

Equity Price Premium in Mainland China and Hong Kong: The Chinese A-H Share Premium

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Abstract: This paper studies the market price of Chinese companies listed in both the mainland China Shanghai/Shenzhen market and Hong Kong market. The aim is to examine whether there is price equilibrium between these stocks ensuring the stationarity of the A-H share premium. The exchange rate between Hong Kong Dollar (HKD) and Chinese Yuan (CNY) had large fluctuations in the past few years and hence it is paramount to also take FX effects into account. The results show that for a large proportion of dual-listed stocks, there is no long-run equilibrium between A and H share prices if one controls for exchange rate movements. We conclude this paper by briefly discussing several possible reasons for the phenomenal we observed in the test. Firstly, pricing models and valuation methods are different in two markets. Secondly, trading restrictions for foreign investors prohibit arbitrage opportunities between the two markets. The market inequilibrium may still exist for long time, before the A-H shares can be freely convertible between markets. Moreover, CNY has on the raising trend and is likely to continue for years, which is an attractive opportunity for foreign investors. Last but not least, we are going to discuss some interesting phenomenon and its rationale behind.

1. Introduction

1.1. China Markets

In Great China, there are three major stock exchanges, Shanghai, Shenzhen and Hong Kong. The formal two markets Shanghai and Shenzhen are called mainland markets, which are mainly for domestic investors in mainland China. In mainland markets, all the stocks are priced in Chinese Yuan (CNY) and dividend are paid in CNY. In the past, foreign investors are restricted to directly invest in the mainland markets, and the markets are considered as separated from the global markets.

In 2001, in the hope of a comprehensive integration with the global markets, China joined World Trade Organization (WTO). Two years later in 2003, China launched two important programmes, QFII (Qualified Foreign Institutional Investors) and QDII (Qualified Domestic Institutional

Investors) programmes. Through QFII, registered foreign institutions are allowed to trade in mainland markets with capital quota. QDII allows registered Chinese institutions to invest in foreign markets. After several years' operation, these two programmes have significantly changed the mainland markets and even the global markets.

With nature boundary with mainland China and well-developed financial infrastructure, Hong Kong has become the biggest non-domestic source for Chinese companies to raise capital since it was officially returned to China in 1997. Stocks in this market are priced in Hong Kong Dollar (HKD) and dividends are paid in HKD. Monitored by Hong Kong Monetary Authority (HKMA), HKD is pegged to USD, and it is a free tradable currency.

Hong Kong is considered as an ideal place for conduct financial business between China and the global markets. Firstly, almost all of the existing financial products are provided in the market, so the investors have more financial tools to seize the investment opportunities. Secondly, Hong Kong has a developed legal system can well protect the interests of investors. Moreover, Hong Kong has a large reservoir of financial specialists. With Chinese background and modern financial knowledge, financial specialists in Hong Kong are able to understand news and policy change from mainland China and interpret it to foreign investors in the western style. Therefore, most of QFII investors choose Hong Kong as its primary site. For mainland QDII investors, Hong Kong is a bridge between the Chinese markets and global markets [1]. Suggestions from financial specialists in Hong Kong are an important source for them to understand the global markets.

1.2. A shares and H shares

In China, A shares are ordinary stocks of Chinese companies listed in Shanghai and Shenzhen stock exchanges. Since 1993, Chinese companies started to list in the Hong Kong Exchange. Now, there are 213 Chinese companies listed on Hong Kong Main board, which are commonly called H shares. Among these companies, 63 companies offered stocks in Shanghai and Shenzhen at the same time, which is so called "dual-listed in A and H markets" or "AH Companies".

Theoretically, the same company's A shares and H shares have the same proportion of the company value and enjoy the same dividends, except for small time delay and tax exemption policy difference on dividend between Mainland China and Hong Kong. Price equilibrium is expected for shares in the two markets. However, according to historical reasons, the relationship between A share price and H share price is complicated. The starting point of this paper is to investigate the price difference for dual-list company shares.

1.3. Premium Index

Recently, as identified in Sensarma and Bhattacharyya [2], the rising growth rate of money supply will improve the corporate profitability, reduce the corporate probability of default, and lead to a decline in credit spread. Nsafoah and Serletis [3] claimed that monetary policy uncertainty would harm interest rates and have a positive effect on bond spreads. Macro monetary policy uncertainty raises increasing risk expectations for investors. It is believed that monetary policy is one of the most essential tools for governments to intervene and regulate the macroeconomy [4]. According to Talavera et al. [5], the macro environmental uncertainty caused by monetary policy not only affects the changes in the corporate operations and investment behaviors, but also lead to the corresponding hedging strategies of the banking industry. monetary policy uncertainty prevents commercial banks from mastering the future liquidity accurately, which will improve the hedging demand. As a result of that, banks will reduce credit activities [6], making it more difficult for corporations to obtain bank loans and deteriorate financing constraints, thus inducing financial risks. Hang Seng Company (the Hong Kong leading index compiler) provides a China AH premium index

to monitor the price premium/discount between mainland markets and Hong Kong market [7-8]. The index measures the absolute price premium/discount of A shares over H shares for 60 of the largest and most liquid AH companies [9].

For both Chinese investors and overseas investors, this index can effectively show the overall pricing premium/discount between mainland and Hong Kong markets. In our paper, we also select testing samples from the constitutions of this index.

1.4. Objectives

This paper's main objectives are to exam the stationarity of the A-H share premium and the relationship between A share price and H share price.

Under market efficient hypothesis, shares of the dual-listed companies should have equal value in different markets. Empirical tests are performed to test the EMH. We use the Engle-Granger cointegration test, as well as Johansen cointegration test to exam the long term relationship between A shares and H shares.

As we mentioned before, the mainland markets were considered as isolated from Hong Kong and global markets in the past. This paper only focuses on the latest trend, especially the recent year (from June 1st 2009 to June 1st 2010). We want to see the current market efficiency situation, after several years of conducting QFII and QDII programmes. Daily dividend adjusted price of A share, daily dividend adjusted price of H share and FX rate CNY: HKD are used in our tests.

This paper further discusses possible reasons behind this A-H premium phenomenal from several aspects in the last session.

2. Testing Process

2.1. Data Collection

We select 16 companies from the Hang Seng AH premium index from 10 major sectors. The daily dividend adjustment prices in mainland markets and Hong Kong market are obtained from Yahoo finance, and duration is from June 1st 2009 to June 1st 2010. The CNY: HKD currency rate is obtained from Reuter's terminal. The index constitution detail is obtained from the website of Hang Seng Index Company Ltd. There are 241 samples in each series.

Table 1: Selected stock list

Company name	Industry	HK code	Shanghai
ICBC bank	Banking	1398.HK	601398.SS
Bank of China	Banking	3988.HK	601988.SS
China Construction Bank Corporation	Banking	0939.HK	601939.SS
China Life Insurance Company Limited	Insurance	2628.HK	601628.SS
China Petroleum	Energy-Oil	0386.HK	600028.SS
Petrochina corporation	Energy-Oil	0857.HK	601857.SS
Yanzhou Coal Mining company	Energy- Coal	1171.HK	600188.SS
Datang Inter. Power Generational Co Ltd	Power & Energy	0991.HK	601991.SS
COSCO Holdings	Shipping	1919.HK	601919.SS
China Shipping Container Lines Co Ltd	Shipping	2866.HK	601866.SS
Aluminum Corporation of China Limited	Metal	2600.HK	601600.SS
Zijin Mining Group Co Ltd	Metal	2899.HK	601899.SS
China Eastern Airlines	Transportation	0670.HK	600115.SS
China South Locomotive & Rolling Stock	Manufacturing	1766.HK	601766.SS
China Railway Group Limited	Infrastructure	0390.HK	601390.SS
Anhui Conch Cement Company Ltd	Infrastructure	0914.HK	600585.SS

The following table (table 1) shows 16 companies that are dual-listed in Shanghai and Hong Kong markets, and are constitutions in Hang Seng AH premium index (June 2010).

2.2. Cointegration Test

For the Engle-Granger Test [10], it is performed by the following steps.

Step one, Check order difference of input series. In the Engle-Granger, all the input series should have the same order difference. Otherwise, the model may lead to a spurious cointegration.

A unit root test is conducted to each series. We use Augmented Dickey Fuller (ADF) test. The hypothesis is there is a unit root at some level of confidence. We use 5% level to test, so if the p-value is less than 5%, we reject the hypothesis. (Detail test steps and procedures are included in the appendix.) After testing, all the input series are I (1) series.

In step two, use Eviews to estimate an OLS regression for the series. If the market is highly efficient, we expect the stock price in Shanghai and Hong Kong should be equal. If the market is less efficient, the H share prices and A share prices may have cointegration relationship or have a constant premium/discount in long term. In order to test this constant premium/discount, we add a constant c into the equation.

$$P_{HKD}^{HK} = c * P_{CNY}^{SH} / e_{HKD.CNY} \quad (1)$$

We transfer the equation to LN mode. The new equation is written as below. β_1 And β_2 are parameters to see the impact from A shares and FX rate, and C is used to test whether there is a constant discount/premium between A share price and H share price. For most China stocks in our list, the market capital in Shanghai is much larger than Hong Kong. The majority market cap and voting power are on the mainland China side, so we think the H share price follow the A share price. We would put Hong Kong price on the left hand side of the equation, which explains the H share price by A share price and FX effect. Refer to the previous OLS model of [11-13], the estimated equal is shown as below.

$$\ln(P_{HKD}^{HK}) = \beta_1 \ln(P_{CNY}^{SH}) + \beta_2 \ln(e_{HKD.CNY}) + C \quad (2)$$

The last step of the E-G model requires another unit root test to the residual from step 2 of OLS model. However, the critical value used in this step is not the same as simple series unit root test. In James's paper, he studied the critical vale and listed a formula to calculate the critical values. γ is the value provided by James' paper due to the series type. T is the number of samples.

$$\gamma_{\infty} + \frac{\gamma_1}{T} + \frac{\gamma_2}{T^2} \quad (3)$$

If the residual does not have a unit root, it is stationary. We confirm that the H shares prices and A shares are cointegrated. Oppositely if the residual is not stationary, the cointegration does not exist.

3. Testing Results and Analysis

3.1. Testing Results

We test all the 16 stocks and summarize the result in the following table 2. "T-statistic" column shows the T-statistic value from the ADF test for the OLS residual. The 1%, 5% and 10% value columns show whether the residual has a unit root at corresponding critical level. "Yes" means the residual has a unit root at that level. "No" means the residual does not have a unit root and the

residual is stationary. R square value is the indicator of the accuracy of OLS model.

Table 2: Testing result

Company name	T-statistic	1% Level	5% Level	10% Level	R square
ICBC bank	-2.075589	Yes	Yes	Yes	0.28
Bank of China	-1.485058	Yes	Yes	Yes	0.02
China Construction Bank Corporation	-2.514221	Yes	Yes	Yes	0.27
China Life Insurance Company Limited	-2.913873	Yes	Yes	Yes	0.56
China Petroleum Petrochina corporation	-2.64742	Yes	Yes	Yes	0.54
Petrochina corporation	-2.474653	Yes	Yes	Yes	0.03
Yanzhou Coal Mining company	-3.58994	Yes	Yes	No	0.83
Datang Inter. Power Generational Co Ltd	-2.396518	Yes	Yes	Yes	0.61
COSCO Holdings	-3.27633	Yes	Yes	Yes	0.41
China Shipping Container Lines Co Ltd	-2.435391	Yes	Yes	Yes	0.49
Aluminum Corporation of China Limited	-3.421455	Yes	Yes	Yes	0.63
Zijin Mining Group Co Ltd	-2.122695	Yes	Yes	Yes	0.49
China Eastern Airlines	-3.062827	Yes	Yes	Yes	0.75
China South Locomotive & Rolling Stock	-3.85546	Yes	No	No	0.71
China Railway Group Limited	-2.632448	Yes	Yes	Yes	0.70
Anhui Conch Cement Company Ltd	-3.714141	Yes	Yes	No	0.72

Table 3: Johansen test result

Company	Optimal VAR Lag	Cointegration
ICBC bank	1 1	No
Bank of China	1 1	No
China Construction Bank Corporation	1 1	No
China Life Insurance Company Limited	1 1	No
China Petroleum Petrochina corporation	1 3	No
Petrochina corporation	1 1	No
Yanzhou Coal Mining company	1 2	No
Datang Inter. Power Generational Co Ltd	1 1	No
COSCO Holdings	1 1	No
China Shipping Container Lines Co Ltd	1 2	Yes
Aluminum Corporation of China Limited	1 2	No
Zijin Mining Group Co Ltd	1 2	No
China Eastern Airlines	1 1	No
China South Locomotive & Rolling Stock	1 2	No
China Railway Group Limited	1 1	Yes
Anhui Conch Cement Company Ltd	1 1	Yes

In table 3, we can see that most of the stocks in the table has unit root in the residual, which means their A price, H price and FX rate are not cointegrated. Only Yanzhou Coal Mining Company, China south Locomotive and Anhui Conch Cement Company have cointegration at 5%-10% level.

The last column R2 value helps us to understand the accuracy of the OLS model, which varies

from 0.28 to 0.83 in our experiment. Further discussion about R² is in the next part.

A similar result is achieved if we apply Johansen Cointegration test. Only 3 stocks have cointegration relationship between A and H shares.

From the testing results, only 3 stocks among 16 samples shows cointegration relationship under the E-G test. Our original hypothesis that long term relationship between A shares and H exists in the past one year's time cannot be accepted.

Before going to market environment analysis, we look at the OLS model and exam the possible reasons behind the data. The OLS model uses least square method to generate a regression function. R square value and coefficients are two important indicators, and we are going to take a detail scrutiny on them.

3.2. Discussion about R²

R² is an estimation of how accurate the OLS can explain the data. A larger R² indicates a higher accuracy of the OLS regression model. If R² is small, which means the OLS cannot well explain the relationships. We find that the R² has some distribution pattern related to Market capital and Industry distribution.

3.2.1. Market Capital

From Table 4, we find the largest companies have the lowest R². R² of Bank of China and PetroChina are only 0.02 and 0.03, which shows the OLS models are not incapable to explain the AH price relationship. The A share price and H share price cannot form a stable regression, which may indicates they do not have a stable relationship.

Table 4: Market capital and R-squared value

Company name	Market Cap in HK(trillion HKD)	Market Cap in SH (trillion CNY)	Total market cap (tri CNY)	R ² value
ICBC bank	19300	13600	30584	0.28
Bank of China	10300	8478	17542	0.02
China Construction Bank Corporation	15500	10800	24440	0.27
China Life Insurance Company Limited	0.842	0.625	1.366	0.56
CHINA PETROLEUM	0.547	0.713	1.194	0.54
Petrochina corporation	15600	18600	32328	0.03
Yanzhou Coal Mining company	0.082	0.091	0.163	0.83
Datang Inter. Power Generational Co Ltd	0.039	0.084	0.118	0.61
COSCO Holdings	0.089	0.101	0.180	0.41
China Shipping Container Lines Co Ltd	0.033	0.047	0.076	0.49
Aluminum Corporation of China Limited	0.089	0.138	0.216	0.63
Zijin Mining Group Co Ltd	0.084	0.094	0.168	0.49
China Eastern Airlines	0.047	0.080	0.121	0.75
China South Locomotive & Rolling Stock	0.083	0.063	0.136	0.71
China Railway Group Limited	0.124	0.092	0.201	0.70
Anhui Conch Cement Company Ltd	0.111	0.081	0.179	0.72

The rationale behind this can be explained by difficult of arbitrage. Large market cap stocks cannot easily be affected by small investors and institutions. Only market consensus and large

driving force can change the direction of the giant elephants. Due to trading restriction, the segment of mainland markets and Hong Kong market is more severe on these large market cap stocks. Investors in two markets have quite different of pricing models, so the investor's expectations are diverged.

3.2.2. Industry Distribution

If we relate the R square value to industry distribution, we can find that most banks have small R2 value, e.g. ICBC bank (1398.HK, 601398.SS), Bank of China (3988.HK, 601988.SS) and China Construction Bank Corporation (0939.HK, 601939.SS). For infrastructure and transpiration companies, large R2 values are found in Table 5. We think that the A-H price inequilibrium may be different to companies in different industries.

Table 5: Industry and R squared value

Company name	Industry	R square
ICBC bank	Banking	0.28
Bank of China	Banking	0.02
China Construction Bank Corporation	Banking	0.27
China Life Insurance Company Limited	Insurance	0.56
China Petroleum	Energy-Oil	0.54
Petrochina corporation	Energy-Oil	0.03
Yanzhou Coal Mining company	Energy- Coal	0.83
Datang Inter. Power Generational Co Ltd	Power & Energy	0.61
COSCO Holdings	Services	0.41
China Shipping Container Lines Co Ltd	Shipping	0.49
Aluminum Corporation of China Limited	Materials	0.63
Zijin Mining Group Co Ltd	Metal	0.49
China Eastern Airlines	Transportation	0.75
China South Locomotive & Rolling Stock	Manufacturing	0.71
China Railway Group Limited	Infrastructure	0.70
Anhui Conch Cement Company Ltd	Infrastructure	0.72

3.2.3. OLS Coefficients

The following table 6 shows the coefficients in OLS models and their corresponding p-value.

Table 6: Coefficients and their probability

Company name	Coeff. for LN_FX β_2	P-value of LN_FX	Coeff. for A share β_1	P-value of A	C	P-value of C
ICBC bank	-23.75	0.00	0.87	0.00	-2.71	0.00
Bank of China	-6.47	0.05	0.01	0.91	0.47	0.34
China Construction Bank Corporation	-19.62	0.00	0.68	0.00	-1.90	0.00
China Life Insurance Company Limited	-34.58	0.00	0.90	0.00	-3.95	0.00
China Petroleum	-6.93	0.00	0.45	0.00	-0.14	0.66
Petrochina corporation	3.30	0.45	0.08	0.40	2.42	0.00
Yanzhou Coal Mining company	-66.53	0.00	0.98	0.00	-8.87	0.00
Datang Inter. Power Generational Co Ltd	65.38	0.00	0.11	0.17	9.57	0.00
COSCO Holdings	-5.79	0.08	0.43	0.00	0.42	0.41
China Shipping Container Lines Co Ltd	-53.87	0.00	1.14	0.00	-7.68	0.00
Aluminum Corporation of	7.63	0.02	0.54	0.00	1.69	0.00

China Limited						
Zijin Mining Group Co Ltd	8.53	0.08	0.62	0.00	1.67	0.03
China Eastern Airlines	-43.22	0.00	1.17	0.00	-6.82	0.00
China South Locomotive & Rolling Stock	-41.65	0.00	0.74	0.00	-5.02	0.00
China Railway Group Limited	41.01	0.00	0.22	0.00	6.73	0.00
Anhui Conch Cement Company Ltd	62.35	0.00	1.15	0.00	7.63	0.00

The probability of variable coefficients shows the significance level of the variables. Most of the variable are significantly different from 0, as the p-value are close to 0. For Bank of China and Petrochina, the variables are not significant. It may be related to market cap effects.

The coefficients for A shares are all positive, which means changes in A share price have an impact on H shares on the same direction. However, coefficients for LN_FX are quite volatile.

$$\ln(P_{HKD}^{HK}) = \beta_1 \ln(P_{CNY}^{SH}) + \beta_2 \ln(e_{HKD,CNY}) + C \quad (4)$$

As mentioned previously, if the market is efficient, we think H share should be the same value as A share when taking FX into account. So β_1 should be equal to 1, and β_2 should be equal to -1, and C should be 0. However, the testing result does not match with our expectation. In the table, we find that 5 out of 16 samples have a β_1 ranging from 0.80 to 1.20. And β_2 and C are even far from the expectation. It reveals market inefficient between Shanghai and Hong Kong markets.

β_1 is expected to be 1, so that change of $\ln(P_{CNY}^{SH})$ in Shanghai market has the same impact in $\ln(P_{HKD}^{HK})$. However, in our result, β_1 are all positive but not equal to 1. It means that the H market shows a change with the same direction as mainland markets but not with the same magnitude. This can be explained by different risk appetites and pricing models in mainland markets and Hong Kong market. We elaborate detail analysis of this point in the discussion part.

β_2 is various from -66 to +66, which can be explained by different expectation to currency rate change. Under EMH, if exchange rate changes, the stock AH prices has to be adjusted and keep the price equilibrium. So β_2 is expected to be close to 1 if market is in strong EMH. However, if we take each company's character into account, FX rate may differently affect the company profits and losses. Most of dual-listed companies have business exposure all over the world, which inevitably brings FX exposure to the companies. For example, exports companies respond negatively to strong domestic currency, but for imports companies, strong domestic currency means lower costs. Further studies can be done to find out each company's character and their exposure to the currency change.

C represents a constant premium/discount between A shares and H shares, and our expectation is 0. However, C value shows no meaningful result or even pattern. Some extreme C values reveal that some OLS model purely matches the Mathematic method but does not fit to our test's economical meaning.

4. Discussion

From the result, we find that the long term relationship does not exist between a share price, H shares price and FX rate for most of the selected representative stocks. It is the evidence that the market is not efficient.

We are going to discuss the market inefficiency from two aspects, large discrepancies from large market cap stocks, and investor behaviours.

4.1. Why the Large Market Cap Stocks Have Larger Discrepancies?

As we spot in the testing result, large market cap stocks suffer most from the market efficiency. This can be explained by valuation model difference, trading restriction and short of practical arbitrage tools. For large market cap stocks, only market consensus and large driving forces can move the giant elephants. Once large discrepancies are formed, it takes a very long time to adjust.

4.1.1. Valuation Model Difference

The pricing model or investment theory in mainland China and Hong Kong have huge differences due to education level and other historical reasons. We exam this point by looking at the average price and volatility of the stock price in mainland and Hong Kong markets.

Table 7: A share price VS H share price (all in CNY)

Company	A price (in CNY)	H price (in CNY)	A:H ratio
ICBC bank	4.80	4.97	1.04
Bank of China	4.01	3.30	0.82
China Construction Bank Corporation	5.75	5.50	0.96
China Life Insurance Company Limited	27.78	30.15	1.09
China Petroleum	11.52	5.63	0.49
Petrochina corporation	13.35	7.84	0.59
Yanzhou Coal Mining company	19.53	12.81	0.66
Datang Inter. Power Generational Co Ltd	8.78	3.33	0.38
COSCO Holdings	13.70	8.78	0.64
China Shipping Container Lines Co Ltd	4.71	2.56	0.54
Aluminum Corporation of China Limited	13.65	7.31	0.54
Zijin Mining Group Co Ltd	9.15	6.21	0.68
China Eastern Airlines	6.90	2.42	0.35
China South Locomotive & Rolling Stock	5.21	4.38	0.84
China Railway Group Limited	5.94	5.42	0.91
Anhui Conch Cement Company Ltd	42.51	42.64	1.00

From table 7, we can see in Hong Kong market investors value Chinese banks and insurance companies higher than mainland China markets, while companies in other sectors are lower than mainland markets. So there are discrepancies of the firms' intrinsic values among markets.

Table 8: Volatility in mainland markets and Hong Kong market

Company	Volatility in A	Volatility in H	Vol ratio
ICBC bank	0.27	0.47	0.572
Bank of China	0.13	0.31	0.430
China Construction Bank Corporation	0.33	0.46	0.722
China Life Insurance Company Limited	2.03	2.87	0.707
China Petroleum	1.29	0.40	3.202
Petrochina corporation	0.90	0.55	1.639
Yanzhou Coal Mining company	2.13	3.20	0.665
Datang Inter. Power Generational Co Ltd	0.92	0.56	1.633
COSCO Holdings	1.58	0.73	2.150
China Shipping Container Lines Co Ltd	0.43	0.37	1.142
Aluminum Corporation of China Limited	1.84	0.85	2.169
Zijin Mining Group Co Ltd	0.90	0.80	1.120
China Eastern Airlines	0.89	0.67	1.321
China South Locomotive & Rolling Stock	0.39	0.56	0.689
China Railway Group Limited	0.52	0.63	0.827
Anhui Conch Cement Company Ltd	4.06	8.43	0.481

Table 8 shows the volatility of A and H shares. The volatility can reveal how the markets react to new information and also investors' risk appetite in the two markets. With the same information

input, the responses are not in line between markets. In mainland markets, the small cap stocks have higher volatility than Hong Kong market's, while large market cap stocks shows lower volatility. This can be interpreted as China investors are quite optimistic to the overall economic situation. They prefer to do long term investment in large market cap stocks and have more speculation activities on small market cap stocks. Hong Kong investors are more allergic to information related to large market stocks, which may mean they care more about the overall economic trend.

In a word, mainland markets have different valuation model and risk-taking appetite as Hong Kong markets. The discrepancy is likely to continue for a long time, as the markets need time to change its pattern and investors behaviour cannot be changed in short term.

Hong Kong investors are mainly giant international investment firms who represent the most advanced technical methods, while mainland China investors use less advanced methods to make investment decisions. It takes time and effort for mainland investors to improve their methods. With more and more exchange activities between markets and universities, we believe the gap will be narrowed in the short future, and it may improve the price inequilibrium between markets.

4.1.2. Trading Restriction

QFII is the only channel for foreign investors to direct invest in mainland China. By 2009, there are more than 70 foreign institutions participated in the programme and the total capital amounts to 15 billion USD, which is less than 1% of the market capitalization of the Shanghai and Shenzhen markets. 1% is a very small size in the market. Foreign investors cannot largely influence the Shanghai market due to limited capital and speaking voice. But in Hong Kong, they have strong power and influence in the market.

In late 2009, Chinese government ease the capital restriction, which allows each QFII member to have 1 billion USD in mainland China market. With more capital in the markets, foreign institutions may change the way of mainland Chinese investors valuating stocks.

4.1.3. Short of Practical Arbitrage Tools

Short of financial tools is another challenge to arbitragers. There are no arbitrage financial products for arbitrage to instantly narrow the pricing difference in the two markets. Strategies like pair trading may work, but without leverage products, it costs a higher execution cost on purchasing equities. Traders can use home-made strategies to arbitrage; however, the size of the strategies is limited due to QFII quota. Moreover, the feasibility of the strategies is doubted due to median-to-long term market valuation difference.

A few years ago, it is reported that Chinese government was proposing a convertible programme, which allows a free conversion between A shares and H shares. This proposal can change the price difference if passed.

4.2. How Does Investors' Behaviour Affect the Price Relationship?

We think that the major concerns of different investor groups are quite different. Domestic investors in mainland markets care more about money supply policy and short term speculation on the small cap companies' performance. Overseas investors in Hong Kong market pay more attention to the foreign exchange rate and overall economic situations. With diverged concerns and objectives, investors are unlikely to make consensus decisions on markets.

4.2.1. Bubbles in China and Political Risk of Mainland Markets

China domestic investors are facing another dilemma – too much easy money in the past few

years without available good investment opportunities. Evidence is the housing prices, which have raised more than 20% in the past year. It keeps going upwards, even after the government released a series of policies to control the market. In the stock market, from 2005 to 2007, the stock index rallied from 1000 points to more than 5900 points. The equity market was overheated at that time, which makes the price difference larger between mainland China and Hong Kong. In 2009 and 2010, Chinese government issues more loans to stimulate the markets. However, a large portion of the loans flow to stocks and housing markets, according to economists.

Another potential risk of mainland China stock markets is its high political risk. Government policy like interest rate, stock trading tax and mortgage rate are not foreseeable or transparent. In 2008, after the government started to control money supply and effects from global recession, the stock market lost 60% in one year's time, more than the global markets. In 2009, Chinese government announced a 4-trillion CNY economic stimulus package to pull the Chinese economy out of the shadow of global recession. The mainland stock markets have some rally at that time. So due to volatile government policies, the mainland markets may have unexpected fluctuation in the future and the domestic investors are more vulnerable to this risk.

4.2.2. Gold Rush of Overseas Investors

China enjoys stable high growth rate of GDP in the past decade, and most companies enjoy huge growth rate with the overall economy. As China is trying to increase inner demands as well as increasing exports, the long term prospective of Chinese companies is positive. This is the first reason for overseas investors to purchase Chinese company shares.

Moreover, since 2005 Chinese government started to change its old currency policy, CNY has gained 20% value compared to USD. And this trend is likely to continue as the huge GDP growth and pressures from trading counterparties. For foreign investors, direct trading of CNY: USD is not allowed. But buying Chinese companies' shares is an efficient way to get CNY exposure into their portfolios. Most of banks and insurance companies have large capital reserves, so their USD-term company value will be directly impacted by the currency exchange rate. Once the CNY goes stronger to USD, the USD-term share prices are surely to increase. This can explain why the foreign investors are prone to invest in Chinese financial companies.

Driven by strong company profit estimation and strong currency, overseas investors rush to China for gold. However, the QFII is limited, so the overseas investors turned to the alternative choice: Hong Kong H shares. According to HKMA, during Oct 2009 to Jun 2010, more than 60 billion USD has rushed into Hong Kong markets, almost four times the size of QFII. Most of the capital is flowed into Hong Kong equity market, and push the H share price to a higher level. Economists and government officers have pointed out the bubbles in equity market and real estate market.

Last but not least, overseas hot money is sensitive to the global economy. If the money source countries have problems, the capital will retreat to the source countries. This is another risk in Hong Kong market.

5. Conclusion

We discuss that the large discrepancies from large market cap companies are due to different valuation models, risk appetites, trading restrictions and lack of efficient arbitrage tools. Domestic investors have the following characters: sensitive to money supply in domestic market, speculative on small cap stocks and optimistic in long term investment, while foreign investors are allergic to foreign exchange rate and global economic outlook. This difference determines the markets' different reactions to the same market information, and nonstationary of AH share price.

The mainland markets and Hong Kong market are facing different issues and potential risks as we discussed previously. China markets have more political risk, while Hong Kong market is more sensitive to global economy. Mainland markets and Hong Kong market are driven by different sources of hot money, which makes the price difference unpredictable in the future.

Taking all these facts into account, the two markets are unlikely to reach a consensus on the stock price. And our tests proofed it from econometrics view: the cointegration relationship does not exist between a shares and H shares, even if one controls for exchange rate movements.

6. Recommendations

As China becomes an active player in the global markets, more trades and communication are conducted between mainland markets and global markets, which gradually help to eliminate the price difference. Meanwhile, Chinese domestic investors are absorbing advanced financial theories, and they will start to use advanced investment method to improve their risk estimation and decision making skills.

The integrating of Hong Kong and mainland China has been brought to a new level in recent years. Investment policies have been loosening, and allow more mainland Chinese companies to list in the stock exchange. Several companies have got chance to list their IPO in two markets at the same time. It may notify the investors the one price law.

Mainland markets are also developing more financial instruments, e.g. Index futures and stock options. These products can stabilize the market and improve market efficiency. The government is also studying on new policies like AH free conversion programme, AH markets “through train” programme. These programmes may not be conducted immediately, but they show the willingness of Chinese government to improve the market efficiency.

For currency policy, Chinese government is promoting CNY business in Hong Kong, e.g. allowing direct CNY settlement in international business. It is not a small change, but is a step forward of making CNY as an international free-tradable currency. In Hong Kong, HKD is now free convertible to RMB under certain amount per day, which implies CNY can be tradable to other currencies though HKD. We believe that the stock market will become more efficient if investors can hedge their FX exposure by other financial products, but not stocks.

Chinese government shows intention to improve the market efficiency situation, but it takes time to see the result. In the near future, the nonstationarity of price premium may still exist, but can be gradually improved. We believe in long run the AH prices in mainland and Hong Kong markets will reach equilibrium.

Appendix

Example of 0386.HK and SS600028.SS

ADF test and OLS regression for HK0386, SS600028_0386 and FX shown in Table 9;

Unit test for the residual of OLS regression shown in Table 10.

Table 9: OLS regression for HK0386, SS600028_0386 and FX

Dependent Variable: HK0386				
Method: Least Squares				
Date: 09/11/10 Time: 17:06				
Sample (adjusted): 1 240				
Included observations: 240 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
SS600028_0386	0.450160	0.029321	15.35281	0.0000
LN_FX_	-6.928882	2.087723	-3.318870	0.0010

C	-0.138599	0.317303	-0.436804	0.6627
R-squared	0.543385		Mean dependent var	1.856839
Adjusted R-squared	0.539531		S. D. dependent var	0.063768
S. E. of regression	0.043272		Akaike info criterion	-3.430221
Sum squared resid	0.443765		Schwarz criterion	-3.386713
Log likelihood	414.6265		F-statistic	141.0182
Durbin-Watson stat	0.196871		Prob (F-statistic)	0.000000

Table 10: Unit test for the residual of OLS

Null Hypothesis: RESID0390 has a unit root				
Exogenous: None				
Lag Length: 0 (Automatic based on SIC, MAXLAG=14)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.632448	0.0085
Test critical values:				
	1% level		-2.574674	
	5% level		-1.942159	
	10% level		-1.615814	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D (RESID0390)				
Method: Least Squares				
Date: 09/18/10 Time: 12:41				
Sample (adjusted): 2 240				
Included observations: 239 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID0390(-1)	-0.059621	0.022649	-2.632448	0.0090
R-squared	0.028217	Mean dependent var		0.000178
Adjusted R-squared	0.028217	S. D. dependent var		0.020265
S. E. of regression	0.019977	Akaike info criterion		-4.984264
Sum squared resid	0.094984	Schwarz criterion		-4.969718
Log likelihood	596.6196	Durbin-Watson stat		2.074689

We use James' method to find that the correct critical value is -4.356118285 for 1% level, -3.777786486 for 5% level, and -3.477744302 for 10% level.

The t-statistic value we get from ADF is -2.632448, which is larger than 10% level's critical value. So we can't reject that the residual has a unit root at 10% level, the residual is not stationary. Thus the A share price of Sinopec, H share price and FX rate do not have cointegration.

From the interim result - OLS equation, R2 value is 0.543385. It is a modest estimation of the relationship. The regression can be written as

$$HK0386 = -6.928881615 * LN_FX_ + 0.4501604406 * SS600028_0386 - 0.1385993459 \quad (5)$$

So the increase in A shares has a positive impact on the H share price, and the increase in the exchange rate of HKD and CNY has a negative impact on the H share price. In other words, if HKD get stronger than CNY, the H price (in HKD) increases. This is in line with our expectation. However, if the market is in strong EMH, we should see (1, 1, 0) for the coefficients on the right hand side.

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