



# Exchange rate expectations and the pricing of Chinese cross-listed stocks

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## ARTICLE INFO

### Article history:

Received 1 March 2010

Accepted 23 August 2010

Available online 27 August 2010

### JEL classification:

F31

F37

G14

G15

### Keywords:

American Depositary Receipts

H-shares

Cross-listings

Exchange rate expectations

## ABSTRACT

I show that the price discounts of Chinese cross-listed stocks (American Depositary Receipts (ADRs) and H-shares) to their underlying A-shares indicate the expected yuan/US dollar exchange rate. The forecasting models reveal that ADR and H-share discounts predict exchange rate changes more accurately than the random walk and forward exchange rates, particularly at long forecast horizons. Using panel estimations, I find that ADR and H-share investors form their exchange rate expectations according to standard exchange rate theories such as the Harrod–Balassa–Samuelson effect, the risk of competitive devaluations, relative purchasing power parity, uncovered interest rate parity, and the risk of currency crisis.

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## 1. Introduction

For two decades, Chinese companies have been allowed to issue A-shares at domestic stock exchanges and to list their shares at international stock exchanges such as H-shares in Hong Kong or American Depositary Receipts (ADRs) in the United States. At the microeconomic level, companies may benefit from cross-listing abroad by increasing the valuation of their stocks relative to domestic rival firms (Melvin and Valero, 2009), by reducing the share of voting rights held by controlling shareholders (Ayyagari and Doidge, 2010), by becoming more immune to the effects of currency crises (Chandar et al., 2009), or by improving investor protection and corporate disclosure (Roosenboom and van Dijk, 2009). At the macroeconomic level, cross-listing may lead to a more integrated domestic capital market with positive spillover effects, such as lower equity costs, even for non-cross-listed companies (Fernandes, 2009).

As A-shares and cross-listed stocks of the same Chinese company generate an identical stream of cash flows, both types of stocks should exhibit the same price in exchange rate-adjusted terms (Chan et al., 2008a). In perfect capital markets, deviations from this “law of one price” should be arbitrated away. However, numerous papers find that the simple fact that both types of stocks

are traded at different stock exchanges can lead to market segmentation. Several of these papers show that cross-listed stocks are more correlated with the stock market on which they are traded than the one on which their cash flows are generated (Froot and Dabora, 1999; Chan et al., 2003, 2008a).<sup>1</sup>

Capital controls or ownership restrictions can lead to a permanent violation of the law of one price between domestic and cross-listed stocks since cross-border arbitrage can not take place (Melvin, 2003; Levy Yeyati et al., 2004; Auguste et al., 2006). Similar to capital controls, ownership restrictions prevent arbitrage between both types of stocks from taking place. Chinese ownership restrictions, for example, prevent domestic investors from buying cross-listed stocks and international investors from buying domestic stocks leading to ADR and H-share discounts of up to 95% relative to domestic A-shares from 1998 to 2006 (Arquette et al., 2008). Given the large and persistent deviations from the law of one price, a literature has emerged that examines the determinants of price discounts on Chinese cross-listed stocks. B-share<sup>2</sup> discounts

<sup>1</sup> For price discovery, however, trading in local stocks is frequently found to be more informative than trading in cross-listed stocks (Agarwal et al., 2007; Eun and Sabherwal, 2003; Frijns et al., 2010).

<sup>2</sup> Chinese companies can also issue US dollar-denominated B-shares in Shanghai or Hong Kong dollar-denominated B-shares in Shenzhen. I do not include B-shares in my analysis because the ownership restrictions were alleviated in February 2001 (Wang and Jiang, 2004; Arquette et al., 2008). As this regime change would complicate the analysis for B-share discounts, I focus on ADR and H-share discounts.

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relative to A-shares are found to be driven by: the low risk aversion of Chinese investors (Ma, 1996); the low liquidity of B-shares relative to A-shares (Chen et al., 2001); information asymmetries (Chakravarty et al., 1998; Chui and Kwok, 1998; Chan et al., 2008b); and, the availability of other types of cross-listed stocks (Sun and Tong, 2000). H-share discounts relative to A-shares are found to be driven by: investor sentiments<sup>3</sup> (Wang and Jiang, 2004; Arquette et al., 2008; Burdekin and Redfern, 2009); liquidity conditions (Wang and Jiang, 2004); and systemic risk premiums (Li et al., 2006).

Arquette et al. (2008) and Burdekin and Redfern (2009) find that a significant part of ADR and H-share discounts can be explained by changes in the non-deliverable yuan/US dollar forward exchange rate. Their finding suggests that ADR and H-share investors take the risk of future exchange rate changes into account when pricing cross-listed stocks. This finding relates to papers that examine how exchange rates affect ADR returns. Since ADRs are denominated in US dollars and their underlying stocks in the domestic currency, these papers find that a depreciation of the domestic currency against the US dollar leads to falling ADR returns (Kim et al., 2000; Bailey et al., 2000; Bin et al., 2004; Grammig et al., 2005).<sup>4</sup>

I contribute to the literature in two ways. First, I show that the relative prices of cross-listed ADRs and H-shares and their underlying A-shares can be used as an indicator of exchange rate expectations. Since China has imposed capital controls and transnational ownership restrictions, cross-border arbitrage cannot take place and the law of one price between A-shares and cross-listed stocks is thus not binding. I argue that ADR and H-share investors will align the relative prices of yuan-denominated A-shares and US dollar-denominated ADRs or Hong Kong dollar-denominated H-shares with their expectation about the future yuan/US dollar exchange rate rather than with the current official exchange rate. Using a rolling regressions forecasting framework I find that ADR and H-share discounts have a better ability to predict changes in the yuan/US dollar exchange rate than the random walk or forward exchange rates, at least at forecast horizons longer than one year.

Second, I investigate the determinants of ADR and H-share investors' exchange rate expectations. China makes a good case to study the validity of exchange rate theories since the yuan was pegged to the US dollar until July 20, 2005 and heavily managed afterwards. This implies that the official exchange rate does not (in the peg regime) or much less (in the managed floating regime) react to changes in macroeconomic fundamentals than one would expect under free market conditions. I study the validity of exchange rate theories by testing the impact of macroeconomic fundamentals on the exchange rate expectations ADR and H-share investors form under free market conditions. Using panel data on 22 ADR/A-share stock pairs and 52 H-share/A-share stock pairs from December 1998 to February 2009 I find that ADR and H-share investors expect more yuan appreciation against the US dollar: if the yuan's overvaluation decreases (the incentive of competitive devaluation); if the inflation differential vis-à-vis the United States falls (relative purchasing power parity); if the productivity growth in China accelerates relative to the United States (the Harrod-Balassa-Samuelson effect); if the Chinese interest rate differential vis-à-vis the United States decreases (uncovered interest rate parity); when Chinese domestic credit relative to GDP decreases (lower risk of a twin banking and currency crisis); or, if Chinese sovereign bond yields fall (lower risk of a twin debt and currency

crisis), *ceteris paribus*. The results suggest that ADR and H-share investors form their exchange rate expectations in accordance with standard exchange rate theories.

## 2. Exchange rate expectations and the Chinese ADR and H-Share discounts

### 2.1. The ADR discount

An ADR stock represents ownership of a specific number of underlying shares in the home market – in this case, China – on which the ADR is written.<sup>5</sup> While the ADR is traded at a US stock exchange and is denominated in US dollars, the underlying Chinese A-share is denominated in yuan and traded at a Chinese stock exchange (Shanghai or Shenzhen). The starting point of the discussion is ADR conversion. ADR conversion means that one ADR, traded in the United States and quoted in US dollars at price  $p_{it}^{ADR}$ , can be converted into  $\gamma_i$  A-shares, traded in China and quoted in yuan at price  $p_{it}^{CN}$ . The variable  $\gamma_i$  is called the conversion ratio and is specific to each Chinese company,  $i$ . ADR conversion implies that the ADR and its underlying A-share are perfect substitutes. As both types of stocks of the same company generate identical streams of cash flows, ADRs and their underlying A-shares should exhibit the same price after applying the current market exchange rate,  $S_t$ , defined as the amount of yuan per US dollar. In a perfect capital market (with no ownership restrictions or capital controls), arbitrage forces ensure the validity of the law of one price:

$$p_{it}^{ADR} = \frac{p_{it}^{CN} \gamma_i}{S_t}. \quad (1)$$

China is not a perfect capital market in this sense. Ownership restrictions and capital controls in China prohibit foreign investors from buying A-shares and domestic investors from buying cross-listed ADRs making cross-border arbitrage between domestic A-shares and cross-listed ADRs impossible. The absence of arbitrage forces allows for a permanent violation of the law of one price, i.e. that price discrepancies between A-shares and ADRs can occur and persist over time suggesting that Eq. (1) is not binding. That is, the relative share prices do not necessarily reflect the managed official exchange rate but can indicate ADR investors' expected exchange rate. If ADR investors anticipate that the expected future exchange rate,  $S_t^{exp}$ , deviates from the current official exchange rate,  $S_t$ , the price relation between ADRs and A-shares should incorporate this expectation as outlined in Eq. (2):

$$p_{it}^{ADR} = \frac{p_{it}^{CN} \gamma_i}{S_t^{exp}}. \quad (2)$$

If ADR investors expect the yuan to depreciate against the US dollar, the relative prices of the ADR and the underlying A-share will reflect an expected exchange rate that is higher than the current exchange rate, i.e.  $S_t^{exp} > S_t$ . In this case, the ADR seems to be undervalued since its price (see Eq. (2)) is lower than the right-hand side of Eq. (1) indicates. Expectations of a depreciation of the yuan against the US dollar thus lead to an ADR discount as the actual market-traded ADR price  $p_{it}^{ADR} = p_{it}^{CN} \gamma_i / S_t^{exp}$  trades at a discount to the ADR price implied by the current official exchange rate,  $p_{it}^{ADR} < p_{it}^{CN} \gamma_i / S_t$ . Thus, by using the observed market prices of the ADR,  $p_{it}^{ADR}$ , and the underlying A-share,  $p_{it}^{CN}$ , and the constant conversion ratio,  $\gamma_i$ , I can back out the expected exchange rate of ADR investors,  $S_t^{exp}$ . If investors expect the yuan to appreciate against the US dollar,  $S_t^{exp} < S_t$ , the actual ADR price,  $p_{it}^{ADR} = p_{it}^{CN} \gamma_i / S_t^{exp}$ , trades at a premium to the ADR price implied by the current

<sup>3</sup> Grossmann et al. (2007), Arquette et al. (2008), and Burdekin and Redfern (2009) do also find a significant impact of investor sentiments on ADR discounts.

<sup>4</sup> Chandar et al. (2009) find that cross-listed stocks suffer significantly less from currency crises than non-cross-listed stocks suggesting that cross-listing may (partly) shield firms from the adverse effects of currency crises.

<sup>5</sup> See Karolyi (1998) for an excellent survey on the ADR market.

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