Regulation of Exchange Rate and Economic Growth and Its Effect on Chinese Economy

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Abstract:

Recently, China has become the world's second largest economy behind only the United States of America. Until 1994, China used the fixed exchange rate and dual pricing system. A sharp fall in global oil prices aggravates the global downturn. Our key data were gotten from Macrotrends expertise in economic development and exchange rates. GDP Growth rate was more fluctuating pattern (variance 0.014, standard deviation 0.122) than exchange rate (Variance 0.004, standard deviation 0.07). From 1990-2019 both variables were analyzed. That means these do not vary systematically over time. In other words, they are time invariant. Regressing two series that are non-stationary likewise, yields a spurious (or nonsense) regression. So, to check it lets check the rule of thumb. We found a Durbin Watson Statistic of 0.612 and R square of 0.117. If we look the calculated t statistic with critical values at 5% significance level only Domestic Demand shows a significant relationship (4.00 >2.756) with GDP of China. A variety of analytical studies suggest that Competitive Exchange Rate strategies are suitable for economic development. We also argued that, considering some constraints on usable policy alternatives, there are theoretical origins in a policy approach such as an ideal strategy.

Keywords: economic growth; exchange rates; policy; Chinese economy; regression; China.

JEL Classification: E60; F31; F41; O40.

Introduction

China is now the second largest economy in the world. China used the method of set exchange rates and dual pricing until 1994 when she modified the floating rate. The Chinese currency has since stacked to the US dollar. RMB stayed unchanged but valued until 1997 (Ping 2012). In 1998, the Chinese government reduced the period of RMB's floating in support of the economy owing to the Asian financial crisis (Liu and Li 2006). China has faced external pressure for a quick reappraisal of the renminbi since the early 2000s (Liu *et al.*2001). However, regardless of the growing civil instability, the Chinese Government has not given in to this constant demand (Kraay 2006). Premier Wen recently claimed that forcing Beijing to revalue its currency would contribute to a catastrophe for the nation, as so many manufacturing enterprises would have to shut down and, refugees would have to return to their villages. Indeed, a period of civil and economic unrest for China could portend serious economic implications for the rest of the world (MacDonald and Flavio 2010).

Following the Asian financial crisis, China's economy entered a steadily developing age. The current account and the budget were both a surplus until 2005, resulting in unbalanced foreign transfers (Rodrik 2008). China's foreign exchange surplus at the end of 2005 was US$ 11 billion (Roodman 2009a). On 22 July 2005, the People's Bank of China (Central Bank of China) declared that China would no longer hold to the US dollar but moved to a regulated floating exchange rate mechanism focused on the availability and need of the markets in relation to a currency basket. The exchange rate between RMB and USD was roughly 8.2765 prior to the introduction of the RMB exchange rate. RMB is now on a road to recognition (Roodman 2009b). The exchange rate between RMB and USD hit 6.0408 at the end of 2013. But it began to depreciate again, particularly after the last half of 2015. After 2012, China's economic development has accelerated relative to previous years (Hua2005). GDP growth was nearly 7%, and the abrupt increase in the exchange rate has been of great interest (Hua 2007). At the end of 2015, the IMF reported the incorporation of RMB in the SDR (Kenneth and Jonathan 2016).

The Federal Free Market Committee published a statement evaluating the present condition of the US economy, stating: "The emerging public-health problem would in the short term be heavier on economic growth, unemployment and prices; and could raise major medium-term economic risks" (CRS 2020).

Chinese officials say that their monetary policy is not structured to favor exports over imports, but instead to encourage economic stability through means of monetary stabilization (Wang *et al*. 2019). The strategy represents the government's aim of utilizing exports to provide Chinese employees with employment and encourage FDI to obtain exposure to technology and know-how. On a variety of occasions, the Chinese government has claimed that monetary reform is a long-term aim to be pursued slowly (Law *et al*. 2018). Officials have firmly opposed external coercion to force China to support the currency and contend that it interferes with the "sovereignty" of China in enforcing its own domestic economic policy. In 2009, the Chinese Prime Minister Wen Jiabao was told in Chinese media that, although pursuing multiple trade protectionist policies against China, "few countries want an appreciation of the yuan. This is unjust and in turn restricts the growth of China" (Ehigiamusoe *et al*. 2018).

Given the multiple concessions reached by the Chinese government on currency reform, it has advanced with some caution (Abdel-Moneim 2015). Chinese officials find economic development to be crucial to maintaining political stability and thus seem very hesitant to follow policies which could disrupt the economy and contribute to large-scale unemployment which could contribute to work unrest. In addition, some analysts reject Chinese officials' arguments that the monetary policy of China threatens the global economy or deep understanding of that (Rod *et al*. 2006). Chinese real exchange rate patterns are increasingly significant for China's macroeconomic strategy and the world capital market. Recent inflows of financial capital, together with international political pressure to revalue the Renminbi (RMB), imply an expected appreciation (Law *et al*. 2018). Where it is expected that domestic price stability will be given future priority to the People's Bank of China, a real appreciation underlying prediction is implied (Rod *et al*. 2006).

Since the latest coronavirus (COVID-19) outbreak in Wuhan, China, on 31st of December, 2019, the World Health Organization (WHO) reported that the spread of the virus is the nightmare of every nation. Data from the European Center for Disease Prevention and Control (2020) reported that the epidemic spread to over 200 countries and territories with about 800,000 infections and about 40 thousand deaths worldwide as of 31st of August, 2020 (Francis 2020). The exchange rate (ER) was linked to economic growth (GDP) in earlier research (Law and Singh 2014, CRS 2020). Researchers claim that underestimated currencies contribute to GDP growth, but overestimated currencies are having an adverse effect on growth. Since trading partners believe that Chinese underestimated currency improves efficiency, pressure on ER appreciation is rising. In response to these stresses, the Chinese authorities must change the monetary policy accordingly, despite continued appreciation by the RMB victims (Bloomberg 2020).

In the last two decades, the Chinese currency has undergone two big changes. The Chinese authorities expanded the monetary system in 1994. This resulted in the abolition of the single currency strategy and the introduction, in 2005, of the floating exchange rate mechanism regulated (Posen 2020). China has enormous foreign reserves to keep its currency stable. It has grown exponentially since 2005 and reached $3,311 billion by the end of 2012. The average annual growth rate was 9 percent, but the political turmoil in 1989 led to a rapid decrease. It has been relatively stable since the beginning of the market economy in 1992. In comparison, the CPI curve has more uncertainties. The sudden increase and decrease is due to the business sector change around 1994. By contrast, global trade has seen surprising changes in China (Jorda *et al*. 2020).

1. Literature Review

The position or uncertainty of the real exchange rate in the nexus of finance development was not thoroughly examined (Arcand *et al*. 2015, Law and Singh 2014). True exchange rates have the potential to affect economic development. In the first place, the key role played by economic diversification in the long-term growth of emerging and developing countries has been well emphasized (Rodrik 2007, Stiglitz and Greenwald 2014). Scaling up operations with higher technical quality is the secret to rapid development in this regard (Chama *et al*. 2017). Such new activities are found in natural resources but mostly related to higher technology production and the development of modern services (Jakob 2016). The perspectives of East Asia, first of the newly developed countries and most recently of China, are illustrated as success stories of this diversification (Rodrik 2013). Although prices have stabilized somewhat from the low of almost 20 US dollars per barrel in April, they still linger about 40 to 45 USD per barrel, indicating the downturn in global economic operation as well as leading to a global economy's decline through numerous networks. On 29th of April, 2020, President of the US Federal Reserve, Jerome Powell, said the Federal Reserve will use its 'broad spectrum of resources' to stimulate economic development, despite US economic growth dropping at a year toyear pace of 33.0% in the second quarter of 2020 (CRS 2020).

Several studies recorded a positive effect on the economic development of real currency (Razmi *et al.* 2012, Rodrik 2008 and Tarawalie 2010), while other studies documented unfavorable relationships (Bleaney and Greenaway 2001, Conrad and Jagessar 2018, Elbadawi *et al.* 2012) or negligible relationships (Tang 2015). Furthermore, Aghion *et al.* (2009) have demonstrated that real currency volatility has an influence on productivity development, while Vieira *et al.* (2013) have shown that high real currency volatility has a negative effect on economic development, whereas it does have a positive effect when volatility is low. Communale (2017), however, noted that variability in the exchange rate has no robust impact on GDP production. In addition to its direct impact on economic growth, studies have shown a complex connection between actual exchange rates and financial progress. Lin and Ye (2011) indicated that financial progress had a considerable influence on currency choices, while Katusiime (2018) stated that the exchange rate had a major impact on private lending growth (Kizito and Hooi 2019).

The link between exchange rate and GDP was one of the controversial issues. Researchers earlier focus on two aspects: firstly, the causal correlation between the two variables: whether the movement of the exchange rate affects efficiency or output affects the currency. Secondly, the direction of both variables: the exchange rate appreciation or the devaluation associated with the increase in demand. Abdel-Moneim (2015) indicates that the theory of arbitration with GDP is affected by the exchange rate. However, some believe that the exchange rate is still economically affected. For example, Cline (1989) suggests that the key explanation of the global debt crisis is the right exchange rate strategy. Keller (2015) maintains that the stability of the exchange rate is one of the drivers of economic development in developing countries. Kaminsky *et al.* (1998) found that one of the key measures of prediction of the currency crisis is continuing overvaluation. UNDP (2015) sum up how the real exchange rate affects economic growth through trade and capital accumulation.

Hausmann *et al.* (2005) sees the exchange rate as a link between economic and political development. In particular, stable exchange rates will promote growth; daily exchange rate adjustments will increase market volatility, with expected price uncertainties raising economic risk. Hull (2009) argues that depreciation lowers production, since depreciation causes inflation and an increase in interest rates. Inflation, in particular, would reduce the confidence of investors on the one hand; on the other, an increase in interest rates would increase the risk of default. Both of these shocks will dramatically reduce credit availability and reduce demand (Hua 2007). Bergh and Zanker (2013) believes that currency devaluation contributes to a reduction in the production of payment deficits as devaluation raises the value of foreign currencies (Rodrik 2008).

Eichengreen (2008) clarified that a depreciated real and low volatility exchange rate benefits the development cycle. Rodrik (2008) and Berg and Miao (2010) argued that overvaluations, particularly in developed countries, are not only poor, but underestimation is good for development. A depreciated (appreciated) real exchange rate helps long-term development, especially in developed and emerging markets (MacDonald and Vieira 2010).

Previous research on the impact of exchange rate regimes on economic growth attempts to determine whether different exchange rate regimes have a different effect on economic growth. The intermediate exchange rate regime is optimistic for the development of the emerging markets (Ma and McCauley 2011). Floating exchange-rate regimes, however, have no major effects on industrialized economies. Tang (2015) argues that for developed countries the differing exchange rate classifications show relatively similar results. These economies typically have a higher growth rate in the flexible exchange rate system. Although the announcement of a US currency connection and de facto currency stability usually have positive effects on growth in both developed and emerging markets. If a currency is tied only to USD, its economic growth can be hindered. As dollarization increases, it is more likely to have a negative effect on development (Benhima 2012). Nonetheless, Habib *et al* (2017) argue that in developing countries, the choice of an exchange rate regime for long-term growth is not directly affected.

With regard to the links between ER and GDP, the latest studies have shown a positive association between ER underestimation and economic growth, but this relationship should be much stronger in the developing countries (Rodrik 2008). The ER fluctuation around its equilibrium stage may have negative or positive developmental effects. In order to analyze the balance exchange rate, scientists use various terms to communicate ER changes, such as currency misalignment, exchange-rate weakness and imbalance. Misalignment of the exchange rate is defined as the difference between the ER and its balance value (Tang 2015). In fact, the currencies of emerging economies are generally undervalued or overvalued. Undervaluing the exchange rate means that the currency is below or seriously depreciated. The exchange rate is overvalued since the exchange rate of one currency is higher than it should be. The undervaluation of the exchange rate (depreciation) has a positive impact on growth, but the overvalued exchange rate reduces growth (Abida 2011). Habib *et al*. (2017) have different opinions on the effect of the exchange rate undervaluation on the different GDP components. Their findings show that undervalued currencies do not affect export sectors in developing countries, but instead foster domestic savings, investment and employment.

2. Data

Our primary data sources were collected from Macrotrends excel sheets for both economic growth and exchange rate. The data sourced from this sheet includes data from 1982 till date. Meanwhile, data from 1990 to August 31, 2020 was extracted for exchange rate and data from 1990 to 2019 was extracted for economic growth this is because the data for economic growth are based on annual records. The variables are listedbelow:

- *Exchange rate*: including China's exchange rate to US dollar, these were measured by direct quotation and are taken logarithm.
- *GDP*: measured by constant prices of China's GDP from 1990 to 2019, these are detrended and are taken logarithm.

Before our empirical analysis, we first test the stationarity on the variables by unit root test, the results show that these variables are all process. Therefore, in the VAR analysis, these variables are used by their first difference.

We sorted out the various factors underlying the observed relationship between exchange rate and output in China and GDP (Cancan and Jia 2017). The relationship between exchange rate and GDP was very low in the 1990 while the GDP rises in the early 1992 with a very strong output. The result showed some stability in exchange rate from the late 90s to early 2000s, from the results obtained in the Figure 1, Covid-19 has a negative impact on both the exchange rate and GDP though, the data obtained revealed a low exchange rate from 2008 to 2020. The results will be briefly analyzed in stages combined with China's policy.

The economic growth rises from 2000 to middle 2007 with a very strong impact or effect. There were decreases in the GDP with increase in the exchange rate from the middle 2007 to 2020, though there was a steady fall in both the economic growth and the exchange rate from the year 2012 till August 31, 2020. This is because China's economy is relatively closed in this stage most especially during the Covid-19 pandemic. What's more, the decrease of income will reduce non-tradable goods consumption, and causes the rise of the exchange rate and the depreciation of theGDP.

3. Empirical Results

To find the association between China's exchange rate and GDP we had to go through some statistical analysis such as descriptive statistics, regression analysis, VAR Analysis *etc*. They are illustrated below:

3.1. Descriptive Statistics:

First we have calculated descriptive statistics of GDP and Exchange Rate using MS Excel. Both variables are converted into log value for proper calculations.

Table 1. Descriptive statistics

Log GDP		Log EXR	
Mean	0.954793053	Mean	0.851385
Standard Error	0.022305663	Standard Error	0.012837
Median	0.966723341	Median	0.840645
Mode	0.923546	Mode	0.918030
Standard Deviation	0.122173149	Standard Deviation	0.070313
Sample Variance	0.014926278	Sample Variance	0.004944
Kurtosis	1.368722642	Kurtosis	-0.48622
Skewness	-0.57955612	Skewness	-0.61412
Range	0.561393099	Range	0.256231
Minimum	0.591854527	Minimum	0.680263
Maximum	1.153247625	Maximum	0.936494
Sum	28.6437916	Sum	25.54156
Count	30	Count	30

From Table 1 we can see that GDP Growth rate is more fluctuating pattern (variance 0.014, standard deviation 0.122) than exchange rate (Variance 0.004, standard deviation 0.07). From 1990-2019 both variables were analyzed. As from the beginning of 2020, World has experienced corona pandemic, for 2020 separate analysis with structural breaks will be conducted for both variables.

3.2. Regression Analysis

After Descriptive Analysis, regression analysis was conducted to find the association between China's GDP and Exchange Rate.

Table 2. Regression between China's GDP and Exchange Rate

Regression Between log_GDP and log_EXR					
SUMMARY OUTPUT					
Regression Statistics					
Multiple R	0.3430233				
R Square	0.117664985				
Adjusted R Square	0.08615302				
Standard Error	0.116791842				
Observations	30				
ANOVA	Df	SS	MS	F	Significance F
Regression	1	0.050932709	0.050932709	3.733978039	0.063490813
Residual	28	0.381929365	0.013640334		
Total	29	0.432862074			
	Coefficients	Standard Error	t Stat	P-value	Lower 95%
Intercept	0.447343756	0.263471566	1.69788248	0.100618743	-0.092353274
log_EXR	0.596027707	0.308447013	1.932350392	0.063490813	-0.035797349

In Table 2 we can see that there existed a positive relationship between both variables from 1990-2019. From the above table we have found an equation like this:

GDP = 0.447 + 0.596 Exchange Rate

R Square = 0.1176

But as *t-stat* of 1.93 is less than critical value of 2.756 we cannot say that there exists any significant relationship between these two variables.

3.3. Stationary Check between Variables

Though we have found a positive coefficient of Exchange Rate when regressed with GDP we need to check stationary between these 2 variables so that any future inference or conclusion can't be wrong from this regression.

As in our research time series data of China's GDP and Exchange Rate were used from 1990-2020, we had to check for whether both series were stationary or not. Stationarity of a series implies that its mean, variance and covariance are constant over time. That means these do not vary systematically over time. In other words they are time invariant. Regressing two series that are non-stationary likewise, yields a spurious (or nonsense) regression. That is a regression whose outcome cannot be used for inferences or forecasting. So, to check it lets check the rule of thumb. We found a Durbin Watson Statistic of 0.612 and R square of 0.117. So as the rule says if r square obtained from the regression is higher than the DW Statistic, then it is a spurious regression (series are non-stationary). But from our empirical results we can see that R square < DW Statistic meaning that series are stationary and it is not a spurious regression. So no further Augmented Dickey Fuller (ADF) Test is required to check for unit root.

3.4. VAR Analysis

The bivariate analysis shows that Granger could cause GDP after 1990. The bivariate analysis, however, cannot assess if other current variables concurrently influence the actual exchange rate and GDP. In this section, a structural VAR model with complete controls for shocks from other variables will be calculated.

We first have variables that should be compared to our interest variables: the real GDP and the real exchange rate following Kamin and Rogers (2000) and paired with the macroeconomic situation of China. Then we construct the outlined model using the variables described. Then we define the VAR core model depending on the one seen. The outlined model comprises of 10 equations, the following is a thorough description:

$$Y = D + NE \quad (1)$$

From our empirical results from 1990-2020 data, when we regressed GDP in terms of Domestic Demand and Net Exports we have found an equation of:

GDP = 0.200 + 0.778 Domestic Demand + 0.004 NE

It means that GDP has been positively related with domestic demand and net exports from 1990-2020. R-square of 0.401 suggests that. But if we look the calculated t statistic with critical values @ 0.5% significance level only Domestic Demand shows a significant relationship (4.00 >2.756) with GDP of China.

$$NE = y_{21}e - y_{22}Y \quad (2)$$

Equation (1) splits GDP into national demand *D* and *NE* (net exports). Equation (2) notes that net exports contribute positively to exchange rate *e* and to *Y* production negatively. Therefore, raising the exchange rate requires depreciating the national currency. The higher production increases product demand and thus lowers net exports.To check the validity of Equation 2 with empirical results we have regressed Net Exports with Exchange Rate and GDP of China for the year 1990-2020 and found an equation of:

Net Exports = 2.418 +0.58 Exchange Rate – 1.159 GDP

R Square = 0.049

Which means that a *Net export* is positively related with *Exchange Rate* but negatively with GDP? But none of these shows a significant relationship if we compare with calculated *t-statistic* values.

$$D = y_{31}deficit + y_{32}credit - y_{33}\pi - y_{34}e + y_{35}rwage - y_{36}rf \quad (3)$$

We consider all of the variables that may impact domestic demand: the *debt*, the bank credit *balance*, the inflation rate, the exchange rate *e*, the pay *rwage* and the nominal rate *rf*.

Equation (3) states, on the one side, that domestic demand has a favorable connection to fiscal deficit, bank credit stock and salary. Firstly, higher budget expenditure contributes to rise in total revenue and an improvement in the deficit. Secondly, increased bank credit results in higher outputs and household demand. Thirdly, the raised real wage shows that higher wages result in higher labor demand. In comparison, equation (3) negatively links domestic demand to inflation rate, exchange rate *e* and nominal rate *rf*. The following hypotheses should clarify this: first and foremost, rising inflation allows market prices to grow and raises overall demand.

Furthermore, the higher interest rate boosts investment costs and decreases investment demand. Finally, since the positive impact of the real exchange rate on production is included in Equation (2), all more effects on domestic demand are rational. Equation (4) states that inflation relies on the currency *e*, the money supply M_2 and the nominal exchange rate *E*.

$$\pi = y_{61}e + y_{62}M_2 + y_{63}E \quad (4)$$

All are strongly correlated to the rate of inflation. The nominal exchange rate decline would raise the costs of tradable products in the short term (Lizondo and Montiel 1989). Empirical data suggests that real currency depreciation would contribute to a higher inflation rate in the long term (Edwards 1989b, Calvo *et al.* 1994, Kamin 1996). Moreover, the shortage of capital would contribute to higher inflation.

Equation 4 can be checked in terms of real life data of china. After regressing inflation rate with exchange rate, money supply and nominal exchange rate we have found an equation of:

Inflation Rate = -0.869 + 9.792 Exchange Rate + 1.219 Money Supply - 9.998 Nominal Rate

R Square = 0.371

Here we can see that for china inflation is negatively related with nominal exchange rate. But it showed a significant relationship with Money supply (*t-statistic* of 3.828 > 2.756).

$$e = -\gamma_{71}NE - \gamma_{72}capt \quad (1)$$

We presume that the exchange rate would conform to the balance of payments. Equation (5) suggests that increased net exports or net capital inflows would contribute to a real exchange rate appreciation. From empirical results we have found an equation of:

Exchange Rate = -0.121 -0.077 Net Exports + 0.102 Capital Inflows

R Square = 0.1298

But the above equation did not result in a significant relationship with *Exchange Rate* when we compare *t-statistic* with critical values.

$$rwag = e\gamma_{81} - y\gamma_{82}\pi \quad (6)$$

Equation (6) notes that the actual pay depends positively on production, but negatively on inflation.

$$r_f = \gamma_{91}\pi + \gamma_{92}y + \gamma_{93}capt \quad (7)$$

Equation (7) assumes that growth rate, production and net capital inflows decide the nominal interest rate. The increased net inflows of capital will contribute to high inflation and the government would raise the rate of interest in reaction. The higher production stimulates money demand and raises the interest rate.

$$capt = \gamma_{101}r_f - \gamma_{102}E - \gamma_{103}r_{us} \quad (8)$$

Equation (8) is calculated by the principle of interest equilibrium whereby an interest rate differential between the two nations is equivalent to an advance and a spot rate gap. In the forward exchange rate system, the currency of high interest rates nation will be subsidized whilst the economy of low interest rate nation will be priced with premium. r_{us} is the exogenous interest rate of the United States.

$$M_2 = \gamma_{111}y - \gamma_{112}r_f \quad (9)$$

Equation (9) is a regular equation of money demand. Monetary demand is linked to the production, but to the nominal interest rate.

$$E = \gamma_{121}\pi - \gamma_{122}\pi_{us} + \gamma_{123}e \quad (10)$$

Equation (10) is based on the concept of the exchange rate e is the US inflation rate. Centered on Equation (1) to Equation (10) we set the coefficients for the exogenous variables to zero by removing the inflation rate, exchange rate *e*, production *Y* for all endogenous variables. The following can be updated to Equation (1) to (10):

$$y = -a_{11}\pi + a_{12}e - a_{13}r_{us} \quad (11)$$

$$\pi = a_{21}e + a_{22}y \qquad e = a_{31}r_{us} + a_{32}\pi + a_{33}y$$

The central VAR model is Equation (11). The Cholesky decomposition technique suggested by Sims (1980) defines the model. We consider a variety of additional models in addition to the core model as follows:

- *Model 1:* China interest rate, yuan exchange rate, GDP;
- *Model 2:* US interest, yuan exchange rate, GDP.

When we regress *Equation 11* with empirical data of China from 1990-2020 we have found an equation of:

GDP = 0.275 + 0.154 Inflation + 0.738 Exchange Rate – 0.042 US Inflation Rate

R Square = 0.346

Table 3. Final regression analysis model

SUMMARY OUTPUT - Final Model						
Regression Statistics						
Multiple R	0.588551027					
R Square	0.346392311					
Adjusted R Square	0.270976039					
Standard Error	0.104314978					
Observations	30					
ANOVA	*Df*	*SS*	*MS*	*F*	*Significance F*	
Regression	3	0.149940094	0.049980031	4.593071267	0.01040848	
Residual	26	0.28292198	0.010881615			
Total	29	0.432862074				
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.275401085	0.245047401	1.123868621	0.2713387	-0.228301057	0.779103
log_INF	0.154239371	0.051134377	3.01635377	0.005656153	0.049131155	0.259348
log_EXR	0.738664561	0.295299055	2.801411871	0.018996672	0.131668667	1.34566
logUS_IR	-0.042289113	0.085114163	-0.496851658	0.623468902	-0.217243778	0.132666

From Table 3 we can see that Inflation and Exchange Rate has been positively related with GDP of China from 1990-2020. T statistics values of 3.016 and 2.801 also confirmed a significant relationship among them.

3.5. Analysis with Structural Breaks

As Bruce Hansen (2001) said that structural change is pervasive in economic time series relationships and it can be quite perilous to ignore. Inferences about economic relationship can go astray, forecasts can be inaccurate and policy recommendations can be misleading or waste.

Bai and Perron (1998) provides the standard framework for structural breaks model in which some but not all of the model parameters are allowed to break at *m* possible break points.As we have used empirical data from 1990-2020. But from 2019 there was a outbreak of corona pandemic all over the world. So some structural breaks analysis needed apparently. But it must have to be checked first whether a break is needed or not.

3.6. Chow Test

TheChow (1960)test was one of the first tests which set the foundation for structural break testing. It is built on the theory that if parameters are constant then out-of-sample forecasts should be unbiased. It tests the null hypothesis that there is no structural break against the alternative that there is a known structural break at time *Tb*. The test considers a linear model split into samples at a predetermined break point such that:

$$y_t = x_t'\beta_1 + u_t, \quad \text{for } t \le T_b.$$

and

$$y_t = x_t'\beta_2 + u_t, \quad \text{for } t > T_b.$$

The test estimates coefficients for each period and uses the out-of-sample forecast errors to compute an F-test comparing the stability of the estimated coefficients across the two periods. One key issue with the Chow test is that the break point must be predetermined prior to implementing the test. Furthermore, the break point must be exogenous or the standard distribution of the statistic is not valid. To test for structural breaks lets plot two series data on line graph.

Figure 1. GDP growth rate of China historical data (1990-2020)

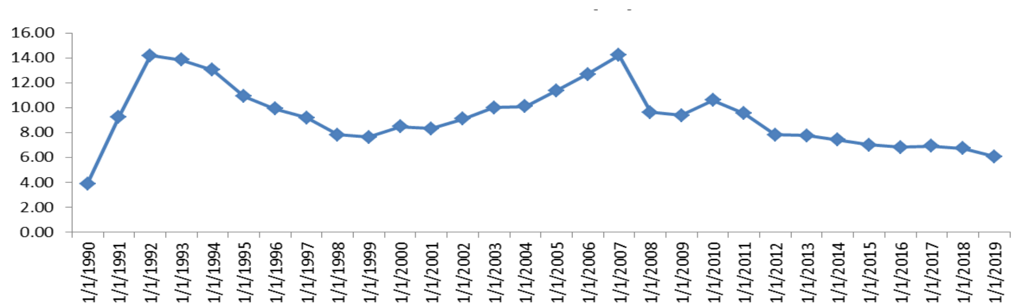
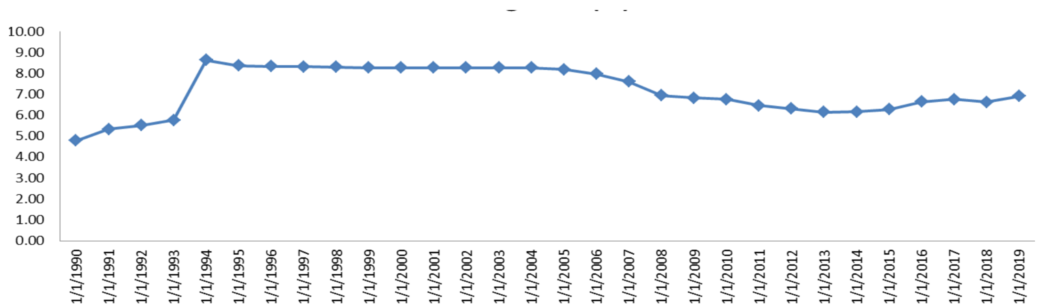


Figure 2. Exchange rate of China historical data (1990-2020)



From Figure 1 and 2 we can see that after 1998 china faced a different pattern for GDP and Exchange Rate. So we will try by breaking a sub set at this point and test Chow Test whether there is significant improvement in fit from running two regressions. So first we divided our data into 2 groups:

- *1st group:* 1990-1998;
- *2nd group:* 1999-2019.

We will regress pooled data as well as both group data and calculate Chow Test (*F* statistic) by using following formula:

$$CHOW = \frac{\left(RSS_p (RSS_1 + RSS_2)\right) / k}{(RSS_1 + RSS_2)/(N_1 + N_2 - 2k)} \qquad (12)$$

After calculating we have found the following results:

Table 4. Chow test for structural break analysis

N1	9
N2	21
RSS_c	0.381929
RSS_1	0.213748
RSS_2	0.142896
K	3
F Numerator	0.0063
F Denominator	0.0162
F Value (Chow)	0.3899
F Critical Value @0.05 Confidence Level	3.01
Null Hypothesis	Accepted

From Table 4 we can see that calculated *F* Value is 0.3899 which is far less than *F* critical value @0.05 significance level. So we have to accept null hypothesis meaning that there is no significant improvement in fit from running two regressions. That means structural breaks are not necessary and efficient for the variables GDP and Exchange Rate for the time period of 1990-2020. So, Bai-Perron Test is not necessary for this Research Paper.

The role of currency policies in economic growth is still commonly discussed. In the macroeconomic literature on emerging markets, two key and intertwined problems linked to the ties between exchange rates, balance of payments and macro stability and development are raised: This would promote the sustainable and steady exchange rate (Ocampo *et al*. 2009, Rodrik 2007, 2013, Stiglitz and Greenwald 2014). Scaling up to higher technical production practices is the secret to competitive development and effective monetary policy will encourage this. The experiences of East Asia, first of the newly developed countries and latest of China, are underlined as success stories of such diversification (Rodrik 1994, Lin 2018). This goes against the difficulties of many resource based economies in diversifying their output and export systems, which was partially due to the subsequent valued exchange rate and also to the so-called 'premature de-industrialization' that many of them faced (Rodrik 2016). The degree to which the exchange rates mechanism and management of capital markets assist with the management of pro-cyclical external finance adjustments for developing and frontier economies as well as trade movements in commodities-exporting countries and expand or restrict the room for anti-cyclical macroeconomic policies, thereby influencing macroeconomic stability.

These problems illustrate the value of exchange rate strategies in transparent economies. We also discussed these topics in a recent paper (Guzman *et al*. 2018). In particular, we discuss the position that exchange rates (ERs) policies may play in supporting economic growth, clarifying how effective ER policies rely on the conditions for enforcing them – including the policy instruments available at the time of implementation. Since the ER is an endogenous variable and not a direct policy weapon, we also talk about actual exchange rate policies, and recognize that such policies rely upon the management of a number of specific policies including, of course, actions correlated with nominal exchange rate management.

Overall, the data shows that the compatible usage of conventional macroeconomic strategies with interventions in foreign exchange markets and the capital account laws is the correct strategy for transparent developing economies prone to boom-bust cycles of global finance. Recent studies have shown that these strategies are successful in stabilizing the macroeconomy and fostering development, overturning earlier 1980s research that widely dismissed their efficacy (Ocampo 2017).

Conclusion

A number of empirical examples confirm the argument that sound, sustainable exchange rate policies (SCRER) are ideal for economic growth. We concluded that there are theoretical roots for a policy solution such as an optimum plan in the face of such limits on the policy options available. Two key points are absent from the core claim against such action that it is an interference with the free running of the economy, which will guarantee productivity in the absence of such action:

- bank interference, including rate fixing, influences the exchange rate value, indicating that there is, therefore, no "pure" exchange rate;
- the market imperfections, like learning and macroeconomic externalities, rival all economies, especially those in developed and emerging markets.

Our review of the empirical data on the efficacy of various policy tools indicates that the laws on foreign exchange and capital markets can be utilized in an efficient way to sustain stable exchange rates and to dim the global finance and exchange rate conditions impact of boom-bust cycles, thus fostering development and stability.

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