The Impact of Exchange Rate Volatility on International Trade: Evidence From China

Dr. Marwa Anis
marwa.anis@bue.edu.eg

Aya AlaaElDin
Aya AlaaElDin@bue.edu.eg

The British University
Arab Republic of Egypt

Abstract

This paper proposes helpful insights regarding the impact of the exchange rate volatility on international trade. The focus has been on China using a monthly data from the period of January 2003 to August 2018. This is mainly an attempt to contribute to the ongoing debates about this relationship. Time series analysis is adopted specifically; stationary test, granger-causality test, co-integration and error correlation model and finally the residual test. Results indicate that there is a co-integration relationship among the variables. The error correlation model has shown that both the exchange rate and inflation have a significant negative impact on imports. Additionally, there is a significant positive relationship between the exchange rate and exports. Further results have shown there is a significant negative relationship between inflation and exports. A few suggestions are provided to the Chinese policy makers. In this connection, a guideline for future researchers are presented.

***Keywords**: Exchange Rate, International Trade, Imports, Exports.*

Introduction

The relationship between exchange rate and international trade is the central part of discussion when examining the consequences of adopting different exchange rates regimes (Latief & Lefen , 2018) Academics have extensively examined the impact of exchange rates on export trade and this relationship has been the subject of many empirical studies; however, they always have conflicting results (Li & Zhu, 2017)

Previous literature which has presented conflicting arguments about the relationship between exchange rates volatility and international trade can be grouped into three categories: (1) studies that reports positive results, (2) studies that report negative results and (3) studies that have diverse results. In these terms, Sercu & Vanhulle (1992), Viaene & de Vries (1992) and Franke (1991) have elucidated that an increase in the fluctuation of the exchange rate may have a positive or inconclusive effect on the performance of international trade. Other studies (e.g. Aristotelous, 2001; Mckenzie,1998; Gagnon, 1993; Bailey & Tavlas, 1988; J.Bailey & S.Tavlas, 1987; Gotur, 1985; Hooper & W. Kohlhagen, 1978) have shown that there is not any significant relationship between exchange rate fluctuations and international trade flows. (Khosa, Botha, & Pretorius, 2015). On the other hand, some empirical studies (e.g. Kasman, 2005; Doyle, 2001; McKenzie, 1997; Sercu & Vanhulle, 1992 Peel, 1991; Franke,1991) show a positive impact of exchange rate volatility on international trade.

In recent years, China economy has been booming; when compared to many other emerging economies, the Chinese economy is known of its high growth rates and its high integrations into international

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trades (Cardoso, 2017). Hence, this raises the attention of many researchers and specifically to evaluate the rigid Chinese policy to have control over its exchange rate. The policy maker aimed to take greater control of its exchange rate for many reasons such as, to increase the export capacity of the country; to maintain internal and macroeconomics stability; avoid inflationary pressure and to promote a gradual adjustment of industrial structure (Cardoso, 2017).

Considering the fact that the effect of exchange rate movements on the trade flows are still not well understood due to the inconclusive results and the growing economic importance of China and its rapid integration with the international trade, the current study aims to inspect the impacts of change rate and its volatility on international trade; to measure the level of exchange rate volatility that affects imports' and exports' value in both the long and short run. The focus is on China as a leading contributor to the universal growth and a stabilizing force during crises as highlighted above.

The current study can be considered as an added value to organizations and government policymakers in considering the impact of exchange rate volatility on trade. By referring to the evidences shown in the current study, new insights into the implementation and choice of the exchange rate and trade policies have been presented. Moreover, the current study can be considered an attempt to resolve the puzzles of the inconclusive results that previous studies have presented. Finally, this research paper may provide useful insights to the trading firms in highlighting the factors that could be more likely than others to affect both exports and imports revenues.

Literature Review

The relationship between exchange rates movements and trade performance has seized the attention of many scholars. However, the mainstream has provided conflicting results. This literature review section presents the different results that were shown from previous empirical studies investigating the above-mentioned relationship. For instance, Senzada and Diaba (2018) have applied the pooled mean-group estimator of dynamic heterogeneous panels' techniques to data for eleven Sub-Saharan African economies over the period from 1993 to 2014. Results indicate no significant effects of exchange rate volatility on imports. However, the study finds negative effect with exports in the short run and positive effect in the long run.

In these terms and in order to determine the short term and the long term relationships, Sharma & Pal (2018) have concentrated on providing evidence regarding the effect of exchange rate volatility on India's cross border trade with the United States, Germany, Japan and China. Auto regression conditional heteroscedastic based model was adopted to estimate the volatility of the nominal exchange rate; they adopted the pooled mean group estimators. Results have shown, in the long run, nominal exchange rate volatility has a significant dampening impact on India's export rates to United States, Germany and China. Nevertheless, in the short run, the effect of the nominal exchange rate is mixed.

An empirical study by Odili (2015) is based on Nigeria covering the period from 19971 to 2011. The study employed the co-integration and the Parsimonious ECM model. Results indicate that exchange rate volatility depressed the imports (Odili, 2015). Furthermore, in a panel data analysis using a sample of nine emerging countries for the period from 1995 – 2010, results have revealed a negative relationship between the exchanges rate volatility and exports and the existence of a long-run relationship (Khosa, Botha and Pretoruis, 2015).

Similarly, Oskooee & Aftab (2017) has considered the issue of symmetric and asymmetric data when they were studying the relationship between exchange rate and international trade. They assumed asymmetric relationship by using monthly data from 54 Malaysian industries out of 63 industries that imports from the United States. Results support the short run and the long run asymmetric effects in almost one third of industries. The approach adopted by them has managed to identify the affected industries with different foreign rates.

For a set of three African countries: Mataura, Morocco, South Africa to aggregate exports the period from 1973 to 1990 was investigated by (Serenis & Nicholas, 2014)Their overall results show significant

negative effects from volatility of exchange rates on exports for all countries in the sample used when a measure of unexpected fluctuations was used. Additionally, (Sweidan, 2013) aims at exploring the effect of exchange rate on exports and imports in Jordan over the period from 1976-2009.They have shown that the impact of foreign currency fluctuation on exports and imports is active in the short-rum only. They did not support adopting a devaluation policy in Jordan.

Several studies have focused on China; for instance, Omofomwan (2014) has chosen China as one of the most important emerging economies. According to the co-integration analysis, there is no relationship between the volatility of exchange rate & international trade. Yet, the Granger causality test shows a significant relationship between exchange rate fluctuation and international trade. These results are not conclusive due to some issues related to the data collection method and the sample size used within the research which may lead to erroneous analysis direction in the regression model.

In these terms, Li and Zhu (2017) have adopted an econometric model that is based on data from 2000 to 2014. The model is used to analyze the effects of exchange rate fluctuations, gross domestic product, and wage level and export commodity price on trade volume. From the analysis and tests of the mathematical model, the regression results show that the exchange rate, gross domestic product and foreign direct investment have an impact on the export trade of China's electronic communication equipment manufacturing industry but RMB real effective exchange rate changes on exports is not significant.

Moreover, Cardoso (2017) analyzed the impact of the Chinese foreign exchange policy on foreign trade with the European Union. The paper aims to examine if the Chinese competitiveness is due to the existence of the misalignment of its exchange rate, or rather, to other sources of competitiveness. The vector error correlation (VEC) model is adopted to estimate the long run export equation. Empirical results have indicated that over the past few years, Chinese exports have benefited from 'unfair' competitive advantage resulting from the manipulation of its currency value.

Reflecting on the different findings of the above discussed models that have attempted to capture the relationship between exchange rate volatility and imports and exports, the wide array of empirical findings indicate that there is somehow ambiguity. Hence, it is crucial to have a fresh attempt to understand the effects of exchange rate volatility on the international trade in developing countries. Consequently, the following question is suggested in order to fulfill the call for further research in these terms, ***"What is the impact of exchange rate fluctuation on international trade in the Chinese context?"***

Empirical Evidence

Sampling and data collection

To test the current practice against the historical record, the drawn sample is (exchange rate, inflation, imports, and exports) of China in the last 15 years on a monthly basis from January 2003 till December 2018. This period is selected in order to provide an up to date analysis for the research problem. Furthermore, the data are both reachable and reliable as retrieved from Organization for Economic Co-Operation and Development (OECD) reports.

All the data of the current research are retrieved from the Organization for economic co-operation and development (OECD). The data is considered both reachable and reliable as they are retrieved from Organization for economic co-operation and development (OECD) reports. Beside yielding accurate data, it avoids the consumption of time (Malhotra, Bechwati, & Baalbaki, 2013) In the line with all the above, the data is entirely relevant as it meets all the requirements in terms of the measurement units (billion of dollars) (Kumar, Abdul Talib, & Ramayah, 2017).

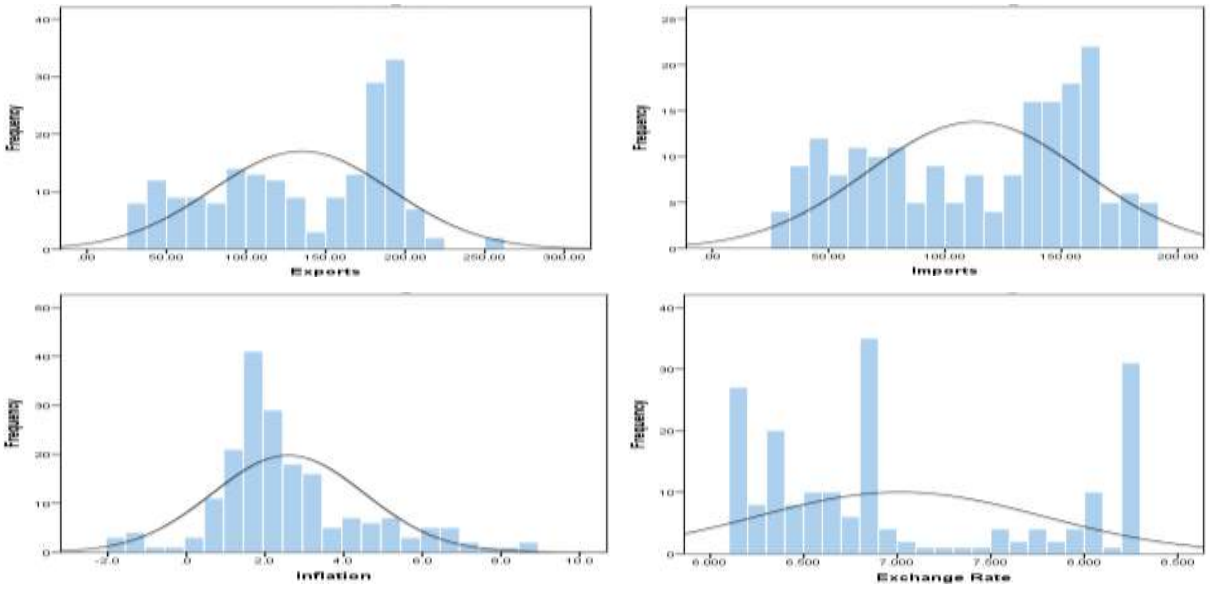
Data Analysis

Time series analysis is utilized to investigate how the changes within the chosen data points is compared to the shifts in the other variables over the exact period of time.

Thome (2014) explained the techniques of usnf the Time Series analysis, in order to build a qualified time series analysis model, there are prerequisites that should be followed: firstly, implementing a stationary test in order to check whether the data is stationary or not. Secondly, based on the results one of the following processes will be followed. In case of the stationary data, Granger-Causality test will be implemented, followed by the VAR test. Finally, if the data is Non-Stationary which is the case of the current research, Granger-Causality test will be implemented but followed with Implementing Co-integration and Error Correction model.

Table (1) Of Descriptive Statistics in Billions of S

Descriptive Statistics					
	No. of Observations	Exchange Rate	Inflation	Imports	Exports
Mean	192	7.014946	2.592188	113.0199	134.8643
Median	192	6.827359	2.100000	125.7565	141.8086
Maximum	192	8.277260	8.700000	190.8257	259.3865
Minimum	192	6.103916	-1.800000	29.61099	31.39980
Std. Dev.	192	0.765985	1.937341	46.28565	56.25316
Jarque-Bera	192	22.09490	26.64736	15.75578	13.02485
Probability	192	0.000016	0.000002	0.000379	0.001485



Graph (1) Standard Deviation of the Research Variables

Table (1) presents the descriptive statistics on a monthly basis for the research variables and they are imports and exports as dependent variables and exchange rate volatility and inflation as independent variables.

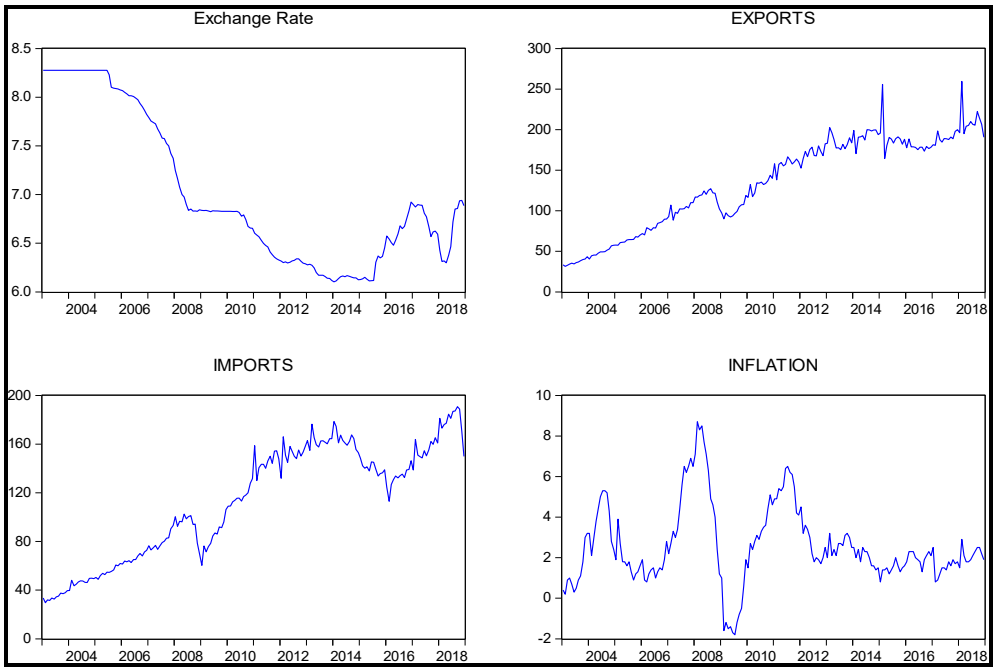
Starting by the exports average during the period 2003 to 2018 was about 134.8 billion dollars, and the median was about 141.8 billion dollars. While it reached the minimum value in 2003 with 31.39 billion dollars, and the maximum value was 259.39 billion dollars in 2018. The standard deviation was 56.25 billion dollars, so covariance which is Standard deviation divide by the mean < 1 which indicates that data points are very close to the mean. As for the Jarque-Bera test indicates that the P-value (Probability) is less than 5% which means that the null hypothesis of the Jarque-Bera test is rejected, more precisely the normality of the data is rejected with 95% confidence level.

On the other hand, the average of imports during the same period was 113.02 billion dollars, and the median was 125.75 billion dollars. The maximum value was 190.83 billion dollars in 2014, while the minimum

value was 29.611 billion dollars in 2003. The standard deviation was 42.28 billion $, so covariance which is standard deviation divide by the mean < 1 which indicates that data points are very close to the mean, While the Jarque-Bera test indicates that the P-value (Probability) is less than 5% which means that the null hypothesis of the Jarque-Bera test is rejected, more precisely the normality of the data is rejected with 95% confidence level.

Regarding the inflation rate for the same period, the average was 2.59%, the median was 2.1. while it reached the maximum value in 2008 with 8.7 % and the minimum value was -1.8% in 2009. The standard deviation was 1.93 billion $, so covariance which is Standard deviation divided by the mean < 1 which indicates that data points are very close to the mean. With regard to the Jarque-Bera test, it indicates that the P-value (Probability) is less than 5% which means that the null hypothesis of the Jarque-Bera test is rejected; more precisely the normality of the data is rejected with 95% confidence level.

Referring to the average of the exchange rate during the period 2003 to 2018, it was 7.014 billion dollars and the median was 6.8 billion dollars. While the maximum value was reached in 2003 with 8.27 billion dollars and the minimum value was reached in 2013 with 6.1 billion dollars. The standard deviation was 0.76 billion $, so covariance which is standard deviation divide by the mean < 1 which indicates that data points are very close to the mean And finally, the Jarque-Bera test indicates that the P-value (Probability) is less than 5% which means that the null hypothesis of the Jarque-Bera test is rejected, more precisely the normality of the data is rejected with 95% confidence level.



Graph (2): Time Series Plot for the Studied Variables

Graph (2) illustrates the time series plot for the research variables (Exports, Imports, Inflation rate, and Exchange rate). By viewing the exchange rate graph, it is clear that there are upward and downward trends over time. It also shows recognizable stability in the exchange rate until 2005, and then the trend went down from 8.5% until it reaches 6.5% in 2008. From 2008 to 2010, they are nearly stable at 6.8%. Then it began to decline until it reaches 6.1% in 2014. The graph also shows a gradual increase in the trend of the exchange rate reaching 6.8% in 2016. In 2017, the exchange rate decreased to 6.2%.

Referring to the inflation graph above, it is noted that there is a random variation in the inflation rate; it is fluctuating upward and downward. During the period 2003 to 2004 that there an upward trend of

inflation that reaches 5%, however, the trend began to decline until it reaches 1% in 2006. Then there is a recognizable upward trend between 2005 and 2007 reaching the highest inflation rate with 8.7%. Followed by abrupt during the period between 2008 and 2009, and again the trend began to rise until it reached 6% in 2011. After that, the graph shows a nonlinear trend until the end of the period.

As for the imports graph, it shows an upward nonlinear trend during the period 2004 to 2007 stating by 30 billion $ and ended by 11 billion $, followed by recognizable downward trend reaching 70 billion $ in 2008. Since 2008 to 2014 there was a non-linear upward trend and imports reached 170 billion $, followed by a non-linear downward trend until 2016 when it reached 120 billion $. After that there was nonlinear upward trend until the end of the period.

On the other side, exports graph shows a nonlinear upward trend from 2003 to 2018, starting with 40 billion $ and ended with 200 billion $. Yet, there was a drop in the exports during 2008, the year of the financial crisis where the exports dropped to 90 billion $.

Time series analysis

Unit root test Tables (2) & (3) show the results of ADF unit root test. It shows that imports, exports, exchange rate, and inflation rate hold a unit root at their original status. Conversely, the four variables are accepted (stationary) at their first difference with confident level 99%, as the P-Value of these variables is less than 1%. Therefore, the ADF null hypothesis "Data is not stationary" will be rejected.

Table (4) entails the results of Granger causality test. It shows the following results: exchange rate granger cause imports and exports. Also, it ensures that inflation rate granger cause imports and exports. This interpretation is based on the results of the p-value as all the results are less than 5%. Accordingly, the H_0 hypothesis of granger causality test is rejected.

Table (2) Augmented Dickey-Fuller

Augmented Dickey-Fuller		
Variables	t-statistic	Prob.*
Exchange rate	-1.678	0.4406
First difference of exchange rate	-7.5	0.000***
Imports	-1.56	0.5012
First difference of imports	-18.6	0.000***
Exports	-1.467	0.548
First difference of exports	-16.2102	0.000***
Inflation	-2.296	0.0404**
First difference of inflation	-6.379	0.0000***

Table (3) Augmented dickey fuller tests' signs illustration

Augmented Dickey-Fuller	
Sign	Indication
*	10% Significance level
**	5% Significance level
***	1% Significance level
H0	Null Hypothesis "Data is non-stationary"
H1	Alternative Hypothesis "Data is stationary"

Note: Augmented dickey fuller tests include intercept and the appropriate lag lengths were selected according to Schwartz Bayesian criterion

Table (4) Of Granger Causality Test

Granger Causality test		
Null Hypothesis	F-Statistic	Prob
H0: Inflation does not Granger Cause exports	2.4725	0.0089
H0: Exchange rate does not Granger Cause exports	1.90313	0.0482
H0: Inflation does not Granger Cause imports	2.71004	0.0042
H0:Exchange rate does not Granger Cause imports	2.4872	0.0020

Co-integration and error correction model

Lag order selection Table (5) shows that the most appropriate lag is 3 for estimating the VAR as it has the least Schwarz information criterion (SC), but since the VAR is already dealing with the first difference. Therefore, the most appropriate lag is 2.

Johnsen Co-integration test Table (6) shows the results of Johnsen Co-integration Model. This model entails two tests (Trace statistics & Max-Eigen statistic). In this test (None) is an indicator for the rejection of null hypothesis if P-Value is < 5%, and at most means that there is at least one co-integration equation

Table (5) Lag order selection

Lag Order selection

VAR Lag Order Selection Criteria

Endogenous variables: IMPORTS EXPORTS

Exogenous variables: DEXCHANGE DINFLATION

Date: 05/07/19 Time: 10:35

Sample: 2003M01 2018M12

Included observations: 184

Lag	LogL	LR	AIC	SC
0	-1900.323	NA	20.69916	20.76905
1	-1318.263	1138.814	14.41590	14.55568
2	-1291.150	52.45723	14.16467	14.37434
3	-1278.068	25.02565*	14.06596	14.34552*
4	-1273.281	9.053729	14.05741*	14.40686
5	-1269.523	7.026990	14.06003	14.47937
6	-1267.613	3.528520	14.08275	14.57198
7	-1265.064	4.655008	14.09852	14.65764
8	-1262.998	3.728509	14.11954	14.74855

* indicates lag order selected by the criterion
FPE: Final prediction error
AIC: Akaike information criterion
HQ: Hannan-Quinn information criterion
SC: Schwarz information criterion

Table (6) Johnsen Co-integration Test

Johnsen Co-integration test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.079611	17.67033	15.49471	0.0232
At most 1	0.010480	1.991199	3.841466	0.1582

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
	0.079611	15.67913	15.67913	0.0297
	0.010480	1.991199	3.841466	0.1582

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

among the variables. Based on the results, of both (Trace statistics & Max-Eigen statistic) there is co-integration vector between the variables because P-value of trace statistics equals 0.0232 which is less than 5 %. On the other hand, the P-value of Max-Eigen statistic at none equals 0.0297 % which is less than 5%. Therefore, the null hypothesis (there is no co-integration among the variables) is rejected. To conclude, there is a long run relationship between each of imports, exports, exchange rate, and inflation. All the variables move together.

Vector Correction Model The results of vector error correction model are shown in Table (7) above. The results show there is a negative and significant relationship between imports and the exchange rate volatility meaning that whenever exchange rate increases, imports will decrease and vice versa. It also indicates that the imports are negatively affected by inflation rate which means any increment in the inflation rate will cause a decrement in imports and vice versa. This outcome is consistent with the descriptive statistics that were presented in the previous part. The results also show that error correction term of imports is insignificant which indicates that there is no disequilibrium in the long-run of exports that need to be corrected.

On the other hand, the results show that exports are positively and significantly affected by inflation rate meaning that when the inflation rate decreases exports will decrease and vice versa. It also indicates that there is a negative and significant relationship between exchange rate and exports which means whenever exchange rate increases, exports will also increase. It also confirms the time series plots of the descriptive statistics that were analyzed in the previous section. Moreover, the results show that the error correction term for exports is significant and equals to 0.265. This means that exports will have disequilibrium with 26.5% in the long run which will be corrected on the next few months (Short run).

The adjusted R-square of imports is equal to 0.105 meaning that both inflation and exchange rate have an impact on imports with 10.51%. Alternatively, the adjusted R-square of exports is equal to 0.4476 meaning that both inflation and exchange rate have an impact on exports with 44.76 % which is considered as a huge effect.

Table (7) Vector Error Correction Model

Vector Error Correction Estimates
Date: 05/07/19 Time: 10:55
Sample (adjusted): 2003M04 2018M12
Included Observations: 189 After Adjustments
Standard Errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	
IMPORTS(-1)	1.000000	
EXPORTS(-1)	-0.833779	
	(0.04538)	
	[-18.3749]	
C	-0.581818	
Error Correction:	D(IMPORTS)	D(EXPORTS)
Error correction term	-0.004887	0.261534
	(0.05190)	(0.06942)
	[-0.09414]	[3.76756]
D(IMPORTS(-1))	-0.311443	0.107592
	(0.09103)	(0.12174)
	[-3.42149]	[0.88379]
D(IMPORTS(-2))	-0.061645	0.009114
	(0.08535)	(0.11414)
	[-0.72230]	[0.07985]
D(EXPORTS(-1))	0.027243	-0.599344
	(0.05589)	(0.07474)
	[0.48748]	[-8.01870]
D(EXPORTS(-2))	0.017181	-0.323776
	(0.05021)	(0.06715)
	[0.34218]	[-4.82160]
C	0.743060	1.432873
	(0.52440)	(0.70134)

Cointegrating Eq:	CointEq1	
	[1.41696]	[2.04304]
DEXCHANGE	-17.89120	-21.83840
	(11.0994)	(14.8444)
	[-1.61191]	[-1.47115]
DINFLATION	-1.834453	3.522010
	(0.85319)	(1.14107)
	[-2.15011]	[3.08660]
R-squared	0.138472	0.468259
Adj. R-squared	0.105153	0.447694
Sum sq. resids	8692.871	15548.73
S.E. equation	6.930145	9.268472
F-statistic	4.15598	22.77018
Log likelihood	-629.9737	684.9232
Akaike AIC	6.751045	7.332520
Schwarz SC	6.888261	7.469737
Mean dependent	0.623719	0.834457
S.D. dependent	7.326019	12.47149
Determinant resid covariance (dof adj.)		3795.824
Determinant resid covariance		3481.286
Log likelihood		-1307.021
Akaike information criterion		14.02139
Schwarz criterion		14.33013

Graph (3) illustrates the results of both imports and exports residuals test. It indicates that the error correction model's residuals for imports and exports are nearly white noise that ensures and supports the robustness of the model.

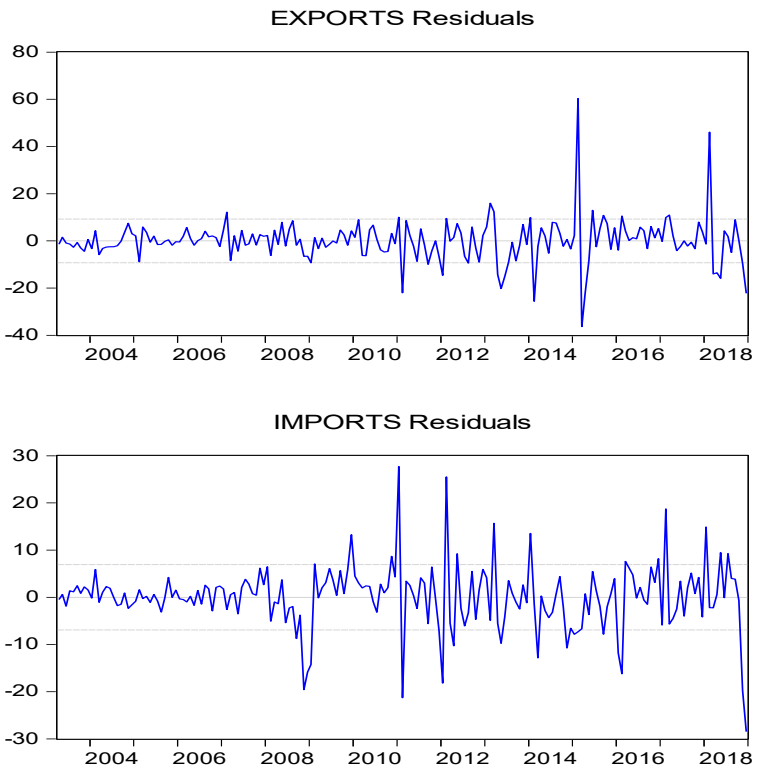
Discussion of the Results

The obtained results are broadly consistent with the major trends as it was stated by (Peree & Steinherr, 1989; Cushman, 1986; Baron, 1986; Ethier, 1973; Clark, 1973) on their theoretical studies that any increase in the volatility of exchange rate will have counter effects on international trades volumes; which means that the high exchange rate volatility will decrease the volume of trade if the traders are risk reluctant. Also, (Asteriou, Masatci, & Pilbeam, 2016; Khosa, Botha, & Pretorius, 2015; Genc & Kibritci Artar, 2014) in their empirical studies shows that there is a significant realtionship bewteen exchnage rate and internatioanl tarde.

The explanation behind the negative relationship between exchange rate volatility and international trade could be assigned to the transaction cost; it is suggested that the costs of currency's conversion and risk come with the potential exchange rate fluctuation have adverse effect on international trade (Huchet-Bour-

don & Korinek, 2013). Such theory advocates that as long as exchange rate volatility exhibits uncertainty in the business environment, rational traders will always have the tendency to avoid facing uncertainty and any form of risk. Accordingly they will adjust their trading activity (Khosa, Botha, & Pretorius, 2015).

At the same time, the negative significant relationship could be associated to the exchange rate regime. By tracing the rate of exports, imports, and the adopted exchange rate system in China, it has been noted that the rate of exports and imports increase when the floating exchange rate regime is adpoted. On the other hand, when the Chinnese pigged their currency to the USD the rate of exports and imports decrease.



Graph (3) Imports & Exports Distribution

In 2005 after more than a decade of pegging its currency "Yuan / RMB" to US dollar "$", China officially has changed its exchange rate regime. The People Bank of China "PBC" has announced that China will no longer peg its RMB to US dollar, instead changed into floating exchange rate system that based on the supply and demand of the market with reference to a basket of countries' currencies that China is trading with. China had revalued its currency to be RMB 8.28 per 1 USD instead of 8.11 which is equal to 25% boosting the exports from 40 billion $ to 140 billion $ and imports from 30 billion $ to 90 billion $ during the period 2005 to 2008 which is a recognizable increment (Fidrmuc & Siddiqui, 2015).

The new exchange rate regime has allowed the RMB to appreciate gradually over the next three years until 2008 when the global financial crisis forced China to halt its currency appreciation policy" floatation" and turn back to peg its RMB to the US dollar till the mid-2010. During this period the exports and has decreased from 140billion $ to 90 million $ and from 100 billion $ to 60 billion $ respectively. This is based on the results of the descriptive statistics and the time series plot discussed in the analysis section (Williams & Luo, 2015).

In July 2010, China's central bank announced the resumption of the managed floated regime (Mertens & Shultz , 2017; Williams & Luo, 2015;) In December 2010 China could replace Germany as the biggest exporter in the world and posted a 17.7% in its exports and imports increased until it reached 170 billion $ (BBC, 2018).On 11 August 2015, it was declared that the daily central parity rate of the RMB would be market-oriented since that time the policy has not been changed, since then the exports have accelerated till it reached 240 billion $ in 2017 (Congressional Research services, 2019).

Contraversy, there is unexpected deceleration in imports during 2016. The author invetigations suggest that the reason behind this is not related to the exchage rate system, However, it is related to imposing new tariff policy. In April 2016, the Chinese government enacted a tariff policy on the imported poructs on both the physical goods and e-commerece products. The duty free goods has been boosted from 5,000

Yuan to 8,000 yuan. Furthermore, any additional amout will be hit be additional rate depenidng on the products type (Delaney, 2018).

More and above, the "Mercantilism theory" may provide justification for the current results. According to Mercantilism theory, the government aims to enhance and promote their domestic by putting aggressive restrictions on imports and this was implemented by the policy makers in China in 2016 through imposing a new tariff policy on imports (DonorsChoose.org, 2012). Recent publications (e.g. Pettinger, 2017; Atkinson, Cory, & Ezell, 2017; Beretta & Iannini, 2014; The national business, 2013; Ezell, 2010) claim that there are a lot of modern examples proves that mercantilism is still being practiced in a form of certain policies in some economies. For instance, the Chinese government is accused of purchasing the assets with foreign currency; in order to retain the undervaluation of the exchange rate paving the way for their exports to become more competitive (Pettinger, 2017) this also ensures the negative relationship between exchange rate and international trade.

Conclusion

The current research has provided useful insights on the impact of exchange rate volatility and inflation on international trade within the Chinese context during the period of 2003 to 2018. The research has utilized the following statistical techniques: stationary test, Granger-Causality test, Co-integration & error correction model, then residuals test for the retrieved data from Organization for economic co-operation and development (OECD). Results have shown that the exchange rate fluctuations have an impact on both imports and exports throughout the fifteen years. Also, the stationary test shows that data is stationary at their first difference; the Granger-Causality test shows that both exchange rate volatility and inflation Granger-Cause imports and exports. Furthermore, the Johnsen Co-integration test indicates that there is a Co-integration relationship between the current research variables. Then, the error correction model results show that both exchange rate and inflation have a negative and significant impact on imports. Exchange rate affects exports positively and significantly, while inflation has a positive and significant effect on exports.

Overall, exchange rate has a significant impact on the Chinese international trade and has highlighted earlier that these results may be associated to the policy regimes. This is an evident to the policy makers that she should give much attention to the significance of having a policy that stabilize the foreign currency exchange rate. They should formulate a proper policy with the goal of reducing the level of foreign currency volatility as this will result in fostering international trade. Thus, policies should help in avoiding the underlying causes that lead to exchange rate volatility and directed mainly to trade expansion. These policies could also be tailored to every partner. These suggestions may lead to reducing the uncertainty and improve the international trade. Also, the government must take position through strengthening its financial system; this may help reducing the consequences of the exchange rate volatility in the short run and the long run in China.

This study is restricted to highlight the impact of the exchange rate volatility on international trade in China. Hence, results cannot be generalized specially that it is denoted in previous studies (e.g. Sharma and Pal, 2018) that the exchange rate volatility varies greatly between industries and destination markets. Also, it is recommended in order to have more precise results is to disaggregate by the sector / industrial levels. Future research also may provide more helpful insights for policy implications if additional factors such as macroeconomics, social and political factors are considered. These factors can be included in a comparative study between developed and developing countries.

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Appendix

Descriptive statistics for the variables of the study

	EXCHANGE_RATE	EXPORTS	IMPORTS	INFLATION
Mean	7.014946	134.8643	113.0199	2.592188
Median	6.827359	141.8086	125.7565	2.100000
Maximum	8.277260	259.3865	190.8257	8.700000
Minimum	6.103916	31.39980	29.61099	-1.800000
Std. Dev.	0.765985	56.25316	46.28565	1.937341
Jarque-Bera	22.09490	13.02485	15.75578	26.64736
Probability	0.000016	0.001485	0.000379	0.000002
Observations	192	192	192	192

	t-Statistic	Prob.*
Exchange rate	-1.678	0.4406
First difference of exchange rate	-7.5	0.000***
Imports	-1.56	0.5012
First difference of imports	-18.6	0.000***
Exports	-1.467	0.548
First difference of exports	-16.2102	0.000***
Inflation	-2.296	0.0404**
First difference of inflation	-6.379	0.0000***

(Augmented Dickey-fuller (ADF Test for Unit Root Variable

Null Hypothesis:	F-Statistic	Prob.
Inflation does not Granger Cause exports	2.4725	0.0089
Exchange rate does not Granger Cause exports	1.90313	0.0482
Inflation does not Granger Cause imports	2.71004	0.0042
Exchange rate does not Granger Cause imports	2.4872	0.0020

Linear Granger Causality Test

VAR Lag Order Selection Criteria
Endogenous variables: IMPORTS EXPORTS
Exogenous variables: DEXCHANGE DINFLATION
Date: 05/07/19 Time: 10:35
Sample: 2003M01 2018M12
Included observations: 184

Lag	LogL	LR	AIC	SC
0	-1900.323	NA	20.69916	20.76905
1	-1318.263	1138.814	14.41590	14.55568
2	-1291.150	52.45723	14.16467	14.37434
3	-1278.068	25.02565*	14.06596	14.34552*
4	-1273.281	9.053729	14.05741*	14.40686
5	-1269.523	7.026990	14.06003	14.47937
6	-1267.613	3.528520	14.08275	14.57198
7	-1265.064	4.655008	14.09852	14.65764
8	-1262.998	3.728509	14.11954	14.74855

* indicates lag order selected by the criterion

FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

VAR Lag Order Selection Criteria

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.079611	17.67033	15.49471	0.0232
At most 1	0.010480	1.991199	3.841466	0.1582
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.079611	15.67913	14.26460	0.0297
At most 1	0.010480	1.991199	3.841466	0.1582
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				

Co-integration test

Vector Error Correction Estimates

Date: 05/07/19 Time: 10:55

Sample (adjusted): 2003M04 2018M12

Included Observations: 189 After Adjustments

Standard Errors in ( ) & T-statistics in [ ]

Cointegrating Eq:	CointEq1	
IMPORTS(-1)	1.000000	
EXPORTS(-1)	-0.833779	
	(0.04538)	
	[-18.3749]	
C	-0.581818	
Error Correction:	D(IMPORTS)	D(EXPORTS)
Error correction term	-0.004887	0.261534
	(0.05190)	(0.06942)
	[-0.09414]	[3.76756]
D(IMPORTS(-1))	-0.311443	0.107592
	(0.09103)	(0.12174)
	[-3.42149]	[0.88379]
D(IMPORTS(-2))	-0.061645	0.009114
	(0.08535)	(0.11414)
	[-0.72230]	[0.07985]
D(EXPORTS(-1))	0.027243	-0.599344
	(0.05589)	(0.07474)
	[0.48748]	[-8.01870]
D(EXPORTS(-2))	0.017181	-0.323776
	(0.05021)	(0.06715)
	[0.34218]	[-4.82160]
C	0.743060	1.432873
	(0.52440)	(0.70134)

Cointegrating Eq:	CointEq1	
	[1.41696]	[2.04304]
DEXCHANGE	-17.89120	-21.83840
	(11.0994)	(14.8444)
	[-1.61191]	[-1.47115]
DINFLATION	-1.834453	3.522010
	(0.85319)	(1.14107)
	[-2.15011]	[3.08660]
R-squared	0.138472	0.468259
Adj. R-squared	0.105153	0.447694
Sum sq. resids	8692.871	15548.73
S.E. equation	6.930145	9.268472
F-statistic	4.155985	22.77018
Log likelihood	-629.9737	-684.9232
Akaike AIC	6.751045	7.332520
Schwarz SC	6.888261	7.469737
Mean dependent	0.623719	0.834457
S.D. dependent	7.326019	12.47149
Determinant resid covariance (dof adj.)		3795.824
Determinant resid covariance		3481.286
Log likelihood		-1307.021
Akaike information criterion		14.02139
Schwarz criterion		14.33013

Error Correction Model