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Various Types & Dimensions of Volatility in Stock Markets: An Empirical Analysis

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Abstract: ***Investment in stock market securities is assumed to be more risky because it is relatively more volatile than other markets throughout the world. Volatility is the variation in asset prices change over a particular time period. In this paper, various previous studies were reviewed and various dimensions relating to volatility in stock and other assets were discussed. The studies were related to different stock markets across the countries. These dimensions found useful for the researchers for their research work predicting stock market behavior and eventually for the growth and development of stock markets in a country.***
Keywords: Stock Markets, Volatility, Asset Pricing

I. INTRODUCTION

Volatility in the stock return is an integral part of stock market with the alternating bull and bear phases. In the bullish market, the share prices soar high and in the bearish market share prices fall down and these ups and downs determine the return and volatility of the stock market. Pricing of securities depends on volatility of each asset. An increase in stock market volatility brings a large stock price change of advances or declines. Stock prices volatility has received a great attention from both academicians and practitioners over the last two decades because it can be used as a measure of risk in financial markets. Over recent years, there has been a growth in interest in the modelling of time-varying stock return volatility across India & International Stock Markets.

II. DIMENSIONS OF STOCK MARKET VOLATILITY

1) *Historical Volatility & Implied Volatility:* Historical volatility is that volatility which is predicated on the basis of information in the past or the past data. “Only past data forms the basis of volatility at present. Whereas, the Implied Volatility is a less well-known, but more valuable measure. Unlike historical volatility which is predicted by the past, Implied Volatility is predicted by the market. An analyst can determine such volatility at virtually any instant in time”.
2) *Inter day or Intraday Volatility:* “The variation in share price return between the two trading days is called inter–day volatility. Inter–day volatility is computed by close to close and open to open value of any index level on a daily basis. Intra–day Volatility: The variation in share price return within the trading day is called intra–day volatility. It indicates how the indices and shares behave in a particular day”.
3) *Real economic effects of Financial Market volatility:* Rises and falls in asset prices were associated with changes in household wealth and thus consumption spending. “Equity price changes alter the propensity to invest because they change the relation between the market value of corporate or individual assets and their replacement cost. Equity price changes have an impact on the balance sheet of firms, therefore altering corporate spending. Asset price booms and busts also affect international capital flows which in turn alter currency values”.

Investors interpret a raise in stock market volatility as an increase in the risk of equity investment and consequently they shift their funds to less risky assets. It has an impact on business investment spending and economic growth through a number of channels. Changes in not only local but also global economic and political environment influence the share price movements and show the state of stock market to the general public.

“The developing economies were facing many impediments in their financial markets, and with many other factors, high volatility in prices is a major factor of erosion of capital from markets. As due to this the investors becomes fearful and run away from the market. Though it is not the sign of inefficiency of market but it poses a threat to crash the market due to high volatility. High volatility creates high uncertainty in a stock market and individual security prices and these may curtail the prices and associated return”.

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III. CAUSES OF VOLATILITY

The stock market volatility is caused by number of factors such as change in inflation rate, interest rate, financial leverage, corporate earnings, dividends yield policies, bonds prices and many other macroeconomic, social and political variables such as international trends, economic cycle, economic growth, budget, general business conditions, credit policy etc. “Volatility is driven by trading volume followed by arrival of new information regarding new floats, or any kind of private information that incorporate into market stock prices”.

“Low volatility is preferred as it reduces unnecessary risk borne by investors thus enables market traders to liquidate their assets without large price movements. It is important to estimate volatility since volatility is a key parameter used in many financial applications, from derivatives valuation to asset management and risk management. Volatility measures the size of the errors made in modeling returns and other financial variables. It was discovered that, for vast classes of models, the average size of volatility is not constant but changes with time and is predictable. Volatility of returns in financial markets can be a major stumbling block for attracting investment in small developing economies”.

There were a number of other things that cause volatility. Amongst other things that cause volatility is arbitrage.” Arbitrage is the simultaneous or almost simultaneous buying and selling of an asset to profit from price discrepancies. Arbitrage causes markets to adjust prices quickly. This has the effect of causing information to be more quickly assimilated into market prices. This is a curious result because arbitrage requires no more information than the existence of a price discrepancy”. The faster information is disseminated, the quicker markets can react to both negative and positive news. Improved trading technology makes it easier to take advantage of arbitrage opportunities, and the resulting price alignment arbitrage causes. Finally, more kinds of financial instruments allow investors more opportunity to move their money to more kinds of investment positions when conditions change. Speculation: Another reason for market volatility is speculation. “Speculation is the act of trading in an asset, or conducting a financial transaction, that carries significant risk of losing most or all of the initial outlay, in expectation of a substantial gain. This involves buying and selling of financial instrument and make money from the anticipated price fluctuation”. Speculation causes deviation of price form their intrinsic value.

The world's first stock index futures contract was the Value Line contract, introduced by the Kansas City Board of Trade on February 24, 1982. “Today, stock index futures and options trade in markets all over the world, with new contracts launched nearly every year. The proliferation of stock derivatives trading has shown tremendous growth in securities markets worldwide. Since the late 1980s many national stock exchange markets in industrial countries have become aware of the increased competitiveness among these markets”. This, in conjunction with a less restrictive climate toward capita movements has brought about the view among economists that the major financial markets of the world were systematically interrelated. This interrelationship may indicate a growing similarity in reactions toward external developments in macroeconomic policies and in the world financial environment. In addition, it may also reflect a temporary, or perhaps more lasting, causal relationship between various individual stock exchanges. “The liberalization and integration of financial markets globally has created new investment opportunities, which in turn require the development of new instruments that were more proficient to deal with the increased risks”. The issue of the impact of derivative trading on stock market volatility has received considerable attention during past few years. Although many factors contribute to stock market volatility, there is concern about the impact of derivative trading on stock market volatility. “The uncertainty about future stock price Movements is measured by the volatility. Therefore, the need to estimate and forecast volatility is one of the greatest issues for financial markets”.

“Derivatives trading would help them to manage their risk exposures in emerging markets. Any information related to the impact of derivatives trading on the volatility of the underlying spot market will be beneficial to create a better risk management”. As for the policymakers, having information about the effects of derivatives trading on the spot market volatility would help them to decide whether further regulation of financial markets were needed. “Causal linkages among stock markets have important implications for security pricing, hedging and trading strategies, and financial market regulations. Also the presence of long-term linear and nonlinear relationships may be used to achieve financial gains from international portfolio diversification and to reduce systematic local risks”. After futures trading have been introduced in all main stock exchanges, the economic literature intensified the debate on the impact of derivative trading on spot price volatility. On the theoretical front, two different arguments exist. “The first group of researchers supports the argument that futures trading increase the volatility of the underlying spot market. They argue that futures markets attract uninformed traders because of their high degree of leverage and the activity of those traders increases spot market volatility”. “The second group of researchers presents arguments in favour of the idea that futures trading have a beneficial effect on the underlying cash market by decreasing its volatility. They argue that futures trading increases market depth and enhances efficiency, therefore reduces spot market volatility”.

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In addition, futures market can help to reduce the risk involved in the cash market by providing the hedging opportunities to the market participants. "The uncertainty of the existent theoretical literature implies that the issue of how futures market affects the volatility of the underlying spot markets is mainly an empirical issue". At present, however, empirical literature has also presented mixed results.

"For index derivatives, trading volume of index derivatives often exceeds the trading volume of underlying stocks". The relationship between volatility and trading volume in financial markets has received significant attention from economists as well as market practitioners. Findings of this study will provide valuable information both for the fund managers and for the policymakers.

IV. REVIEW OF LITERATURE

Antoniou & Holmes (1995) analyzed the effect of trading in the FTSE Stock Index Futures in the volatility of the fundamental cash market. Closing price of daily trading day indices for period November 1980 to October 1991 was used in the study.

Arshanapalli & Doukas (1997) examined the association of S & P 500 and S & P 500 Futures Prices for the period October 1987. The study applied co-integration and error-correction estimation techniques, and reported that these markets were extremely integrated for most trading days in the month of October.

Gulen & Mayhew (2000) examined before and after stock market volatility the in-production of equity-index futures trading in 25 countries, with the help of different models that which account for asynchronous figures, asymmetric volatility responses, conditional heteroskedasticity and the joint dynamics of the particular country's index with the world-market portfolio.

Shenbagaraman (2003) analyzed the impact of the opening of the Nifty futures and options contracts on the fundamental spot market volatility. Study took the closing daily prices during the period 5 October 1995 to 31 December 2002 for the SNX Nifty and the Nifty Junior. The effect of index futures and option contract prologue in the Indian market is analyzed by using a univariate GARCH (1,1) model . The Result indicated that Derivative trading has no statistical significant effect on spot Market volatility.

Spyrou (2005) analyzed about the introduction of derivative instruments that stabilizes or destabilizes for underlying assets markets. This study used the closing prices for the main market indices FTSE-ASE -20and ASE General price Index. It covered the term during September 1997 - September 2003.

Khan (2006) covered the period of January 1, 2003 -December 9, 2005 for futures contract. Researcher used the of closing daily prices of the Karachi Stock Exchange (KSE-100) Index and the daily total value of the futures contracts which are traded on the KSE-100 Index. The study found more reliable favor for the alternative hypothesis so as to volatility in the future market will be an outgrowth of the unstable spot market.

Alexakis (2007) investigated effect of beginning of Stock Index Futures on the volatility of Cash Equity Market. Study comprised closing prices daily observations of Spot Stock Index rate from 23rd September 1997 to 7th June 2004.To investigate the impact of the introduction of Stock Futures Contract, a GARCH Model is customized all along the appearance of GJR-GARCH Model particularly to get in account the connection between volatility and information.

Debashish (2008) intended to learn the effect of the beginning of Nifty index futures especially on the volatility of the Indian cash markets. Cash returns volatility is reported to be fewer significant in explanation of the spot returns after the arrival of futures trading in NSE Nifty.

Kasman & Kasman (2008) examined the effect of the beginning of stock index futures on the volatility of the Istanbul Stock Exchange (ISE), by using asymmetric GARCH model basically for the tenure during July 2002–October 2007. Results from EGARCH model designate the beginning of futures trading declined the conditional volatility of ISE-30 index.

Sakthivel (2008) examined the effect of beginning of index futures trading on volatility of Nifty. The results of the study indicated that after the introduction of futures trading declined volatility of stock market which help to increase to increase market efficiency.

Debasish (2009) examined the impact of Future trading on the stock market volatility and operational efficiency of underlying Stock Market in India by considering a particular sample of various selected Stocks. Results of this study informed that there exists a tradeoff among profits and costs which are connected after the introduction of trading in derivative on a short term viewpoint.

Gupta & Singh (2009) examined the effect of Equities, Equity Futures and option trading on ICash market Volatility in India. .For this objective, It was examined that the behaviour of volatility of NIFTY during a period January 1997 -June 2006. Research showed that Future and Option trading have led to decline in volatility which is consistent.

Gahlot et. al. (2010) analyzed the effect of stock market volatility due to trading in equity derivative. The Research showed that there is no statistical significant change of S & P CNX Nifty in stock market volatility Researcher also introduced Dummy variable to examine the effect of stock market future volatility in future that is zero. Miscellaneous results showed the effect of introduction

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of future on the underlying spot market volatility. Nifty showed opposing pattern of increasing in its unconditional GARCH volatility.

Singh & Agarwal (2010) assessed the impact of trading of Index Futures on the Returns and volatility of Index by examining the nature and strength of relationship that exist between Nifty Index and Nifty Futures. Study consisted the closing prices of NF & NSI for a period January 2004 to September 2007. Study used Regression Run using GARCH (1, 1) Model showed that the interrelationship between the markets were strong. GARCH effects were stronger in Spot Index Market for Nifty, ARCH effects were stronger in Index Futures Market. Study concluded that there is bi-directional flow of information from futures Market to the Index Market and vice versa. Study also concluded that Nifty Equity Future trading act the same a Mechanism for Price discovery for Nifty Stock Prices and trading in Future Market provide additional payback to investors and speculators.

Debashish (2011) attempted to investigate the change, if any, in the volatility observed in the Indian stock market due to the introduction of futures trading.

Ray & Panda (2011) examined the impact of the beginning of equity derivatives of the India stock exchange volatility. Study analyzed the impact of equity derivatives on India Stock Market volatility for 2nd January 1998 to 31st December 2009.

Das & Chattopadhyay (2012) examined the effect of equity futures and equity options contracts on cash market volatility. Data on closing spot prices of shares in which there were Derivatives were collected from Capita Line Software Package and data on the closing Indices of NIKKEI 225 and FTSE 100 from http://finance.yahoo.com/q/hp and http://ukfinance.yahoo.com for a period of 1998-2008.

Sahu (2012) examined the effect of equity future derivative trading on cash market volatility, mainly the impact of equity future derivative opening on cash market volatility in India stock exchange by observing daily closing prices of seventy three companies The results indicate that it is concluded in the study that introduction of equity future derivative trading has declined cash market volatility.

Singla (2012) analysed for research was the daily closing prices of S&P CNX NIFTY during term June 14, 1999 to June 3, 2002. Researcher calculated the daily index returns by using the formula ln (pt / pt-1). The Research compared the variances and rolling standard deviation in the daily return data in different period and concluded that there has been statistical significant reduction in the unconditional volatility.

Xie & Mo (2014) analysed the impact on futures stock market volatility in CSI 300 Index. The sample period of this study covers from May 2005 to December 2012.

Venkatraman & Sowmya (2014) analyzed and compared the intraday volatility of futures stocks and index. The price of open, close, high and low of the Future index CNX S&P Nifty and future Stocks such as ITC, INFOSYS, SBI and RELIANCE which were the top 4 stocks in NSE during the period of April-2013 to September-2013 were collected. It was concluded that investors who, were willing to take high risk can invest in future index and those who, were not ready to take high risk can invest in future stocks.

Chen & Zhang (2015) focused the effect of stock equity index futures the stock exchange by observing CSI 300 index. Data used in study was selected from April 16, 2010 to December 31, 2014. Result of the study showed that the stock equity index future that is not significant effects on spot market volatility.

Movalia (2015) focused the effect of F&O on volatility in Stock Market with reference to S&P CNX Nifty. Study was conducted for the period of June, 2000-01 to 2014-15(February). Regression was applied to know relationship between effect of derivatives (F&O) turnover of Cash market. It was concluded that it is showing strong positive association among F&O and Cash Markets. So introduction of Derivatives (F&O) has created more volatile market and has enhanced the investor's confidence and wealth.

Raghavan & Tomar (2017) identified the retail investor's perception on derivatives trading.

In this paper convenient sampling method was used in Visakhapatnam District. The findings of this study were that derivative equity market facilitate to retail investors to enlarge their investment in the long period.

Kaura et. al. (2018) investigated the issue of price discovery and volatility spillovers in the context of non-agricultural sector of Indian commodity market using econometric models. The study uses the futures and spot price data of nine highly traded non-agricultural commodities of Multi Commodity Exchange of India Limited. The results prove that all commodities futures and spot prices are co-integrated. There exists bidirectional error correction in all commodities spot and futures market, and futures market leads in price discovery over the spot market. Only in the case of commodity gold, spot market leads the futures market. The results of GARCH test prove that there are bidirectional spillover effects in the case of most of the commodities, and spillovers from futures returns to spot returns are more prominent than the other way round. The results imply that futures market in India is playing its role in improving pricing efficiency and also influences the spot market volatility.

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BouriElie et.al. (2019) studied the volatility relation between commodities and sovereign risk of BRIC. They used the GARCH-quantile regression with a dummy variable. The authors studied whether the contemporaneous and lagged volatility of the commodity/energy markets can help predict the volatility of Brazil, Russia, India, China (BRIC) sovereign risk in the quantiles, They first define the latent volatility using Generalized Autoregressive\Conditional Heteroscedasticity (GARCH) specifications and then use it within a quantile-based regression augmented with a dichotomous variable identifying the periods before and after the mid-2014 energy price decline. The analysis on daily data from January 4, 2010 to August 31, 2016 provides evidence that the volatility relation between commodity/energy and sovereign Credit Default Swap (CDS) markets is not the same under different volatility conditions, although energy volatility is slightly more important than commodity volatility. Importantly, the volatility of commodity/energy markets shapes sovereign risk in middle and upper volatility quantiles of commodities/energy exporters (Brazil and Russia). While in commodities/energy importers, such as China, predictability is only significant in upper volatility quantiles. The study reveals the importance of the mid-2014 energy price decline for the volatility dynamics of BRIC sovereign risk; after the mid-2014, the volatility of the sovereign risk has increased in Brazil and Russia, while it has decreased in India.

R L, M. & Mishra. (2020) studied the Price discovery and spillover effect are prominent indicators in the commodity futures market to protect the interest of consumers, farmers and to hedge sharp price fluctuations. The purpose of this paper is to investigate empirically the price discovery and volatility spillover in Indian agriculture spot and futures commodity markets. This study uses Granger causality, vector error correction model (VECM) and exponential generalized autoregressive conditional heteroskedasticity (EGARCH) to examines the price discovery and spillover effects for nine most liquid agricultural commodities in spot and futures markets traded on National Commodity and Derivatives Exchange (NCDEX). The VECM results show that price discovery exists in all the nine commodities with futures market leading the spot in case of six commodities, namely soybean seed, coriander, turmeric, castor seed, guar seed and chana. Whereas in case of three commodities (cotton seed, rape mustard seed and jeera), price discovery takes place in the spot market. The Granger causality tests indicate that futures markets have stronger ability to predict spot prices. Supporting these, the results from EGARCH volatility test reveal that there exist mutual spillover effects on futures and spot markets. Thus, it could be inferred that futures market is more efficient in price discovery of agricultural commodities in India.

Rastogi & Agarwal (2020) found the volatility spillover effects across spot, futures and option markets. The NIFTY 50 index is taken into observation. The study period is from January 8, 2010 to October 25, 2019. The main findings of this paper are: a bi-directional volatility spillover effect is found between spot and futures market and is a bit stronger from spot side; no volatility spillover was found between spot and options market in which both call and put contracts are considered; a unidirectional shock volatility spillover was reflected from futures to call options contract but there were no price volatility spillover effects across these markets. Bivariate BEKK-GARCH model was implemented to find the volatility spillover effects among these markets. Later CCC-GARCH model was used to find the close proximity between the markets to check the robustness of our volatility spillover results obtained from bivariate BEKK-GARCH and the results from CCC GARCH supports the BEKK-GARCH results.

V. CONCLUSION

The various dimensions relating to stock and other markets are identified from the previous studies as:

1) Volatility spillover effects across spot, futures and option markets.
2) Price discovery and spillover effect are prominent indicators in the commodity futures market to protect the interest of consumers, farmers and to hedge sharp price fluctuations.
3) Pattern of volatility in daily return from select Commodity Futures and Stock market in India.
4) Volatility relation between commodities and sovereign risk of BRIC
5) Issue of price discovery and volatility spillovers in the context of non-agricultural sector of Indian commodity market
6) Retail investor‘s perception on derivatives trading
7) Effect of F&O on volatility in Stock Market with reference to S&P CNX Nifty
8) Effect of stock equity index futures the stock exchange by observing CSI 300 index.
9) Intraday volatility of futures stocks and index
10) Impact on futures stock market volatility in CSI 300 Index.
11) Statistical significant reduction in the unconditional volatility.
12) Effect of equity future derivative trading on cash market volatility, mainly the impact of equity future derivative opening on cash market volatility in India stock exchange
13) Effect of equity futures and equity options contracts on cash market volatility.

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14) Impact of the beginning of equity derivatives of the India stock exchange volatility.
15) Investigate the change, if any, in the volatility observed in the Indian stock market due to the introduction of futures trading.
16) Impact of trading of Index Futures on the Returns and volatility of Index by examining the nature and strength of relationship that exist between Nifty Index and Nifty Futures.
17) Effect of stock market volatility due to trading in equity derivative.
18) Effect of Equities, Equity Futures and option trading on ICash market Volatility in India.
19) Impact of Future trading on the stock market volatility and operational efficiency of underlying Stock Market in India by considering a particular sample of various selected Stocks.
20) Effect of beginning of index futures trading on volatility of Nifty.
21) Effect of the beginning of stock index futures on the volatility of the Istanbul Stock Exchange (ISE), by using asymmetric GARCH model
22) Effect of the beginning of Nifty index futures especially on the volatility of the Indian cash markets.
23) Effect of beginning of Stock Index Futures on the volatility of Cash Equity Market.
24) Reliable favor for the alternative hypothesis so as to volatility in the future market will be an outgrowth of the unstable spot market.
25) Introduction of derivative instruments that stabilizes or destabilizes for underlying assets markets.
26) Impact of the opening of the Nifty futures and options contracts on the fundamental spot market volatility.
27) Before and after stock market volatility the in-production of equity-index futures trading in 25 countries,
28) Association of S & P 500 and S & P 500 Futures Prices
29) Effect of trading in the FTSE Stock Index Futures in the volatility of the fundamental cash market.

These various dimensions related to Stock Markets provide a useful insight to the researchers predicting stock market behavior & pattern of its growth & development.

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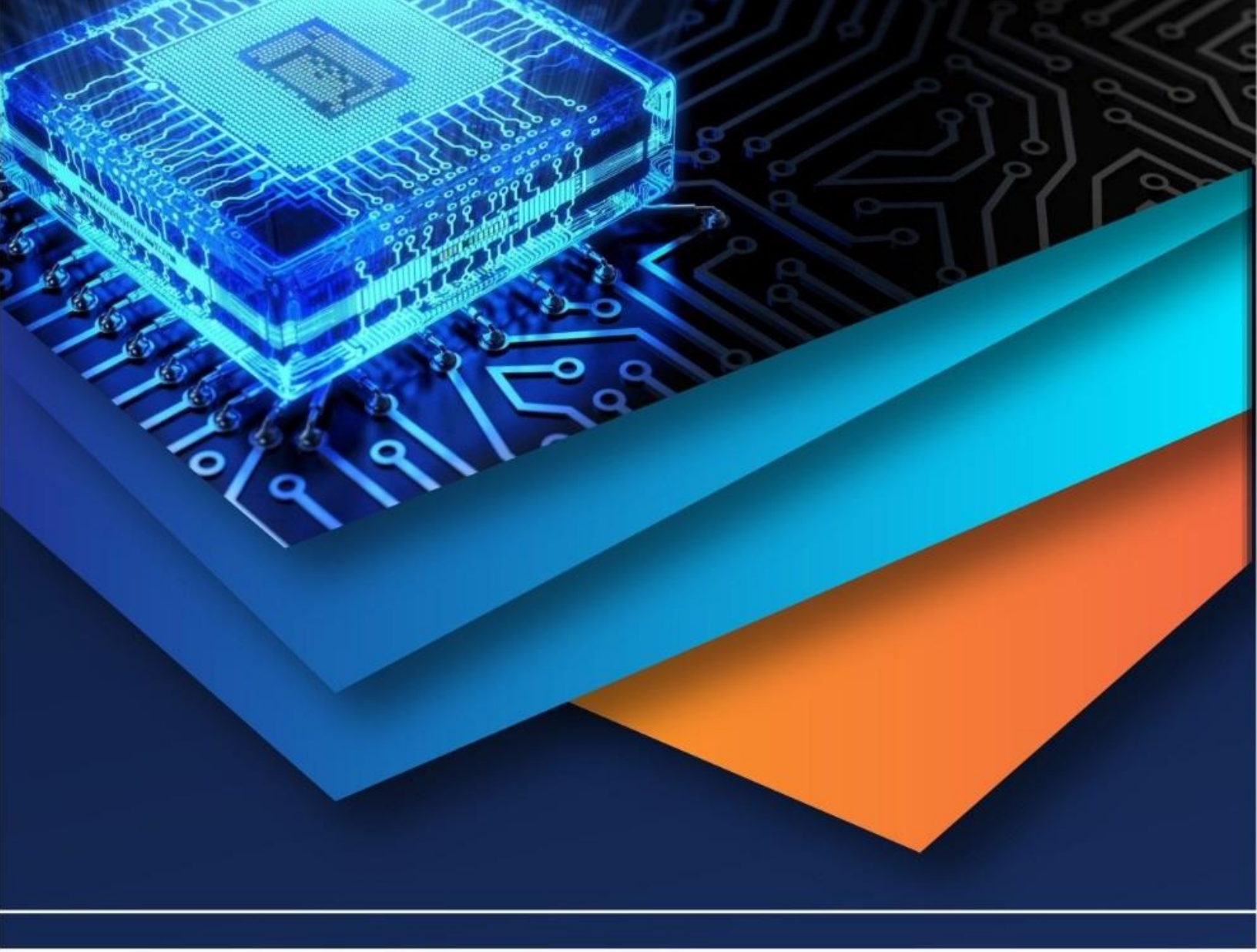

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