DERIVATIVE TRADING IN EMERGING MARKETS: A SURVEY

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No doubt in recent past there has been overwhelming use of derivatives in advanced economies but its use in emerging economies has also accelerated, especially after global financial crises. However, derivatives operate under different conditions in emerging markets. In this survey, we have analyzed the literature on derivatives use in emerging economies to see if its role in these economies is any different from that in advanced countries. We have focused on issues that have attracted attention in last four years with respect to use of derivatives such as price discovery, risk management and hedging, price stabilization, market efficiency and market structures.

***Keywords**: Derivatives, Emerging Economies, Exchanges, Risk, Hedging, Price Discovery*

JEL classification: G0, G12, G18,O57

1. Introduction

The emerging economies have witnessed a phenomenal growth in derivative markets in recent years. As these economies are growing in size and income and consequent outward orientation, the market players are increasing their reliance on derivatives. However, development of the derivative instruments and its markets has not been uniform across all emerging economies, with some being more robust than others. The main derivative activity has been concentrated in Korea, Brazil, and the two Asian financial centers of Singapore and Hong Kong (Mihaljek and Packer, 2010). Amongst all derivative instruments, foreign exchange (FX) derivatives have the largest share, clearly in line with economies' outward orientation. The existing literature has primarily focused on financial derivatives though there has been emergence of commodity futures and options markets in China, India and Korea. Another feature of derivative markets in emerging economies is that about half of total turnover comes from over the counter (OTC), whereas the share is about one third in advanced counties (Mihaljek and Packer, 2010).

The mainstream literature on derivative use has concentrated on advanced countries mainly due to liberalized markets and huge turnover of derivatives on both OTC and exchanges. But in the last decade there have been many studies on derivative use in newly emerging

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economies (Atilgan, Demirtas and Simsek, 2016). All these studies have focused on different economic aspects of derivatives like price discovery, hedging effectiveness, market structure and market efficiency (Lien and Zhang, 2008). The derivative instruments and markets work under different economic conditions prevalent in these emerging countries. As these economies adopt derivatives, the question as to what role derivatives play in these economies in terms of their traditional functions becomes very significant. The motivation for this study emerges out of understanding the role of derivatives in the different contextual setting of emerging economies. Especially of interest to us is the question whether global financial crises had any impact on derivative use in these economies.

Another notable feature of derivative markets in emerging economies is that price discovery is still taking place in advanced countries especially for foreign exchange and for important commodities like wheat, corn, soybean, gold, silver, crude oil and others. This throws up a question as to why price discovery for such commodities is not taking place at consumer centers in emerging economies. To find an answer to this question and other related issues, we address the following concerns in emerging economies:

- How far do futures prices help in price discovery?
- Do derivative markets in emerging and advanced countries co-integrate?
- Do microstructure issues like trader types, order limits, margins, and liquidity affect the prices, profits, etc.?
- Are derivative markets efficient in terms of having no arbitrage opportunities?

Emerging economies have less sophisticated markets and derivatives operate in a less competitive environment. In commodity space, the physical market is fragmented, underdeveloped and lacks uniform standardization (Ramaswami and Singh, 2007). In addition not all financial instruments are available for proper risk management. This is why the appraisal of the performance of derivative markets in emerging economies has its own significance.

2. Derivative Trading in Emerging Economies: Issues

The economic rationale of derivative markets is price discovery and risk management. The derivatives have outgrown their traditional functions and are now being increasingly utilized for generating profits. Derivatives can be classified into two types- foreign exchange traded (FX) and OTC derivatives. Despite their economic rationale being risk management, they were mainly utilized as speculative tools to maximize returns. That is why after the global financial crises, derivative studies have invited skepticism of new kind. There have been

many studies on use of financial derivatives by non-financial firms as well as banks (Rivas-Chavez, 2003). This usage of financial derivatives by these firms in emerging economies is markedly different to that in developed countries. The domain knowledge and understanding about derivatives greatly influences the derivative use in emerging economies.

The derivatives literature has also examined the relationship between derivative use and global financial crises in many East Asian Economies (Karwowski and Stockhammer, 2017). Derivative trading had encouraged capital inflows through interest rate and currency swaps. Derivatives can hide many risks to counterparties that exacerbate their destructive role in emerging economies. In many emerging East Asian economies, the increased short-term lending by banks during financial crises worked through derivative contracts. Some other financial derivative instruments like loans with put options as well as its ability to reduce transparency in financial reporting was also responsible for financial crises in many emerging economies.

Despite the potential destabilizing role of derivatives because of its leveraging position, they have been used as a welfare-enhancing tool especially in commodity futures markets. In the last decade, many commodity exchanges have emerged in China, India and other similar economies. The number of contracts traded and volume of trade have witnessed an exceptional growth. In the domain of financial futures too, index futures, options, interest rate and currency swaps have made substantial headway (Table 1).

Table 1: Volume of Trade of Futures and Options at Different Exchanges

Region	Jan-Dec 2015	Jan-Dec 2014	Change (per cent)
Asia-Pacific	9,701,681,822	7,257,085,363	33.7
North America	8,195,399,670	8,215,935,876	-0.2
Europe	4,769,831,611	4,409,853,320	8.2
Latin America	1,450,744,978	1,516,759,488	-4.4
Other	658,103,273	433,297,533	51.9
Total	24,775,761,354	21,832,931,580	13.5

Note: Other includes volume at exchanges in South Africa, Greece, Turkey and Israel
Source: FIA's Annual Survey of Derivative Exchange Volume, 2015

Asia has been the major contributor of increase in derivative use in the World. In fact, Asia Pacific region witnessed a 33.7 per cent rise in volume of trade of derivatives. This has shifted the engine of growth of futures and options trading from advanced nations to Asia. The major exchanges in Asia that led to this growth are Korea, Singapore, Hong-Kong,

China and India. This has been more so after the global financial distress.

In emerging economies, the share of OTC and exchange traded derivatives is about the same. The foreign exchange derivatives are more successful than interest rate derivatives. One of the very active derivative markets is for Chinese Renminbi averaging about $150 billion a day (Upper and Valli, 2016). Derivatives have achieved an international dimension and emerging country currency trading is taking place off-shore. The increased financialization of these economies has also contributed to an enhanced use of derivatives in these economies (Mihaljek and Packer, 2010).The most liquid fixed-income derivatives are being traded at Singapore, Brazil and South Africa. Equity index derivatives are actively being traded at Hong Kong, Taiwan, Korea, Brazil and South Africa (Lien, 2008). However, derivative contracts being traded at exchanges in emerging economies markets are less complex compared to advanced countries. Compared to their relative contribution in global GDP, their share in derivative markets is much less.

Coupled with their growth in emerging markets, derivatives have been performing a variety of functions and roles. Some of these roles are price discovery, risk management, price stability, market structures and market efficiency. These functions have not been clearly understood as derivatives operate in different setting of emerging economies. In this study, we are trying to understand whether derivatives use is efficient and serves its economic functions for which they are designed. The focus of our discussion centers around price discovery, price stabilization, hedging effectiveness, market efficiency and microstructure of market functions of derivative trading.

(i) Price Discovery: These studies entail formation of prices based on information in futures and cash markets. Majority of studies have demonstrated that information transfers from futures to spot market with estimates ranging from immediate to thirty minutes. Futures and options affect production decisions through its expectations about demand (Stoll and Whaley, 1990). The evidence in the opposite direction is weak though not absent in some other studies. The degree of integration of futures and cash markets depends on elasticity of arbitrage services. There is evidence that two markets integrate over long- run but there are slippages over short-run. Others studies have also examined the volatility spillovers between the futures and cash markets in order to establish the linkages between these markets. We examine price discovery and linkages of spot and futures markets in emerging economies to see how derivatives affect this transmission.

(ii*) Price Stabilization***:** The futures markets facilitate storage decisions by enabling stakeholders to hedge against price risks. Academic research has extensive studies on

relationships between futures prices, production and inventories (Dasgupta, 2004). Attainment of price stabilization, however, is based on quite restrictive assumptions. Particularly, in emerging economies where the markets for commodities are less competitive and thin, futures positions can be manipulated to distort cash prices as evident in studies of Khwajaa and Mian (2005). Some other studies have also demonstrated that cash prices are not influenced by futures trading. Several empirical event studies have tried to capture developments before and after introduction of derivative markets and also, examined the behavior of prices around maturity dates. There is evidence of price effect on both sides. Since in many emerging economies like China, India and Brazil, inflationary pressures can affect sectoral resource allocation and these countries suffer economic inequalities and poverty, the question of price stabilization assumes great significance.

(iii) Hedging Effectiveness: Both theoretical and empirical research is abundant with risk management function of derivative markets. The futures and options markets provide insurance against risk and the positions taken in derivative markets can be used to hedge against price risk inherent in cash positions. The optimization of hedging has been the cornerstone of hedging research. The hedging strategy is based on utility maximization postulates. This analysis entails the maximization of expected utility subject to variance minimization. Empirically, the hedging literature on derivatives has tried to define optimal hedge ratio, both static and dynamic. In commodity markets, hedging strategy takes into account price and output uncertainties as well as price-quantity relationship. In financial derivatives domain, hedging strategy has been employed in currency markets. It has been used both for taking single and multiple risks. In the context of emerging market economies, the hedging of exports has been seen as a better strategy to protect exports (Fortenbery and Zapata, 2004). In emerging markets protecting against exchange risks constitutes a major benefit of derivative markets. There has also been research on taking multiple positions in derivative markets to insure against multiple risks associated with foreign contracts. It is highly motivating to see how derivatives are employed to manage risk in emerging economies. Hedging assumes importance in emerging economies as these economies are becoming globally integrated and thus, face uncertainties in prices and output. Since many of emerging economies are commodity producers, risk management through derivatives needs an examination.

(iv) *Market Efficiency*: The market efficiency debate centers around weak, semi-strong and strong efficiency. It ascertains the question that there remain no arbitrage opportunities with prices manifesting complete information. In emerging economies this investigation has been done for many economies including India and China.

(v) *Microstructure of the Market:* The microstructure of derivative markets has also been researched to know about the role of margins, ownership and management, clearing arrangements, contract specifications and delivery settlements (Tsetsekos and Varangis, 1997). It is more pertinent to emerging economies as many of the institutions are evolving and maturing. Many of the emerging exchanges are making joint efforts with developed exchanges to introduce and manage contracts. The literature on the structural issues has important significance for developing regulation in emerging market economies.

In this study, we have utilized the literature that has been available since 2011 in mainstream journals and focus on derivative use and functions around the themes mentioned above.

3. Empirical Literature

3.1 Price Discovery

The economic justification of futures markets is its ability to discover prices. Price discovery role of futures markets has been researched thoroughly in literature both in mature and emerging market-settings. Though emerging markets suffer from thinly traded volumes, underdeveloped spot markets, inadequate regulation, lack of risk management instruments, yet derivative markets have worked quite well. Ryu (2015) investigate the information content of futures and option trades of underlying securities of Korea Composite Stock Price Index (KOSPI) 200 index. They trace the price effects of trades over successive periods of time. The price effect seems quite permanent and futures markets have better price discovery than options markers. Individual trades have less information content than institutional futures trades. In addition, these institutional trades also have lasting impact on prices.

Lee and Ryu (2014) analyze regime-dependent dynamics between Korea's implied volatility index (VKOSPI) and stock market index (KOSPI 200) under different market conditions. Firstly, they observe a negative contemporaneous relationship between the VKOSPI and KOSPI 200. Secondly, while the KOSPI 200 generally leads the VKOSPI under normal market conditions, this relationship is reversed when market volatility as measured by VKOSPI is very high. Thirdly, the effects of lagged VKOSPI on the KOSPI 200 are positive only under higher volatility regime, while the effects of lagged KOSPI 200 on the VKOSPI are positive only under normal conditions. Additionally, KOSPI 200 is more affected by VKOSPI when volatility is high than in lower volatility regime.

The issue of price discovery has also been examined in Taiwan derivative markets. Chen, Chung, and Yuan (2014) discuss how positive and negative volatility information can be captured from the deviations in put-call parity. It also contains information about future

trading volume. Traders with privy to positive volatility information trade in option market in the first place and then its effect is visible in underlying index. The predictive ability about volatility is better in options having high liquidity and in underlying asset with fewer turnovers.

Studies in Indian Context: Sendhil et al. (2013) examine the efficiency of futures trading in wheat, chickpea, maize and barley markets. The futures and spot market prices co-vary in all but for barley. The futures market is more efficient in discovering prices in wheat and maize. Spot prices exhibit pattern of volatility persistence. However, they do not show any explosive trend. Farmers are not able to take part in futures markets due to their small holding size.

Singh (2015) investigates the price discovery function for two commodities - nickel and zinc on Multi-Commodity Exchange (MCX) using cointegration technique, error correction model and Granger causality test. The study finds that both spot and futures prices are co-integrated and exhibit a stable long-run equilibrium relationship. Further, the relationship between spot and futures market is bi-directional but the futures market is more robust in terms of information assimilation.

Kumar and Arora (2011) examine price discovery in gold market in India. Using cointegartion techniques, the results clearly indicate that a gold market discovers prices very efficiently.

Studies in Chinese Context: Many Chinese research studies have been undertaken on derivative trading. Yang, Yang and Zhou (2012) investigate transmission of price and return volatilities between the Chinese stock index markets and stock futures market to gather more knowledge about information flows between these markets. There is abundance of individual players over institutional traders in capital market. Authors employ recursive cointegration method to analyze the time varying price discovery of Chinese stock futures market. In contrast to developed markets, the paper finds that in the initial period of introduction of stock futures, it was not informational efficient because of restrictions on entry into the market. During this period, the cash market was better place for price discovery. The stock index futures did not contribute to cash market slide in the initial period of introduction. The authors also observe bidirectional intraday price discovery and volatility transmission between the Chinese stock index and the stock index futures markets.

Guo et al. (2013) look at the relationship between Chinese financial futures (Chinese Security Index, CSI300) and Singapore A50 index futures. They find that Chinese CSI300 scores over the A50 futures in both intraday price discovery and volatility spillovers, clearly

showing their progression towards maturity. In each market, the futures discover prices better than corresponding cash market. However, given small size of Singapore A50 futures compared to CSI300, its informational efficiency is not small. It does contribute to price discovery and volatility transmission.

Xie and Huang (2013) look at how Chinese security index (CSI300) futures affect price in underlying spot market. This paper analyzes the volatility magnitude, spot price sensitiveness to information, asymmetric volatility in spot prices to know about the effect of futures on spot markets. The authors find no substantial reduction in cash market volatility after the introduction of CSI index futures. However, the linkage between the two markets has increased the spot market sensitiveness to historical information and decreased it to new information.

Xu and Wan (2015) argue that in the available literature on advanced nations, price discovery takes place in low transaction futures markets over cash markets. However, in emerging economies, this discovery is questionable. Authors use information and common factors to probe the question of price discovery in CSI index futures. Information asymmetry across different traders can be used to classify investors as institutional and individual. Institutions rely on informed decisions whereas individuals act on sentiments. Authors investigate the relationship between institutional and individual trading and price discovery on index futures markets. They find that institutional trading positively impacts price discovery whereas the individual trading affects price discovery negatively. Since there is dominance of individual investors in this market, the participation of institutional investment will improve the price discovery function of this market.

Studies in Context of Other Emerging Economies: Bowe et al. (2013) use very liquid 28 days interbank interest rate futures contract (Tasa de Interés Interbancaria de Equilibrio-TIIE28) being traded on Mexican derivative exchange to analyze the price effects of trading intensity. The examination involves finding relationship between liquidity, order flows, duration between transactions and their separate and combined directional effect on TIIE28 futures prices. The temporary and permanent information parts of duration affect prices positively and negatively respectively. Duration timing has increasing effect on prices. Price decreases when liquidity increases and order flows decrease, respectively. The second effect, however, is smaller than the first relationship. The liquidity components suggest that market makers trading behavior dominates the price impact of trade process variables on Mexican Derivatives Exchange (MexDer).

Arce et al. (2013) analyze the difference between the sovereign bond yield spread and

corresponding credit risk default (CDS) spread. Abstracting from market frictions and other abnormalities, spread difference, i.e. basis, should be zero. However, the European sovereign debt crises, including in Greece, presents interesting analysis about the above hypothesis. Authors look at the difference in spreads and their possible causes. Counterparty risks were found to have negative effect on basis spread. Lagged basis tend to persist, thus resulting in lower movement for adjustment in basis. Also, more credit risk information is imbibed in sovereign bond market because of its state-dependence. What constrains the CDS market in price discovery process is the counterparty risk and similar volatility pattern across European equity markets.

Park (2015) finds that currency and interest rate hedging and counterparty default, funding and market risks are important factors to determine the deviation from equilibrium levels of interest rate swaps (IRS) rates and currency swaps (CRS) rates in Korea. There are linkages amongst CRS, IRS and Korean Treasury Bond rates and sudden movements in CRS rates do affect the movements in IRS and KTB rates.

It seems that as derivative markets in emerging economies mature with the introduction of more risk management instruments as well as with more institutional investors, price discovery will improve and derivative prices will lead spot prices. Like advanced countries, institutional players help discover prices better than individual investors. When there is preponderance of individual investors in emerging derivative market, price discovery is weak. As the liquidity and volumes improve in these markets, derivatives lead cash markets. In the initial phase of development of derivatives, this market is not so informational efficient in discovering prices. This is true for both financial and commodity derivatives. Additionally, as these markets become more integrated with global exchanges, they will co-vary with them, thus resulting in better price discovery.

3.2 Price Stabilization

There has been a raging debate about price stabilization impact of futures and options trading in emerging markets. It is more so in the domain of commodity derivatives as it concerns major stakeholders like consumers, producers and policy makers. Derivative trading affects the commodity spot market volatility through production decisions, inventory management and expectations (Dasgupta, 2004). There have been diverging studies about price stabilization roles of future and option markets in emerging economies. On the one hand, we have literature supporting price stability role of commodity derivatives through better price discovery, efficient markets and informed risk management. On the other hand, we have studies showing destabilizing impact of commodity derivatives through excessive

speculation and manipulation (Ahmad and Sehgal

Financial derivatives too have impact on underlying assets. Bohl et al. (2011) investigate unique micro-structural issue of predominance of individual traders in futures market in Poland to analyze their influence on spot market volatility. Employing Markov-switching-GARCH model, authors find no evidence of futures markets destabilizing spot market.

Chen, Han, Li, and Wu (2013) examine the same impact on Chinese Stock Markets. They find that futures reduce cash price volatility substantially. Xie and Mo (2014) on the other hand find little evidence of any significant long-term impact on spot market volatility after the initiation of CSI 300 index futures trading.

Using intraday data from KOSPI200 futures market, Ryu (2013) investigate the price impact of buy and sell orders as well as information content of trade size. Based on modified MRR model, the study concludes that larger trades exert greater impact on prices than smaller ones. Also, sell orders have more information than buy orders. This result is drastically different from earlier studies that showed buy orders exerting greater impact. This could be due to high volume of trading, liquid market, market structure and behavioral pattern amongst traders.

Tsai et al. (2015) study the linkages of a new law targeting speculation in real estate, "New National Ten" and the Shanghai composite index. This market volatility and asymmetric behavioral linkages between stock market and real estate are on account of investors' speculative behavior. Results clearly show that promulgation of law had stabilizing effect on stock market. Market participants expect market to behave asymmetrically and become bullish. The stock market participants expect policy to be permanent.

Yang (2016) establishes that the agricultural commodity cash prices tended to become stable after the introduction and development of sugar futures markets at Zhengzhou Commodity Exchange at China.

The commodities futures markets in emerging markets have invited a lot of skepticism from public and policy makers for inflationary spikes. Especially, India and China being populous countries need to be very careful in designing such contracts as inflation affects allocation of resources and also impacts the poor masses adversely. In general, there is a contradiction in terms of introducing risk management derivatives as well as managing these markets and its players so that they don't manipulate the markets. Many of the commodity markets in emerging markets are thin and underdeveloped; hence, they can be easily cornered by market players. Additionally, the regulation in these markets is also not tight leading to

episodes of market manipulations. The evidence about price stabilization is tilted towards reduced volatility than about destabilization in emerging economies. This is true both about financial and commodity derivatives.

3.3 Hedging Performance

One of the other economic rationales of using derivatives is risk management. The literature of risk management function of derivatives on emerging economies focuses more on currency and commodity derivatives. Hammoudeh and McAleer (2013) emphasize this theme of risk management and financial derivatives. Rossi (2012) uses non-linear model specification to gauge the exchange rate exposure of Brazilian non-financial firms as well as relationship between exchange rate movements and value of companies. The main factors causing non-linearity in companies' foreign exchange exposure and value are exports, foreign currency denominated debt, and currency derivative use. Gatopoulos and Loubergé (2013) identify motivation for non-financial firms to use currency derivatives when countries face financial stress in Latin-American countries and firms have substantial foreign debt. The use of long-term foreign debt is not independent from the short-run use of currency derivatives. The expected devaluation significantly determines the foreign debt ratio and derivative ratio. Authors are able to determine the choice of derivatives as hedging tool in the aftermath of financial crises.

Kim and Kim (2015) discuss the firms' choice for stabilizing their foreign exchange exposures in emerging economies especially when they face external shock like financial crises. Authors address the question of use of hedging to tackle exchange rate uncertainties so that firms can maintain their value. The firms are less exposed to exchange uncertainties if they are engaged in hedging activities. There is evidence of relationship between sound corporate governance and risk management use by firms. The firms imbibing corporate governance in their operations will use hedging more than others. Hedging significantly improves the financial position of firms when governance is stronger. However, this relationship is weak during crises period.

Chkili (2016) discusses as to whether gold can act as a hedge and observe dynamic linkages between gold and stock markets across BRICS countries. This paper examines as to whether this relationship has remained resilient to global financial and European debt crises. Using conditional correlations and variances, it observes asymmetric behavior of equity markets. The negative shocks have more impact, thus requiring gold to act as refuge asset. It also calculates the hedge effectiveness of two asset portfolio- stocks and gold.

Many studies also examine the role of Central Banks in foreign exchange through financial

derivatives. Kohlscheen and Andrade (2014) examine the effects of action of Brazilian Central Bank with regard to currency swap auctions on the US Dollar- Brazil Real (USDBRL) exchange rate. Currency swap derivatives undertaken by Central Bank of Brazil do impact the exchange rate level without altering the foreign currency supply. This supply of currency swaps provide alternative to hedgers to demand the currency, thereby affecting its price. Short positions by the Central Bank in currency swap markets had more impact than long position. Keefe and Rengifo (2015) find that the Colombian Central Bank used inflation-targeted monetary policy while undertaking volatility option strategy. Such currency put and call options have also been associated with lowering of volatility in foreign exchange markets.

Apart from focusing on foreign currency derivatives, there has been some research focusing on credit risk defaults. Hammoudeh et al. (2014) analyze the co-movement of five Chinese commodity futures market indices and Shanghai stock exchange composite index (SHCI) in China for portfolio diversification. Copula functions are employed to examine the average and upper and lower end dependence between two markets. Empirically, they find low and positive dependence between two markets signifying partial co-movements. By employing the two asset classes of commodity and stocks, traders are able to diversify their risk and protect them from downside risk.

The academic literature on derivative use has also examined the valuation of firms. Ameer et al. (2011) have done a survey of derivative use in emerging economy like Malaysia. The two derivatives that are used substantially in Malaysia are foreign exchange and interest rate. They document the factors that constrain firms from using derivatives, what kinds of firms and instruments are involved, and how they are handled with regard to governance and accounting within the firm. The survey does not support the hypothesis of using derivatives to lower the cost of capital of firms, even if used effectively. Coutinho et al. (2012) look at the effectiveness of currency derivatives use for determining the cost of capital of Brazilian listed non-financial companies. Their empirical examination shows reduction in cost of capital through hedging instruments. By employing total average cost of capital (TACC) model, authors find that hedging frees up the locked up capital, thus lowering cost of capital to the company. Gómez-González, Rincón, and Rodríguez (2012) also find positive association between derivative use through hedging and firm's valuation as measured by Tobin's q for Colombian firms.

Banks also face financial risks due to highly leveraged nature of their balance sheets. They do use derivatives to unload some of their risk exposures that arise due to commodity and

financial prices. This aspect has been appraised by many authors in the context of emerging economies. Shiu and Moles (2010) address motivations for Taiwanese banks to use derivative instruments for hedging in contrast to its use in developed countries. They examine bank-specific factors like bank size, foreign exposure, affiliation etc and find that they are positively related to derivative use. There are different reasons for the use of currency and interest rate derivatives. Another peculiar and interesting finding of this paper is that institutional and regulatory framework in an emerging economy like Taiwan influences the bank decision about not ensuring themselves against financial distress. Analyzing data from 34 banks in Taiwan, Wang (2014) finds a negative relationship between bank value and its derivative use in the long run and positive association between bank-specific capital requirements and market discipline norms and value of banks. Banks need to do proper assessment about the risk emerging from business environment and economic uncertainties.

Another strand of literature on derivative use is the optimization of hedging strategy. Perfect hedging assumes perfect alignment of spot and futures prices. In addition, there are static and dynamic hedging strategies. Lau and Bilgin (2013) discuss the hedging performance of Chinese aluminium futures contract. By incorporating structural factors, basis effect and volatility transmissions into the generalized autoregressive conditional heteroskedasticity (GARCH) model, the authors find that hedging effectiveness is not improved by volatility spillovers. Wu (2014) shows that the traditional ordinary least squares (OLS) regression technique used for determining hedge ratio is only helpful as long as both spot and futures prices co-vary. In this study, the dynamic hedge ratio linearly combines the hedge ratio of OLS and the value of the spread to capture long-run relationship and short-run deviation. As a tool for understanding economic performance by considering risks and transaction costs, the combined ordinary least squares spread (COLSS) strategy outperforms other models, registering a large utility improvement. Finally, the dynamic hedge ratio created by combining the OLS and spread captures both the long-term and short-term behaviors between spot and futures returns, and then achieves better hedging performance in the extended data set of the Taiwan Capitalization Weighted Stock Index (TAIEX).

Liu, Chng, and Xu (2014) employ stochastic volatility model to incorporate the time-varying volatility, price and volatility jumps in spot and futures prices of China's copper and aluminum markets. This model performs well for generating optimum hedge ratio that is superior to that derived from OLS regression.

The risk management role of derivative markets is quite significant in emerging economies

as these markets could be used for hedging and risk diversifications. Especially, in the aftermath of global financing crises, financial and non-financial firms use financial derivatives to hedge their risk in these economies. Negative external shocks do determine the hedging need in emerging derivative markets. The governance structure also is responsible for hedging decisions. Many governments undertake currency swaps to affect exchange rate. There is evidence of risk reduction through asset diversification. Empirical literature clearly shows the relation between valuation of company and derivative use for hedging. The literature also discusses the optimum hedging strategy. However, many of emerging markets are not very liquid, thus limiting its use by corporate entities. In many such markets, there is preponderance of speculators in these markets making its economic use very limited to market players. As these markets become more robust, they are likely to become platforms for managing risks. Many of financial instruments like Options, weather derivatives, carbon credits, freight futures, are not fully developed in these economies making risk management very limited in scope.

3.4 Market Efficiency

The concept of market efficiency has been deployed in derivative literature also. Here when price imbibes complete information, then it is not possible to make excessive profits from taking futures positions. In the literature, weak-form, semi-strong and strong-form efficiency has been examined. In the emerging economies spot and derivative markets suffer from underdevelopment, wrong contract design, and lack of regulation, thus raising opportunities for making arbitrage profits.

In the recent studies, Moura and Gaião (2014) investigate how unexpected macroeconomic surprises are assimilated into the determination of nominal interest rates, inflationary expectations, and real interest rates in an emerging economy - Brazil. There study shows that both domestic and international macroeconomic news significantly affect current and delayed response in interest rates. They also investigate and find the significant relationship between responses and macroeconomic news even during global financial crises.

Ahmad et al. (2012) investigate the market efficiency hypothesis for Asia-Pacific foreign currency markets because these currencies seem more susceptible to market shocks and speculative attacks, especially during financial crises. To make results more robust, market efficiency is tested with-in and across country dimensions. Different currencies have been tested for efficiency using Johansen cointegartion test. However, they fail when we use Fama's traditional regression method to test forward unbiasedness hypothesis. This biasedness was removed by authors using Pilbaem and Olm model. They find that with-in

market efficiency puzzle could be resolved by such exercise. Asia-pacific currency markets generally pass with-in efficiency test and are more resilient than developed markets. The Asian financial crises affected Asia-Pacific currencies more than the global financial crises. It was the policy failure than the crises per se that was responsible for such result. The free float currency regime is more market efficient than managed float currency regime.

Doukas and Zhang (2013) examine turnover of high and low yielding currencies (carry trade) of emerging economies. They address the pay-offs from carry trade strategies for currencies with non-deliverable forwards (NDF) trade and look at the difference between NDF and deliverable forwards (DF) carry trades. The difference between onshore interest on currencies with capital controls and offshore interest inherent in NDF prices provide arbitrage opportunities. NDF carry trades usually carry higher pay-off than DF carry trade. This is due to higher compensation for risk due to capital controls and currency conversion restrictions.

Using the trading data in Chinese stock index futures market, Yang and Gao (2014) examine the relationship between stock index futures sentiments; stock index sentiments and returns on CSI300 futures. They show that sentiment aggregate effect and sentiment spillover effect are important determinants of stock index futures returns. Sentiment aggregate effect is more dominant than sentiment spillover effect in its impact on stock index futures returns. Further, these sentiment effects are monotonically decreasing functions of time. Noise trading governed by irrational sentiments have more effect in the short term causing futures prices to deviate from equilibrium values. They elucidate how sentiments can affect the investment at different frequencies.

Li et al. (2013) examine the disposition effects for three different types of traders – retail traders (RTs), foreign institutional traders (FIs), and proprietor traders (PTs) for futures contracts traded at Taiwan Futures Exchange (TAIFEX). FIs with lesser disposition effect perform better than RTs with higher disposition effect. This is because higher disposition effect negatively influences performance. RTs with disposition effect tend to reduce disposition effects in the subsequent period. Dynamically, RTs with prior profits tend to have lower disposition effect in the later period, especially when they have no prior disposition effect. When RTs have prior profits and disposition effects, they experience an increased disposition effect in subsequent periods.

Liao et al. (2014) examine the irrational behavior of traders in Chinese warrants markets where they do not exercise them at expiration leading to losses. "T+1" delivery schedule is partly responsible for such behavioral decisions. Traders are exposed to risk for one more

day by keeping underlying share. In addition, lack of domain skills regarding warrant expiration also contribute to such loss making behavior. Investors trade such instruments where they do not have knowledge. They do some exercise out-of-money warrants because of lack of attention.

Kuo et al. (2015) identify cognitive limitations for making investment decision at round-number prices. There is limit order clustering around round-number prices. Such lower cognitive short-cuts negatively affect investment performance. In a dynamic setting, authors also seek answers to persistence of such heuristic cognitive behavior. There is also heterogeneity among different traders who submit limit orders at round numbers.

Many of the emerging economies have robust and efficient derivative markets. However, in the absence of accompanying policies like convertibility of currency, capital controls, thin markets, lack of regulation, and proper taxation policy in many other markets, the efficiency in some of these markets gets compromised. Due to this the derivative activity gets shifted to advanced countries. Despite these limitations, the efficiency of prices to imbibe information so that there are no arbitrage opportunities is reflection of market efficiency of derivatives in emerging economies. In commodity futures markets in such economies, spot market prices are not representative signals leading to problems of convergence of prices at maturity, disputes about quality on delivery, and different delivery centers. In many emerging markets like India and China, the mirror contracts across different off shore and on shore exchanges provide opportunities to hedge on exchange rate risks.

3.5 Market Structure

The market structure of derivative markets defined by its operational and structural features distinguishes it from the cash market. Low transaction costs, short-selling and more liquidity make derivative markets more useful. The structural features of contract size, maturity effects, order splitting, margins and limits make it different from cash markets. Using order and trading data from Taiwan index futures market (TAIFEX), Chen et al. (2014) explore the questions as to whether (a) informed traders make more profits, (b) what type of orders are informed trade. This exercise was conducted on (i) foreign institutional investors (ii) domestic institutional investors (iii) futures proprietary firms (iv) domestic individuals. The analysis was done using the concept of asymmetric information, salient feature of exchange microstructure. Results indicate that foreign institutional investors make more profits than domestic institutional investors. Aggressive orders are submitted by informed traders having access to information and take part when liquidity is high. Individual traders make losses.

Chiu et al. (2014) use intraday tick-by-tick data from Taiwan index futures market to

investigate the question of liquidity provided by different types of institutional and individual traders. Foreign institutional traders and futures proprietor firm traders supply about half of total limit order placed with exchange for these contracts and majority of their order is predominantly limit order. Undoubtedly, they provide liquidity to the market. Individual day and noonday traders consume liquidity by placing market orders. Institutional traders make more market orders in the starting and closing time of trading day. Individual day and noonday traders provide liquidity in early trading session and consume liquidity in closing sessions. Additionally, the magnitude of limit orders of foreign institutional traders, individual day and non-day traders are larger than their market orders. Transitory volatility and informational volatility are related to net limit order placed by institutional and individual traders.

Kuo et al.(2015) look at market microstructure issues of exchange participants and analyze the predictive ability and effects of individual and institutional traders. Individuals predict returns poorly and distort future volatility. Institutions have better information about future returns and also moderate the volatility. Similarly foreign institutions have better information than domestic institutions. However, domestic institutions have stabilizing influence on markets compared to foreign entities.

Chae et al. (2013) attempt to analyze the liquidity provided by marker makers and algorithmic traders (ATs) or high frequency traders (HFT) in the equity-linked warrants (ELW) market in Korea. The profits earned by these traders are decomposed into information, market-making, and mixed components. Results show that the ATs provide liquidity and they earn profits by possessing information about future prospects of warrants. HFTs are able to earn and sustain profits by providing liquidity. LPs are actively involved in trading and are not merely liquidity providers.

Chou et al.(2015) conclude that the individual day traders operating in Taiwan Index Futures market (TAIFEX) tend to behave in contrarian way rather than using momentum strategies. The contrarian strategy adopted by day traders is stronger in the morning thus eroding market efficiency that relies on new information. They tend to lose money in the morning. The authors examine the effects of net trading strategies of day traders on liquidity and volatility. Contrary to the view that individual day traders destabilize the market, they are able to contribute to liquidity by squeezing bid-ask spread, transient market volatility, and temporary price impact. However, they consistently lose money but remain in business as new day traders enter the market to replace losing day traders.

One salient feature of the derivative markets is the behavior of price volatility as the contract

approaches maturity. Agarwalla and Pandey (2013) empirically investigate the expiration-day-effect of the maturing contracts on single stock futures (SSF) that are cash-settled on expiration on National Stock Exchange (NSE). The intra-day volatility build-up towards expiration is due to unwinding of positions by arbitragers in line with settlement procedures. The scheduled trading breaks caused by satellite communication outages cause the volatility patterns to change before and after the break. There is increase in volatility after such breaks.

Chay et al.(2013) analyze the expiration-day effects of KOSPI futures and options contracts. The trade imbalance around maturity causes increase in volume and price volatilities of underlying stocks. Authors examine the usefulness of expected settlement price derived from last 10-minute call auctions. It was found that the expiration-day effect diminished substantially after the introduction of indicative price mechanism. Additionally, no price reversals were witnessed on the day following the expiration day, signifying the usefulness of indicative prices for expiry-day effect.

Chang and Shie (2011) argue that relative order imbalance arises due to different views of sellers and buyers about the futures prices. These order imbalances arising out of unsatisfied orders occur due to frictions of cost of waiting to execute orders. Authors employ quantile regression technique to understand the relationship between order imbalance and futures returns under the conditions of higher and lower futures returns. Higher order imbalances have positive relationship futures returns and vice-versa. This linkage is especially significant under low futures returns due to liquidity constraint. Returns are higher in the morning due to structural break and new informational inflows. However, returns dwindle during the last part of trading session signifying preponderance of individual uninformed traders at that time and lack of interest by informed traders with private information to trade at time

Compared to earlier literature available on the relationship between commonality of trading activity by various traders across stock markets and futures-cash basis, this study by Lee, Chien, and Liao (2012) examine the relationship between commonality of trading activity by various types of institutional investors across futures and cash markets and futures-cash basis. The liquidity and signaling phenomenon highlights the impact of futures activity on futures-cash basis. The authors using first component analysis find commonality in trading activity in futures and cash markets is positively related to futures trading activity in mutual funds. Moreover, the first component factor of trading activity and futures trading activity in mutual funds cause futures-cash basis to change. Impulse response function also corroborates this finding.

Jun and Rui (2013) examine the usefulness of appropriate settlement window to prevent expiration-day effect and improve hedging effectiveness. Using China Securities Index (CSI) 300 index at China Financial Futures Exchange (CFFEX), authors critically examine the adoption of two hours window for determining average price for settlement. Since the exchanges want to maximize their revenue from operations and reduce cost through appropriate specification of contract design, they optimize the settlement window. The authors suggest a settlement period between zero and twenty five minutes to improve hedging effectiveness and prevent manipulation.

Asymmetric information flows among different market players characterize the derivative markets in emerging economies. This leads to informed traders making profits at the cost of uninformed traders. Most of the liquidity is provided by foreign institutional investors and institutional traders. The predominance of individual traders in emerging derivative markets make price discovery distorted as they predict returns poorly. As these markets become more institutionalized, their price predictability will improve. Individual day traders lose money in trading. The expiration day effects on derivatives in emerging market economies are quite like that in advanced countries. The literature also suggests the appropriateness of optimum settlement window to improve hedging effectiveness of derivatives in these economies.

3.6 Miscellaneous Functions

Many studies have discussed the pricing of derivatives in the emerging markets. It is more so in case of options. Lin et al. (2015) document the superiority of truncated Gram-Charlier over other standard models employing volatility models. Maldonado (2012) discuss pricing of USDBRL (the exchange rate of Brazil real with regard to US dollar). They discuss equilibrium values of exchange rate with the help of different models. These models are based on purchasing power parity and monetary model of exchange rate. Santos and Guerra (2015) compare different models of observing risk neutral density function from options prices for US-Brazil exchange rate. These were appraised using summary statistics and root mean integrated squared error method. They observed the superiority of DFCH for finding out the current and risk-neutral probability for future events.

Ng, Li, and Chan (2013) discuss basket options that are used by hedgers and investors as different assets underlying them are not perfectly correlated. The authors examine the quanto basket option if returns follow conditional hetroksedaticity.

Discussing differing beliefs about rare events in emerging economies that witness information asymmetricity and political instability, Dieckmann and Gallmeyer (2013) examine the equilibrium debt contract. They propose joint determination of interest rate and

recovery rate as interdependent in equilibrium. Ertugrul and Ozturk (2013) empirically investigate the impact of market indicators belonging to bond, equity, and foreign exchange markets on credit default swap (CDS) spreads for the selected EMEs. They find that the CDS spreads have a long-term relationship with the financial market indicators. Additionally, the CDS spread is negatively related with the CDS market uncertainties.

Akdoğan, and Chadwick (2013) argue that despite the short-run discrepancies between the CDS and bond yield spreads, they are cointegrated in the long-run. The researchers examine the non-linearities in the adjustment of CDS-bond basis towards its long-run equilibrium. Higher liquidity in these assets leads to greater speed of adjustment in emerging economies. Aktug (2014) looks at the usefulness of structural models to measure sovereign risk. They propose incorporation of market based CDS into structural models for better accuracy.

Derivatives research in emerging economies has also analyzed implied volatility of indices. Ryu (2012) examine the predictive ability of VKOSPI, which captures implied volatility of option prices. It also explains that the relationship between VKOSPI and its underlying index is efficient in terms of containing information. If it is used as an input variable in GARCH model, it increases the usefulness of nested GARCH method. Its forecasting performance is better than Black-Scholes implied volatility model. The study also shows that there is a negative and asymmetric association between returns and VKOSPI. Kotzé et al. (2013) derive implied volatility surface for South African Exchange as Black-Scholes model is unable to capture underlying and expected information. This exchange uses trade data and linear deterministic approach to calculate implied volatility. Authors suggest non-linear deterministic function for options traded at this exchange. Among the debates circling around comparison between implied volatility models and stochastic volatility approaches for their information content and predictive ability, Kim and Ryu (2015) propose that they should be compared for their risk management function. This study makes empirical performance of various types of volatilities - historical, model-free and model-dependent implied volatilities. According to the authors, Value at risk (VaR) based on VKOSPI proved to be better than other risk models based on their volatility forecasts.

Another risk management derivative instrument is weather derivatives that are increasingly being utilized by insurance companies and traders in derivatives markets. These weather derivatives are unique in market structure as underlying index is not traded. Zong and Ender (2014) provide a comprehensive comparison of two models- Alaton et al. (2002) and the CAR model of Benth and Saltyte-Benth (2007) for the simulation and pricing of temperature-based weather derivatives. The authors analyze whether the CAR model, as a

more advanced model has a better performance in fitting the daily average temperature (DAT).

In addition, derivative market research has also analyzed role of financial derivatives during financial crises period and its spread to emerging economies. Aizenman and Hutchison (2012) discuss how external pressure caused by global financial crises affected the external financial position of emerging economies. There were variations in their exposure to external financial shocks as well as in the impact on their economies. External liability/GDP ratio determined how resiliently emerging economies could face exchange rate depreciation and lost foreign exchange. However, emerging economies having higher proportion of short-term external debt to their foreign reserves faced currency devaluation.

Dominguez (2012) discusses how macroeconomic crises faced by emerging economies triggered by global financial turmoil led them to manage their foreign exchange reserves. Cross-country comparison seems to suggest that these countries didn't disturb their foreign reserves position to tackle such crises. This paper examines this question by looking at measurement of components of reserve positions. Reserves change due to changes in interest as well as valuation changes of current assets. The author aims to analyze the changes in exchange reserves due to policy intervention only. The explanation is dependent on reserve position and its constraint to fulfill certain objectives before the crises period. The reserve decreased in those emerging economies where there were pre-crises excess reserves. Those emerging economies where reserves got eroded during global financial crisis, rebuilt them after the crises. Aizenman et al. (2015) examine the structural changes in accumulation of international reserves taking place in emerging economies in recent times. Notable among them are insurance against volatility of global capital, hoarding of international reserves (IR) by China, "keeping up with Joneses", sovereign wealth funds, bilateral swap windows, outward capital flows, and export composition. The experience of China and Korea show how structural changes and global financial crises have affected the IR hoarding. Authors argue for the need for appropriate policy, proper institutions and prudent regulation. According to this paper, five countries-Brazil, India, South Africa, Indonesia and Turkey held fewer IR than their optimum level and thus may experience exchange rate depreciation when confronted with tapering news in USA.

Dabrowski, Śmiech, and Papież (2015) look at the policy option used by the central banks of emerging economies and their role in moderating financial crises. It is not exchange rate regimes that are of prime importance for tackling financial distress but policy tools to mitigate the external shocks. Countries having fixed exchange rates are less inclined to

devalue their currency than countries having floating rates. However, there is no significant growth difference between such economies during financial crises period. The policies of currency depreciation and reserve depletion are major policy decisions which can be used to categorize similar countries. The authors also use quantile regression to examine relationship between gross domestic output growth and monetary policy options at different quantiles and find them stable all across. Bussière et al. (2015) argue as to what extent international reserves with different emerging economies were able to protect them from financial crises. When we use international reserves as a percentage of short term debt, there is a significant relationship between extent of crises and international reserve ratio. This means that countries that accumulated more reserves as a percentage of short-term debt have been less impacted by shocks than others. Moreover, additional capital controls and international reserves work together to reinforce each other. Capital controls as a policy option have helped policy makers to cushion against flight of capital.

The distribution properties of derivatives like pricing and volatility behavior are becoming quite mature in emerging economies as they transmit right signals. Attempts have also been made to test the viability of weather derivatives so that they can be employed by insurers.

Of particular interest to us is the difference in the impacts of global financial crises on external financial position of emerging economies. These economies didn't disturb their external reserves to deal with the external financial shock. There is more likelihood of exchange rate depreciation in emerging market economies, if faced with global shocks.

4. Conclusion

With the development of capital markets and liberalized regimes, the emerging economies are increasingly using derivative markets for risk management and better price discovery. Though the volume of derivative trade in advanced economies is many multiples of what is being traded in emerging economies, yet the rate of growth of derivative use has been higher in emerging economies. This is more so after the episode of global financial crises. There is, however, concentration of few financial centers (Hong-Kong, Singapore, China, Korea, and India) in these economies where derivatives use is significant. Many of these economies have outward orientation in their policy making them very integrated with the global world.

In this study, we have identified some focus areas that define the economic role of derivatives. We have surveyed the derivative literature concerning price discovery, risk management and hedging, market efficiency and market structural issues that arose in the last few years. Derivatives market development in many emerging economies has not been very sophisticated. In fact, absence of mature financial derivative instruments, thin markets

and improper regulation are common characteristics of several of these economies.

Further, with the emergence of China as an economic powerhouse, there has been price discovery of many commodities dependent on Chinese production and consumption data. In price discovery, especially for commodity futures markets in emerging economies, the futures markets are paving the way for development of cash markets. Many of these markets are quite integrated with advanced markets in US, but price discovery still takes place in traditional mature markets (with the exception of sugar and palm oil). As derivative markets become more institutionalized it will improve price discovery. In the initial phase of development, derivative markets in emerging economies are weak in determining true prices.

In hedging literature too, many country-specific parameters weigh heavily on the decision of firms in emerging economies as opposed to firm-specific reasons in advanced economies. In addition, the hedging performance can be improved with better regulation in such countries. Research does indicate different efficiency and inefficiency levels for different asset classes in emerging economies. Currency markets look more efficient than commodity markets because of regulation and market development. The peculiar nature of market structure also impinges on the performance of derivatives in emerging economies.

In terms of market efficiency, derivatives in emerging market economies display information dissemination. In some markets, however, there are instances of irrational behavior by investors and noise traders. Traders do suffer from heuristic cognitive patterns. There is larger evidence of derivative trading being responsible for reduced volatility of cash prices, though some evidence exists to the contrary also. This function of price stabilization is of prime importance in emerging economies like India and China, where substantial population proportions live in abysmal poverty.

The emerging economies are facing global financial crises by allowing variation in exchange rate rather than allowing variations in external reserves with their central banks. There have been structural changes in international reserve position of emerging economies like insurance against external shocks, export composition, capital flows, etc.

Further, research is required on clubbing heterogeneous countries in the emerging world into sub-groups and then applying panel data techniques to analyse the economic performance of derivatives at different levels of development in these economies. It will help in policy formulation and design of financial architecture in emerging economies.

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