(L),\ i = 1,2$ and $k = HK, CN$ so as to allow for both contemporaneous and lagged Northbound and Southbound flows to affect the A-H Share premium. Additionally, we permit vectors of domestic (D) and external or foreign (F) variables to impact the A-H Share premium.[7]

As Hamilton (1988) suggests, a constant-parameter linear model does not allow for market participants incorporating the possibility of changes in regime in their forecasts and actions. Changing perceptions about the probability of belonging to different states would be expected to affect stock market behavior as well. By way of an analogy, Morana and Beltratti (2002) employ a Markov-switching model in their analysis of the effects of the introduction of the Euro on European stock market volatility precisely to allow for varying investor perceptions. In the present study, as previously discussed, the positive sentiment in the Shanghai market, which we associate with a period of low uncertainty, is replaced, following the summer of 2015, by a pivot toward a regime of high uncertainty as investors sour on China's largest stock market. As a result, we allow for a regime shift in our analysis of the impact of the 2014 Stock Connect. Providing for two distinct regimes, namely low and high uncertainty states, we can rewrite the above equations such that:

$$AH_{j,t} = \lambda_{j,0} + \lambda_{j,1}(L)NF_t + \lambda_{j,2}(L)SF_t + \boldsymbol{\theta}_{j,1}(L)\mathbf{D}_t^k + \boldsymbol{\theta}_{j,2}(L)\mathbf{F}_t + \varepsilon_{j,t} \quad (2)$$

[7] Not shown are interaction effects between NF, SF and domestic and/or international variables. We experimented with some of these but were dropped due to their statistical insignificance. There is also the potential for testing interactions between Chinese (CN) and Hong Kong (HK) variables. Again, such experimentation did not improve the results.

where $j \in \{1, 2\}$ identifies the two regimes and $\varepsilon_{j,t} \sim N(0, \sigma_j^2)$.

It is well known that financial time series often display leptokurtosis. Therefore, the model given in equation (2) is re-estimated allowing one or even both regimes to be governed by a fat-tailed distribution. To this end, the t distribution is relied on as well as on the generalized error distribution (GED).[8] We assume the latent state variable to be driven by a first-order Markov process, with transition probabilities, $p_{ij,t} = \Pr(S_t = j \mid S_{t-1} = i), i, j \in \{1, 2\}$.

Time-varying transition probabilities can themselves provide insights into the factors driving changes in the AH premium over time. This means making $p_{11,t}$ and $p_{22,t}$ dependent on a set of exogenous variables X_{t-1} including a constant.[9] Variables relevant to explaining switches in investor herding behavior include market sentiment and data on macroeconomic conditions that are available at the daily frequency.[10] Implied volatility, here measured using the Chicago Board Options Exchange Market Volatility Index (VIX), is also a candidate variable. Motivated by the branch of literature on sentiment (Baker and Stein 2004; Baker and Wurgler 2006), the share turnover relative to market capitalization is also considered. The variable was dropped when it was found not to statistically contribute to changing or improving the estimates to be discussed below.

Turning to estimation, the models that assume a normal distribution can be estimated

[8] The GED may provide further insights into the distributional properties of the dispersion of single stock returns since, unlike the t distribution, it also allows for thinner tails than in the case of the normal distribution.

[9] These variables are lagged because the transition probabilities governing switches from $t-1$ to t must be determined at time $t-1$.

[10] Other candidate variables are, of course, also possible. For example, based on Campbell, Hilscher and Szilagyi (2008), variables representing firm performance may also be considered. Nevertheless, their work also highlights the important connection between the behavior of the VIX and the financial distress they seek to empirically measure. Although it is preferable, under the circumstances, to estimate our Markov Switching model with daily data some of alternative determinants are not available at the daily frequency.

using the expectation maximization (EM) algorithm (Dempster, Laird and Rubin 1977). A closed form solution for all parameters was put forward by Hamilton (1990), while the solutions for φ_j, the parameters for (3), are derived in Diebold, Lee and Weinbach (1994). The specifications using *t* and GED-distributed errors are also estimated using the EM algorithm. Unlike the case of the normal distribution, no analytic solutions for the regression parameters are available. Nevertheless, since the conditions for the closed-form solution for the transition probabilities, $p_{ij,t} = \Pr(S_t = j \mid S_{t-1} = i)$, given in Hamilton (1990) still hold, these can be calculated as a by-product of the smoothed probabilities, $p_{j,t|T}$. Thus, obtaining estimates for the remaining regression and distributional parameters requires a whole numeric optimization in each iteration of the EM algorithm relying on the Broyden-Fletcher-Goldfarb-Shanno (BFGS) algorithm.[11] When applying the GED distribution to the errors, $\varepsilon_{j,t} \sim GED(0,\sigma_j^2)$, a one-step estimation procedure can be followed since this distribution reduces to the normal for a tail thickness parameter, κ_j, equal to 1.

To account for autocorrelation, we make use of the covariance matrix proposed by Newey and West (1987) where a lag length equal to eight is set as suggested by the Newey and West (1994) criterion. Since the construction of this error matrix and the selection of the appropriate lag length rests on several assumptions that might be crucial for the results, a robustness check is conducted by performing the analysis based on different numbers of lags. Since the autocorrelations in S_t are in general found to be relatively large (Chang, Cheng and Khorana 2000), all models are re-estimated for 6, 10, 12 and 14 lags.

[11] Watanabe and Yamaguchi (2004) and Azzalini and Capitanio (2014) address the statistical properties of the various assumed error distributions considered here.

4. Empirical Results

In this section we present evidence on the impact of the Stock Connect program based on a Markov-switching model. Our post-November 2014 sample is divided into two alternative regimes, with Regime 1 representing the high uncertainly regime and Regime 2 the low uncertainty regime. The A-H Share premium is itself entered in first difference form owing to the presence of a unit root in the levels.[12] Figure 3 plots how changes in the daily A-H Share premium since November 17, 2014 evolved and the probability of being in the high uncertainty Regime 1. What is most striking about the figure is the extent to which the probability of the A-H Share premium being in Regime 1 rises around June 2015. This is precisely when the Shanghai stock market begins to experience turmoil, marking the beginning of an unsettled period that came to a head in August of the same year. It appears to remain Regime 1 through September 2015. Indeed, the probability of being in the high uncertainty regime peaks around the time of "Black Monday" in late August 2015, when the Shanghai index dropped precipitously after a series of earlier plunges in June and July. Following a series of undertakings by the Chinese government in September, market calm was restored, at least for the time being, and the Regime 1 probability dropped back down. Thereafter, there are only periodic but brief increases in Regime 1 probabilities.

Our estimates for the Markov-switching model are presented in Table 2. It is immediately apparent that the Northbound and Southbound flows' impact the premium only when markets are in the high uncertainty Regime 1. The A-H Share premium declines when

[12] This could be because of a structural break. We also tried version in the levels with a deterministic trend term but this did not yield results that were fundamentally different from the ones discussed below.

flows increase in a southerly direction, so long as we are in Regime 1, this effect is quantitatively small but reversed for Northbound flows. Southbound flows imply an exit from the Shanghai market that would be expected to lower the A-share premium insofar as demand from local investors is falling. The positive impact of the Northbound flows is what one would expect from any higher demand for A-shares from Hong Kong investors. In any event, mainland Chinese investors clearly appear to have a much larger, and more clear-cut, impact on the A-H Share premium than their counterparts in Hong Kong.

The other variables that are subject to regime shifts are the Shanghai and Hong Kong market returns. Consistent with the simple correlation coefficients from Table 1, higher returns in Shanghai raise the A-H Share premium. This relationship holds across both Regime 1 and Regime 2, but is somewhat stronger in the low uncertainty Regime 2. This suggests that the premium is pushed up relatively more when returns are rising in Shanghai and is consistent with Shanghai stocks becoming relatively more attractive when the market is buoyant. In contrast, better Hong Kong returns push down the premium as one might expect (and again in line with the pattern seen in Table 1). Although this result holds across both regimes, the impact is significantly stronger for Hang Seng returns under Regime 1.

Turning to the coefficients for the control variables not divided by regime, we find that changes in the RMB offshore rate have no significant impact on the A-H Share premium. S&P 500 market returns also exert no significant effects on the A-H Share premium. The same is true for the VIX, a US based indicator of "fear" or uncertainty.[13]

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[13] Prior estimation for a sample ending in June 2016 yielded a near identical pattern of results. The only difference is that the VIX variable was statistically significant over the shorter sample.

5. Conclusions

Our econometric results suggest that, notwithstanding the relatively small scale of the Stock Connect program, Northbound and Southbound cash flows have meaningfully affected the A-H Share premium over the post-November 2014 period. These effects are significant only for part of the sample, however, emerging during the high uncertainty regime that developed in the midst of the market turmoil seen during the summer and early fall of 2015. An important consideration concerns how prevalent this regime type, and its concomitant significant effects of Northbound and Southbound flows on the A-H Share premium, will be in the future. In a more stable environment, our analysis suggests that the Northbound and Southbound have not so far been significantly affecting the scale of the A-H Share premium. More conclusive findings will require more data, preferably including more than the single high uncertainty regime period observed during 2015.

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Table 1

Correlations for Northbound and Southbound Cash Flows, the A-H Premium and Stock Market Indices:

November 2014-December 2016

(coefficient estimates with p-values in parenthesis)*

	Northbound Cash Inflow	*Southbound Cash Inflow*	*A-H Share Premium*	*Shanghai Composite*	*Hang Seng Index*
Northbound Cash Inflow	1				
Southbound Cash Inflow	-0.10 (0.03)	1			
A-H Share Premium	-0.38 (0.00)	-0.09 (0.05)	1		
Shanghai Composite	-0.02 (0.60)	0.09 (0.05)	-0.01 (0.86)	1	
Hang Seng Index	0.10 (0.03)	0.08 (0.09)	-0.07 (0.15)	0.53 (0.00)	1

*Note: the table gives the unconditional correlations for the pairs of series shown.

Table 2: Markov-Switching Estimates for the A-H Share Premium under the Post-2014 Stock Connect

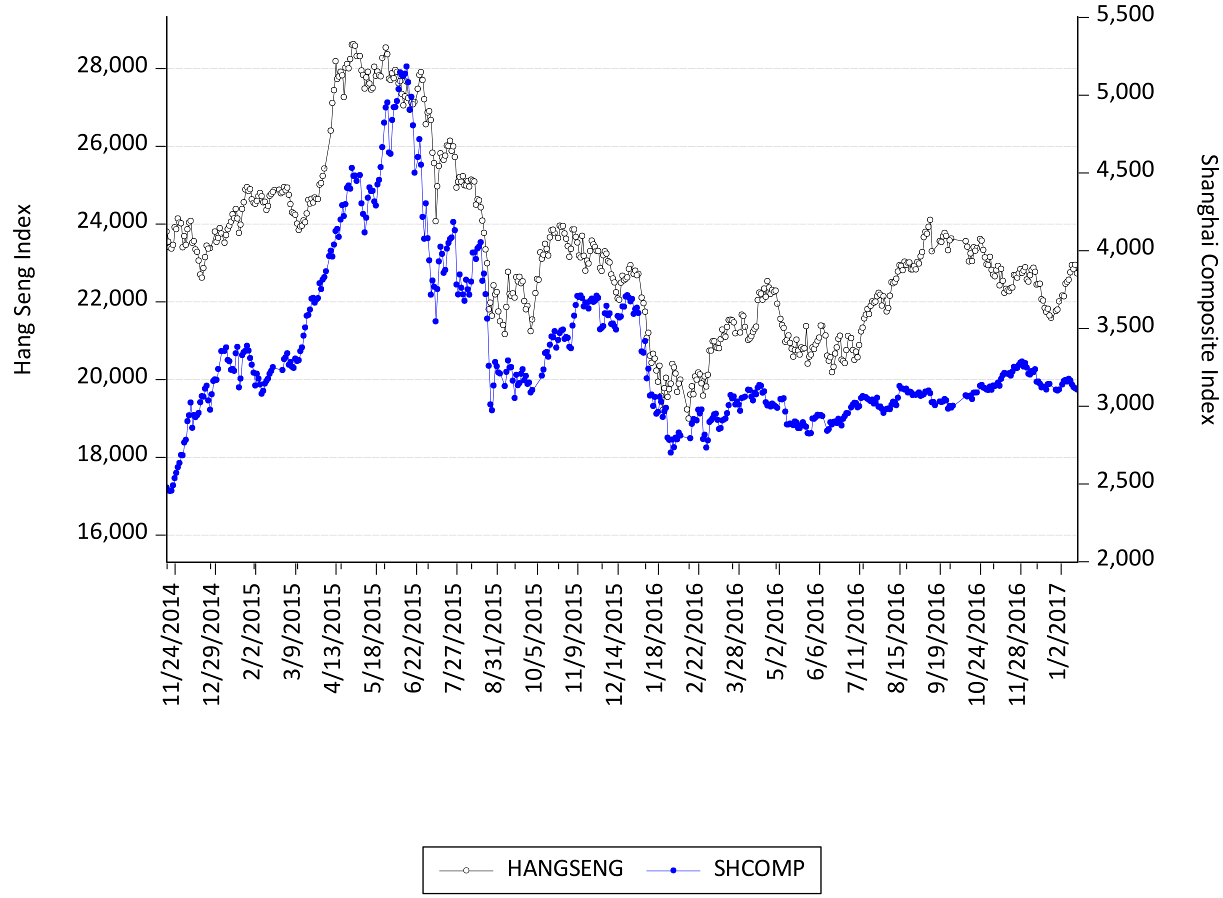
Dependent Variable: Change in the A-H share premium
Method: Markov Switching Regression

Variable	*Coefficient*	*Standard. Error*	*z-Statistic*	*Probability*
Regime 1 (High Uncertainty)				
Constant	0.35	0.23	1.51	0.13
Lagged Northbound Cash Inflow	0.01	0.01	1.87	0.06
Lagged Southbound Cash Inflow	-0.13	0.06	-2.28	0.02
Shanghai Market Return	0.79	0.06	13.88	0.00
Hang Seng Return	-1.00	0.12	-8.65	0.00
Log(SIGMA)	0.40	0.08	5.16	0.00
Regime 2 (Low Uncertainty)				
C	0.26	0.21	1.51	0.13
Lagged Northbound Cash Inflow	-0.002	0.01	-0.48	0.63
Lagged South Cash Inflow	-0.005	0.04	-0.01	0.99
Shanghai Market Return	0.83	0.03	23.74	0.00
Hang Seng Return	-1.26	0.05	-25.19	0.00
Log(SIGMA)	-0.63	0.06	-11.24	0.00
Common Effects				
Lagged S&P 500 Return	-0.07	0.05	-1.33	0.18
Lagged RMB Offshore Premium	-2.30	11.68	-0.20	0.21
Lagged VIX	-0.02	0.01	-1.24	0.84

Note: Estimates are based on daily data for the sample: November, 2014–January 16, 2017 (439 observations), after differencing and lags.

FIGURE 1

Shanghai and Hong Kong Stock Market Performance after the Establishment of the Stock Connect



Note: HANGSENG is the Hang Seng Index (Hong Kong); SHCOMP is the Shanghai Composite Index.

FIGURE 2

The Net Flow of Funds under the Stock Connect Program and the A-H Share Premium

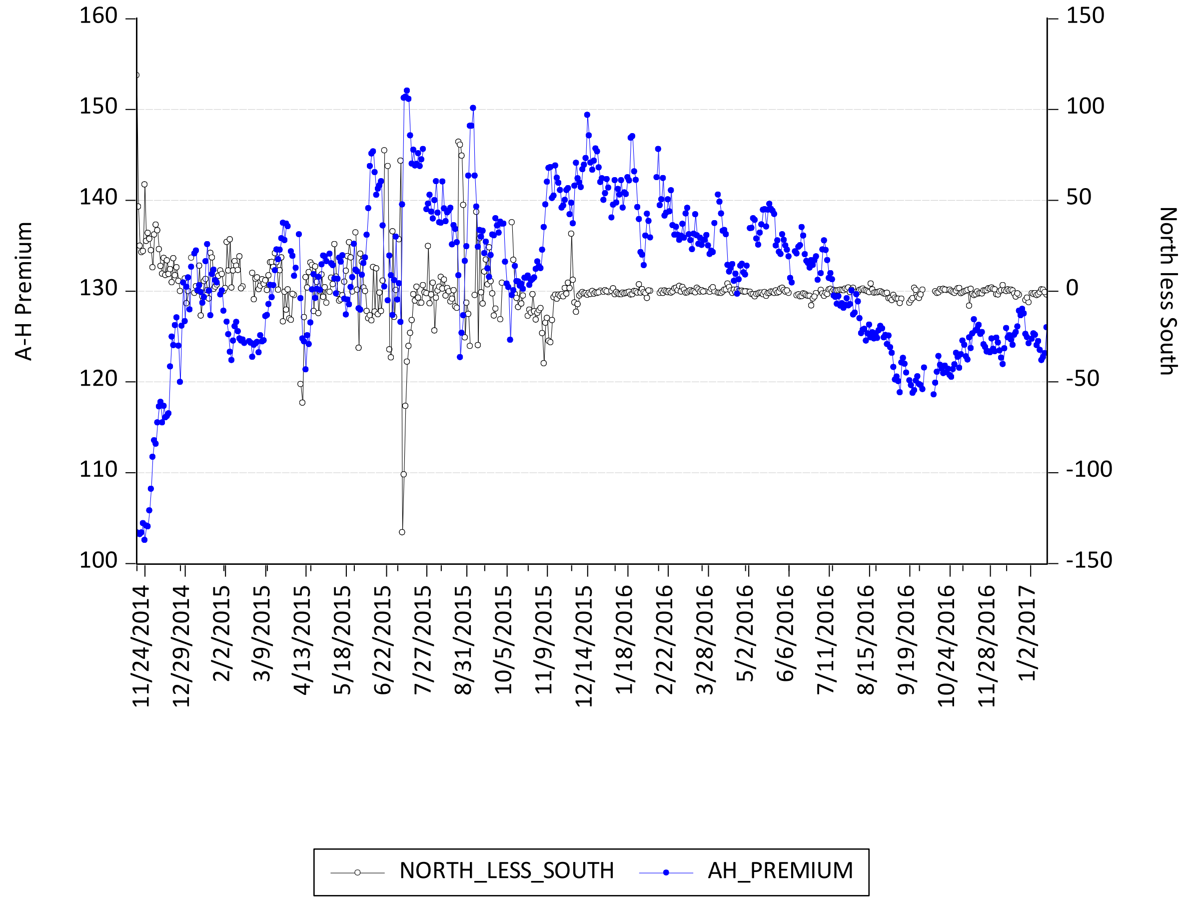
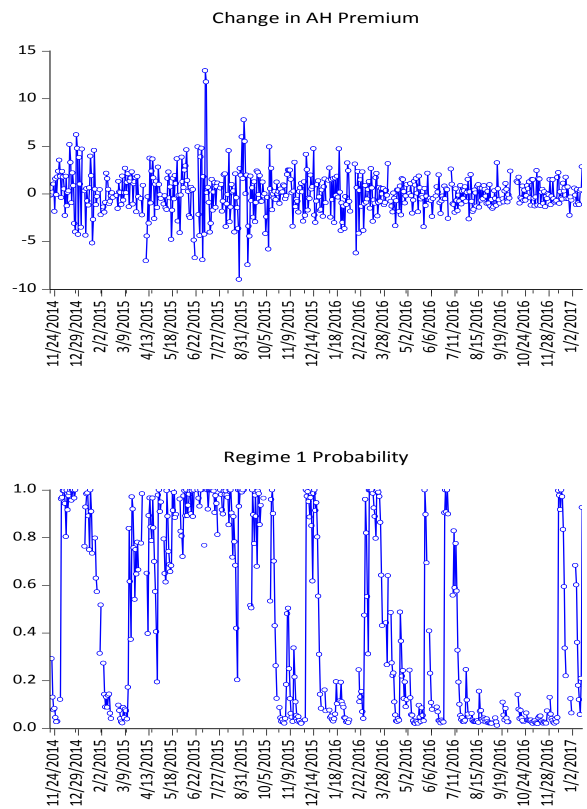


FIGURE 3

Changes in the A-H Share Premium and Probabilities of a High Premium Regime (Regime 1)*



Note: Regime 1 is the High uncertainty regime. See also Table 2. See Figure 2 for the A-H share premium in levels.