# AN ANSLYSIS OF IMPACT ON HONG KONG ECONOMY UNDER FREE CONVERTIBILITY AND INTERNATIONALIZATION OF RENMINBI CURRENCY

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## ABSTRACT

*Nowadays, countries around the world, including economic giant USA, are increasingly concerned over the issue of undervaluation of RMB. Also, with the trade of China diversifying to various countries around the world in recent years, China has been urged to internationalise its currency- RMB. Undoubtedly, with the pressure of various countries, internationalisation of RMB seems only the matter of time. Hong Kong has been a very close relationship with China. Therefore it is expected the change would bring a profound impact to Hong Kong. In this research, below chapters are looked into what the role should Hong Kong play for coming development of RMB. The potential benefits and dangers of internationalization of RMB would be analysed. Furthermore, explore whether it would bring golden opportunities to Hong Kong's economy. If so, what should be the positioning of Hong Kong? These are the questions going to solve in this research. In China's part, since internationalisation of RMB is inevitable, therefore, China needs time to minimize the risk deriving from free convertibility of RMB. To help RMB be internationalising, China needs to choose locations as a tool to further internationalise its financial systems. Clearly, since Shanghai and Hong Kong have a relatively mature financial system and regime, those places are able to help China as well as RMB to step into the global financial market.*

**Keywords:** *Renminbi, Hong Kong, RMB, undervaluation, convertibility, USD*

## 1.0 INTRODUCTION

During the financial crisis in 2008 and 2009, it was the devastating period for current international monetary system. The incident of Lehman Brothers occurred within this period and then went broke in September 2008. It is no surprising that currency USD is no longer in high confidence since USD has been depreciated and its economy has been very poor in recent years. While second largest economy, China, because of its abundant and low-cost material and labour supply, seemingly has huge potential contributions to the world economy. Therefore, someone may argue that China's main currency – RMB, may be the next international currency, replacing the fragile USD. Since then, China has been accused for intentionally manipulating its currency for undervaluation to gain huge trade surplus between Sino trades. China's authority strongly denied the accusation by US and said that RMB is properly valued. Two sides have been in huge divergence. Is RMB really being manipulated as accused by the US? This is one of the questions pending answer. For Hong Kong's side, in 1997s, China uses the new method to control Hong Kong as one country- two systems, after the guarantee of "No change in coming fifty years". In the past decade, central government seems to make some concessions such as new round of QDII and QFII, to show support Hong Kong to develop as RMB offshore center. Since Hong Kong is now facing tougher competition from Singapore, Shanghai, Shenzhen and even Macau. Hong Kong is likely to have enough prestige to win the "International financial hub" in the world. From 2004 onwards, Hong Kong has developed her offshore RMB business. Furthermore, RMB would likely become an international currency in the future. If it is true that the benefits brought to Hong Kong would be profound. It is well known that China has a relatively lower cost of both labour and raw materials, products from China has been highly competitive in the global market. Export of Chinese goods to other countries is hugely demanding and continuing increasingly and that makes RMB has been in very high demand for international trade. In Hong Kong, she has well-developed infrastructures and is prestigious as a free and financial city .As a result, it is able to lend a helping hand for China to be a paradise for global investors. Although there are some strong

competitors, like Singapore or Shanghai, to compete for RMB business, Hong Kong is still the number one candidate to be RMB official offshore center.

## 2.0 LITERATURE REVIEW

In 1974, Hong Kong government had no intention of pegging HKD with USD. Nine years later, Hong Kong government has announced to peg the link of the USD with HKD officially at USD1 to be equal around to HKD 7.80. The first step is to mention the history of Hong Kong currency highly instable in terms of exchange rate against foreign currencies from 1967 to 1973. This is bringing to the attention of the currency problem in which one currency HKD had to peg with, Schenk (2009). The other is talking advantage and disadvantage with link of currency arrangement, Stanek (2002), since some currencies identify to peg with HKD and maintain its currency without floating. Under the linkage, the exchange rate pegged between HKD and USD has been in operation since 1983 although it is critical to have pegging system in Hong Kong. During Asian financial crisis broken out in July 1997, three powerful men, including Joseph Yam, Donald Tsang and Rafael Hui, have joined forces to tackle the financial crisis whilst some foreign speculators conspired to ruin Hong Kong's financial stability. The linkage with USD exchange rate ranging between 7.75 and 7.85, and has not conceived any incentives to alter this historical decision, even at the moment, Chan (2010). It is very effective for HKD to link with USD and therefore HKD would not be affected by currency fluctuation. On the other hand, if Hong Kong does not link with USD, Hong Kong would enormously suffer financial shock, Luk (1998). Another investigation of swap curve against USD and HKD markets, Huang (2008). The pegging system, which has been used over 28 years, with exchange rate at HKD7.8 per USD, annoyed most investors concerning their investment fund under their charge, which makes their earning less in return under such narrow convertible range. As Latter (2010) points out the problem that Hong Kong should abandon the linkage with USD. What is the appropriate time HKD pegged with RMB? As per aforesaid information, it is not the suitable time in view of current economic situation in Hong Kong. This is the fact that it has been of great help to Hong Kong's economic stability in the past years under the peg between USD and HKD. However, if USD being in weak situation in the future, RMB would be appreciated sharply and hence greatly affect the exchange rate between RMB and USD.

Before talking about RMB to run international currency, it is considerate to draw the strength or weakness against the reforms. Actually, the internationalisation of RMB definitely brings the benefit to global economy. As told by Dobson, Masson (2008), RMB's role of internationalisation need longer period of time well over one or two decades and China should then be sufficient for consolidating her foreign exchange reserves. Another journal as Liu (2004), prefer to consider RMB value. Dobson or Liu are under due consideration to the questions about RMB's benefit or its valuation, it is highly valuable that once RMB becomes international currency. As Li (2004), worry about that RMB has started to run internationally in order to boost much confidence for foreign investors, Author gravely concerns the question the use of the offshore center as a plot for good trial experiment. Since the handover in 1997, the trade between China and Hong Kong has increasingly been climbed, Yin (Economics, 330013). In fact, CEPA has put a close link between China and Hong Kong under economic aspect. With IVS launched in 2003, Chinese residents have more chances to visit Hong Kong and thus contributed to 2% in Hong Kong's GDP growth in 2004 as a whole. As stated, China needs to reform on banking system, Alicia, Sergio and Daniel (2006). The fact is that China is now a partially--developed country and runs its business worldwide very rapidly. Another author discuss that RMB runs to global market, Hong Kong does assist China, Miguel (2011). Similar to Miguel, Ho (2009) creates another problem in association with RMB cross-border payment arrangement. As a result, both authors prefer to select Hong Kong as a global financial center. Of course, all transactions are requested by Pilot Program with well-established legal framework to lay down the risk in Hong Kong. Some authors suggest that keeping more RMB would be a good choice and good investment planning in the future, Kwong & Lau (2008). At present, some investors feel that keeping RMB is nearly risk-free. As Hong Kong people feel that keeping RMB is now better than HKD, maintain capital assets value.

As previously mentioned, pegging between HKD and USD have been over 28 years and have overcome many challenges for different situations and crises successfully. Therefore, someone may argue to take another currency peg again for USD and RMB in the future (Mellor, 2009). With reference to the pegging system, Hong Kong has to follow suit the USD currency in the same direction. China does not want to follow Japan's step as "Plaza Accord", (Zheng, Li, Xuemei, Xun and Wang). Another journal as Wang (2010) focuses on the valuation of RMB. As per Zheng and Wang's consideration, subject to the case of "Plaza Accord", China makes the right decision and RMB is beginning appreciation. The other one query, China has used different trade patterns or models to improve it. The purpose is to maintain competitive power even the currency value goes up. During financial crisis around year of 2008 and 2009, people began lack of confidence towards USD and wish the

currency of RMB to become internationalization after second decade, Lee(2010).   As viewed from Ling, He and Wei(2007), China begins to reform RMB exchange rate step by step, maintain the currency rate as an advantage for economic development. Considering authors of Lee and Ling's conclusion, they bring up the message of a stronger RMB currency worldwide than previous year. During the past years, it is increasing percentage rate for Chinese goods being exported to worldwide while the economy of US is beginning to weaken. No matter how RMB is significantly increasing its position in Asian currencies. Zongrun, Weitao, Chao and Yanju (2010), they show evidence of underestimation in RMB value in their journal. Considering this problem, US makes some noise to push further appreciation of RMB.


As clearly emphasized by Dobson and Masson(2009), RMB is inevitable to run internationalization in the future and has great impact on China's financial system. At the other point of Tsuyuguchi, Yosuke(2008), offshore non-deliverable markets can help to monitor its trading segmentation. As aforesaid similar case applied to China, Hong Kong residents wish to set up the offshore centre in Hong Kong to handle similar duty for Mainland China under the process of RMB internationalization. Hong Kong does receive more benefit against RMB free convertibility as a consequence. China has been accused for manipulating exchange rate of RMB. What is the exchange rate and how can it be computed? These questions would be solved in this chapter. Below is the diagram showing the changes between HKD and RMB. In the diagram, it can be seen that Chinese currency has gradually become more expensive in terms of HKD. But how the mechanism operates? Exchange rate is determined by demand and supply of currency. If one country's products or services are attractive or inexpensive, it will have huge demand. On the other hand, the supply of currency is controlled by central bank, it has the power to manipulate exchange rate.   Since China has abundant and low-priced labour supply as well as raw materials resulting in relatively low selling price, huge trade imbalance has been a main concern over other countries. It is known that exchange rates affect a country's trade balance very much. When undervaluation occurs, the country may experience in trade surplus since the exported goods are much cheaper than in foreign countries. The biggest victim is US since she has imported much goods and services from China. In the above diagram, it is clear to see that there has been increasingly mounting trend for the value of US import from China, adding to relatively slow increase in export, the trade deficit has been worsening over the past ten years. Therefore, it is the reason why US has exerted pressure to urge RMB to further appreciation.

The above diagram depicts the trade condition between China and the rest of the world. It is obvious that even compared to the whole world, China still have positive trade balance, not only limited to US. Big Mac Index, the economist publishes it since 1986. It measures the purchasing power parity (PPP) between currencies and provides a test of the extent to which market exchange rates result in goods costing the same in different countries. It makes readers much easier in exploring the content of complicated exchange rate issue. Big Mac index bases on the theory of purchasing-power parity (PPP), the notion that in the long run exchange rates should move towards the rate that would equalize the prices of a basket of goods and services around the world. They have shown the Big Mac index in 2011 published by Economist. Since USD has served as an indicator in the analysis, it is quite clear to spot that RMB is now undervalued by using this Big Mac index. Based on the above table, Big Mac is sold at USD4.07 in US while only US$2.31 can be bought in China. Therefore, RMB is expected to have an increase of her value. It is concluded that RMB cannot be internationalised for the time being until the value of it is properly valued.

### 3.0 RESEARCH METHODOLOGY

This chapter presents how to use the research method, what method is used against RMB free convertibility to have impact on Hong Kong economy. On the other hand, search some materials to find out the relationship amongst RMB, HKD and USD. Not only use the regression method, but also examine to use other method such as the Purchasing Power Parity (PPP) concept and the Interest Rate Parity (IRP) concept. Regarding the research method, to use one of research of correlation method is the purpose to find out the currency valuation which have impact on Hong Kong economy. On the other hand, using regression method is to test whether null hypothesis valid to meet the topic outcome or not. Also, Paired test, one way ANVOA and chi-squared would also be used in the analysis. According to data collection, it substantiates that the common use of RMB would definitely have impact not only in global market, but also the influence on Hong Kong economy. As history linked with HKD/USD, does it need to continue on the use of the pegging system?   Does it really underestimate the value of RMB which would have profound influence on US GDP? The research data truly reflect above worries and attitudes regarding concerned party. Data gathering is generated from a set of useful journals, financial books, economic books, articles, information from Hong Kong Monetary Authority(HKMA), International monetary fund (IMF), data from local bank and foreign universities, internet sources from

university whether local or overseas and etc. Secondary data analyses the opinions to run internationalization of RMB and the appreciation of valuation of RMB which may affect Hong Kong economy. In sum, the data in this chapter have made a point of view on regression analysis about the gross domestic product and regression outcome in Hong Kong. Internationalization of RMB is based on other factors in terms of Hong Kong economic condition, such as inflation, interest rate and unemployment.. The relevant data source mainly came from the website of HKMA, IMF, National bureau of Statistics, National Statistics Bureau of China and World Bank. Whatever RMB run to international currency, it is essential to keep analysis whether to obtain the benefit or not. If the answer is negative, it should give up this action.

It is estimated that the RMB reserve currency would have been reached the level of 21% in the year of 2020 under the calculation concept of EUR. On the other hand, base on the existing economic growth rate of 8%, keep the growth rate to the end of the year 2020 and Shanghai can fulfil the requirement of financial center completely together with exchange rate floating and capital account at open market . Shanghai may be met the target of international financial center in 2020. At the same time, RMB reserve currency needs to meet the level around 10% as same as sterling and yen. That means RMB to be fulfilled the requirement of international currency. Now, consider the risk of RMB trade clearing under exchange rate to be including its cost reduction. The purpose is increasing competitive power. Under the international currency, increase the trade business outside country and raise up the profit of financial center. Under the circumstance, build up the competition power of financial center, enlarge the liquidity of RMB in global market. At the time of RMB internationalise, focus the commodity price, enlarge the supply requirement, no need to set the price to deal with United States dollar or Euro. It is because this is unfair to trade commodity in global market at the moment. On the opposite side, it is time to have right printing own paper money or keep stock of gold. Under the circumstance, keep a small amount of United States dollar to be sufficient. Besides, RMB internationalization's purpose is to achieve the maximization and minimize cost.

## 4.0 ANALYSIS AND FINDINGS
### Relationship Between Hong Kong Economic Growth And Value of RMB
Since handover in 1997, the relationship between Mainland and Hong Kong has been getting closer. In the past decade, there were many agreements signed by China and Hong Kong in order to boost bilateral trades. Since China is predicted to persist a high economic growth in the near future, it is highly expected its currency- RMB will be further appreciated. With the gradual internationalisation and appreciation of RMB, what will be the implication of Hong Kong's GDP growth? Therefore, in order to predict the potential economic growth of Hong Kong, it is critical to examine the if there is a substantial relationship between the value of RMB and Hong Kong's economics indictors – Gross Domestic Product. Tt seems two determinants are fairly interrelated. Exchange rate of RMB and Growth rate of GDP are generally positively related in past 16 years.

SUMMARY OUTPUT

| Regression Statistics | |
|---|---|
| Multiple R | 0.554838736 |
| R Square | 0.307846023 |
| Adjusted R Square | 0.258406453 |
| Standard Error | 4.691732137 |
| Observations | 16 |

ANOVA

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 1 | 137.0645938 | 137.064594 | 6.226713232 | 0.025697012 |
| Residual | 14 | 308.1729062 | 22.0123504 | | |
| Total | 15 | 445.2375 | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
|---|---|---|---|---|---|---|---|---|
| Intercept | 1.382943959 | 1.444675452 | 0.95726965 | 0.354671098 | -1.715579475 | 4.481467392 | -1.715579475 | 4.481467392 |
| X Variable 1 | 1.293822449 | 0.518495808 | 2.4953383 | 0.025697012 | 0.181758552 | 2.405886345 | 0.181758552 | 2.405886345 |

Table 1: Excel Output: Relationship between exchange rate of RMB and HK GDP (95-10)

From the summary table, it shows R square is 30.78%. This is suggested that there is only about 31% of the total variation in changes of RMB can be explained, or is due to, the variation in GDP. The remaining 69% is unexplained.

Note that $r^2 = \frac{SSXY^2}{SSX \times SSY}$

Hypothesis testing: Here will analyse if there is any evidence provided 5% level to conclude that changes value of RMB and HK's GDP are linearly related. $H_0: B1 = 0$ and $H_a: B1 \neq 0$

Since this is a two-tail test, there are two critical values. Accordingly, reject $H_0$: if the value of the test statistic calculated is smaller than the t-value. $T(obs) = \frac{b1}{sb1}$.

Based on the output table 2, since *P value = 0.0257* which is smaller than $\alpha$=0.05. Therefore, reject $H_0$ and conclude at the 5% level of significance that the changes value of RMB and HK's GDP are linearly related. It seems the value of RMB is not quite related to the economic growth of Hong Kong. But it is reminded that since Hong Kong still under British's governance before 1997 and the bilateral trades between Hong Kong and China are getting closer just before recent years. It will be more meaningful if the regression analysis includes the most updated information only. The above diagram show the relationship between HK's GDP and the value of RMB in the more related years, 2007-2010. Having tried more than fifty times, it finally concluded that the *R* square of two variables is 84.80%. This is suggested that there is about 84.8% of the total variation in changes of RMB can be explained, or is due to, the variation in GDP. The remaining 15.2% is unexplained. The result is more reliable than previous result since it uses more updated information. From 2007 onwards, RMB settlement services and its bonds are available in Hong Kong, so relationship is getting closer.

RMB Becomes The International Currency.
The second regression testing is to test the potential of China's currency – RMB to become the international currency. To be an international currency, it must have adequate contribution or influence on world total output. It is generally known that USD has been an internationalized currency for many years. The main reason is that US economy is hugely linked to global economy. In the recent decade, the economy of China has been vastly developed. The proportion of GDP accounted for has been growing for a larger portion. In order to have a deeper understanding of the role that USD has been played and the development of RMB, regression analysis would be concluded. The above diagram shows the relationship of global aggregate output as a whole and the change of US GDP in the year of 2001-2010. It depicts there is very close relationship between two variables. 89.2% of aggregate output is related to US GDP. The result has explained why US economic situation is closely linked to global situation. Therefore, USD is still the most convincing currency to be the international currency. The *R* square is only 33.55%. It shows that, compared to United Stated, China has less influence on global GDP

| Relationship between global aggregate output and China GDP (2001-2010) | | | | | | | |
|---|---|---|---|---|---|---|---|
| SUMMARY OUTPUT | | | | | | | |
| | | | | | | | |
| *Regression Statistics* | | | | | | | |
| Multiple R | 0.579222453 | | | | | | |
| R Square | 0.33549865 | | | | | | |
| Adjusted R Square | 0.252435982 | | | | | | |
| Standard Error | 1.709567197 | | | | | | |
| Observations | 10 | | | | | | |
| | | | | | | | |
| | | | | | | | |
| ANOVA | | | | | | | |
| | *df* | *SS* | *MS* | *F* | *Significance F* | | |
| Regression | 1 | 11.80476238 | 11.80476238 | 4.039102713 | 0.079308681 | | |
| Residual | 8 | 23.38096002 | 2.922620002 | | | | |
| Total | 9 | 35.1857224 | | | | | |
| | | | | | | | |
| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
| Intercept | -4.219217422 | 3.377695746 | -1.249140757 | 0.246923775 | -12.00819778 | 3.569762936 | -12.00819778 | 3.569762936 |
| X Variable 1 | 0.639201899 | 0.318050152 | 2.009751903 | 0.079308681 | -0.094223067 | 1.372626864 | -0.094223067 | 1.372626864 |

Table 2: Excel output: Relationship between global aggregate output and China GDP (2001-2010)

Hypothesis testing: The below analysis would be conducted if there is any evidence provided 5% level to conclude that if the relationship between global aggregate output and value of RMB are linearly related.

$H_0: B1 = 0$ and $H_a: B1 \neq 0$. Accordingly, reject $H_0$ if the value of the test statistic calculated is smaller than the *t-value*. $\qquad T(obs) = \frac{b1}{sb1}$

Since P value = *0.0793* which is larger than $\alpha$ =0.05, have to reject $H_0$ and prove that the relationship between GDP of China and global aggregate output are linearly related. Therefore, having try more than forty times, it shows that not reject $H_0$ and conclude at the 5% level of significance that RMB cannot be the international currency for the time being. Matching to the reality, since USD still the largest economy in the world and the credibility of RMB is still in doubt, China's currency, RMB, for the time being, cannot replace USD to be the most demanding currency in the world. But since the China's economy is increasingly related to the global economy while US economy is in the contrary, there is fair possibility RMB would become internationalized in future.

Multiple Regression Analysis: To have a deeper understanding in how China's economy have made profound impact on Hong Kong's economy, not only the change of RMB would be analysed in the regression analysis, but the growth rate of China's GDP would add to analysis together in order to test how these China's main indictors have an impact to Hong Kong. Since there are two independent variables $(k \geq 2)$ carried out in the regression analysis, multiple regression analysis would be taken.
Multiple regression equation: $\widehat{Y_i} = b_0 + b_1 X_{1i} + b_2 X_{2i} + \cdots + b_k X_{ki}$

## Multiple regression output in the relatioship of HK GDP, China GDP and RMB ex. Rate (1995-2010)

| Regression Statistics | |
| --- | --- |
| Multiple R | 0.65295749 |
| R Square | 0.426353484 |
| Adjusted R Square | 0.338100173 |
| Standard Error | 4.432475787 |
| Observations | 16 |

**ANOVA**

| | df | SS | MS | F | Significance F |
| --- | --- | --- | --- | --- | --- |
| Regression | 2 | 189.8285592 | 94.91427959 | 4.831019739 | 0.026989096 |
| Residual | 13 | 255.4089408 | 19.6468416 | | |
| Total | 15 | 445.2375 | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Intercept | -13.16961768 | 8.984358983 | -1.46583832 | 0.166458964 | -32.57914522 | 6.239909869 | -32.57914522 | 6.239909869 |
| X Variable 1 | 0.395240351 | 0.735258116 | 0.537553196 | 0.599967046 | -1.193188239 | 1.98366894 | -1.193188239 | 1.98366894 |
| X Variable 2 | 1.612984307 | 0.984255387 | 1.638786364 | 0.125220882 | -0.513370181 | 3.739338795 | -0.513370181 | 3.739338795 |

Table 3: The regression output in the relationship of HK GDP, China GDP and RMB Ex. Rate (1995-2010)

Multiple regression equation: $\widehat{HK's\ GDP} = b_0 + b_1(RMB) + b_2(China\ GDP)$

$\widehat{HK's\ GDP} = 0.3952(RMB) + 1.6130(China\ GDP) - 13.1696$

The above multiple regression result is based on the statistics of various items for 1995-2010. The $R^2$ in relation to three variables is only accounted for 42.63%. If seems that China's GDP and RMB exchange rate are not too related to the value of Hong Kong's GDP. The reason behind that is probably the scope of years selected for analysis. Hong Kong and China has started in closer relationship from these recent years. Therefore, in order to have an accurate test in our analysis, more recent data would be selected.

## Multiple regression output in the relatioship of HK GDP, China GDP and RMB ex. Rate (2004-2010)

| Regression Statistics | |
|---|---|
| Multiple R | 0.785212252 |
| R Square | 0.616558281 |
| Adjusted R Square | 0.424837422 |
| Standard Error | 3.875912637 |
| Observations | 7 |

ANOVA

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 2 | 96.62349064 | 48.31174532 | 3.215916531 | 0.147027552 |
| Residual | 4 | 60.09079508 | 15.02269877 | | |
| Total | 6 | 156.7142857 | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
|---|---|---|---|---|---|---|---|---|
| Intercept | -11.96622141 | 11.51614698 | -1.039082032 | 0.35744817 | -43.94017131 | 20.0077285 | -43.94017131 | 20.0077285 |
| X Variable 1 | 0.779682176 | 0.824976723 | 0.945095969 | 0.398124186 | -1.510820409 | 3.070184761 | -1.510820409 | 3.070184761 |
| X Variable 2 | 1.306355503 | 1.18576784 | 1.101695846 | 0.332427331 | -1.985863812 | 4.598574819 | -1.985863812 | 4.598574819 |

Table 4: The regression output in the relationship of HK GDP, China GDP and RMB Ex. Rate (2004-2010)

Multiple regression equation: $HK's\ \widehat{GDP} = b_0 + b_1(RMB) + b_2(China\ GDP)$

$$HK's\ \widehat{GDP} = 0.7797(RMB) + 1.3063(China\ GDP) - 11.9661$$

From the above table finding that $R^2$ is 61.66%, which is far higher than the statistics using from 1995-2004. The result showed that China's GDP and the change of value in RMB are indeed having vital impact to Hong Kong economy. The above equation is to use for prediction of Hong Kong's economy growth. The coefficient of "X variable 1" (RMB) and "X variable 2" (China GDP) are also positive. When there is an appreciation of RMB and growth of China's GDP, these factors also bring positive impact to Hong Kong's GDP.

Correlation Analysis: Correlation analysis is different from regression analysis. It is concerned with the measurement of the magnitude of the relationship and is aimed at giving estimation for the degree of linkage between two variables.

### Correlation Table between HK GDP and RMB (2004-2010)

| | HK GDP | RMB |
|---|---|---|
| HK GDP | 1 | |
| RMB | 0.7073 | 1 |

Table 5: Correlation Table between HK GDP and RMB

The correlation of two variables is 0.7073 which shows there is a strong relationship for the movement of the value of RMB affecting Hong Kong's GDP. As in the above figure, it almost can be plotted with a straight line showing that two variables are positively related. Therefore, it is predicted that if US continues to push pressure on the appreciation of RMB, the prospects of Hong Kong's economy may be affected positively.

### Correlation Table between HK GDP and China GDP (2004-2010)

| | | | | | | |
|---|---|---|---|---|---|---|
| HK GDP | 1 | | | | | |
| China GDP | 0.7287 | 1 | | | | |

Table 6: Correlation Table between HK GDP and China GDP (2004-2010)

The correlation of the change of HK GDP and China GDP is accounted for 72.87%. This result has once again proved the very close relationship between these two territories. As in the above graph, it can be seen that there is a positive and linear relationship between them. Therefore relationship seems normal. IT is because when

there are increasing amount of rich people in China, those people would consume and make investment in Hong Kong. Also, with the gradual prosperity of China, propensity of foreign investors to doing business would increase and hence benefits Hong Kong.

### Regression output in the relationship of HKGDP and RMB in 2004-2010

SUMMARY OUTPUT

| Regression Statistics | |
|---|---|
| Multiple R | 0.707256337 |
| R Square | 0.500211527 |
| Adjusted R Square | 0.400253832 |
| Standard Error | 3.957878057 |
| Observations | 7 |

ANOVA

| | df | SS | MS | F | Significance F |
|---|---|---|---|---|---|
| Regression | 1 | 78.39029213 | 78.39029213 | 5.004232327 | 0.075497082 |
| Residual | 5 | 78.32399358 | 15.66479872 | | |
| Total | 6 | 156.7142857 | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
|---|---|---|---|---|---|---|---|---|
| Intercept | 0.410597328 | 2.585714438 | 0.158794538 | 0.880045401 | -6.236193238 | 7.057387895 | -6.236193238 | 7.057387895 |
| X Variable 1 | 1.392219727 | 0.622356244 | 2.237014154 | 0.075497082 | -0.207597929 | 2.992037383 | -0.207597929 | 2.992037383 |

Table 7: Regression output in the relationship of HKGDP and RMB in 2004-2010

$$\left. \begin{array}{c} C = 95, so\ \frac{\alpha}{2} = 0.025 \\ \hline n = 7, so\ df = 5 \end{array} \right\} t_5 = 2.571$$

$=1.39222 \pm 0.6236 \times 2.571 = (-0.2076, 2.9920)$

Therefore, it can be concluded that with 95% confidence interval, it can be stated that the slope coefficient is within -0.2076 to 2.9920.

Chi-squared test: Chi-squared test, which also named in chi-square test or $\chi2$ test, is aiming at testing the relationship between two variables of a sample. Through chi-squared test, whether two variables are interrelated can be certain with the use of hypothesis testing. US has been accused of the impact of RMB have deeply and adversely affected the economies of herself as well as the rest of the world. Is that the value of currency that can be able to impact other main economic indicators, such as GDP and current account? Applying chi-squared test in the analysis of impact of value currency, it is viable to test whether currency is influential enough to affect GDP and current account. The analysis would be conducted using data of 184 countries around the world with their recent movement (2009 and 2010) in exchange rate, balance of current account and change of GDP.

Exchange Rate And Current Account
For chi-squared test, the first step is to set hypothesis for independence of two variables. The null hypothesis states that there is no significant relationship between the observed variable. The alternative hypothesis states two variables are mutually dependent.

Setting of Hypothesis

$H_0$: Exchange rate and current account are independent

$H_a$: Exchange rate and current account are dependent

As per observation in the findings, the below table is generated.

| Category | Favourable Current Account (Observed Value) | Unfavourable Current Account (Observed Value) | Total | Favourable Current Account (Expected Value) | Unfavourable Current Account (Expected Value) |
|---|---|---|---|---|---|
| Appreciation based on US$ | 83 | 72 | 155 | 82.5543 | 72.4457 |
| Depreciation based on US$ | 15 | 14 | 29 | 15.4457 | 13.5543 |
| | 98 | 86 | 184 | | |

Table 8: Chi-squared test table– Exchange rate and current account, Appendix

Notes that expected value= $\sum O_i \times \frac{\sum O_{U+F}}{\sum O_{Total}}$

| $X_2$ Test statistic   Squared Deviations from expected divided by expected | | |
|---|---|---|
| | Favourable Current Account | Unfavourable Current Account |
| Appreciation based on US$ | 0.0024 | 0.0027 |
| Depreciation based on US$ | 0.0129 | 0.0147 |

Table 9: Chi-squared value- Exchange rate and Current account

Notes that Chi-square $= \frac{(O-E)^2}{E}$. Therefore, chi-squared value= 0.0327.

Note that Chi-squared value $X_c^2 = \sum \frac{(O_i - E_I)^2}{E_i}$

The degree of freedom (n-1) is 1, based on output in excel, the p-value for the above test is 0.8566.

| Alpha level = α | 0.05 |
|---|---|
| Test statistic = | 0.0327 |
| Critical[2] value = | 3.8415 |
| p-Value = | 0.8566 |
| Decision is | Do not reject $H_0$ |

Table 10 – Result Table- Chi squared test 1

Since p-value is 0.8566, which is not smaller the alpha level α of 0.05, not reject $H_0$ that exchange is independent of the movement of balance in current account.

Exchange Rate and GDP

$H_0$: Exchange rate and GDP are independent

$H_a$: Exchange rate and GDP are dependent

As per observation in the findings, the below table is generated.

| Category | Increase in GDP (Observed Value) | Decrease in GDP (Observed Value) | Total | Increase in GDP (Expected Value) | Decrease in GDP (Expected Value) |
|---|---|---|---|---|---|
| Appreciation based on US$ | 128 | 27 | 155 | 127.2011 | 27.7990 |
| Depreciation based on US$ | 23 | 6 | 29 | 23.7990 | 5.2011 |
| | 151 | 33 | 184 | | |

Table 11: Chi-squared test table– Exchange rate and GDP

Notes that expected value $= \sum O_i \times \frac{\sum O_{U+F}}{\sum O_{Total}}$

| $X_2$ Test statistic    Squared Deviations from expected divided by expected | | |
|---|---|---|
| | Favourable Current Account | Unfavourable Current Account |
| Appreciation based on US$ | 0.0024 | 0.0027 |
| Depreciation based on US$ | 0.0129 | 0.0147 |

Table 12: Chi-squared value- Exchange rate and GDP

Notes that Chi-square $= \frac{(O-E)^2}{E}$. Therefore, chi-squared value= 0.177513713. Note that Chi-squared

value $X_c^2 = \sum \frac{(O_i - E_I)^2}{E_i}$

The degree of freedom (n-1) is, based on output in excel, the p-value for the above test is 0.6736.

| Alpha level = α | 0.05 |
|---|---|
| Test statistic = | 0.1775 |
| Critical $^2$ value = | 3.8415 |
| p-Value = | 0.6736 |
| Decision is | Do not reject $H_0$ |

Table 13: Result Table - Chi-squared test 2

Since p-value is 0.6736, which is not smaller the alpha level α of 0.05, not reject $H_0$ that exchange is independent of the movement the main economic indicator, GDP. Therefore, this test has indicated that currency is not influential enough to affect some main economic indicators by only one factor. There are a lot of factors affecting those main economic indicators but not limited to the exchange rate.


The Value of RMB

As previously stated, the value of RMB has been increased rapidly in the recent years. The use of t-test can help to predict the true population mean for the value of RMB and to predict the future growth of it. Hypothesis testing

The right-tail test would be conducted.

$H_0$: The population mean (μ) of RMB is less than or equal to RMB75: μ≤75

$H_a$: The population mean (μ) of RMB is more than RMB75: μ>75

Critical Value approach

Test result:

| | |
|---|---|
| Alpha level (α) = | 0.05 |
| Tested population mean (μ) = | 75 |
| Sample Mean $\bar{x}$ | 96.918 |
| Standard deviation (s) = | 9.4560 |
| Sample size (n) = | 10 |
| Degree of freedom (n-1) | 9 |
| Test Statistic = | 7.3298 |
| Critical t Value = | 1.8331 |
| p-Value = | 0.00002 |
| Decision is | Reject $H_0$ |

Table 14: Result Table - One sample t test 1

Note that $t = \frac{\bar{X} - \mu}{\frac{s}{\sqrt{n}}} = \frac{96.918 - 75}{\frac{9.456}{\sqrt{10}}} = \mathbf{7.3298}$

From critical value approach: Since calculated t statistic =7.3298 > 1.8331 (from table, DF=9, one tailed test, α=0.05). Therefore, reject $H_0$ from α=0.05. From p-value approach: Since p-value =0.00002 which is less than α=0.05, reject $H_0$. That means that the population mean (μ) of RMB is more than or equal to RMB75. The result has shown that the population mean of RMB is more likely more than RMB75. Therefore, based on the output solely, it is implicated that the value of RMB would not be appreciated to RMB75 to HKD100 in the coming few years.

The Growth of GDP in Hong Kong

Although the uncertainty of global economic is now under way around the world, Hong Kong has experienced positive growth in GNP. The below test is aiming at predicting the population mean of Hong Kong's GDP growth rate, whether it would be positive (<0) or negative (>0).

Hypothesis testing

The right-tail test would be conducted.

$H_0$: The population mean (μ) of growth rate is more than or equal to 0%: μ≤0
$H_a$: The population mean (μ) of growth rate is less than 0%: μ>0

Test result:

| | |
|---|---|
| Alpha level (α) = | 0.05 |
| Tested population mean (μ) = | 0 |
| Sample Mean $\bar{x}$ | 3.11 |
| Standard deviation (s) = | 5.3534 |
| Sample size (n) = | 10 |
| Degree of freedom (n-1) | 9 |
| Test Statistic = | 1.8371 |
| Critical t Value = | 1.8331 |
| p-Value = | 0.0497 |
| Decision is | Reject $H_0$ |

Table 15: Result Table - One sample t test 2

Note that $t = \dfrac{\bar{X}-\mu}{\frac{s}{\sqrt{n}}} = \dfrac{3.11-0}{\frac{5.35339}{\sqrt{10}}} = \mathbf{1.8371}$

From critical value approach, Since calculated t statistic =1.8371> 1.8331 (from table, DF=9, one tailed test, α=0.05)

Therefore, do reject $\boldsymbol{H_0}$ from α=0.05. From p-value approach, since p-value =0.0497 which is less than α=0.05, do reject$\boldsymbol{H_0}$. That means that the population mean (μ) of Hong Kong's GNP s very likely more than or equal to 0%. That is in line with the reality. More than or equal to 0% means that there would not be negative growth of Hong Kong's GNP. The economy of Hong Kong is now getting back on the track. Therefore, this prediction is in line with the reality.

Impact of RMB to Hong Kong Economy

The below test would have an analysis of how the development of RMB business in Hong Kong has strengthened economy in Hong Kong in a mathematical and statistical way. Using paired t test, the test would use the change of GNP of Hong Kong before the commencement of RMB business and after it. Since Hong Kong started RMB business officially since 2004. The effect of pre-RMB era and post-RMB era in Hong Kong can be ascertained using the comparison of growth rate of GNP compared the year of year since handover and the year starting RMB business.

| | $X_1$ | | $X_2$ | $X_D$ |
|---|---|---|---|---|
| Year since handover | Growth rate of GNP | Year starting RMB business | Growth rate of GNP | Difference $(X_1 - X_2)$ |
| 1 | 11.9 | 1 | 4.1 | 7.8 |
| 2 | -3.4 | 2 | 5.2 | -8.6 |
| 3 | -2 | 3 | 8.6 | -10.6 |
| 4 | 2.7 | 4 | 10.5 | -7.8 |
| 5 | 0.1 | 5 | 6 | -5.9 |
| 6 | -3.4 | 6 | -5.4 | 2 |
| 7 | -1.5 | 7 | 6.9 | -8.4 |

Table 16: The difference of GNP for year just after handover and the development of RMB

Hypothesis testing

The Left-tail test would be conducted.

$\boldsymbol{H_0}$: The population mean of difference$(\boldsymbol{\mu_D})$ is more than or equal to 0: $\boldsymbol{\mu_D \geq 0}$

$\boldsymbol{H_a}$: The population mean of difference$(\boldsymbol{\mu_D})$ is less than or equal to 0: $\boldsymbol{\mu_D < 0}$

Test result:

| | |
|---|---|
| Alpha level (α) = | 0.05 |
| Tested population mean of differnce $(\boldsymbol{\mu_D})$ = | 0 |
| $X_D$ Mean of difference= | -4.5000 |
| Standard deviation $(s_D)$ = | 6.7777 |
| Sample size (n) = | 7 |
| Degree of freedom (n-1) | 6 |
| Test Statistic = | -1.7566 |
| Critical t Value = | -1.9432 |

| p-Value = | 0.0647 |
| Decision is | Do not reject $H_0$ |

Table 17: Result Table – Paired t test

Note that $t = \frac{\bar{X}_D - \mu_0}{s_D / \sqrt{n}} = \frac{-4.5 - 0}{6.778 / \sqrt{7}} = -1.7566$

From critical value approach: Since calculated t statistic $=-1.7566 > -1.9432$ (from table, DF=6, one tailed test, α=0.05). Therefore, do not reject $H_0$ from α=0.05.

From p-value approach: Since p-value $=0.0647$ which is less than α=0.05, do not reject $H_0$. That means that the population mean of difference ($\mu_D$) is very likely more than 0. The result has once again shows that the development of RMB business in Hong Kong brings positive growth the Hong Kong economy, even more than the effect of handover to China.

One-way ANOVA test: "One way ANOVA" would be used for below analysis since it can be able for using to analyse more than 2 samples in one test. Very similar to t-test, hypothesis test would be applied. As $H_0$ assumes for all means of groups are identical, while $H_a$ is hypothesised that at least one group of mean is significantly different from other group. In the below test, GDP of main-developed countries (including China and Hong Kong) for the recent 10 years would be adopted to test whether the economic growth of a country is outstanding then the others.

GDP Growth Rate
In the test, there would be a set of data for six groups, each including the GDP changes in recent years for 2001-2010.

| Group | Country |
|-------|---------|
| 1 | China |
| 2 | Germany |
| 3 | Hong Kong |
| 4 | Japan |
| 5 | United Kingdom |
| 6 | United States |

Table 18: Six groups for ANOVA test

The first step is to set hypothesis for the test.

$H_0$: The population means of six groups are equal   $\mu_1 = \mu_2 = \cdots = \mu_6$

$H_a$: At least one mean is significantly different

| Group | Mean | Variance | n | Degree of freedom (n-1) | $(\bar{\bar{x}} - \bar{x})^2$ |
|-------|------|----------|---|-------------------------|-------------------------------|
| 1 | 10.2935 | 3.2845 | 11 | 10 | 525.3120 |
| 2 | 1.1530 | 6.6022 | 11 | 10 | 54.6974 |
| 3 | 4.4425 | 13.1716 | 11 | 10 | 12.3490 |
| 4 | 0.9377 | 7.8159 | 11 | 10 | 65.7729 |
| 5 | 1.663 | 5.7268 | 11 | 10 | 32.5424 |
| 6 | 1.8081 | 4.5705 | 11 | 10 | 27.2837 |

Table 19: Individual statistical information for six groups

The basic information of the data from six groups has been outputted in the above table. These data are useful in determining the final result of the hypothesis.

| Title | Result |
|---|---|
| Sum of Squares Within $(SS_{s/A})$   = | 411.7146 |
| Sum of Squares Between $(SS_A)$ = | 717.9575 |
| Mean= $(\frac{\sum_n^{i=0} Mean \times n)}{\sum n})$ | 3.383 |
| Within variance MS(Error)$(MS_{s/A})$ = | 6.8620 |
| Between variance M $(MS_A)$ = | 143.5915 |
| F Test Statistic $\frac{MS_A}{MS_{s/A}}$= | 20.9259 |
| Critical F-Value = | 2.3683 |
| P-Value = | 4.8376E-12 |
| Decision is | Reject $H_0$ |

Table 20: Result Table - ANOVA test

Critical value approach: For the interpretation of the statistical result, since the F test statistic $\frac{MS_A}{MS_{s/A}}$ 20.9259 of

which is larger than the critical value of F, 2.3683, based on the above mentioned criteria, $H_0$ has to be rejected.

P-value approach: The α is 0.05 which is larger than the p-value of 4.8376E-12, therefore, it proves again that $H_0$ should be rejected.

Both results have shown that $H_0$ should be abandoned and suggest $H_a$ should be adopted. That means at least one group of mean significantly different. However, the result is not clear since it is still unknown which country is different from the other in economic growth. In order to have a deeper understanding in the above issue, the data of group to group would be used for comparison and setting hypothesis testing.

| Critical Value = | 11.84135118 | | | |
|---|---|---|---|---|
| Comparison | F Test Statistic | Critical Value | Results | Decision |
| Group 1 VS Group 2 | 66.9658 | 11.8414 | Larger | Reject $H_0$ |
| Group 1 VS Group 3 | 27.4396 | 11.8414 | Larger | Reject $H_0$ |
| Group 2 VS Group 3 | 8.6729 | 11.8414 | Smaller | Do not reject $H_0$ |
| Group 1 VS Group 4 | 70.1586 | 11.8414 | Larger | Reject $H_0$ |
| Group 2 VS Group 4 | 0.0372 | 11.8414 | Smaller | Do not reject $H_0$ |
| Group 3 VS Group 4 | 9.8457 | 11.8414 | Smaller | Do not reject $H_0$ |
| Group 1 VS Group 5 | 59.7027 | 11.8414 | Larger | Reject $H_0$ |
| Group 2 VS Group 5 | 0.2084 | 11.8414 | Smaller | Do not reject $H_0$ |
| Group 3 VS Group 5 | 6.1925 | 11.8414 | Smaller | Do not reject $H_0$ |
| Group 4 VS Group 5 | 0.4216 | 11.8414 | Smaller | Do not reject $H_0$ |
| Group 1 VS Group 6 | 57.7122 | 11.8414 | Larger | Reject $H_0$ |

| Group 2 VS Group 6 | 0.3439 | 11.8414 | Smaller | Do not reject $H_0$ |
|---|---|---|---|---|
| Group 3 VS Group 6 | 5.5629 | 11.8414 | Smaller | Do not reject $H_0$ |
| Group 4 VS Group 6 | 0.6072 | 11.8414 | Smaller | Do not reject $H_0$ |
| Group 5 VS Group 6 | 0.0169 | 11.8414 | Smaller | Do not reject $H_0$ |

.Table 21: AVOVA- Comparison of statistic in six groups

Notes that Critical value= $Critical\ F\ value \times DF - 1$

The above result is enough to tell what country brings different economic results than other regions. That is group 1, the data set of China. Whenever the comparison of China to other regions, hypothesis testing would show that $H_0$ has to be rejected and suggested $H_a$. Therefore, it shows the mean economic growth indicator of GDP is significantly different from other countries. As a less-developed country, the result of China is very satisfying. Even experiencing the global economic downturn in 2008, the rate of growth in GDP still record in positive figure, 9.22%, but all other countries were experiencing in negative growth. With this trend, it is highly predict that China would replace US to become the largest economy in the world. Also, with the gradual open and rising transparency of its economy, and the help of Hong Kong, China's main currency can be qualified as an international currency in the foreseeable future.

## 5.0. CONCLUSION

The value of RMB is positively related to growth rate of GDP in Hong Kong. Also, with more and more foreign investors eager to take investment in China, Hong Kong can serve the role of springboard for those investors before entering their business in China. Most often, those foreign institutions would set up office in Hong Kong in advance to get deep understanding in Chinese market. Therefore, the rapid development of China and RMB has given a helping hand to Hong Kong's development. However, everything thing has two sides. Hence, Hong Kong, as a prestigious city in the world, possesses many advantages over the other cities. Such as, it has many professionals here, with a simple tax system and low tax rate strategy, comprehensive communication, genuine information freedom, advanced I.T. network, without government intervention, reputable legal basis and well-structured infrastructure. With these built advantages, Hong Kong is surely the city to be the top priority of being offshore RMB center for China. With this golden opportunity, Hong Kong must hold it tightly. It can be able to assist the rapid development of services in RMB when it goes internationalized gradually. Hong Kong would be absolutely very efficient for this duty. Although Shenzhen and Shanghai are highly competitive with Hong Kong, it is about 40% of foreign direct investments (FDI) and foreign trade to involve market share in China as handling by Hong Kong. Once RMB is freely convertible in global market, Hong Kong would face serious competition from rival hubs. It is because Hong Kong suffers high factor costs, such as business services, financial services and business trade. This factor costs are including land costs and wages costs. The similar case is lost their comparative advantage for manufacturing as London and New York. Of course, their reputation position are remain unchanged against their business changed to business services, finance service and business trade.

If RMB is freely convertible, Hong Kong obtains its outcome to decrease currency risk. Some countries use RMB currency swaps against trade in late 2008. People use RMB against trade and increase demand percentage of RMB in outside China. Some RMB bonds is issuing in Hong Kong. Hong Kong is ready to match China's instruction. China needs to prepare its international reserve currency before developing to international financial center. The influence of China in worldwide is much higher than previous year, such as State Administration of Foreign Exchange considers opening domestic foreign exchange accounts for Chinese Bank. For part of Hong Kong, it is eager to be development of offshore center. As a prestigious international financial hub, offshore RMB center will help Hong Kong further uphold this good reputation. United States still faces the financial crises at present, hold RMB currency more than before in the financial markets and raise up RMB free convertibility rapidly. PRC economy has been reshaping the world economy recently. As mentioned, PRC may handle its currency to be fully convertibility in the worldwide in future. In one day, investors make a deal with stock, consumer stock, golden stock and future stock as similar at London and New York financial center. Hong Kong has well network in worldwide. Korea may be behind position between Hong Kong and Guangzhou. New form of competition is not only country vs country and it may be city vs city. If Hong Kong links up with Guangzhou, it is quite strong and has more power to build up another "New Manhattan" city. Also, it may improve economy in Hong Kong.

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