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Are Asian Markets and Developed Markets Interlinked? An Application of Causality Approaches

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***Abstract:** This paper examined the relationship between the stock market returns for three Asian countries and three developed countries. It Investigate two way causality among exchange rate, inflation rate, GDP, with stock returns of the sample countries. This paper examines long term and short term co movement of stock indices of stock market. To check the stationary this study apply unit root test, OLS test and found that data is stationary. This study used ADF test with and without intercept till data become intercept till the data become stationary. The data series is stationary at i(1) and 2 difference and intercept level as presented in above tables. The P value of ADF test in India GDP value is 0.0006, India exchange rate is 0.0002, and Indian stock return is 0.0001 which are less than 5%. It means data series is stationary. Bangladesh exchange rate is 0.0004, inflation rate is 0.0001, stock returns 0.0004. Also predicting the value of ADF test equation the coefficient value ids negative in all cases suggesting that the model is fit.. To investigate the causality The Granger causality test was applied to check the causal relationship between the variables and found that hypothesis is not rejected so there is no causality between the variable.*

I. INTRODUCTION

Third largest economy in the world is Indian economy in terms of purchasing power. As given by Goldman Sachs, the global investment bank, by 2035. India would be the third largest economy of the world just after the US, and China. From 2010 to till now Malaysia is the most open economy in the world related to trade. From 2010 to till now, Malaysia's average growth is 5.4%. Three pillars of Bangladesh growth is export, social progress and fiscal prudence. Its export grows at 8.6% every year compare to world's average of 0.4% this country mostly focused on products growths. The US economy is a highly developed or mixed economy. It has the second largest purchasing power parity compared to the world. It has the seventh highest per capita income. We can say it is the most powerful technical economy in the world. US is the world largest exporter and second largest importer. UK is the fifth largest country in purchasing power parity (PPP) and ninth largest national economies in the world by nominal gross domestic product and fifth largest by). It is the most globalised economy. It is fifth largest importer as well as exporter. London is the second largest financial center in the world.

Looking to growth prospects and importance of economy, we decided to take theses country basically this study examines the relationship between Asian and developed countries and the variable for the study is stock return, exchange rate inflation rate GDP. For economists, policy maker and even the investors, it is important to know the factors that influence the behavior of stock price with changing the other economic variables.

It will basically help policy makers, forecasting about the stock market and exchange rate is very important to make decisions about the fiscal and monetary policy. It will help regulators to know about currency and equity market relationship is helpful in forecasting the future crisis.

This study aim to establish long term relationship between stock return, inflation rate, GDP, exchange rate, between Asian countries and developed countries. This study applies to unit root test OLS test Granger causality test. If stock prices and macroeconomic variable are eminently related and causation runs from microeconomic variable to stock prices than crises in stock markets can be intercept by controlling fluctuations in macroeconomic variables (exchange rate inflation rate GDP)

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II. LITERATURE REVIEW

Mukherjee and Mishra (2005) authors found a long run relationship among Indian stock market and other Asian stock market. They apply Johansen Co-integration test on Asian group of countries. Tripathy (2006) found that all over world market impact on developed market and moreover they found that world stock market co integrated with developed market and there is longer equilibrium relationship

Chittedi (2010) Author applied Granger causality test to find the relationship between Developed countries stock market. Author found Unidirectional Causal Influence between Indian stock market, US stock market, Japan, Finance. Aloui and Kkiri.(2010) Authors apply a wavelet approach to examine the relationships among the returns of GCC (Gulf Cooperation council) they found strong dependency exists among the considered market.

Modi (2010) author found US investor has good portfolio diversification potential with Hong Kong, russia, India after applying Granger causality test they examined the relationship between developed countries and develop country stock market

Tripathi and Sethi (2010) examined the co- integration of the Indian stock market with Japan stock market. They used the Granger causality test to analyze the relationship between Indian stock market and the Japanese stock market. Authors found the results that there is no long run relationship.

Gregorio and Guidotti (1995) Author found Efficient of investment instead of volume of investment as the major determinant for economic growth Abd ,Majid (2005) Author apply Co integration test among Japan and US stock market and found stock markets moving towards a greater integration among the Japanese and US stock markets.

Gogineni (2010) found that in addition to the stock returns of industries that depend heavily on Oil and some industries stock return.

Tsuji (2012) author apply co integration test and evaluate data from 2001 to 2005, found no causal relationship between the japans markets gradually relationship among the stock market of seven-advance market examined the relationship between stock return of Japan. (Ajayi et al**,** 1998) Author found the result that there is empirical evidence that the correlation of stock return between the Japanese markets gradually increased. Further study found no causal relationship among the stock market of seven-advance market. He examined the relationship for seven-advance market. Authors applied Granger causality test to analysis the data for the year 1985 to 1991.

Samadder and Amalendu (2018). This study examines the long run and short run relationship with Indian stock market and developed stock markets this study is based on time series and time taken from 2001 to 2016. Study applied Johansen co integration test, Granger Causality test it found that Indian stock market and USA stock market are associated in the long run

Gupta .L and Shrivatava. R (2018) this study examine the relationship between India and Japan Study applied Johansen co integration test, Granger Causality test it found that, There is co integration between NSE and TSE

C .Pornpiun (2017) the study examine the international transmission of volatility in the stock markets of countries time taken for study is two decade and author found that there is strong financial integration during the clam periods.

Agmon, T.(1972).

This paper examines the relationship between equity market of United States and United Kingdom and found that there is long term relationship between the given markets.

Janakiramanan, s & Lamba, S A. (1998) this paper examine the linkage between the stock market in the pacific basic region , the time duration for study is 1988 to 1996, study apply vector auto regression model and found that The US market influences all other Australasian markets except Indonesia and none of these markets expert a significant influence on the US market

III. OBJECTIVES OF THE STUDY

The objective of the study is to analyses the causality and co integration between Asian country and developed countries.

The objective of the study is following

A. To calculate the stock market returns for three Asian countries and three developed countries
B. To investigate two way causality among exchange rate, inflation rate, GDP, with stock returns of the sample countries.
C. To examine long term and short term co movement of stock indices of stock market
D. To open new vistas for further research.

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IV. RESEARCH METHODOLOGY

A. *Unit root Test*

There are several test available to check the stationary of the data, unit root is applied on the time series index data. This study prefers ADF Test. In this study to examine and make the series stationary of GDP, inflation rate , exchange rate , stock return The Augmented Dickey-fuller (ADF) unit root test was applied

The test consist the following procedure for the ADF test.

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \cdots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t, \text{---------- [1]}$$

Where, α is a constant, β the coefficient on a time trend and p the lag order of the autoregressive process. Imposing the constraints $\alpha = 0$ and $\beta = 0$ corresponds to modeling a random walk and using the constraint $\beta = 0$ corresponds to modeling a random walk with a drift. Consequently, there are three main versions of the test, analogous to the ones discussed on dickey fuller test (seismic time trend terms in the test equation [3].) By including lags of the order p the ADF formulation allows for higher-order autoregressive processes. This means that the lag length p has to be determined when applying the test.

B. *Ordinary Least Squares (OLS)*

It is types of linear least squares method for estimating unknown parameter in linear regression model with a goal of minimizing the differences between the observed responses in some arbitrary dataset and the response predicted by linear approximation of the data. The single regression resulting estimator can be expressed by a simple formula, especially in the case of an on the right-hand side.

C. *Granger Causality test*

It is first proposed in 1969. It is statically hypothesis test to examine whether one time series is useful for forecasting another's, This test is performed using the level values of two or more variables. If The variables are non stationary, then the test is Done using first differences. Under the Granger causality the number of lags to be included is usually chosen using an information criterion, such as the Akaike information criterion or Schwarz information criterion. Any particular lagged value of one of the variables is retained in the regression if (1) it is significant according to a t-test, and (2) it and the other lagged values of the variable jointly add explanatory power to the model according to an F-test. Then the null hypothesis of no Granger causality is not rejected if and only if no lagged values of an explanatory variable have been retained in the regression.

The Granger method involves the estimation of the following equations:

$$\Delta SP_t = \beta_0 + \sum_{i=1}^{q} \beta_{1i} \Delta SP_{t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta ER_{t-i} + \varepsilon_{1t}$$

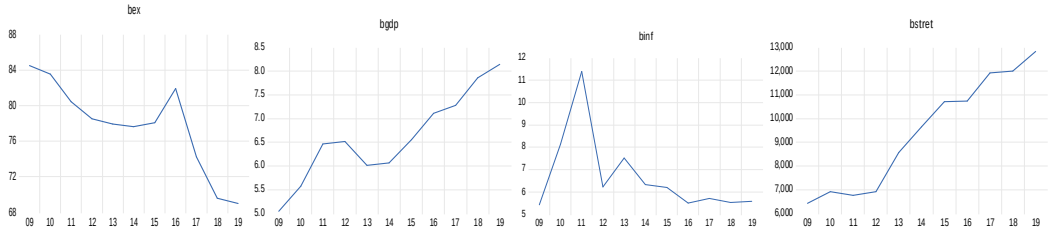
$$\Delta ER_t = \varphi_0 + \sum_{i=1}^{r} \varphi i_{1i}\, \Delta ER_{t-i} + \sum_{i=1}^{r} \varphi_{2i}\, \Delta SP_{t-i} + \varepsilon_{2t}$$

. (2)

V. EMPIRICAL ANALYSIS OF DATA

Figure 1
Graphical analysis of Asian countries

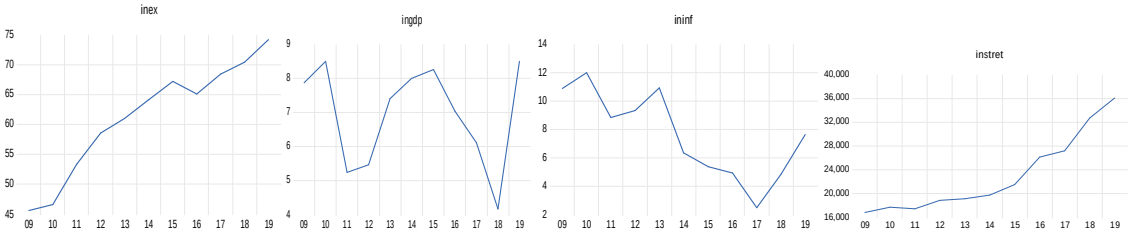
Bangladesh



Exchange rate GDP Inflation rate stock return

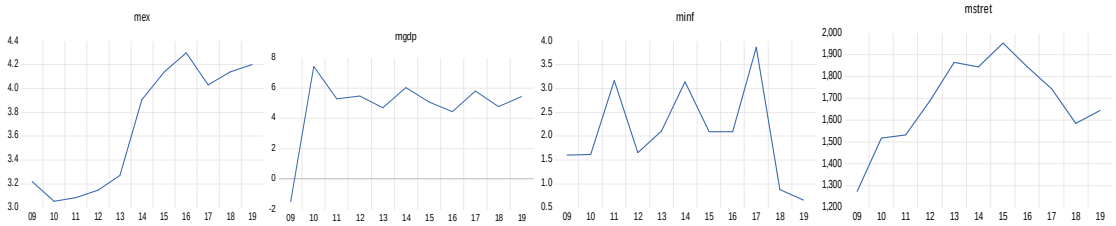
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India



Exchange rate GDP Inflation rate stock return

Malaysia

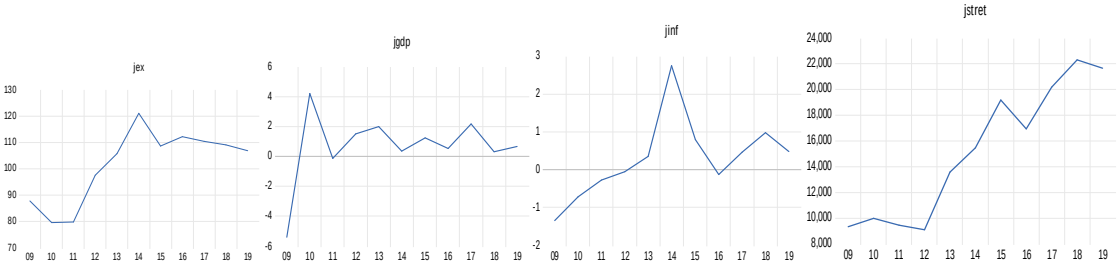


Exchange rate GDP Inflation rate stock return

The figures is given above is indicating Asian countries regarding exchange rate, Inflation rate, GDP, Stock return all are showing fluctuation on regular basic.

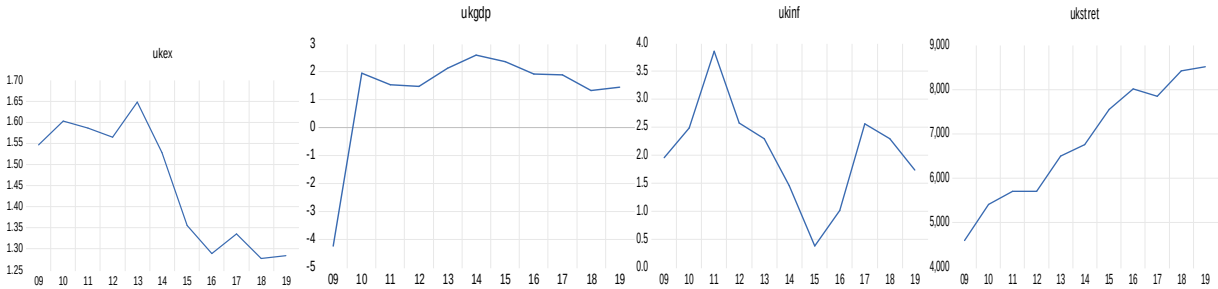
Figure 2
Graphical analysis of Developed countries

Japan



Exchange rate GDP Inflation rate stock return

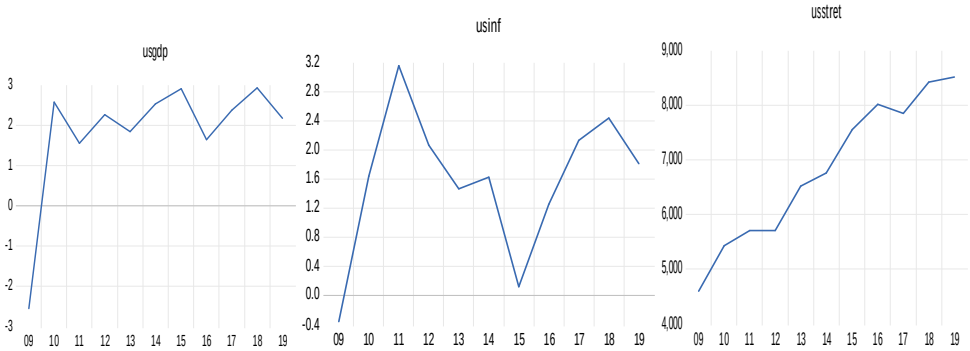
UK



Exchange rate GDP Inflation rate stock return

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US



GDP Inflation rate stock return

VI. ANALYSIS AND RESULTS

Table I
Results of ADF test

Countries	GDP			Inflation rate			Exchange rate			Stock return		
	Const	Intri	pro	Const	Intri	pro	Const	Intri	pro	Const	Intri	pro
India	-3.170500	I(2)	0.0060	-2.92436	I(2)	0.0086	-5.307	I(2)	0.0002	-6.61509	I(2)	0.0001
Malaysia	-8.10577	I(2)	0.0016	-6.6921	I(2)	0.0050	-3.9658	I(2)	0.0016	-5.18723	I(2)	0.0003
Bangladesh	-3.75352	I(2)	0.0284	-28.042	I(2)	0.0001	-3.4815	I(2)	0.0004	-4.95855	I(2)	0.0004
US	-10.5552	I(2)	0.0001	-3.521378	I(2)	0.0034	-4.84915	I(2)	0.0003	-5.03177	I(2)	0.0004
UK	-3.452457	I(2)	0.0044	-3.804837	I(2)	0.0021	-3.39151	I(2)	0.0048	-4.81949	I(2)	0.0006
Japan	-4.849159	I(2)	0.0004	-3.75352	I(2)	0.0001	-4.2948	I(2)	0.0004	-5.25279	I(2)	0.0002

The present study used to time series analysis in three Asian countries and three developed countries it determine causality between GDP exchange rate, inflation rate, stock return. In order to examine Dynamic relationship between GDP, inflation rate, exchange rate, stock return of Asian countries and developed countries data should be stationary therefore four types of unit root test were employed in this log levels and log differenced form between these variables. The above table of unit root test report that the stock indices of three Asian countries and three developed countries India, Malaysia, Bangladesh, Japan, US, UK,. It contains unit root at level as ADF test for 5%

This study used ADF test with and without intercept till data become intercept till the data become stationary. The data series is stationary at i(1) and 2 difference and intercept level as presented in above tables. The P value of ADF test in India GDP value is 0.0006, India exchange rate is 0.0002, and Indian stock return is 0.0001 which are less than 5%.

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It means data series is stationary. Bangladesh exchange rate is 0.0004, inflation rate is 0.0001, stock returns 0.0004. Also predicting the value of ADF test equation the coefficient value ids negative in all cases suggesting that the model is fit.

Table II
Least square test table

countries	Coefficient	Std. Error	t-Statistic	Pro
India	23575.28	2081.086	11.32836	0.0000
Malaysia	1712.230	48.05299	35.63212	0.0000
Bangladesh	9611.514	729.0480	13.18365	0.0000
US	7045.785	370.8370	18.99968	0.0000
UK	7040.153	373.0055	18.87413	0.0000
Japan	15689.29	1606.440	9.766474	0.0000

The Least Square Test helps to examine the Cause and effect relationship between the variables of sample countries. It is estimated by ASIAN countries and developed countries.
This table explains that there is strong relationship among the variables of the sample countries India, Malaysia, Bangladesh, US, UK, Japan where multiple regression statics is significant at 5% in all the cases. The significant relationship explaining that GDP, Inflation rate and exchange rate are quite associate with stock returns of their country.

Table III
Granger Causality Test Results

Null Hypothesis	ob	f-stat	p-values	Decision
INSTRET does not Granger Cause BSTRET	9	0.65244	0.5686	Not rejected
BSTRET does not Granger Cause INRET	9	2.77557	0.1754	Not Rejected
MSTRET does not Granger Cause BSTRET	9	0.81280	0.5056	Not rejected
BSTRET does not Granger Cause MSTRET	9	1.69153	0.2935	Not rejected
UKSTRET does not Granger Cause BSTRET	9	1.69392	0.2931	Not rejected
BSTRET does not Granger Cause UKSTRET	9	2.31633	0.2147	Not rejected
USSTRET does not Granger Cause BSTRET	9	1.72622	0.2881	Not Rejected
BSTRET does not Granger Cause USSTRET	9	2.14812	0.2325	Not Rejected
JSTRET does not Granger Cause BSTRET	9	0.36622	0.7144	Not Rejected
BSSRET does not Granger Cause JSTRET	9	4.01126	0.1107	Not rejected
MSTRET does not Granger Cause INSTRET	9	0.58040	0.6007	Not rejected
INSTRET does not Granger Cause MSTRET	9	1.08729	0.4197	Not rejected

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UKSTRET does not Granger Cause INSTRET	9	1.09456	0.3741	Not rejected
INSTRET does not Granger Cause UKSTRET	9	0.27816	0.7707	Not rejected
USSTRET does not Granger Cause INSTRET	9	1.24518	0.3798	Not rejected
INSTRET does not Granger Cause USSTRET	9	0.26889	0.7770	Not rejected
JSSTRET does not Granger Cause INSTRET	9	2.63506	0.1862	Not rejected
UKSTRET does not Granger Cause MSTRET	9	0.11017	0.8983	Not rejected
MSTRET does not Granger Cause UKSTRET	9	1.46956	0.3323	Not rejected
USSTRET does not Granger Cause MSTRET	9	1.70464	0.2917	Not rejected
MSSTRET does not Granger Cause USSTRET	9	1.18584	0.3327	Not rejected
JSTRET does not Granger Cause MSTRET	9	1.33389	0.2915	Not rejected
MSTRET does not Granger Cause JS TRET	9	0.08376	0.3941	Not rejected
USSTRET does not Granger Cause UKTRET	9	0.10023	03599	Not rejected
UK does not Granger Cause USSTRET	9	1.87528	0.9212	Not rejected
JSTRET does not Granger Cause UKSTRET	9	2.34569	0.9068	Not rejected
UKSTRET does not Granger Cause JSTRET	9	1.78989	0.2664	Not rejected
JSSTRET does not Granger Cause USSTRET	9	2.37639	0.2118	Not rejected

This table explains Granger causality test result. This test was applied between India, Malaysia, Bangladesh, Japan, US, UK. Granger Causality test significant at 5%. In the Granger Causality test if the first value significant than we can say there is unidirectional relationship. If both value is significant than we can say there is bi directional relationship. If both value are not significant than there is no causality between the variable. The Granger causality test was applied to check the causal relationship between the variables. In case of India, Malaysia, Bangladesh f-stat and p-values both are less than 5% which indicate that both value are not significant than it stipulate there is no causality between the variable. In order to achieve, US, UK, Japan f-stat and p-values both are less than 5% which prudent that both value are not significant than it stipulate there is no causality between the variable

VII. CONCLUSION

Recognizing the importance of relationship between the stock market returns for three Asian countries and three developed countries. This paper aim to examine the long term relationship between the stock market returns for three Asian countries and three developed countries and also examine long term and short term co movement of stock indices of stock market.

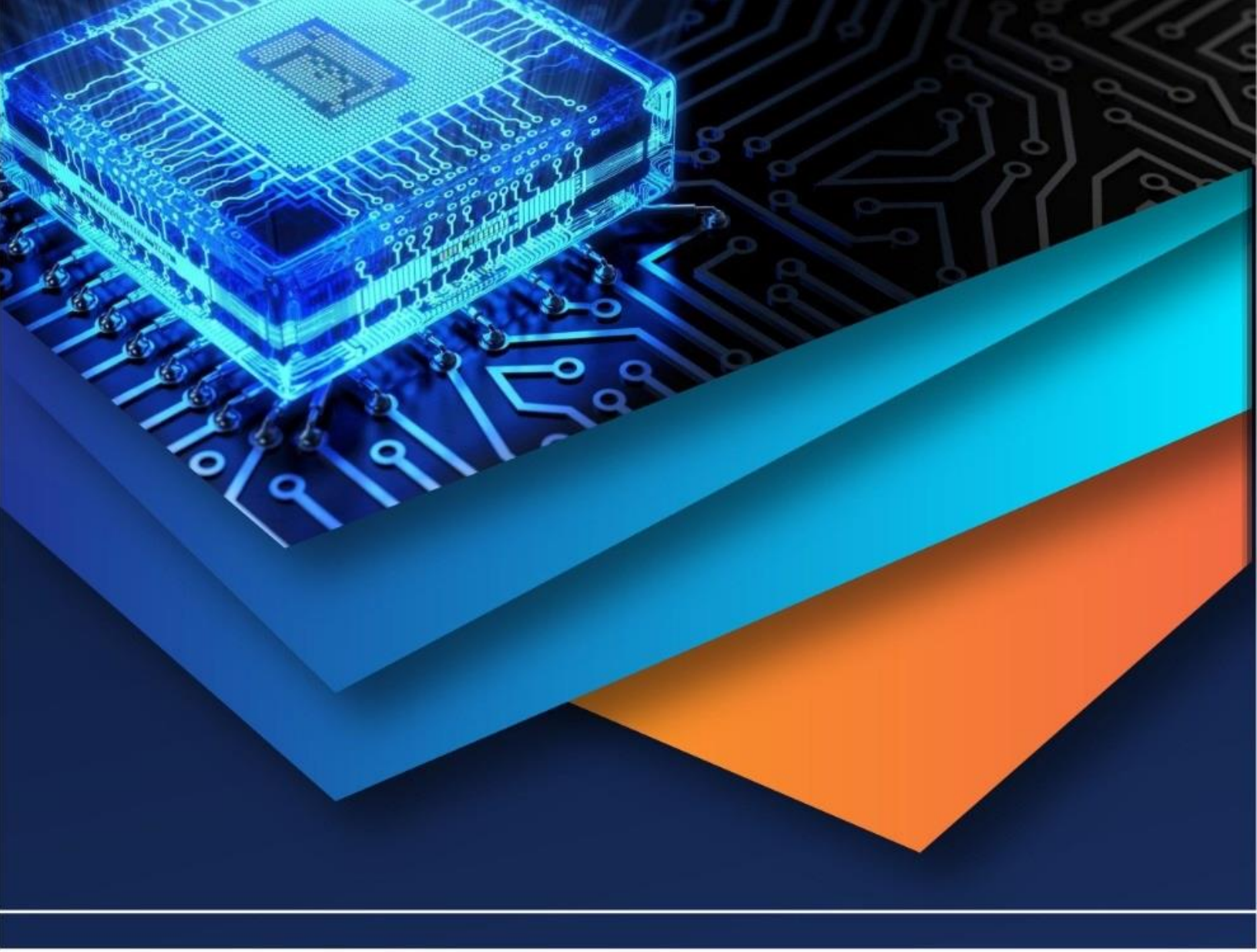
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