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Empirical Determinants of Derivative Markets in Asia, Latin America and Sub Saharan Africa

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Abstract
The paper examined the relationship between the derivative markets and financial markets depth, efficiency, stability and access in Asia, Latin America and Sub-Sahara Africa. A panel logit model was applied from the period 2009 to 2017 on the financial market development data collected for countries in Asia, Latin America and Sub-Sahara Africa. The results of the panel logistic regression model positively revealed that derivative markets are influenced positively by the improvement to financial access (measured by stock market capitalization to GDP) and financial efficiency (measured by net interest margin) of the financial markets of the regions studied. However, an examination of financial depth and financial stability were observed to have an adverse propensity for the derivative market development. Therefore, countries in Asia, Latin America and Sub-Sahara Africa are recommended to significantly focus on improving financial efficiency and financial access within their respective financial markets. Further a document review was carried on the publications of the Committee of Global Financial System (CGFS) and Committee on Payment and Settlement Systems (CPSS) of the Bank for International Settlement (BIS). It is recommended that policy makers must promote greater respect for market autonomy, strengthen legal and judicial systems, boost regulatory independence and effectiveness, deepen the domestic investor base, pursue bi-directional international participation while preparing for spill overs and develop robust financial market infrastructure to facilitate the establishment of vibrant derivative markets.
Keywords: Bank for International Settlements (BIS), Derivative markets, financial access, financial depth, financial efficiency, financial stability and panel logit model.
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1. Introduction

The establishment of Derivative markets has inevitably become an integral part of financial development in the emerging and developed economies of the world. Levine et al., (2005) further postulated that a growing body of evidence suggests that financial institutions (such as banks and insurance companies) and financial markets (including stock markets, bond markets, and derivative markets) exert a powerful influence on economic development, poverty alleviation, and economic stability.

This paper focused on examining the financial systems that influence the establishment of derivative markets in Latin America, Asia and Sub-Saharan Africa. Volumes of derivative trading were observed from the major derivative exchanges of Latin America, Asia and Sub-Saharan Africa.

1.1 Financial Development

Levine et al., (2005) broadly regarded financial development as improvements in the quality of five key financial functions: (a) producing and processing information about possible investments and allocating capital based on these assessments; (b) monitoring individuals and firms and exerting corporate governance after allocating capital; (c) facilitating the trading, diversification, and management of risk; (d) mobilizing and pooling savings; and (e) easing the exchange of goods, services, and financial instruments (Levine et al., (2005).

Martin et al., (2012) developed a comprehensive simple conceptual framework to measure financial development around the world. This conceptual framework regarded as a "4x2 framework" characterise financial institutions in terms of four characteristics of financial stability, financial depth, financial access, financial efficiency and captured these characteristics for both financial institutions and financial markets. This study focuses on characterising financial systems in Asia, Latin America and Sub-Saharan Africa using this framework and for financial indicators refer to Table 1 below.

1.1.1 Measurement of Financial stability using the Z-scores

Martin et al., (2012) admitted that they are numerous definitions of financial stability. It is stressed that financial stability is about resilience of financial systems to stress. According to the world bank a stable financial system is capable of assessing and managing financial risks, efficiently allocating of resources, eliminating relative price movements of financial assets or real assets that will affect the monetary stability or employment levels and maintaining employment levels close to the economy's natural rate.

1.1.2 The z score

Martin et al., (2012) affirmed that a common measure of financial stability at the level of individual financial institution is the z-score. It compares capitalization and returns with the volatility of returns in measuring a bank's risk of becoming insolvent. The significant limitation of the z-score is that it is based on accounting data and is subject to smoothing and manipulation.

1.1.2.1The z-score is defined as $z \equiv (k+\mu)/\sigma$

where σ standard deviation of returns on assets a measure of return volatility, k is equity capital as percentage of assets and where μ is the return as a percentage of assets. The strength of the z-score is that it has a clear relationship of a financial institution's probability of becoming insolvent by determining the probability of a financial institution's assets value becoming less than its debt value. A higher z-score implies a lower probability of a financial institution becoming insolvent. Many studies used the z-score in analyzing bank stability including Detragiache, and Tressel (2008); Laeven and Levine (2009) and Čihák and Hesse (2010).

1.1.2.1.1 Systemic stability measures using the z-score

A number of studies aggregated firm level stability measures as determined by the z-score into a system wide evaluation of financial stability by weighting each measure by the financial institution's relative size. The major short coming of such measures is that they do not consider the interconnectedness of the financial institution, that is the failure of one financial institution can be contagious.

1.1.3 Measurement of Financial Depth

Martin et al., (2012) regarded financial depth as the size of banks, financial markets in the country and other financial institutions in the country taken together and compared to a measure of economic output.

Measures of financial depth include private credit to GDP. The strength of this measure is that it is closely linked to poverty reduction and it has a strong statistical link to long term economic growth. According to the world bank a high ratio is not necessarily a good thing as in 2010, eight countries (United Kingdom, Spain, Cyprus, Switzerland, Ireland, Spain, Portugal and Netherlands) were noted to have the highest ratios of private credit to GDP and these were observed as countries that had a major crisis episode since the global financial crisis of 2008. The world bank regarded total banking assets to GDP as an alternative measure of financial depth to total private credit to GDP. It is regarded as more comprehensive measure that include credit to government sector as well as bank assets and private sector credit. A major limitation of the measure is that it is only available to few number of countries.

1.1.4 Measurement of Financial Efficiency

Martin et al., (2012) asserted that financial efficiency occurs when financial instruments, intermediaries and markets ease the effects of transactions, information and enforcement costs and do a better job of providing the key functions of the financial sector in the economy.

The key functions of the financial system include facilitating trade, diversification and management of risk, mobilizing and pooling of services, easing the exchange of goods and services, producing information ex ante about possible investments and allocate capital and monitoring investments and exerting corporate governance after providing finance.

Financial Efficiency is regarded as a measure of financial development and several ratios are used to measure financial efficiency of financial institutions including lending deposit spread, net interest margin, non-interest income to total income, total overhead costs to total assets (% of total assets), profitability (return on equity, return on assets) and the Boone indicator.

1.1.5 Measurement of Financial Access

Martin et al., (2012) regarded financial inclusion as the use of financial services by firms and individual. It further proclaimed that policy makers are becoming increasingly concerned with the potential negative consequences for macro stability when financial system assets are concentrated in relatively few sectors, firms and individuals.

Demirgüç-Kunt, Beck, & Honohan, (2008) financial inclusion allows firms and individual to take advantage of business opportunity, insure against risk, save for retirement and invest in education.

Table 1 below summarises the 4x2 Matrix of Financial System Characteristics

Characteristics	Financial Institution	Financial markets
DEPTH	Private sector credit to GDP Financial institutions' assets to GDP M2 to GDP Deposits to GDP Gross value-added of the financial sector to GDP	Stock market capitalization plus outstanding domestic private debt securities to GDP Private debt securities to GDP Public debt securities to GDP International debt securities to GDP Stock market capitalization to GDP Stocks traded to GDP
ACCESS	Accounts per thousand adults (commercial banks) Branches per 100,000 adults (commercial banks) % of people with a bank account % of firms with line of credit (all firms) % of firms with line of credit (small firms)	Percent of market capitalization outside of top 10 largest companies Percent of value traded outside of top 10 traded companies Government bond yields (3 month and 10 years) Ratio of domestic to total debt securities Ratio of private to total debt securities (domestic) Ratio of new corporate bond issues to GDP
EFFICIENCY	Net interest margin Lending-deposits spread Non-interest income to total income Overhead costs (% of total assets) Profitability (return on assets, return on equity) Boone indicator (or Herfindahl or H-statistics	Turnover ratio (turnover/capitalization) for stock market Price synchronicity (co-movement) Private information trading Price impact Liquidity/transaction costs Quoted bid-ask spread for government bonds Turnover of bonds (private, public) on securities exchange Settlement efficiency
STABILITY	Z-score (or distance to default) capital adequacy ratios asset quality ratios liquidity ratios other (net foreign exchange position to capital etc)	Volatility (standard deviation / average) of stock price index, sovereign bond index Skewness of the index (stock price, sovereign bond) Vulnerability to earnings manipulation Price/earnings ratio Duration Ratio of short-term to total bonds (domestic, int'l) Correlation with major bond returns (German, US)

Source: Martin et al., (2012)

Martin et al., (2012) noted that measures of financial inclusion around the world has focused on density indicators such as number of bank branches or ATMs per capita or ATMs per 100000 adults (a measure of financial development) etc.

Fernandez (2003) unveiled that there has been considerable heterogeneity in the development of derivative markets in the world and notably in Latin America. This observation by Fernandez (2003) and together with aftermath effects of the Global financial crisis of 2007-2008 still holds today in Latin America, Asia and Sub-Saharan Africa.

Bekale (2015) stressed that the establishment of a vibrant, well supervised and well-regulated derivative markets is crucial to avoid the risks of derivative aggravated disasters occurring and hence the need to anticipate the infrastructural requirements of these markets.

1.1.6 Latin America Background

There are seventeen countries in Latin America and Fernandez (2003) observed that in Latin America the largest derivatives exchanges were located in Argentina (MATBA, ROFEX), Brazil (BM&F, BOVESPA), and Mexico (MexDer). The current study focused on countries with the largest derivative markets in Latin America that include B3 - Brasil Bolsa Balcão in Brazil, Bolsa y Mercados Argentinos in Argentina and Bolsa Mexicana de Valores in Mexico (WFE,2022).

1.1.6.1 Asian Background

In Asia they are forty-eight countries. The five largest countries being Russia, India, Kazakhstan, Saudi Arabia and Indonesia. The paper focused on studying countries with the largest derivative exchanges that included Shanghai Futures Exchange, Zhengzhou Commodity Exchange and China Financial Futures Exchange in China, BSE India Limited, National Stock Exchange of India, India Commodity Exchange and Multi Commodity Exchange of India in India and Japan Exchange Group in Japan (WFE,2022).

1.1.6.2 Sub-Saharan Background

In Sub-Saharan Africa they are forty-six countries. This paper focused on studying three countries in Sub-Saharan Africa with derivative exchanges namely Johannesburg Stock Exchange (JSE) in South Africa, Nairobi Securities Exchange derivatives market (NEXT) in Kenya and Nigeria exchange limited in Nigeria.

The study is organized into an Introduction that embraces the background to the study including research objectives and research questions. Section 2.0 contains Literature review. Section 3.0 contain a discussion of the Research Methodology and design used in the study. Section 4.0 focuses on a discussion of the research findings. The Conclusions and Recommendations are discussed in the last section of the paper.

1.1.7 Research Objectives

1. To identify derivatives instruments available for trading in Asia, Latin America and Sub-Saharan Africa.

2. To establish the relationship between financial systems and derivatives markets in Asia, Latin America and Sub-Saharan Africa.
3. To characterize derivatives markets in Asia, Latin America and Sub-Saharan Africa.
4. To identify factors that determine the establishment of derivatives markets in Asia, Latin America and Sub-Saharan Africa.
5. To identify possible impediments to the establishment of derivative markets in Asia, Latin America and Sub-Saharan Africa.

1.1.8 Research Questions

1. What are the derivatives instruments available for trading in Asia, Latin America and Sub-Saharan Africa?
2. What is the relationship between financial systems and derivatives markets in Asia, Latin America and Sub-Saharan Africa?
3. How can derivatives markets in Asia, Latin America and Sub-Saharan Africa be characterized?
4. What are the factors that determine the establishment of derivatives markets in Asia, Latin America and Sub-Saharan Africa?
5. What are the possible impediments to the establishment of derivative markets in Asia, Latin America and Sub-Saharan Africa?

1.1.9 Hypothesis of the Study

H0: There is no association between derivative markets and financial system factors in Asia, Latin America and Sub-Saharan Africa.

H1: There is association between derivative markets and financial system factors in Asia, Latin America and Sub-Saharan Africa.

2.Literature Review

In a study by Tahir, Arif and Khan (2018) based on probit regression analysis it was unveiled that user banks with risky assets and portfolios having non-performing loans were observed to be more oriented towards using derivatives in order to achieve higher returns. In addition, it was observed that larger capitalized banks were more likely to use derivatives instruments as a result of regulatory pressures to meet the restrictive regulatory prescriptions required to comply with Basel 3 and as an effective substitute to manage portfolio risk. It was also revealed that banks are more likely to use derivatives when financial distress costs increase.

Another study stressed that derivative exchanges in Sub-Saharan Africa are most likely to add value to the economy if competitive derivative instruments are offered on commodities such as oil, gold, coffee etc. since they are already offered to buyers and sellers to hedge risk by other international derivative exchanges. The study uncovered that it is economic growth that leads to the development of derivative markets. In accordance with the study the expansion of the economy is the factor that creates new demands for derivative instruments in a particular country. In addition, it was uncovered that derivative exchanges are credited a decreasing effect on economy volatility and lead to more stable economic conditions under the unique circumstances of a developing country (Bekale, 2015).

Sittisawad and Sukcharoensi (2018) acclaimed that size, volatility and liquidity of the spot market were significant factors in the determination of the success of the financial derivative markets in Thailand, Malaysia, Singapore, South Korea, Japan and Hong Kong. The study examined the financial derivative market in Asia using panel logistic regression methodology.

Beets (2004) acclaimed that derivatives must be considered as part of any bank's interest rate risk management strategy and also as part of its total risk management strategy to ensure optimal financial performance. It was further alluded that apart from interest rate risk management derivatives could be used for other important purposes such as in speculation. Derivatives are also said to have disadvantages for which the banks should be prepared for and ensure that the usage of derivatives would be more beneficial than detrimental(ibid).

In yet another study by Song and Hee (2017) based on panel data logistic regression analysis conducted in Korea, concerning factors affecting derivative use for life insurance companies, it was discovered that asset size, foreign assets and liabilities, deposit insurance, liquidity and risk backed capital (RBC) affect derivative usage by life insurance companies. The study was based on multivariate analysis.

Al Janabi (2021) postulated that some emerging markets have accelerated the opening up of derivatives exchanges when their microstructure and base are incomplete just for the sake of competing with neighboring countries. Al Janabi (2021) reiterated that this has been caused by the lack of knowledge and responsibility by policy makers. It was further observed that emerging economies had fallen into the trap of launching illiquid and inefficient derivatives products and markets with loopholes that could foment abusive practices, manipulations, fraudulent acts and other types of misconducts(ibid).

Duc, Son, Anh and Dao (2018) investigated the dynamic relationship between derivatives markets and

economic development in four large economies comprising China, India, Japan and the US. The study was based on Granger-causality test in the framework of a vector error correlation model (VECM). The derivatives markets were proved to contribute to economic development in the short run in the US, Japan and India with the effect disappearing in the long run. It was further revealed that derivatives had a negative effect on economic development in the short run in China but however a positive effect was observed in the long run through the use of dynamic ordinary least squares and modified ordinary least squares. The development of derivatives caused volatility in India both in the short run and long run(ibid).

Lantara and Takao (2013) provided evidence that the decision to use derivatives by Japanese insurance companies is positively related to leverage, firm size, proportion of assets invested in stocks and bonds and organizational form. It was also refuted that the decision to use derivatives was negatively correlated with reinsurance dependency. It was also found that the decision by Japanese insurance companies to expand globally increases the probability for the need for derivatives contracts. The study was based on the Probit and Logit regression models for the period 2001 to 2011.

Sriwati (2021) stated that the cost of debt and corporate governance significantly affect the company's decision to use derivatives. It was also indicated that Return on Assets (ROA) significantly affect a company's decision to use derivatives and whilst firm size had no significant effect on the company's decision to use derivatives. More so it was discovered that risk management and foreign sales did not affect significantly the company's decision to use derivatives (ibid). Their research was conducted in Indonesia based on logistic regression through the application of Statistical Product and Service Solution software (SPSS).

In a further study on derivative usage by Austrian industrial firms, based on panel data logistic regression analysis, it was indicated that the use of derivatives in Australia was influenced by a firm's gearing ratio and negatively by its propensity to growth (Tanha, Dempsey and Labeb, 2018).

Yuhasril, Wahyono and Sumiyarsih (2020) showed that firm size has a significant effect on decision to hedge. Liquidity, growth opportunity and leverage has no significant effect on hedging activities. The study was based on logistic regression analysis based on a sample of 40 companies listed on the Indonesian Stock Exchange from 2015 to 2018.

Another study used logit regression to empirically test the hypotheses of the study, to examine which firm specific factor determine the decision by the Pakistan financial sector to use derivatives. It was uncovered that, organizations used derivatives when they were short of funds, had high growth, had high levels of gearing and if they wanted to operate internationally (Kouser, Muhammad, Bano and Aamir, 2022).

Fernandez (2003) unveiled that the considerably heterogeneity in the development of derivative markets in Latin America was due to regulatory constraints and illiquidity. Fernandez (2002) noted that the largest derivative exchanges were located in Argentina, Brazil and Mexico.

Hardwick and Adams (1998) indicated that the propensity to use derivative instruments is positively related to leverage, firm size and international links and negatively related to the extent of reinsurance. Further it was found that mutual life insurance had a greater propensity to use derivatives than proprietary firms. The negation association with reinsurance and the positive correlation with leverage supported the hypotheses that UK life insurance use derivatives to hedge risk rather than for speculation means of generating income. The study was analyzed using the logistic regression model and a Heckman two stage sample selection regression model based on a sample of a sample of 88 UK life insurers in 1995.

What is studied in this paper is sharply delineated from the previous papers as noted in the above discussion of the literature review. Previous studies some discussed above have focused on the use of derivatives by both financial firms (Al Janabi, 2021; Sriwati, 2021; Yuhasril, Wahyono and Sumiyarsih, 2020; Kouser, Muhammad, Bano and Aamir, 2022; Tahir, Arif and Khan, 2018; Duc et al., 2018; Sittisawad and Sukcharoensi,2018; Hassan et al., 2018; Song and Hee, 2017; Kouser et al. 2016; Bekale et al. 2015; Lantara and Takao 2013) and none of these papers have focused on the impact of financial depth, financial access, financial efficiency and financial stability on the development of derivative markets for economic growth.

3.Research Methodology and Design

The study used mixed method research method (Creswell, 2009). Qualitative research data was predominantly collected through document review on the websites of Bank of International Settlement (BIS) and regional exchanges of Asia, Latin America and Sub Sahara Africa. The research also used panel data logistic methodology to analyse quantitative data (Dempsey & Labeb, 2018). Hassan et al., 2018 asserted that panel data logistic methodology had a merit of combining time series dimension with cross-sectional data approach. The financial market data used in the study was obtained from the Financial Development and Structure dataset of the World Bank. The data base captures various aspects of financial institutions and markets (Thorsten et al., 2000). Thorstern et al., 2000 described the source, construction and intuition behind the different indicators and descriptive statistics of the Financial Development and structure data set used in this report and further alluded that the indicators can be used to analyse the implication of the financial structure for economic growth.

Large countries in terms of population size and derivative usage were selected for the study, Brasil(204,259,812 people), Argentina(43,431,886 people) and Mexico (121,736,809 people) in Latin America, China(1.37 billion people), India(1.299 billion people) and Japan(125,670,178 people) in Asia and Nigeria(200,963,600 people), Kenya(52,573,970 people) and South Africa (58,558,270 people) in Sub-Saharan Africa (Worldometer, 2022). Further eight countries were selected at random from Asia, Latin America and Sub-Saharan Africa and resulting in thirty-three countries (33) being examined in total.

For each derivative market, information was sought on the country's use of derivatives, as well as proposed explanatory variables (Thorstern et al., 2000): Stock market capitalization to GDP, Net interest margin, Bank Concentration, Remittance Inflows to GDP and Bank Z-score (GFD, 2019). Data was collected on the thirty three countries from the Global Financial Development(GFD) report of 2019 of the World Bank.

To determine the financial characteristics that are associated with derivative usage a panel data logistic regression model is run covering the period 2009 to 2017, as a short wide analysis represented in the following equation (1);

$$USEit = \alpha i + \beta 1 Stock\ market\ capitalization\ to\ GDP\ it + \beta 2\ Net\ interest\ marginit + \beta 3\ Bank\ Concentration + \beta 4\ Remittance\ inflows\ to\ GDPit + \beta 5\ Bank\ Z\ Score + vit \quad (1)$$

where, it is the subscript for the country financial market i in year t of the country financial market's global financial development annual report (2009- 2017);

USEit for country financial institution i in year t takes the value of 1 if the country had a derivative market in the report for that year, and is otherwise zero;

β1- Stock Market Capitalization to GDP relates to Value of listed shares to GDP, calculated using the following deflation method: {(0.5)*[Ft/P_et + Ft-1/P_et-1]}/[GDPt/P_at] where F is stock market capitalization, P_e is end-of period CPI, and P_a is average annual CPI.

β2-Net interest margin relates to Accounting value of bank's net interest revenue as a share of its interest-bearing (total earning) assets.

β3-Bank Concentration relates to Assets of three largest banks as a share of assets of all commercial banks.

β 4-Remittance inflow to GDP- Net remittance inflows to GDP.

β 5- Bank Z score estimated as (ROA+equity/assets)/sd(ROA); sd(ROA) is the standard deviation of ROA.

vit is the error term.

4. Presentation and Discussions of Research Findings

This section of the study discusses the possible outcomes of the research. It starts by presentation of the number of derivative product lines and Volumes of derivatives traded by the world's largest exchanges in section 4.1. Section 4.2 discusses the factors that affect the establishment of derivative markets in Asia, Latin America and Sub-Sahara Africa. Section 4.3 provides a brief discussion of the possible impediments to the establishment of derivatives in the studied regions. Lastly section 4.4 presents an analysis of the relationship between derivative markets and financial system factors of Asia, Latin America and Sub Sahara Africa.

4.1 Number of derivative product lines traded by largest exchanges in Asia, Latin America and Sub Sahara Africa

Table 2 and 3 summarizes the number of derivatives instruments products and volumes traded in the derivative markets of each nine largest countries studied for the ended 2019.

Table 2)-(Adopted from World Federation of Exchanges (WFE, 2019))

Derivative Market/Country	Brazil	Argentina	China	India	South Africa	Nigeria	Kenya	Mexico	Japan
India Commodity Exchange				1					
Shanghai Futures Exchange			1						
Multi Commodity Exchange of India				2					
Zhengzhou Commodity Exchange			2						
Bolsa y Mercados Argentinos		3							
China Financial Futures Exchange			3						
B3 - Brasil Bolsa Balcão	12								
Johannesburg Stock Exchange					15				

Derivative Market/Country	Brazil	Argentina	China	India	South Africa	Nigeria	Kenya	Mexico	Japan
Japan Exchange Group									6
Bolsa Mexicana de Valores								9	
Nigeria exchange limited						0			
Nairobi Securities Exchange derivatives market (NEXT)							0		

Table 3 the number of world top 10 country-year derivative use by instrument in Asia, Latin America and Sub-Saharan Africa (WFE,2019).

Country/DExchange	Single Stock Options	Single Stock Futures	Stock Index Options	Stock index Futures	ETF Options & Futures	STIR Futures & Options	LTIR Futures & Options	Currency Options & Futures	Commodity Options & Futures
National Stock Exchange of India	201,931,170	255,120,205	**4,165,447,121**				16,391,410	**1,266,571,646**	
India Commodity Exchange									
Multi Commodity Exchange of India									307,095,652
BSE India Limited									983,059,471
Shanghai Futures Exchange									**1,411,969,733**
Zhengzhou Commodity Exchange									1,092,486,045
China Financial Futures Exchange									
Japan Exchange Group			30,699,470		842,360		10,245,316		
B3 - Brasil Bolsa Balcão	**983,518,149**	11,077,800	41,785,034	**1,454,364,476**	36,989,550	481,027,598	44,578,570	451,365,590	
Bolsa Mexicana de Valores									
Bolsa y Mercados Argentinos									
Johannesburg Stock Exchange (JSE)								71,437,308	
Nigeria Exchange limited	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Nairobi Securities Exchange derivatives market (NEXT)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total of World top 10	**1,185,449,319**	266,198,005	**4,237,931,625**	**1,454,364,476**	37,831,910	481,027,598	**71,215,296**	**1,789,152,532**	**3,794,610,901**

Source: World federation of Exchange 2019

4.1.1 A discussion of the factors that affect the establishment of derivative markets in Asia, Latin America and Sub Sahara Africa

The Bank for International Settlement [BIS, 2019] discussed in a world working group round table forum the following factors as drivers of derivative market development notably, an enabling environment that embraces macroeconomic stability, greater market autonomy, sound rule of the law and an efficient legal and judicial framework and as well as an effective and efficient regulatory regime. Further it [BIS, 2019] posited that the following market development drivers which are more focused on specific market functions, affect the development of derivative markets including better disclosure standards, investor diversity, internationalisation and deep hedging and funding markets as well as efficient and robust market infrastructures are also key in the establishment of the derivative markets.

4.1.2 A discussion of the possible impediments to the establishment of derivative markets in Asia, Latin America and Sub Sahara Africa

The Committee of the Global Financial System [CGFS, 2019] noted the following as inhibiting in the establishment of derivative markets around the globe, i) lack of respect for market autonomy characterised by

financial repression policies that override the market-based pricing and funding allocation in various ways resulting in undermining the allocative efficiency in the economy, ii) weak legal and judicial systems iii) insufficient regulatory independence and effectiveness iv) shallow domestic institutional investor base v) lack of international participation in the establishment of the markets and vi) lack of robust market infrastructures to sustain the development of derivative markets.

4.1.3 Analysis of the relationship between derivative markets and financial system factors

Descriptive statistics are presented in Table 4. Standard deviations, maximum and mean observations are presented together with mean and median values.

Table 4 Descriptive Statistics for Financial Markets from 2009 to 2017 in Asia, Latin America and Sub-Saharan Africa.

Item	Mean	Median	Standard Deviation	Maximum	Minimum
Stock Market Capitalization (SMC-Gdp) to GDP	118.30	51.08	227.67	1098.94	6.53
Bank net Interest margin(BIM)	4.30	3.88	2.13	10.35	0.72
Bank Concentration (BC)	54.91	51.76	16.79	100	26.45
Remittance inflows to GDP (RIGdp))	1.55	0.54	2.07	10.59	0.02
Bank Z Score	13.31	‘14.50	5.07	23.39	4.46

Hassan et al., 2018 proclaimed that a panel data Logit analysis is designed to be applicable to “short-wide” data, relating to data that has sufficient data points and short in time. Hassan et al.,2018 further reiterated that the strength of the analysis is based on its ability in referencing data simultaneously in cross section and through time. Thirty-three countries were availed for the study comprising of eleven countries in each region of the study. The results of the logit regression analysis is highlighted in Table 5 below;

Table 5 Derivative Usage and Determinant Factors

Variable / **Model**	Short-Wide” panel data Logit analysis (June 2009-July 2017)	Short-Wide” panel data Logit analysis (June 2009-July 2017)	Short-Wide” panel data Logit analysis (June 2009-July 2017)
	Coefficient	**p-value**	**z-Statistic**
Constant	6.30	0.0020	3.09
Stock market capitalization to GDP	0.06	0.0008	3.36
Bank net Interest margin	0.019	0.9123	0.11
Bank Concentration	-0.098	0.0001	-4.04
Remittance inflows to GDP (RIGdp))	-1.21	0.000	-4.44
Bank Z-Score	-0.033	0.5661	-0.57
Cross-section	33		
Number of observations	117		

The results above reflected in Table 5 manifest the coefficients β1, β2, β3, β4 and β5 of the panel logistic regression equation (1) that were run through e Views student version 12. Derivative market was used as the dependant variable and took a value of 1 if a country had a derivative exchange and otherwise zero if a country had no derivative exchange. Stock market capitalization relates to the Value of listed shares to GDP. Bank net interest margin relates to accounting value of bank's net interest revenue as a share of its interest-bearing (total earning) assets. Bank concentration relates to assets of three largest banks as a share of assets of all commercial banks. Remittance inflows to GDP relates net remittance inflows from citizens to GDP (World Development Indicator). Bank Z-score is estimated as (ROA+equity/assets)/sd(ROA); sd(ROA) is the standard deviation of ROA.

It was revealed that financial markets with higher stock market capitalization and bank net interest margin are more likely to have an increasing propensity for derivative markets than those without. However, it was also observed that financial markets with higher bank concentration, remittance inflows and Bank Z-score have a decreasing propensity for derivatives markets.

4.1.4 Conclusion and Recommendations

The contribution of this study is acknowledging the growing significance of derivative markets in Asia, Latin America and Sub-Sahara Africa to global financial development. The study examined countries with the most active derivative exchanges registered on the World federation of Exchanges (WFE). The study revealed that the most derivatives instruments that are likely to be traded are Stock Index Options followed by Commodity Options and Futures, Currency Options and Futures, Stock Index Futures and Single stock Option. The study uncovered that a positive significant relationship exist between derivative markets with Stock Market Capitalization and Bank Net Interest Margin. In conclusion the finding of this study resonates well with discussions of the Bank of international Settlement (BIS).

4.1.5 Recommendations

The study recommends countries in Asia, Latin America and Sub-Saharan Africa to focus primarily on improving financial access and financial efficiency of the financial markets to facilitate the development of the underlying derivative markets.

The working group of the Bank of International Settlement (BIS) Committee of the Global Financial System [BIS-CGFS, 2019], recommended policy makers to consider formulating comprehensive initiatives that take into account the following six named dimensions in the establishment of viable derivative markets, i) firstly greater market autonomy would enhance capital market pricing and funding allocation, ii) Second, capital market development can be placed on firmer foundations by strengthening legal and judicial systems for investor protection, iii) Third, enhancing regulatory independence and effectiveness is a key factor in striking a balance between investor protection and issuer costs, Fourth, many economies have scope to increase the depth and diversity of the domestic institutional investor base, Fifth, a broad and bi-directional opening of derivative markets can exert a general positive influence on domestic derivative market development and finally, the establishment of derivative markets requires a coordinated effort along multiple dimensions mentioned here.

It is further posited that coordinated effort for the establishment of well-functioning derivative markets should include a supportive legal and regulatory environment that facilitates activities such as netting, transfer of securities and short selling to enable development of these markets [CGFS, 2019].

In addition, the establishment of derivative markets should foster regulatory coordination to broaden the investor base in the derivative markets through introduction of diversity in balance sheets and encouraging trading strategies that generate volume and liquidity [CGFS, 2019].

Lastly, it is contended that the establishment of derivative markets require robust and efficient market infrastructures and mandated reporting through central counterparties (CCP) and trade repositories can mitigate potential financial stability risks(ibid). It is also emphasized that the development of derivative markets required sound infrastructures with sufficient transparency on pricing and volumes to help in maintaining confidence in periods of financial market stress, this is achieved through the provision of information on the build-up of the risks, reduction of market abuse and as well as through the deterrence of other predatory practices in derivative markets [CGFS, 2019].

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