Study of OTC Derivative Market in Asia

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Abstract

This paper attempts to review OTC derivatives markets in major Asian economies, namely India, China, Japan and US for comparison. At the same time, it attempts to identify factors determining the OTC foreign exchange derivatives turnovers. Easy bi-variate associations between the turnover of foreign exchange derivatives and some systemic economic conditions, commonly correlated with the expansion of derivatives markets, have been examined. Being first step towards more comprehensive econometric analysis, the goal here is, to define possible drivers of foreign exchange derivatives turnover. The study shows that activities in OTC derivatives markets are growing in these Asian economies and their share in global derivatives markets is increasing as well. The pace of activities in OTC interest rate derivatives in these economies lagged behind that of OTC foreign exchange derivatives activities. In relation to those in advanced economies, this illustrates lagging growth and liquidity in bond and money markets in these economies. There has been major share of activities in derivatives markets with reporting dealers, indicating relative immaturity of OTC derivatives markets in these economies. About one-third of transactions in derivatives markets in these Asian economies related to cross-border. However, this is far below the level of cross border transactions in advance economies.

Key words: Foreign exchange derivatives, interest rate derivatives, foreign exchange swaps, foreign exchange outright forwards, currency swaps.

I Introduction

In 1981, the two most important institutions of world i.e., World Bank and IMF has started derivatives market and loans for currency. This derivative market plays a critical role in the financial system as well as the country's economic development, particularly in developing nations. Prof. Lien and Zhang (2008) explains; (both

theoretically and empirically); the role, function and working of the market in the developing economies. Firstly, this market is an important component of the process that influences the contribution of price risks for various commodities raded in the market, thereby supporting producers in dealing with price fluctuations.It also aids in the seamless hedging and risk management of developing and rising economies by promoting capital inflows. The financial system was indirectly affected by the market, which introduced more unexpected crisis dynamics and acted as a contagion driver. Secondly, derivative market performs important functions of a channel of risk reduction and redistribution. That implies that there was a price discovery as well as price stabilizer. Few derivative instruments like hedgers or spectaculars helps to reduce risk for different

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agents. This market also aids in the expansion of information flows. Future pricing data or demand estimates are used to affect production and storage decisions, reducing spot price volatility.

Atilgan et al. (2016) also explains the role of derivative market in developing economies. The study divides various empirical studies of the derivative market according to their functions into various groups. Further, the study have updated the new function of this market like hedging, risk management and price management in the spot market. They have also explained the new issues related to market efficiency, structure, and risk and price management.

This paper is divided in six sections. The section first deals with introduction, second section deals with previous literature, third data base and methodology, fourth section explains the growth of derivatives markets globally and in Asian Economies i.e., India, China, US, and Japan,fifth segment investigates the impact of derivative markets on economic growth, and the final chapter wraps up the study.

II. Review of Literature

The relationship between the financial sector and economic growth has been the subject of numerous studies.The studies examined its objectives both theoretical as well as empirically. Wicksell (1934) and Goldsmith (1969), were found positive relation between financial system and the economic activity. Levine (1991) there supports long run investments in stock market which reduces risk and releases more funds for investment for companies.

Merton discovered in 2005 that the introduction of new financial goods, new financial theories, and new operational procedures, such as computer and telecommunications techniques, resulted in changes in global financial market trading and structures. Finance theory has a greater influence on financial applications. Rajan (2006) concludes that growth and financial sector was mostly affected by change in the institutional structures and introduction of new assets.

Lien (2008) explains the importance, role and working of the OTC market in under developed countries. The study tested theoretical model for explaining the importance and empirical model for the working of the market. He found that risk and price volatility have close relation. Further, the study concludes that derivative market instruments helps in reducing risk. The instruments of derivative market were preferred because of the less risky.

The importance and role of the derivative market in the finance and growth of any economy has been explained by Haiss and Sammer (2010). Volume, efficiency, and risk were the three channels used in the research. The first channel, volume, explains the progress of derivatives markets, which has an impact on both the financial and economic markets by raising capital. It stimulates the distribution of varied resources to various investment opportunities with significantly greater rates of return. This can be done with the help of saving mobility and also because of the better potential of investment opportunities in various risky projects. The second channel i.e., efficiencyis a crux of various functions, like better substitute of trading done in cash, movement of resource through time and also through space, and knowledge provider for risk management also for the price strategy. Hence, it helps the agents, firms, various financial institution and also to the government for larger investment at lower cost. The study's third channel, risk, revealed the market's detrimental influence on both the financial industry and economic growth.It addsuncertainty to the economy by making financial sector volatile. But with the shifting of

investment instruments towards hedging instruments would be more beneficial for agents as well as for the firms.

III. Data Base and Methodology

The study has used panel data (both time series and cross-sectional data) collected from various issues of Bank for International Settlements, World Bank and FIA for the study period of 2006 to 2018. The study has applied percentages, growth rate for explaining the growth of derivative market. The study used an OLS estimation and a GMM model with a one-year lag and a two-year lag to explain the impact of derivative markets on economic growth. Data has been transformed into logarithm form for reducing skewness before application of OLS and GMM model.

OLS Model

The following relationship is tested for the impact of derivative instrument on economic growth

$$Y_{it} = a + b\ X_{it}$$

Where, Y: per capita GDP,

X: Volume of Derivative instrument in US dollar

There are various advantages of using panel data:

1. There will be no problem of Multicollinearity.
2. Provides more information by handling more variables
3. It provides more efficient results
4. No problem of Homosdasity.

The GMM estimator approach was developed by Arellano and Bover in 1995. This approach was used to estimate the variables. Further, few improvements were made by Blundell and Bond

Figure

in 1998. The equation of GMM has been given in the following equation:

$$\hat{\theta}_{GMM} = \begin{pmatrix} \hat{\alpha}_{GMM} \\ \hat{\beta}_{GMM} \end{pmatrix} = \left(\left(y_{-1}^*; x^{*\prime} \right) z^* V_N^{-1} z^* \begin{pmatrix} y_{-1}^* \\ x^* \end{pmatrix} \right)^{-1} \left(\left(y_{-1}^*; x^{*\prime} \right) z^* V_N^{-1} z^{*\prime} y^* \right)$$

The equation is a regression equation with information on time and levels. The variable lags in levels are mainly used as instruments in the above equation in differences.

Another test i.e.,Sargan test was used by the study to detect autocorrelation at the first order and second order in the data. This test ensures validity GMM given by Arellano and Bond.

$$s = \hat{v}' Z \left(\sum_{i=1}^{N} Z_i' \hat{v} \hat{v}' Z_i \right)^{-1} Z' \hat{v} \ \sim \chi^2 \left(p - k - 1 \right).$$

Theabove equation follows chi-square distribution with p-k-1 degrees of freedom, where

$v^\wedge$ --- residuals vector,

Z --- imposed conditions number,

k --number of variables and

p-- number of columns

IV. Global OTC Derivatives Markets

The notational amount of OTC derivatives has been shown in graph-1. It represents a countable fraction of financial assets as there are large number of contracts and assets worldwide. It is clearly shown from the figure. Because of global financial crises, there was a decline in the notational amount of OTC derivate globally but overall growth is very impressive despite of low values. The notional amount of OTC derivatives market has been declined from 595 trillion dollar to 544 trillion dollar in the second half of the year   2018

Lhs: — Notional amounts   Rhs: — Gross market values
— Gross credit exposures
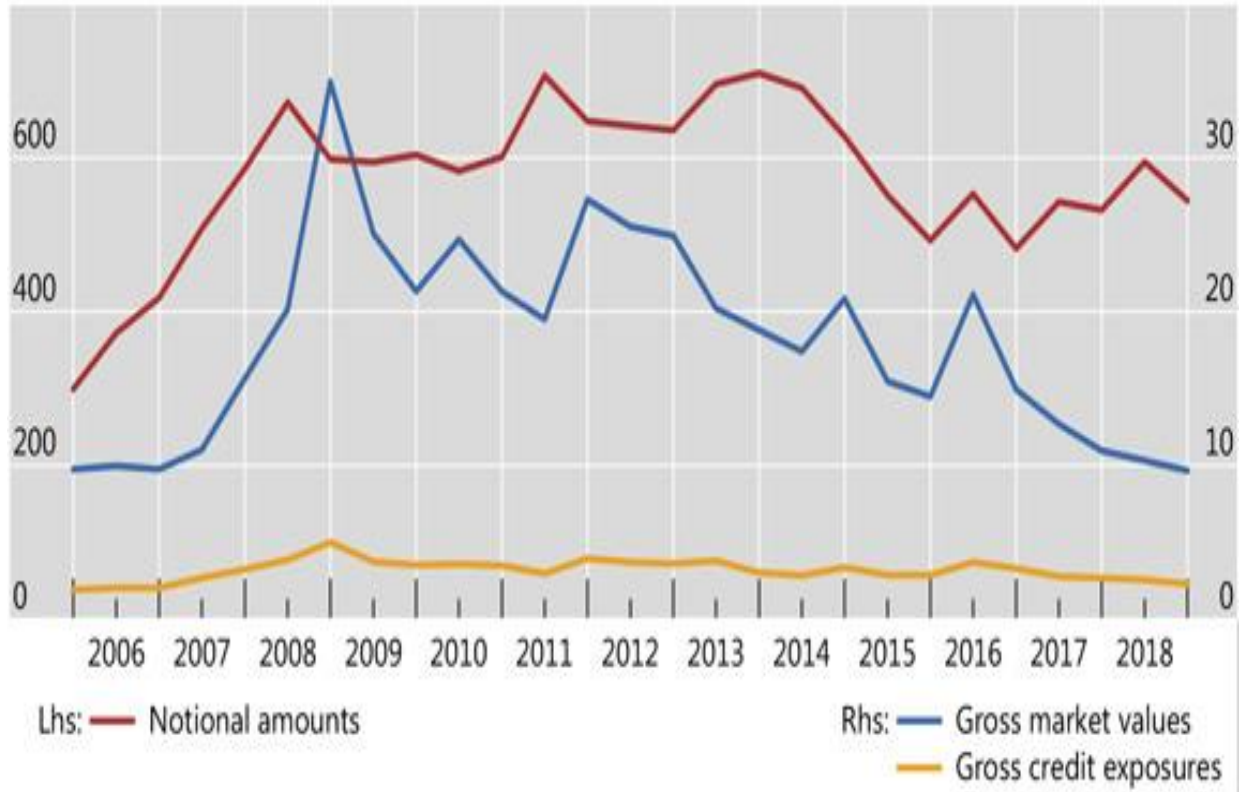
Source: BIS

There are two main important components of this market which are traded globally are futures and options. Individual stocks, equity indexes, interest rates, currency, energy, precious and non-precious metals, and agriculture are all classified into several categories. Diagram 1 shows tradingvolumedatastarting from 2008 (after global financial crises) till 2017 in the exchanged-traded market. It is clear that after the global financial crises there is a rise in the volume which are traded in derivative market, from 17.5 billion in 2008 to 25 billion in 2011.After the year 2011, the values of volume of exchange-traded declined considerably and shows further upwards trend from 2015. This may be because of that corporate have shifted towards derivative market instruments for hedging purposes.

Japan has long-standing market among the selected countries. This market was set up their future exchange market in the year 1730 named Dojima Rice Exchange in Osaka. US open ChicagoBoard of Trade market in the year 1848. China start operating its first trading market in Shanghai named Financial Futures Exchange which was set-up in September2006

This daily average OTC turn over forthe interest rate and for the foreign exchange instruments which are traded in derivatives markets are given in Table2

Fig2: Volume of Traded Exchange (Annually)
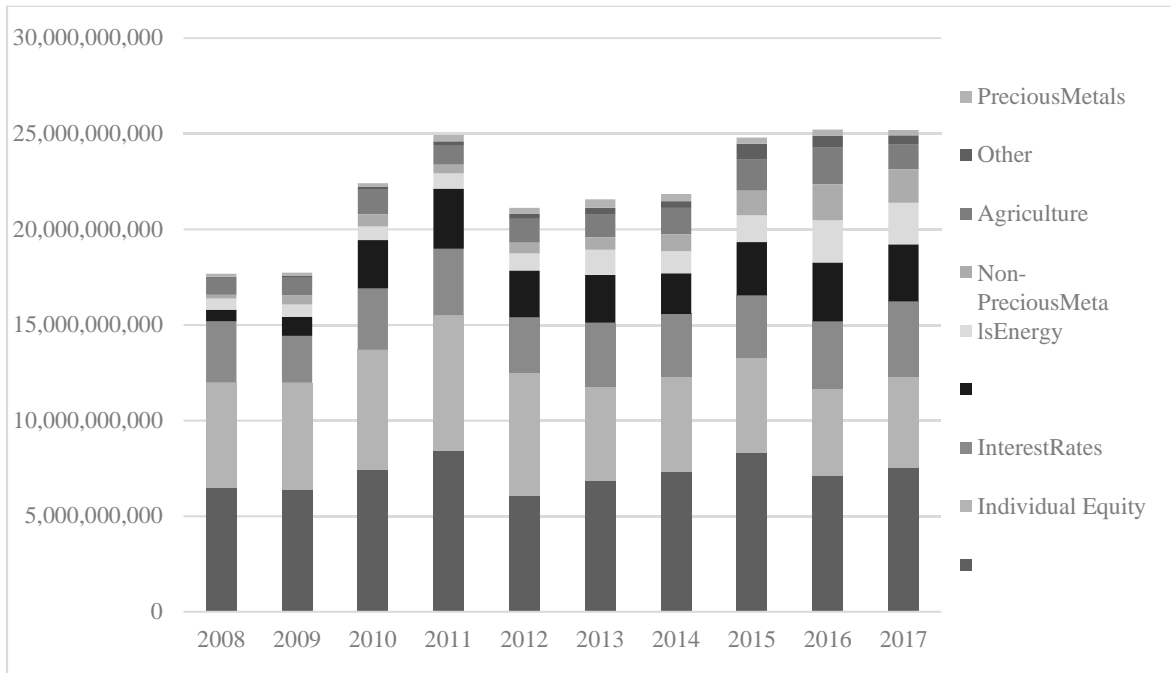
Source:(Future Industry, Association).

Table3.The OTC turnover (average of daily basis) in four countries

	Exchange Instruments			Interest Rate Derivatives		
Country	1998	2007	2016	1998	2007	2016
China	211	9289	72834			4087
Japan	146269	250224	399029	31624	76858	55911
United States	383359	745204	1272123	58448	525012	1240775
India	2446	38364	34331		3396	1859

Source: BIS
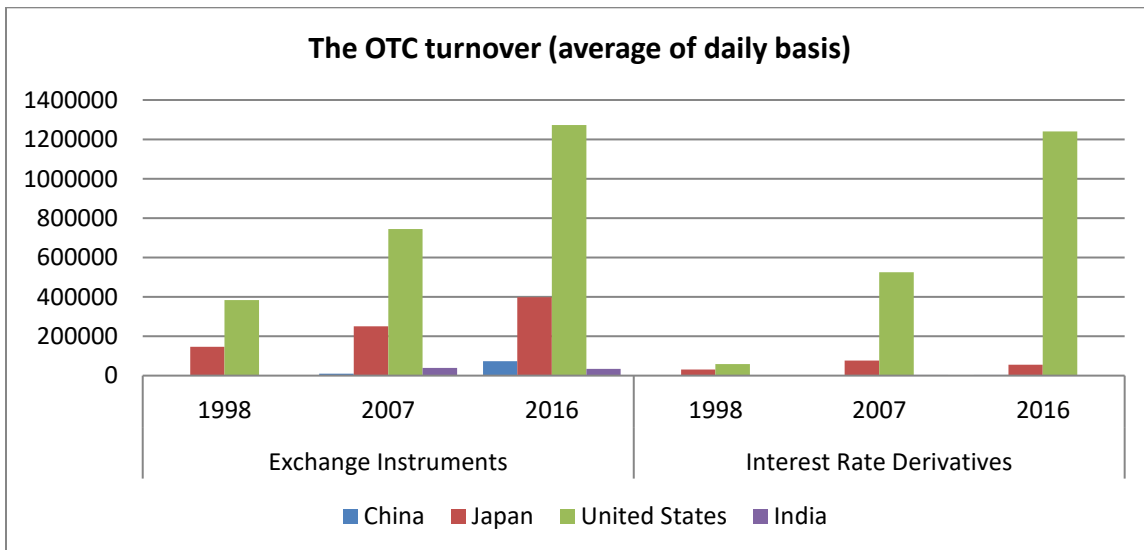
The average daily turnover of selected countries has been shown in table 3. The real-time OTC traded in derivatives market has risen in all the selected countries. China has shown highest growth in daily turnover followed by India, US and Japan. Interest rate derivatives has also shown upward trend in all the economies. The average daily turnover of global OTC interest rate derivatives rose from $58448 billion during 1998 to $1240775 in 2016 in US whereas in Japan it rose from $31624 billion to $55911 billion in 2016. The growth of OTC interest rate derivatives was highest in US.

V. Analysis of empirical results
OLS Estimation

This section explains the relation between derivative market and per capita GDP using panel data of selected Asian economies. The dependent variable is per capita GDP and independent variables are volume of market in selected economies (in US$). The period under study was 2008-2018 i.e., 10 years with 4 group. The data was collected from various reports of the World Bank and also from the FIA(Future Industry Association). Results were calculated with the help of Stata software.

Table: 4: Results of the static model

Variable	Estimation
Log(volume)	0.15*
Constant	7.8920*
R^2	0.5

Source: FIA and World Bank

Table 4 depicts results of the static model. The dependent variable of the model is the per capita GDP in real terms converted into logarithm form and the independent variable is the volume of the market in logarithm form. Results of OLS estimations shows that there is a direct, positive and significant relation between volume of the derivatives market and real per capita gross output. Value of coefficient of determination is 0.5 which shows the 50 percent variation in real per capita gross output was because of volume of the derivatives. There is a problem of auto correlation in the data as the value of Durbin-waston test is 0.64. Hence, the study has estimated GMM model with dynamic panel data. The results of the GMM model estimators are shown in Table 5.

Dynamic   Model

Table: 5: Estimators of GMM of the Dynamic Panel Data

Variable	Difference GMM with One-sided	Difference GMM with two-sided
Log(GDP)	0.998*	0.989*
Log(volume)	0.020*	0.030
Constant	0.954	0.032
Sargan test	0.42	0.98

Source: World Bank and FIA

Table 5 provides the estimators of GMM of the dynamic panel data. The real per capita GDP is the dependent variable whereas one year lag of per capita GDP and volume of the market are independent variables. All the variables are converted into log form. Serial correlation test both at first-order and second-order were tested along with the Sargan test. For the estimators of

one-step difference-GMM, the table shows that there is a positive and significant relationship between the dependent and independent variables.There was no over-identification of the model was found by the sargan test. Hence, the study concludes that validity of the instruments and model specification are supportive. Although the volume of the derivatives market was not substantial, the GMM model's two-step difference demonstrated a favourable association between variables.Serial correlation was rejected at second order level but there was a presence of serial correlation in the first order estimation.In this model, Sargan test concludes that there was over-identification of the model. Further,the model specification is rejected and the validity of the overall of the model instruments are also rejected.

The impact of derivative market on economic growth was well explained by the model GMM estimation with 1 year lag period. As a result, the study suggests that trade volume and per capita GDP had a favourable and significant impact. To put it another way, a 1% rise in derivative market volume will result in a 0.20 percent gain in GDP.

VI Conclusions

The derivative market is critical to the financial sector's development and economic prosperity. It offers information, which improves the financial system's efficiency and, as a result, economic growth. It serves through hedging. Hence, the study of derivative market is very crucial. Various research has been done for explanation of the role and impact of the derivative market both on theoretical grounds and empirically tested. The essence of prior study was that derivative markets and economic growth are linked. This maybe because of the capital accumulation, raising investment, reducing risk and uncertainty in the investment projects.

The present study tries to explain the growth of the derivative market and also tested empirically the role and importance of the volume on real GDP. Three Asian countries were selected i.e., China, India, Japan, and the U.S. for the period just after the global financial crises i.e., till 2017. There is no long run relationship were found but there is significant relation in the short-run. The growth of derivative market was highest in the China followed by India. The OTC derivatives market has risen in all the selected countries. Interest rate derivatives has also shown upward trend in all the economies. The growth of OTC interest rate derivatives was highest in US.

Furthermore, the results of OLS estimations revealed a positive, direct, and substantial relationship between derivatives market volume and real per capita gross production. The findings of the GMM model for one-step difference estimators demonstrate that the dependent and independent variables have a positive and significant connection.The impact of derivative market on economic growth was well explained by the model GMM estimation with 1 year lag period. As a result, the study suggests that trade volume and per capita GDP had a favourable and significant impact.

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Appendices

Appendix 1
Descriptive Statistics

	FXT (US $ bn)	XM (US $ bn)	AL(US $ bn)	FXR(US $ bn)
Mean	5.940	600	1008	306
Median	2.061	292	418	100
Max	27.681	4666	9901	3821
Min	0.403	61	80	13
Std Dev	7.460	981	1734	703
Skewness	1.58	3.02	3.79	3.95
kurtosis	4.34	11.5	18.2	18.2
Jarque-Bera	22.64	21.01	552.8	563.9
Observations	46	46	46	46

Source: Author work

Appendix 2: Correllogram

	FXT	XM	AL	FXR
FXT	1.00	0.37	0.48	0.37
XM	-	1.00	0.78	0.76
AL	-	-	1.00	0.99
FXR	-	-	-	1.00

Source: Author work