HOW CHINA TO U.S. FOREIGN EXCHANGE RATE RELATES TO U.S. INTEREST RATE AND BANK LOANS

Van Hoa Nguyen, Chung Yuan Christian University, Taiwan

ABSTRACT

This research investigates the interactions of U.S. interest rate, the different types of bank loans at all U.S. commercial banks, production activities and the foreign exchange rate between U.S. and China. This paper uses monthly data from 1981 to 2012 to show that some U.S. bank-loan-related macro-economic indicators are related to exchange rates between U.S. and China. The results demonstrate that U.S. short-term federal funds rate, U.S. manufacturing capacity utilization, and three types of banks loans at all U.S. commercial banks could be good predictors and determinants of the overall exchange rate between these two important international currencies.

JEL: F31, F33

KEYWORDS: Foreign Exchange, Interest Rate, Loans, U.S., China.

INTRODUCTION

The continued strength and vitality of the US economy continues to attract economics forecasters. According to the International Monetary Fund, the U.S. GDP of $15.1 trillion constitutes 22% of the gross world product at market exchange rates and over 19% of the gross world product at purchasing power parity (PPP). Though larger than any other nation's, its national GDP is about 5% smaller than the GDP of the European Union at PPP in 2008. The country ranks ninth in the world in nominal GDP per capita and sixth in GDP per capita at PPP. The U.S. dollar is the world's primary reserve currency. The United States is the largest importer of goods and third largest exporter, though exports per capita are relatively low. In 2010, the total U.S. trade deficit was $635 billion. Canada, China, Mexico, Japan, and Germany are its top trading partners. In 2010, oil was the largest import commodity, while transportation equipment was the country's largest export. China is the largest foreign holder of U.S. public debt.

China has experienced a remarkable period of rapid growth spanning three decades, shifting from a centrally planned to a market based economy with reforms begun in 1978. During this time, it grew at an average rate of about 9.7% per year, with exceptionally strong growth in the period of 2003-2007 averaging about 11% per year. Growth remained strong during the recent global financial crisis, reflecting massive stimulus and strong underlying growth drivers. China became the world's second largest economy in 2010. Increasingly, it is playing an important and influential role in the global economy.

Research about the relation of US interest rates, and other factors with the foreign exchange rates between US and China plays an important role. However, it is difficult to predict the exchange rate movements since there are many short-term and long-term factors and disconnections between the leading macro-economic indicators and the nominal exchange rates (Hellerstein, 2008). This study investigates the interactions of some U.S. indicators in the banking system as a whole, such as interest rates and outstanding bank loans to determine the exchange rate between the U.S. dollar and China Yuan. These two countries are top economic entities in the world and their currencies are most traded in the foreign exchange (Forex) market (Wikipedia, 2012). U.S. and China also are important mutual trading partners with significant imports and exports in goods and services.

The remainder of the article is organized as follows. The next section reviews the literature development of U.S interest rates, the categories of outstanding banks loans at all U.S. commercial banks and the

foreign exchange rate of U.S. and China. It also points out the direction & focused issues of the current research which will contribute to the existing body of literature. Section 3 describes the methodology, data collection procedures and the formation of five hypothesis & final sample. Section 4 discusses the empirical results. Section 5 presents the summary and conclusions focusing on the implications and ideas for further research.

LITERATURE REVIEW

In foreign exchange markets, interest rates are an important factor for the exchange rate. The study on the relationship between interest rates and exchange rates is voluminous. On the theoretical side, it is widely believed that there is a positive correlation between interest rates and exchange rates. Most economics textbooks use demand and supply theory to demonstrate this relationship (Case, Fair and Oster, 2009; Hubbard and O'Brien, 2008). A high interest rate in the U.S. creates demand for dollars from foreign countries. A larger demand for dollars from China will appreciate U.S. dollars and depreciate the Chinese Yuan. A low interest rate in the U.S. relative to China shrinks demand for dollars as investors move toward the Chinese market. A lower demand for dollars depreciates dollars and appreciates Chinese Yuan. Finance textbooks use the interest rate parity (IRP) theory to determine the relationship between interest rate differentials and foreign exchange rate volatility (Crum, Brigham, and Houston, 2005; Ross, Westerfield, and Jordan, 2010). Very loosely, IRP says the forward exchange rate movements counteract nominal interest differentials to equalize expected nominal rates between two countries.

On the empirical side there are some contradictions to the theory. The hypothesis that ex post changes in exchange rates should be positively related to interest differentials with a coefficient of unity (called the unbiasedness hypothesis) has been strongly rejected by most economists. The survey of 75 papers on this subject by Froot and Thaler (1990) finds the average estimate of the coefficient is -0.88. Papers by Mayfield and Murphy (1992), and McCallum (1994) have similar findings.

Recently, several scholars argue there is weak evidence for IRP in the data. Alexius (2001) finds a substantial evidence in favor of the unbiasedness hypothesis by examining 14 long-term bond rates for the 1957-1997 period. Chinn and Meredith (2004 and 2005) test the IPR by using different terms of maturities for G-7 countries. Their results suggest IRP strongly holds with longer-term (5-year and 10-year) bond interest rate data. The unbiasedness coefficient value is positive and much closer to one. The common standpoint on the past papers, no matter the rejection or support of the unbiasedness hypothesis, is the use of short or long-term risk-free government security interest rates as a benchmark.

Unlike the existing studies, this paper adopts a different financial instrument, namely the federal funds rate. The federal funds rate has a direct effect on all other interest rates and it is a current monetary policy tool used by the Federal Open Market Committee (FOMC) to influence the U.S. money supply (Madura, 2006). The U.S. federal funds rate is also the major indicator of liquidity conditions in U.S. banking system as a whole. A high federal funds rate implies a more expensive financing cost and a tough liquidity situation for the banking pipeline in general (Gardner, Mills, and Cooperman, 2005).

Consumer spending, business and aggregate economic activities have long depended heavily on bank loans. Wen (2009) conducts a time-series study to demonstrate that two bank-loan-quality-related ratios may be good predictors and determinants of the overall financial performance measured by return on assets (ROA) in small U.S. banks. On the other side, aggregated U.S. bank loans could also be good indicators of the overall financial health and money supply condition in U.S banking system. The commercial banks, as the key component of U.S. depository institutions, play a significant role in financial intermediation, especially in the implementation of monetary policies (Rose and Marquis, 2008). Furthermore, with the rising of economic globalization and openness of capital markets, banking

activities shall relate to the movement of exchange rates. Hellerstein (2008) suggests that business firms and consumers may have an effect on foreign exchange rate fluctuation.

This paper also focuses on three outstanding bank loan measurements to show U.S. domestic money supply in the banking system as a whole. According to the Federal Deposit Insurance Corporation (FDIC) data, business loans, also called commercial and industrial loans (C&I loan), is the No. 2 holding in all loan portfolios for U.S. commercial banks, second only to real estate loans. Consumer loans are in third place, which is the money directly lent to the individual borrowers (Saunders and Cornett, 2008). I examine whether these three largest loan portfolios at U.S commercial banks have a direct or indirect impact on the foreign exchange rate between U.S. dollars and Chinese Yuan. We expect C&I loans and consumer loans to negatively relate to the change of exchange rates, but real estate loans to positively relate to the exchange rate. With expanding consumer and business expenditures, the demand for Chinese products by American consumers and the activities in Chinese markets by U.S. businesses will increase, which will inevitably increase the demand for Chinese Yuan and depreciate the U.S. dollar. Increasing real estate loans suggest a prosperous real estate market.

The last factor we want to investigate is U.S. manufacturing capacity utilization. Capacity utilization is a ratio of the actual output and the potential output which could be produced with currently installed equipment. It is a good indicator for economic expansion and contraction. Implicitly the capacity utilization is also an indicator of how efficiently the factors of production are being used (Wikipedia, 2012) and a nation's productivity. Due to its economic impact on the global market, U.S. manufacturing capacity utilization will impact foreign exchange rates. However, the study on the correlation of manufacturing capacity utilization and the exchange rate has not received much attention. Most researchers focus on the link between productivity and the exchange rates. The earliest papers on this subject are Balassa (1964) and Canzoneri, Cumby and Diba (1999). All of these pioneer studies confirm a positive relationship between productivity and exchange rates.

Although Balassa-Samuelson's hypothesis is universally accepted as the predictor of exchange rates, Ito, Isard and Symansky (1996) find skeptical evidence on this hypothesis with an examination of the Asia Pacific Economic Cooperation Council (APEC) countries and economies. They find Australia, Canada, New Zealand, Philippines, Indonesia, Thailand, and Malaysia's growth patterns refute the Balassa-Samuelson's hypothesis. A recent paper by Lee and Tang (2007) provides more insights on the time-honored link between productivity and exchange rates. Contrary to the traditional approach of using only one productivity measure, they evaluate both labor productivity and total factor productivity. They find that labor productivity tends to appreciate the exchange rate which is consistent with the traditional view, but total factor productivity depreciates the exchange rate. To examine the exchange rate between the U.S. dollar and Chinese Yuan, I view the total factor productivity, rather than the labor productivity, is more appropriate since trade between the U.S. and China is primarily on capital-intensive goods. Our study is to fill a gap in the literature. Instead of using the productivity rate, we examine the correlation between manufacturing capacity utilization and the exchange rates. As stated earlier, capacity utilization is a good indicator of the overall U.S. economic health conditions.

DATA AND METHODOLOGY

In this research, data is collected from FRED (Federal Reserve Economic Data) electronic database at Federal Reserve Bank of St. Louis. The sample time is from January 1, 1981 to April 1, 2012. The total sample size is 376. The paper tests the following null hypothesis.

H_0: The factor X_i is not related to the foreign exchange rate between U.S. dollar and Chinese Yuan. In which, X_1 = federal funds rate; X_2 = business loans; X_3 = consumer loans; X_4 = real estate loans; X_5 = U.S. manufacturing capacity utilization.

The alternative hypotheses are: Based on the theoretical background discussed above, we propose the following alternative hypotheses:

H_1: U.S. federal funds rate is related to the foreign exchange rate between U.S. dollar and Chinese Yuan.
H_2: The commercial and industrial loans at all U.S. commercial banks are significantly related to the foreign exchange rate between U.S. dollar and Chinese Yuan.
H_3: The consumer (individual) loan at all U.S. commercial banks is significantly related to the foreign exchange rate between U.S. dollar and Chinese Yuan.
H_4: The real estate loan at all U.S. commercial banks is significantly related to the foreign exchange rate between U.S. dollar and Chinese Yuan.
H_5: U.S. manufacturing capacity utilization is negatively related to the foreign exchange rate between U.S. dollar and Chinese Yuan.

Multiple linear regression (MLS) method is applied to test the above five hypotheses. The definitions of variables in this study are consistent with the standards described by FRED (Federal Reserve Economic Data). The dependent variable is the unit of Chinese Yuan in exchange for one U.S. dollar on a monthly basis (EXCHUS) (Y), which is the most common European term quotation in foreign exchange trading (Crum, Brigham, and Houston, 2005).

The five independent variables are followed. The effective federal funds rate (FEDFUNDS) (X_1) is a daily average value on a monthly basis reported by the Federal Reserve System board of governors. The proxy for business loans (BUSLOANS) (X_2) equals the natural log of billions of dollars for commercial and industrial loans at all U.S. commercial banks. The measure of consumer loans (CONSUMER) (X_3) is represented by the natural log of billions of dollars for consumer (individual) loans at all U.S. commercial banks. The indicator of real estate loans (REALLN) (X_4) equals the natural log of billions of dollars for real estate loans at all U.S. commercial banks. The variable for monthly U.S. manufacturing capacity utilization (MCUMFN) (X_5) is expressed as a monthly number in percentage format.

Regression Model:

$$Y = \beta_0 + \beta_1 * X_1 + \beta_2 * X_2 + \beta_3 * X_3 + \beta_4 * X_4 + \beta_5 * X_5 + \mu \quad (1)$$

Estimated multiple regression equation:

$$\hat{Y} = b_0 + b_1 * X_1 + b_2 * X_2 + b_3 * X_3 + b_4 * X_4 + b_5 * X_5 \quad (2)$$

$\hat{Y}$ = the unit of Chinese Yuan in exchange for one U.S. dollar on a monthly basis
b_0 = constant (y-intercept); $b_{1\text{-}5}$ = slope coefficient; μ = error term.
X_1 = the effective federal funds rate to measure the general interest rate environment on a monthly basis
X_2 = the natural log of commercial and industrial loans (in billions of dollars) at all U.S. commercial banks on a monthly basis
X_3 = the natural log of consumer/individual loans (in billions of dollars) at all U.S. commercial banks on a monthly basis
X_4 = the natural log of real estate loans (in billions of dollars) at all U.S. commercial banks on a monthly basis
X_5 = the monthly U.S. manufacturing capacity utilization based on the North American Industry Classification System (NAICS), given in percent format.

EMPIRICAL RESULTS

Table 1 presents the descriptive statistics of six variables. The average value of exchange rate between Chinese Yuan and U.S. dollar is CNY6.112/$. The maximum of exchange rates was reported at CNY8.725/$ in April 1994. The minimum of exchange rates was quoted at CNY1.551/$ in January 1981. The average value of effective federal funds rate (FEDFUNDS) is 5.35%. The highest federal funds rate was 19.1% in June 1981. The lowest federal funds rate was 0.15% in July, October, and December 2011. National Bureau of Economic Research (NBER) reports that U.S. economy enters a recession in December 2007 (Crutsinger, 2008). The decline of the federal funds in recent 2 years rate shows that U.S. economy began to slow down very quickly since the second half of 2007. The Federal Reserve changed its monetary policy accordingly under the impact of the sub-prime lending meltdown and banking crisis. The average value of business loans (BUSLOANS) is $ 822.1 billion. The maximum value of business loans was $1607.8 billion in October 2008. The minimum value of business loans was $ 577.3 billion in January 1981.

The average value of consumer/individual loans (CONSUMER) is $513.5 billion. The maximum value of consumer/individual loans was $1163 billion in April 2010. The minimum value of consumer/individual loans was $ 178.8 billion in January 1981. The average value of real estate loan (REALLN) is $1570.1 billion. The maximum value of real estate loan was $3878.9 billion in May 2009. The minimum value of real estate loan was $ 263.8 billion in January 1981. The average value of monthly U.S. manufacturing capacity utilization (MCUMFN) is 79.4%. The maximum of monthly U.S. manufacturing capacity utilization was reported at 85.2% in January 1989. The minimum of monthly U.S. manufacturing capacity utilization was quoted at 67.3% in June 2009.

Table 1: Descriptive Statistics of Six Variables

	EXCHUS (Y)	FEDFUNDS (X_1)	BUSLOANS(X_2)	CONSUMER(X_3)	REALLN(X_4)	MCUMFN (%)(X_5)
AVERAGE	6.112	5.35	822.1	513.5	1,570.1	79.4
MAX	8.725	19.10	1,607.8	1,163.0	3,878.9	85.2
MIN	1.552	0.07	312.4	178.8	263.8	66.8
MEAN	6.112	5.349	822.14	513.5	1.57	79.44
STD. DEVIATION	2.343	3.715	323.54	242.82	1,164.5	3.837

This table illustrates the summary statistics of six variables. The data is collected from FRED (Federal Reserve Economic Data) at Federal Reserve Bank of St. Louis. The sample time is from January 1, 1981 to April 1, 212. The total sample size is 376. The definitions of variables in this study are consistent with the standards described by FRED. The dependent variable is the unit of Chinese Yuan in exchange for one U.S. dollar on a monthly basis (EXCHUS (Y)). The effective federal funds rate (FEDFUNDS (X_1)) is a daily average value on a monthly basis reported by board of governors of the Federal Reserve System. The business loans (BUSLOANS (X_2)) is the commercial and industrial loans at all U.S. commercial banks, which are reported in billions of dollars. The measure of consumer loan (CONSUMER (X_3)) is represented by the consumer (individual) loans at all U.S. commercial banks, which are reported in billions of dollars. The numbers of real estate loan (REALLN (X_4)) equal to the real estate loans at all U.S. commercial banks, which are reported in billions of dollars. The variable of monthly U.S. manufacturing capacity utilization (MCUMFN (X_5)) is expressed as a monthly number in percentage format.

The empirical results of the regression model are showed in Tables 2 and 3. The regression is estimated with the unit of Chinese Yuan in exchange for one U.S. dollar as the dependent variables. There are five significant independent variables, all of which are significantly related to the dependent variable.
Using t-Test to test five hypotheses, and identify individual significance with rejection rule as follow: Reject H_0 if p-value $\leq \alpha$. At $\alpha = 0.01$, the results as follow:

For the effective federal fund rate (hypothesis H_1), p-value = 0.00 < α, we reject H_0, and the regression coefficient of the effective federal fund rate used to measure the short-term interest rate benchmark (FEDFUNDS) is negative (regression coefficient = -0.377). This result indicates that the effective federal

funds rate in U.S. is negatively related & significant to the foreign exchange rate between U.S. dollar and Chinese Yuan. H_1 forecasts a negative relationship between these two variables. Thus, H_1 is supported.

For the proxy of business loans (BUSLOANS) (hypothesis H_2), p-value = 0.00 < α, we reject H_0, and the regression coefficient of the proxy of business loans is positive (regression coefficient =0.005). This result indicates the effective federal funds rate in U.S. is positively related & significant with the foreign exchange rate between the U.S. dollar and Chinese Yuan. H_2 forecasts a positive relationship between these two variables. Thus, H_2 is supported.

For consumer loans (CONSUMER) (hypothesis H_3), p-value = 0.024 > α, we can't reject H_0, so there is no significant relation between consumer loans and the foreign exchange rate between the U.S. dollar and Chinese Yuan. H_3 is not supported. The fourth independent variable is the indicator of real estate loans (REALLN) (hypothesis H_4). With a p-value = 0.089> α, we can't reject H_0, so there is no significant relation between X_4 and the foreign exchange rates between the U.S. dollar and Chinese Yuan. H_4 is not supported.

The fifth independent variable is the monthly U.S. manufacturing capacity utilization (MCUMFN) (hypothesis H_5). With a p-value = 0.00 < α, we reject H_0, and the regression coefficient = 0.238. This result indicates that monthly U.S. manufacturing capacity utilization is positively related & significant to the foreign exchange rate between U.S. dollar and Chinese Yuan. H_5 is supported. From the above analysis, we have the regression equation as follows:

$$\hat{Y} = -13.362 - 0.377 * X_1 + 0.005 * X_2 + 0.238 * X_5 \quad (3)$$

At α = 0.05, with the same principle and analyses, we have the final regression equation as follows:

$$\hat{Y} = -13.362 - 0.377 * X_1 + 0.005 * X_2 - 0.02 * X_3 + 0.238 * X_5 \quad (4)$$

Table 2: Model Summary

Model	R	R2	Adjusted R2	Std. Error of the Estimate	
1	0.838	0.703	0.699	1.286	
Analysis of Variances					
Source	DF	SS	MS	F	P
Regression	5	1445.8	289.16	174.75	0.00
Residual Error	370	612.22	1.655		
Total	375	2058.02			

This table presents Model summary with predictors including Constant, MCUMFN, FEDFUNDS, BUSLOANS, CONSUMER, and REALLN.

Table 3: Regression Statistics

VARIABLE	COEFFICIENT	T- VALUE
CONSTANT	-13.362	-8.395***
FEDFUNDS (X1)	-0.377	-12.793***
BUSLOANS (X2)	0.005	7.915***
CONSUMER (X3)	-0.002	-2.267**
REALLN (X4)	0.000	-1.061*
MCUMFN(X_5)	0.238	11.744***

*This table illustrates the regression statistics of exchange rate of Chinese Yuan per U.S. dollar (dependent variable EXCHUS (Y)) and five independent variables including FEDFUNDS (X_1), BUSLOANS (X_2), CONSUMER (X_3), REALLN (X_4), and MCUMFN (X_5). A multiple linear regression (MLS) method is applied to test the above five hypotheses. The numbers in the second column are regression coefficients and the numbers in the third column are t-statistics. ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively.*

CONCLUSION

U.S. and China play important and influential roles in the global economy. Research about the relation of US interest rate and other factors with the foreign exchange rate between US and China is important. This paper shows that some U.S. macro-economic indicators, including U.S. federal funds rate, U.S. manufacturing capacity utilization, three largest loan portfolios at all U.S. commercial banks, could be good predictors and determinants of the foreign exchange rate between the U.S. dollars and Chinese Yuan. The data is collected from FRED (Federal Reserve Economic Data) at Federal Reserve Bank of St. Louis. The sample period is from January 1, 1981 to April 1, 212 with a total sample size of 376. The definitions of variables in this study are consistent with the standards described by FRED. The multiple linear regression (MLS) method is applied to test the specified hypotheses. However, it is difficult to predict accurately the exchange rate movements since there are many short and long-term factors and disconnections between the leading macro-economic indicators and nominal exchange rates. Further research is needed to explore these relationships.

REFERENCES

A. Williams, David R. Anderson, Dennis, "Statistics for business and economics 9e", Thomson, Southwestern, 2008.

Alexius, A., "Uncovered Interest Parity Revisited," *Review of International Economics*, 9(3), 2001, 505-517.

Balassa, B., "The Purchasing Power Parity Doctrine: A reappraisal," *Journal of Political Economy*, No. 72, December, 1964, 584–96.

Canzoneri, M. B., Cumby, R., and Diba, B., "Relative Labor Productivity and The Real Exchange Rate in the Long Run: Evidence for a Panel of OECD Countries," *Journal of International Economics*, No. 47, 1999, 245–266.

Case, K., Fair, R. and Oster, S., Principles of Macroeconomics, 9th edition, Prentice Hall, 2009.
Chinn, M.D., Meredith, G., "Monetary Policy and Long Horizon Uncovered Interest Parity," IMF Staff Papers, 51 (3), 2004, 409-430.

Chinn, M.D., Meredith, G., "Testing Uncovered Interest Parity at Short and Long Horizons during the Post-Bretton Woods Era," *NBER Working Paper*, 2005, No. 11077.

Crum, R., Brigham, E., and Houston, J., Fundamentals of International Finance, 1st Edition, Thomson Southwestern, 2005.

Froot, K.A. and Thaler, R. H.,"Foreign Exchange," *Journal of Economic Perspectives*, Vol. 4, No. 3, Summer, 1990, 179-192.

Hellerstein, R., "Who Bears the Cost of a Change in Exchange Rate? Pass-Through Accounting for the Case of Beer", *Journal of International Economics*, Vol. 76 Issue 1, 2008, 14-32.

Hubbard, R. and O'Brien, A., Principles of Macroeconomics, 2nd edition, Prentice Hall, 2008.

Gardner, M., Mills, D. and Cooperman, E., Managing Financial Institutions, 5th Edition. McGraw-Hill Higher Education, 2005.

Ito, T., Isard, P., and Symansky, S., "Economic Growth and Real Exchange Rate: An Overview of the Balassa-Samuelson Hypothesis in Asia" In: Changes in Exchange Rates in Rapidly Developing Countries: Theory, Practice, and Policy Issues (T. Ito and A.O. Krueger, Eds.) Chicago: Univ. of Chicago Press, 1999, 109-128.

Lee J., Tang M. K., "Does Productivity Growth Appreciate the Real Exchange Rate?" *Review of International Economics*, Vol. 15, 2007, 164-187.

Madura, J., Financial Markets and Institutions. 7th Edition. Thomson South - Western Higher Education, 2006.

Mayfield, E. and Murphy, R., "Interest Rate Parity and the Exchange Risk Premium: Evidence from Panel Data," *Economics Letters*, 40, 1992, 319-324.

McCallum, B.T., "A Reconsideration of the Uncovered Interest Parity Relationship," *Journal of Monetary Economics*, 33, 1994, 105-132.

Rose, P. and Marquis, M., Money and Capital Market, 10th Edition. McGraw-Hill / Irwin, 2008.

Ross, S., Westerfield, R., and Jordan, B., Essentials of Corporate Finance, 7th Edition, McGraw-Hill/ Irwin, 2010.

Saunders, A., and Cornett, M., Financial Institutions Management: A Risk Management Approach, 6th Edition, and McGraw-Hill/Irwin Publishing, New York, 2008.

Wen, L., "The Loan Loss Reserve, Commercial Lending and the Prediction of Return on Assets in Small U.S. Banks from 1988-2008", *Journal of International Finance and Economics*, Vol. 9 No. 2, 2009, 101-106.

Wikipedia, 2012, http://en.wikipedia.org/wiki/Foreign_exchange_market

Wikipedia, 2012, http://en.wikipedia.org/wiki/Economy_of_the_United_States

World Bank, http://www.worldbank.org/en/country/china/overview

BIOGRAPHY

Nguyen Van Hoa is a Ph.D. student at College of Business, Chung Yuan Christian University, Taiwan. He can be contacted at College of Business, Chung Yuan Christian University, 200 Chung Pei Rd, Chung Li City, Tao Yuan 320, Taiwan (R.O.C). Email : nguyenvanhoa_hubm@yahoo.com