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Connecting the markets? Recent evidence on China's capital account liberalization☆

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ABSTRACT

We use longitudinal data to investigate abnormal systematic changes in the price disparity of cross-listed stocks in China. We identify a recent liberalization policy that generated an unprecedented abrupt reduction in price disparity. The policy, known as *Shanghai-Hong Kong Stock Connect*, partially liberalizes capital flow between both stock exchanges. We find that the announcement of the policy caused the price disparity to immediately reduce by 4.0 to 4.5 percentage points. To estimate the longer-run impact, we use a panel data model and a two-step estimator that accounts for unobserved common factors and potential nonstationarity in outcomes. The effect is somewhat smaller, reducing the price disparity by 1.6 to 2.1 percentage points, or 3.0 to 3.5 percentage points after adjusting for spillovers.

1. Introduction

The capital account of China has remained relatively closed since economic reform started in the late 1970s. In recent years, China has included ambitious plans in its reform agenda to liberalize its financial system. Financial market liberalization can lead to considerable revaluation of equity prices, which exert influence on wider aspects of economic welfare (e.g., Henry, 2007). A prominent feature of China's financial market is the prevalence of cross-listed firms, which constitute a sizable proportion of the total market capitalization. These firms are concurrently listed in Mainland and Hong Kong markets (as *A-shares* and *H-shares*, respectively). Their widely varying price disparities have been one of the most interesting puzzles in the Chinese financial market.

Although theory predicts that market de-segmentation should result in price convergence, empirical evidence remain mixed.[1] In the literature of Chinese financial markets, the pioneering study by Bailey (1994) considers the price disparity between A- and B-shares – A-shares were accessible by domestic investors only, while B-shares were accessible by foreign investors.[2] Chan et al. (2008) consider a large institutional change in 2001, which opened the B-share market to domestic investors. They find that the price disparity between A- and B-shares narrowed considerably between 2000 and 2001, but substantial difference still remained. Since the early 2000s, *cross-listing* in Hong Kong (i.e., issuing H-shares in the Hong Kong market) has become a popular option among domestic firms that look for access to foreign capital. Relative to the B-share market, the Hong Kong market is much larger and more liquid, and it operates under a different institutional background with stringent corporate governance standards. The cross-listed stocks (A- and H-shares) mainly belong to large firms that are representative of the Chinese economy. Thus these stocks have substantial influence over the Chinese financial market, and at the same time they are also subject to similar types of risks to the overall economy. Much of the related literature focuses on explaining the pattern of preexisting price disparities between A- and H-shares (e.g., Wang and Jiang, 2004; Chang et al., 2013; Chung et al., 2013). A common view is that the price disparities between A- and H-shares may not be surprising due to market segmentation and institutional

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[1] At a broader level, Lamont and Thaler (2003) summarize various event studies such as twin shares (e.g., Froot and Dabora, 1999; Rosenthal and Young, 1990) and corporate spinoffs (e.g., Lamont and Thaler, 2003). These studies usually focus only on one pair of twin shares because of their rarity in markets. The authors conclude that violation of the law of one price is quite prevalent. Possible explanations include short sale constraints, and the risk of arbitraging due to the presence of "noise traders" (e.g., DeLong et al., 1990).

[2] Both A- and B-shares are traded in the Shanghai market. The B-share market was established in the early 1990s and it was denominated in USD. Some domestic firms issued B-shares for purchase by foreign investors. Today, the B-share market constitutes a tiny portion of the market capitalization of the Shanghai market.

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differences. Yet this view has become increasingly controversial as China continues to open its financial market.

A number of studies also examine the relationship between price disparity and episodes of financial market liberalization (e.g., Su et al., 2007; Cai et al., 2011; Chan and Kwok, 2016a).[3] These studies consider how liberalization strengthens the *price co-movement* or co-integration between A- and H-shares. The main focus is thus related to the "relative" law of one price, i.e., whether there exists an equilibrium level of price disparity (which is not necessarily zero), and whether liberalization strengthens the equilibrium relationship. Amidst the growing literature on cross-listed firms, few studies have provided direct evidence on whether particular liberalization episodes narrow the level of price disparity between A- and H-shares. Moreover, the existing literature is predominantly based on cross-sectional or time-series approaches, while the longitudinal perspective is relatively rare.

Using longitudinal data on stock prices of cross-listed firms, we first investigate abnormal systematic changes in the price disparity between the Hong Kong and Shanghai markets from 2002 to 2014. We identify a liberalization policy that generated an unprecedented abrupt reduction in price disparity. The policy, known as *Shanghai-Hong Kong Stock Connect*, serves to lower the capital control barrier of cross-market investment between both markets. The announcement of the policy, which occurred in April 2014, caused the price disparity to immediately reduce by an average of one-sixth, or between 4.0 and 4.5 percentage points. The magnitude was the largest since 2002, and was seven standard deviations away from the historical average. We also find considerable heterogeneity that is consistent with theoretical predictions – firms with a higher preexisting level of price disparity are subject to larger price convergence.

We draw on recent methodological advances in the policy evaluation literature to estimate the policy's longer-run impact on price disparity. Our baseline model is a panel data model with a multi-factor error structure. The identification strategy resembles a difference-in-differences (DID) approach: (1) there is a control group consisting of firms that are cross-listed in Hong Kong and *Shenzhen* markets, and (2) the estimation sample covers an extended period both before and after policy announcement. However, as Chan and Kwok (2016b) show, the conventional DID estimator may yield misleading results: (1) its "common trend assumption" can be violated when the control and treatment groups have different loadings on the unobserved factors, and (2) inference is problematic when the outcome is driven by nonstationary factors. Chan and Kwok (2016b) develop a two-step estimator that is robust to the above issues. To implement the estimator, they first use the full panel of control group outcomes to extract principal components, which serve as proxies for (linear combinations of) the unobserved factors. Then, for each treatment group unit, they estimate the treatment effect in a time-series regression with a post-intervention indicator augmented with the principal components.

We apply the estimator to a daily panel containing the H-A price disparity of 76 cross-listed firms between January and July 2014. Panel unit root tests provide strong evidence for nonstationarity in some series, which suggests that the two-step estimator should be applied. Results from the two-step estimator suggest that the policy narrowed the H-A price disparity by an average of 1.5 to 2 percentage points during the sample period. This estimate likely represents a lower bound due to evidence for spillover effects in the Shenzhen market; our simple adjusted estimate after taking into account of spillovers is between 3.0 to 3.5 percentage points. Overall, our results are strongly in favor of a model with factor error structure. The control group tends to have different factor loadings from the treatment group, which undermines the "common trend assumption" of the conventional DID estimator. Indeed, the DID estimate suggests that the policy increases H-A price disparity, which is at odds with theoretical predictions.

The rest of the paper is organized as follows. Section 2 presents evidence from longitudinal data regarding the overall pattern of changes in price disparity from 2002 to 2014, and potential anomalies. Section 3 provides a summary of the policy background related to *Shanghai-Hong Kong Stock Connect*. Section 4 presents results on the immediate effect of the policy. Section 5 introduces the econometric tools that are used for estimating the longer-run effects of the policy. Section 6 presents the empirical results from the two-step and DID estimators. Section 7 concludes.

2. Pattern of changes in price disparity, 2002-2014

To form a preliminary analysis, we first construct a longitudinal sample of cross-listed stocks on each day from January 4, 2002 to September 2, 2014. For each firm that is concurrently listed in the Shanghai and Hong Kong markets during the period, we collect the daily dividend-adjusted closing prices of its A-shares (in the Shanghai market) and H-shares (in the Hong Kong market).[4] The prices are expressed in Hong Kong dollars using the contemporaneous exchange rate between the Hong Kong dollar and Chinese Yuan (Appendix Fig. A5). Denote firm i's A-share price on day t by P_{Ait}, and its H-share price by P_{Hit}. The *HA premium*, denoted by y_{it}, is defined as a measure of price disparity as follows:

$$y_{it} \equiv \frac{P_{Hit}}{P_{Ait}} - 1. \tag{1}$$

A positive HA premium indicates that the price of H-shares is more expensive than A-shares; by contrast, a negative HA premium indicates that the price of H-shares is less expensive than A-shares.

It is useful to briefly describe the characteristics of the cross-listed stocks, which are an important group in the market (Appendix Table A1). Relative to non-crosslisted stocks in the Shanghai market, the cross-listed stocks have a much larger size and are more likely to pay dividends.[5] This is partly due to the fact that many cross-listed stocks represent big banks; 22% of the cross-listed stocks belong to the financial sector. The cross-listed stocks tend to have more stable performance than non-crosslisted stocks. Their historical returns have a slightly lower mean and standard deviation, and the historical beta is also lower on average (0.876). Nevertheless, when it is measured as a proportion of the total risk, systematic risk appears to play a larger role among cross-listed stocks.

We are primarily interested in the systematic change of price disparity across all cross-listed firms for each day in the sample period. To weed out firm-level idiosyncratic shocks, the following simple analytical framework is considered:

$$\Delta y_{it} = \alpha_t + \beta_t y_{i,t-1} + \epsilon_{it}, \tag{2}$$

where $\Delta y_{it} \equiv y_{it} - y_{i,t-1}$ represents the change in the HA premium of firm i between day t and day $t-1$. The regression coefficient β_t represents the average change in the level of HA premium today for a given level of HA premium on the previous day; it could thus be interpreted as the average speed of HA premium adjustment among the cross-listed firms on day t. In particular, if there is systematic convergence in HA premium across firms on day t as opposed to day $t-1$, the slope coefficient β_t will be negative. We perform a separate regression in Eq. (2) for each day in the sample period.

[3] Doukas and Wang (2014) look at how the early liberalization episodes affect the bonding effect of cross-listing. Choi et al. (2013) consider the price co-integration between A- and H-shares before and after the global financial crisis. Seasholes and Liu (2011) consider how a short-sale ban affects cross-listed firms.

[4] There were 14 cross-listed firms at the beginning of the sample period. The number of cross-listed firms grew slowly to 20 in late 2005, increased sharply to around 40 in 2008, and then increased gradually to around 60 in 2014.

[5] Because our main emphasis is the convergence of price disparity (law of one price), non-crosslisted stocks are out of our scope in this paper. A detailed analysis of non-crosslisted stocks can be found in Chan and Kwok (forthcoming).