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MEASURING MARKET SENTIMENT IN HONG KONG'S STOCK MARKET – RECENT DEVELOPMENT OF THE HANG SENG CHINA ENTERPRISE INDEX

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Abstract

The Hang Seng China Enterprise Index (the H-share Index) has drawn increasing attention as it currently accounts for 25% of total market capitalisation and over 40% of turnover of the Hong Kong stock market. For market surveillance purposes, it is important to have a measure to monitor market sentiment towards the H-share Index. In this note, following the methods in a previous working paper (Yu and Tam (2007)), we estimate the risk appetite index for the H-share Index from June 2004 to July 2007. The result shows that the risk appetite index and the H-share Index have moved more or less in tandem since the end of 2006. The risk appetite index also indicates that the market was still optimistic about the H-share market even during the correction in the A- and H-share markets at the end of February 2007.

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I. INTRODUCTION

As at the end of June 2007, there are a total of 100 Mainland enterprises listed as H-share on the Main Board of the Hong Kong Stock Exchange, accounting for almost 25% of market capitalisation and over 40% of turnover of the Main Board. Due to its growing importance in the Hong Kong stock market, the Hang Seng China Enterprise Index (H-share Index) has drawn increasing attention of the market. For market surveillance purpose, hence, it is important to have a measure to monitor investors' sentiment towards the risks in investing in Mainland enterprises.

In the previous working paper (Yu and Tam (2007)), we have developed a measure for investors' risk appetite for the Hang Seng Index based on the methodology in Gai and Vause (2006). We found that this measure is able to capture fluctuations in investor sentiment.

In this note, we use the same method to measure market sentiment vis-à-vis the H-share Index. Details of the data are discussed in the next section, followed by the estimation results in Section 3. Section 4 concludes.

II. DATA

The derivation of the risk appetite indicator requires the estimation of two density functions (1) the risk neutral density function (RND), based on the stock option prices; and (2) the history-implied density from the H-share cash market.[1]

The trading of the H-share Index options commenced in June 2004. At the end of each month, spot month H-share Index options with strike prices ranging from 1,200 points below the at-the-money (ATM) level to 1,200 points above the ATM level are used to estimate the density function.[2] The risk-free interest rate in the estimation is approximated by the 1-month Hong Kong Interbank Offer Rate (HIBOR).

The history-implied density, which is a proxy for the subjective probability distribution of investors, is derived from the GARCH (1, 1) model. Month-end closing prices of the H-share Index from July 1994 to July 2007 are used for this GARCH estimation. The estimation of the variance and the mean of return in the GARCH model from June 2004 to July 2007 is based on a rolling window of 10-year starting from July 1994.[3]

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[1] A brief technical note on the estimations of the two density functions and the derivation of the risk appetite indicator is provided in the Appendix. For more details, please refer to Yu and Tam (2007).

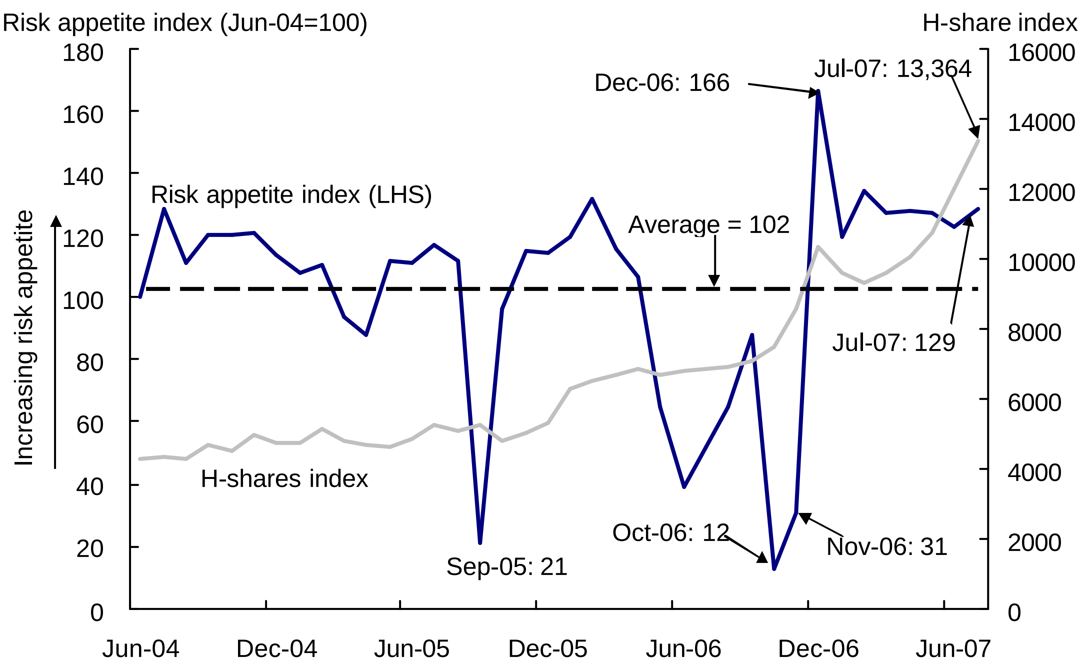
[2] As the strike prices of H-share Index options are at an interval of 200 index points, there are altogether 13 contracts to be considered for each risk neutral density estimation.

[3] In view of the possibly structural changes in the data, we use rolling samples in the estimation of the GARCH model.

III. RESULTS

Chart 1 depicts the risk appetite index of investors towards H-shares from June 2004 to July 2007.[4] A small index value indicates a low appetite of investors towards risk in H-share investment and vice versa. Over time, the index has moved around its average value, with occasional spikes to reflect extreme optimism and pessimism of investors. There is no clear evidence that the risk appetite index and the H-share Index moved in tandem prior to late 2006. The H-share Index first hit 10,000 in December 2006 when the risk appetite index rose to the record high of 166. The risk appetite index then dropped to a level of about 120 at the end of January 2007. Despite the market correction at the end of February, the index bounced back to the level of 129. The optimism shown by the risk appetite index might be a useful hint for the subsequent surge in the H-share Index after the end of February 2007.

Chart 1: Risk appetite index of investors towards the H-shares



Source: Staff estimates

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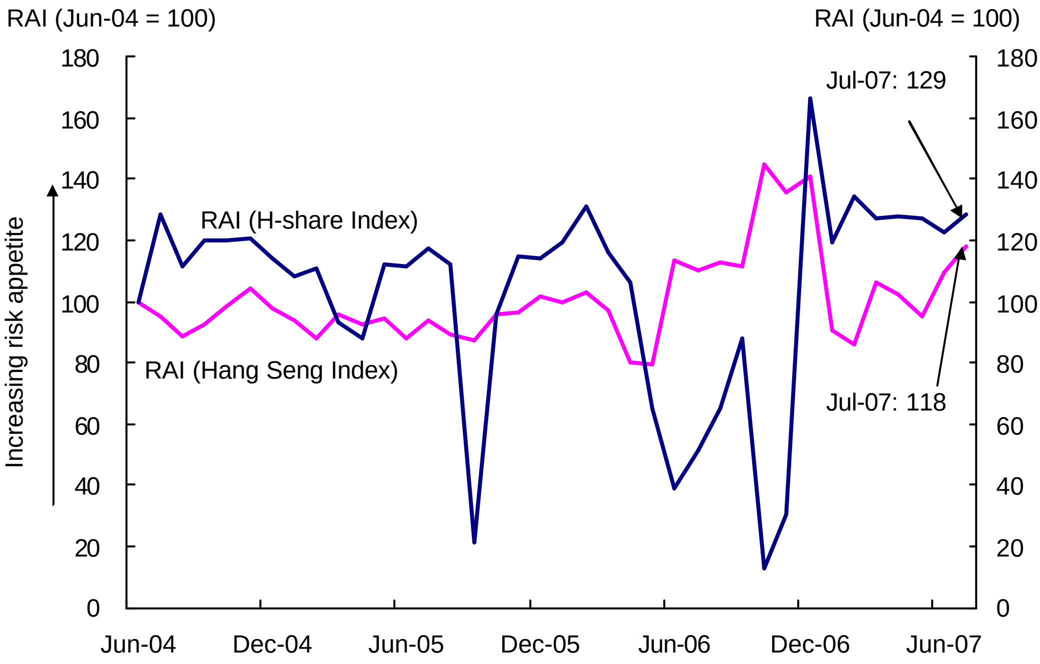
4 For the ease of interpretation, the risk appetite indicator estimated by the method described in Yu and Tam (2007) is rebased with 100 at June 2004 in this note.

Chart 2 compares the risk appetite of investors towards both the Hang Seng Index (HSI) and the H-share Index. From the chart, it is clear that the risk appetite index for H-shares is more volatile than that for the HSI stocks as a whole, with larger and more frequent surges and drops during the same period. This larger volatility is partly due to the higher vulnerability of China enterprises to policy changes on the Mainland. The risk appetite index for H-shares has stayed at a higher level than that for the HSI since December 2006. This indicates that investors are more willing to take risk on investing in H-shares.[5] At the end of July 2007, the risk appetite index of the HSI was 118, while that of the H-shares was more optimistic at the level of 129.

Chart 2: Risk appetite index of investors in Hong Kong's stock market



Source: Staff estimates

5 Given the fact that some constituents are both in the H-share index and the HSI, the difference between the risk appetite indices for both indices indicates that the risk appetite for non-H-share HSI is substantially smaller than that for the H-shares.

IV. CONCLUDING REMARKS

Based on the methodology of Gai and Vause (2006), we estimate the risk appetite index of investors in the H-share Index using data from the cash and option markets. The risk appetite index is found to move roughly in tandem with the H-share Index since the end of 2006. This index also shows the presence of investors' optimism towards the H-shares even during the short term market correction at the end of February 2007. Compared to non-H-share HSI stocks, the risk appetite for H-shares is substantially larger in recent months. The presence of optimism among investors at that time might relate to the subsequent surge in the H-shares afterwards.

REFERENCES

Gai, P. and Vause, N. (2006): "Measuring Investors' Risk Appetite", *International Journal of Central Banking*, Vol. 2, p.167-188.

Yu, I.W. and Tam, C.S. (2007): "Measuring Market Sentiment in Hong Kong's Stock Market", *HKMA Working Papers*, HKMAWP07-05.

Appendix

The risk appetite indicator developed by Gai and Vause (2006) can be derived as:

$$l_t = \frac{1}{R^f_{t+1}} \text{var}\left(\frac{f^*_{t+1}(s)}{f_{t+1}(s)}\right)$$

where l_t is the unit price of risk, which indicates the investors' appetite towards risk of the underlying asset at time *t*, R^f_t is the gross risk free rate of return at time *t*, $f^*_t(s)$ is the risk neutral density (RND) of the asset price s at time *t*, $f_t(s)$ is the history implied density of the asset price *s* at time *t*, var( ) is the variance operator.

The methods we used to find the option-implied RND of the H-share Index and statistical density function are highlighted in this appendix.

A. Finding the RND by fitting the two-lognormal mixture distribution

The prices of European call and put options at time *t* can be written as the discounted sums of expected future payoffs:

$$c(X,t) = e^{-rt} \int_X^\infty f^*(S_T)(S_T - X)dS_T \qquad \text{(A1)}$$

$$p(X,t) = e^{-rt} \int_0^X f^*(S_T)(X - S_T)dS_T \qquad \text{(A2)}$$

where $c(X,t)$ and $p(X,t)$ are the call and put prices respectively. The option prices are functions of the strike price (X), the time to maturity (t), the asset price at the expiry (S_T), the risk free interest rate (r) and the density function of the asset price as at expiry $(f^*(S_T))$. Assuming that the density function is a two-lognormal mixture, $f^*(S_T)$ at time *t* can be expressed as:

$$f(S_T) = \sum_{i=1}^{2} q_i L(a_i, b_i; S_T) \qquad \text{(A3)}$$

where:

$$a_i = \ln S_t + (m_i - \frac{s_i^2}{2})t \qquad \text{(A4)}$$

$$b_i = s_i \sqrt{t} \qquad \text{(A5)}$$

$L(a_i, b_i; S_T)$ is the i-th lognormal density function with parameters a_i and b_i, q_i is the weight of the i-th density in the mixture and the mixtures are summed to unity, m_i and s_i are the mean and volatility of asset return and volatility (in standard deviation) respectively. At any time *t*, five parameters (a_1, b_1, a_2, b_2, q_1) in the two lognormal density functions are estimated by solving the following minimization problem:

$$\underset{a_i, b_1, a_2, b_2, q_1}{Min} \{ \sum_{n=1}^{N} [c(X,t) - c_{obs}]^2 + \sum_{n=1}^{N} [p(X,t) - p_{obs}]^2 \} \qquad \text{(A6)}$$

where N is the number of possible expiry asset price, c_{obs} and p_{obs} are the observed call and put prices at *t* respectively. By substituting the estimated parameters into (A3), the probability density at different prices can be calculated accordingly. [6]

B. *Finding the statistical probability by the threshold GARCH model*

The statistical probability is estimated by the threshold GARCH model of the H-share Index return (r_t)[7]:

$$r_t = b + e_t \qquad \text{(A7)}$$

$$s_t^2 = f_1 + f_2 e_{t-1}^2 + f_3 e_{t-1}^2 D_{t-1} + f_4 s_{t-1}^2 \qquad \text{(A8)}$$

$$D_t = 1 \text{ if } e_t < 0 \text{ and 0 otherwise} \qquad \text{(A9)}$$

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[6] Note that L is the standard lognormal density function: $L_i = \frac{e^{\frac{-(\ln S_T - a_i)^2}{2b_i^2}}}{S_T b_i \sqrt{2p}}$

[7] We have tried different specifications for GARCH model, such as AR(1) and AR(2) for the mean equation, GARCH(1,2) and GARCH(2,2) for the GARCH equation, and they make no or insignificant difference on the resulting density. So we chose the simplest one for the sake of convenience.

where r_t is the return of the H-share Index at t, s_t is the volatility of the return which follows the threshold GARCH (1,1) model.

To estimate the risk appetite index at time t, we need to obtain the forecast of statistical probability as at $t+1$. For this purpose, we first estimate the GARCH model by the data up to time t. The expected return and variance of return as at $t+1$ can then be forecasted by (A7) and (A8). Plugging these forecasts into the lognormal density function of asset price gives the statistical probability of the H-share Index.[8]

[8] As the H-share Index is assumed to be lognormally distributed, its log-return should be normally distributed. Therefore the normally distributed GARCH-implied return and the corresponding variance can be directly plugged into the lognormal distribution function.