Impact of exchange traded derivatives on economic growth Evidence from (North America, Europe, Asia and Pacific) over the period (1993-2022)

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Abstract:

This study aimed to investigate the effect of exchange traded derivatives on economic growth using panel data set of three regions in the world (North America, Europe, Asia and Pacific) over the period (1993-2022). The study used GDP Per Capita (GDPPC) as dependent variable. Exchange traded derivatives and inflation as independent variables. The study used multiple linear regression model to examine the effect of independent variables on dependent variable. Fixed effect model was the appropriate model for the study data.

Empirical findings indicated that inflation was statistically insignificant. While the exchange traded derivatives variable was statistically significant. The results revealed that the exchange traded derivatives contribute positively to economic growth in the short run, but the influence disappears in the long run for the study sample and period. The empirical findings confirmed also the existence of bi-directional short-run causality between GDPPC and DER.

***Key Words*:** Derivatives market; Exchange traded derivatives; Economic growth; Panel data analysis; North America; Europe; Asia and Pacific.

JEL Classification: G15; F43; B23; C33.

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Introduction:

Over recent three decades, derivatives markets have become increasingly important in the world of finance and investments due to the vital role that they play it in financial system and their contribution in various aspects of an economy as a whole. According to the international bank for settlements, worldwide volume of exchange-traded derivatives (ETD) reached $80.64 trillion at the end of 2022 (BIS), while global over-the-counter derivatives notional outstanding totaled 617.96 $ trillion at the end of 2022 (BIS). Various studies attempted to examine the impact of derivatives market development on economic indicators principally economic growth. Numerous empirical researches indicated positive rapport betwixt economic and derivatives markets. Thence, the present study aims to investigate the effect of exchange traded derivatives-which represent about 11.5% of total derivatives

markets in the world (2022)- on economic growth for three world regions namely, North America, Europe, Asia and Pacific, using a panel data analysis.

Problematic of the Study: Based on the above, the study attempts to answer the following main question:**Does the Exchange Traded Derivatives affect economic growth?**

Hypothesis of the Study: To ascertain the objective of the study the following hypothesis is undertaken and tested:

The exchange traded derivatives affect positively the economic growth.

Structure of the study: The paper is organized as follows; Following this Introduction, Section one provides a theoretical framework on financial derivatives markets. Section two reviews the relevant literature in terms of empirical studies conducted about the effect of derivatives on economic growth. Section three offers an overview on the derivatives market in the world. Lastly, we review the data and debate our empirical findings in section four. Part five outlines the final conclusion.

I. Theoretical framework on financial derivatives markets

1. Derivatives Markets:

A derivative is defined as an asset whose value is derived from the value of other asset, known as the underlying asset.

In the current world there is a huge diversity of several derivative products. These are traded on organized exchanges or in over- the-counter (OTC) market, where deals are contracted over the telephone or through electronic media (Chisholm, 2004, p. 23).

The differences between the exchange-traded and OTC derivatives are not limited to where they are traded but also how they are traded. In exchange-traded markets, derivatives contracts are institutionalized with specific delivery or settlement terms. Negotiation between traders generally was managed by screaming on the trading floor. But electronic transaction system has become increasingly favored in many major exchanges (Chui, p. 9). The benefit of trading on an exchange is that dealers do not have to concern for the creditworthiness of their counterparties. The clearing house fix this problem by requiring both traders to retain a certain margin at the clearing house to respect their agreements (Wanying & Xinrun , 2021, p. 3278). By opposition, derivative trades in OTC markets are bilateral in nature. All contract terms such as location, quantity, prices…etc. are negotiable among the two parties. Transactions can be agreed by communication channel. Prices are not reported openly.

2. Major types of derivatives:

There are four fundamental types of derivatives contracts: forwards; futures, options and swaps.

2.1. Forwards and futures contracts: are identical in that they are agreements to trade an asset on some date in the future for a certain price (Hull, 2008, p. 39).

Table (1) summarizes the main differences between forward and futures contracts.

Table (1): «Differences between Forwards and Futures»

Feature	Forward	Futures
Operational mechanism	It is not traded on the exchanges.	It is an exchange-traded contract.
Contract specifications	Terms of the contracts differ from trade to trade (tailor made contract) according to the need of the participants.	Terms of the contracts are standardized.
Counter-party risk	Exists, but at times gets reduced by a guarantor.	Exists but the clearing agency associated with exchanges becomes the counter-party to all trades assuring guarantee on their settlement.
Liquidation profile	Low, as contracts are tailor made catering to the needs of the parties involved. Further, contracts are not easily accessible to other market participants.	High, as contracts are standardized exchange-traded contracts.
Price discovery	Not Efficient, as markets are scattered.	Efficient, centralized trading platform helps all buyers and sellers to come together and discover the price through common order book.
Quality of information and its dissemination	Quality of information may be poor. Speed of information dissemination is week.	Futures are traded nationwide. Every bit of decision related information is distributed very fast.

Source: (Manish & Ashutosh, 2014, p. 28)

2.2. Options contracts: A financial option contract gives its owner the right (but not the obligation) to purchase or sell an asset at a fixed price at some future date. Two different kinds of option contracts exist, call and put options. A call option grants the holder the right to buy the asset; a put option grants the holder the right to sell the asset (Jonathan & Demarzo, 2011, p. 673). If the option can be exercised just at maturity, it is commonly known as a European call; in other cases, the option can be exercised on or at any time ahead of maturity, and it is then noted as an American call (Brealey et al., 2011, p. 409).

There is a special vocabulary associated with options. Here are some important definitions (Stephen et al., 2010, p. 761):

- Exercising the option: the act of buying or selling the underlying asset via the option contract is named exercising the option.
- Strike price: the fixed price specified in the option contract at which the owner can buy or sell the underlying asset is named the strike price (exercise price).

- Expiration date: an option commonly has a limited life. The option is said to expire at the end of its life. The last day on which the option may be used is named the expiration date.

2.3. Swaps: In a swap transaction two parties agree to exchange cashflows, the sizes of which are established on different price indices. Usually, this is represented as an agreed fixed rate versus a variable or floating rate. Swaps are traded on an agreed notional amount, which is not exchanged but establishes the volume of the fixed and floating cashflows. Swap contracts are commonly of longer-term maturity (i.e. more than one year) but the exact terms of the contract will be open to negotiation. The frequency with which the cashflows are settled is open to negotiation but they could change in tenor between 1 month and 12 months (Schofield, 2007, p. 26).

3. Underlying assets and derivative products:

In this part, we review a set of derivatives products that derive their values from five underlying asset categories: equity, fixed-income instrument, commodity, foreign currency and credit event.

3.1. Equity derivatives: Many different index options presently trade throughout the world in both the OTC and the exchange-traded markets. The most widespread exchange-traded contracts in the United States are those on the S&P 500 Index (SPX), the S&P 100 Index (OEX), the Nasdaq-100 Index (NDX), and the Dow Jones Industrial Index (DJX). All of these trade on the Chicago Board Options Exchange. Most of the contracts are European. An exclusion is the OEX contract on the S&P 100, which is American (Hull J. , 2012, p. 199).

3.2. Interest rate derivatives: are tools whose payment streams and/or current valuation are determined through movements in an underlying standard interest rate or collection of several interest rates.

Interest rate futures contract: is a fixed, standard contract between a buyer and a seller for the delivery of a round lot of a specific financial instrument or its cash equivalent. Still only a small proportion of traded interest rate futures contracts actually go to delivery, the possibility is important since it provide the eventual convergence of the prices of the underlying financial instrument and the futures contracts. (Frankel, 1984, p. 6).

Interest rate options: are options whose payoffs are dependent in some way on the scale of interest rate.

Interest rate swaps: include the exchange of one set of interest cash for another set of interest cash and have default risk and liquidity problems similar to those of forward contracts. As a result, interest-rate swaps often involve intermediaries such as large commercial banks and investment banks that make a market in swaps (Mishkin & Eakins, 2015, p. 654).

3.3. Commodity derivatives: Commodity futures: provide rights or obligations to buy to sell certain commodities at a predetermined price and time or during a stated period.

Commodity Options with Cash Settlement The buyer of a Commodity Put Option pays a premium for the right to get the difference between the exercise price and the

market price in relation to the nominal amount of the market price follows below the fixed amount.

Commodity swaps: is a contract involving the exchange of a set of commodity price payments (fixed amount) against variable commodity price payments (market price) (UniCredit Bank).

3.4. Foreign exchange derivatives: in forward exchange agreements, two counterparties agree to deal in foreign currencies at a defined exchange rate in a specified amount at future agreed date.

Foreign exchange options: are primarily traded in the OTC market. The benefit of this market is that large trades are possible, with exercise prices, expiration dates, and other characteristics tailored to meet the requirements of company treasurers. They can be used by company treasurers to hedge a foreign exchange exposure (Hull J. , 2012, p. 357).

Cross-currency interest price swaps agreements: involve an exchange of payments related to interest payments and an exchange of principal amounts at an defined exchange rate at the end of the agreement; there might also be a swapping of principal at the inception of the contract and in these circumstances there may be posterior repayments, which include both interest cashflows and the amortization of principal, over time according to predetermined rules (Heath, 1998, p. 31).

3.5. Credit derivatives: are contracts where the payoff depends on the creditworthiness of one or more commercial or sovereign entities. Credit derivatives allow corporate to trade credit risks in much the same way that they trade market risks (Hull, 2008, p. 461).

Credit options: For the fee, the purchaser gains the right to receive profits that are tied either to the price of an underlying security or to an interest rate. A second type of credit option ties profits to changes in an interest price, such as a credit price (Mishkin & Eakins, 2015, p. 651).

Credit default swap (CDS): is like insurance against value loss due to a firm defaulting on a bond. As in other swaps, a person involved in a CDS is called a counterparty. There are always two counterparties in a CDS. In a typical CDS, counterparty 1 pays counterparty 2 a periodic payment. In exchange, counterparty 2 agrees to pay par for a particular bond issue if default occurs. Counterparty 1 is called the protection buyer and counterparty 2 is called the protection seller. The periodic payment is called the CDS spread (Stephen et al., Corporate finance, 2010, p. 786).

II. Literature Review on the effect of derivatives on economic growth:

A great effort has been expanding in examine the impact of the derivatives market on various aspects of financial systems. In this section, we will present a number of studies that focused on the impact of financial derivatives on economic growth.

In their study on the impact of derivatives on economic growth in Nigeria (Gbadebo & Omolaja, 2022) found that derivatives have a positive significant relationship with economic growth in the long and short terms, whereas the exchange rate had a negative and significant impact on economic growth.

In the same context, (Aizirek, 2020) attempted in its study to examine the linkage between the derivatives and economic development in (Japan, China, India, United States, and Eurozone). The results show that the derivatives market affect positively the economic development.

Another study by (Duc Hong et al., 2019) conducted about the connection between the derivatives and economic development in (China, India, Japan, U.S.). It turned out that derivative markets contribute positively to economic development in the short run in the U.S., Japan, and India, but the influence disappears in the long run. In China, the derivatives market negatively affect economic development in the short term. In the long term, they observed a positive impact of the derivatives market on economic development. Likewise, financial derivatives markets result growth fluctuations in India in the short and long term.

(Oliinyk et al., 2019) examined the influence of derivatives exchange market on economic growth in USA during the period (2000-2015). They used a Granger-causality test to investigate this impact based on 21 macroeconomic and financial indices of the USA. The results showed that derivatives market affect positively economic growth.

(Aali-Bujari et al., 2016) also tried to evaluate the impact of financial derivatives on economic growth in (the European Union, the United States, Japan, China, India, and Brazil) during the period 2002-2014. They found the same results obtained in the previously mentioned studies, that financial derivatives markets influence positively economic growth.

Through the previous studies presented in the current research, we note that their results agreed on the positive impact of derivatives markets on economic growth.

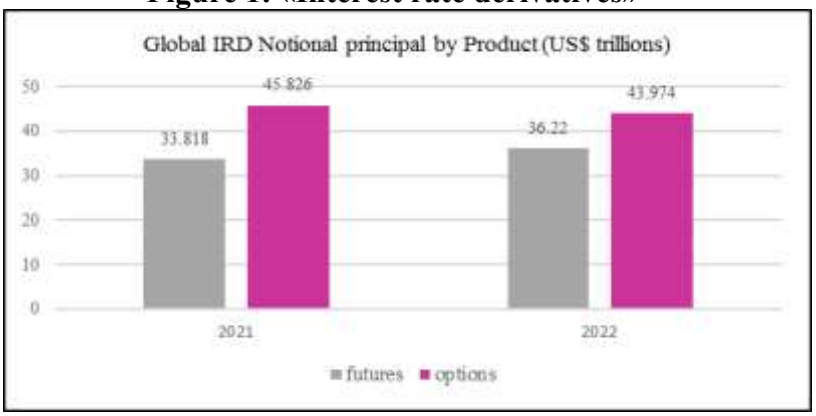
III. Overview on the Derivatives Market in the world

1. Exchange-traded derivatives statistics:

Global exchange-traded derivatives notional principal totaled $80.64 trillion at the end of 2022, 0.68% higher compared to year-end 2021.

1.1. Interest rate derivatives: Interest rate derivatives (IRD) notional principal totaled $80.194 trillion and accounted for 99.45% of global Exchange-traded derivatives notional principal at year-end 2022. IRD notional principal rose by 0.69% versus year-end 2021 (see Figure 1). Interest rate futures notional principal increased by 7.1% to $36.22 trillion and accounted for 45.16% of total IRD notional principal at year-end 2022. Options notional principal fell by 4.04% to $43.974 trillion (see Figure 1).

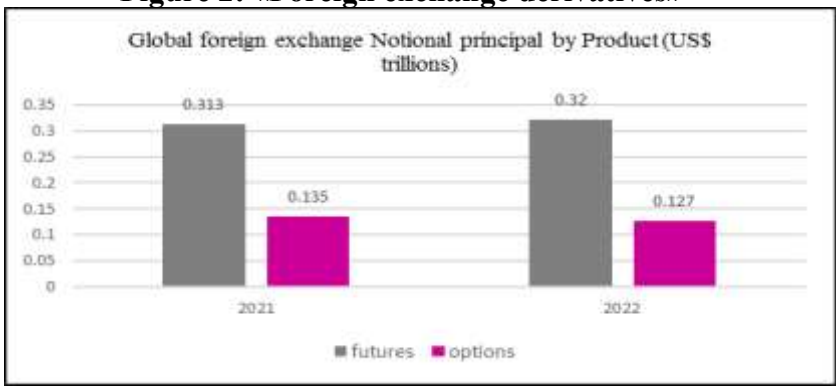
Figure 1: «Interest rate derivatives»



Source: Prepared by the researcher based on: (BIS)

1.2. Foreign exchange derivatives: Foreign exchange derivatives notional principal totaled $0.447 trillion and accounted for 0.55% of global Exchange-traded derivatives notional principal at year-end 2022. Foreign exchange derivatives notional principal fell by 0.22% versus year-end 2021 (see Figure 2). Foreign exchange futures and options notional principal were $0.32 and $0.127 trillion respectively at year-end 2022.

Figure 2: «Foreign exchange derivatives»

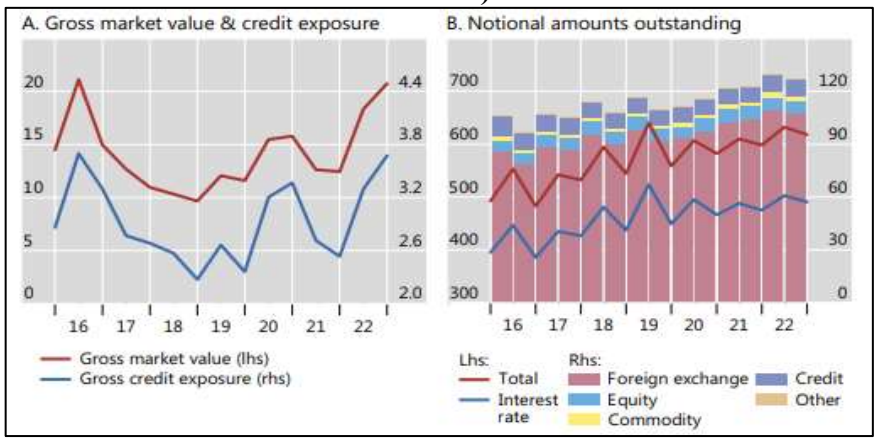


Source: Prepared by the researcher based on: (BIS)

2. Over the counter (OTC) derivatives statistics at end-December 2022:

As we see from (Figure 3); The gross market value of outstanding rose by 13.09% in the second half of 2022 to reach 20.75 $ trillion. Likewise, Gross credit exposure of OTC derivatives leaped by 44.9% at year-end 2022 compared to year-end 2021. It totaled $3.7 trillion and accounted for 0.6% of notional outstanding at year-end 2022. In contrast, the notional value of derivatives changed slight.

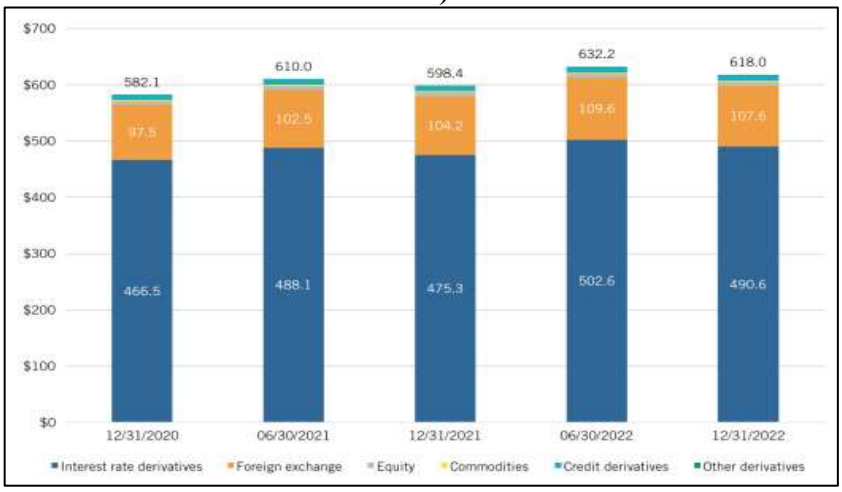
Figure 3: «Outstanding over the counter derivatives at end 2022 (in trillions of US Dollars)»



Source: (BIS, 2023)

Global OTC derivatives notional outstanding totaled 617.96 $ trillion at the end of 2022, 3.26% larger compared to the end of 2021 and 2.25% lower compared to mid-year 2022 (see Figure 3, 4).

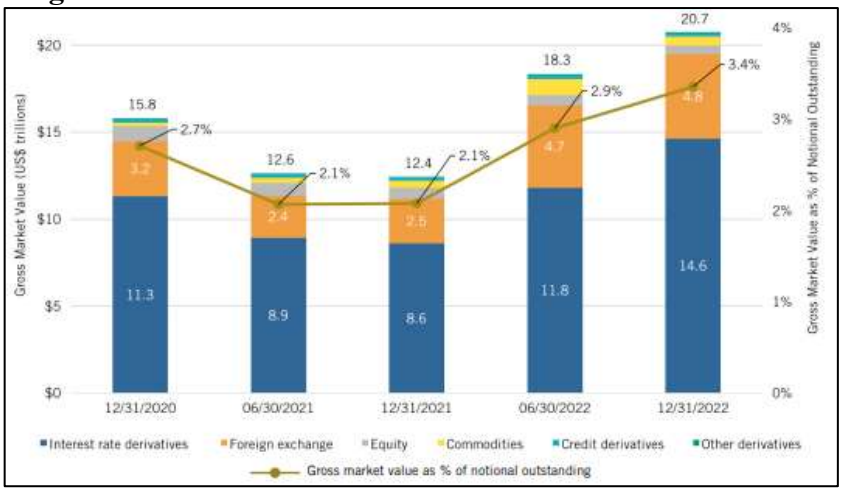
Figure 4: «Global OTC Derivatives Notional Outstanding (in trillions of US Dollars)»



Source: (International Swaps and Derivatives Association (ISDA), 2023)

Gross market value of IRD leaped up to $14.6 trillion at the end of 2022 compared to $8.6 trillion at year end 2021. Gross market value of FX derivatives doubled, rising to $4.8 trillion from $2.5 trillion over the same period (see Figure 5).

Figure 5: «Gross market value of Global OTC derivatives»

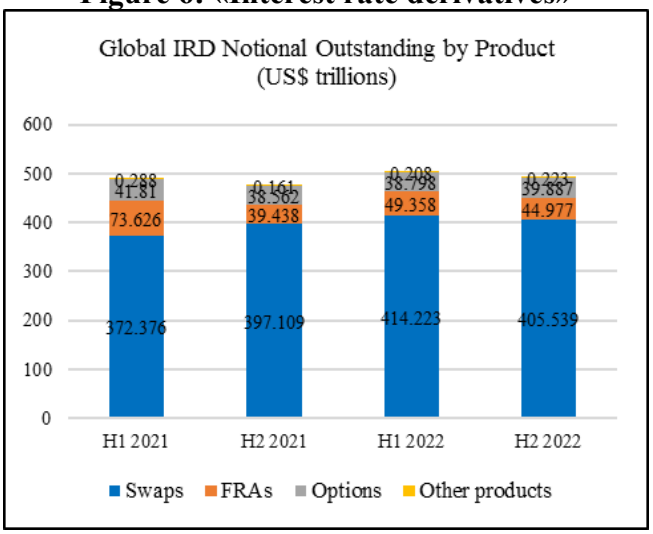


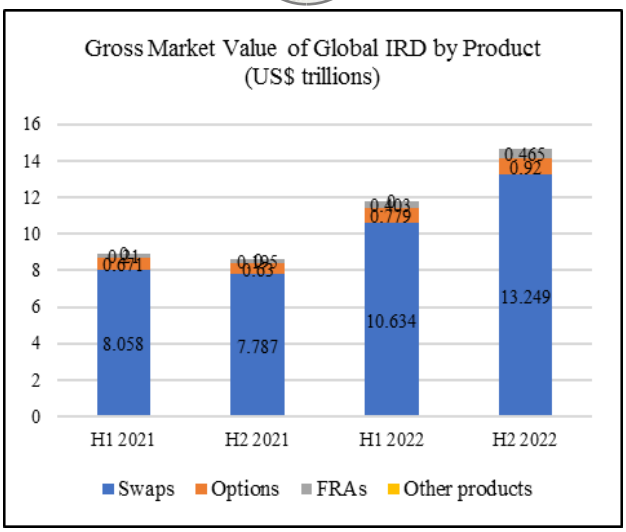
Source: (International Swaps and Derivatives Association (ISDA), 2023)

2.1. Interest rate derivatives: IRD notional outstanding was $490.63 trillion and accounted for 79.4% of the OTC derivatives notional outstanding at the end of 2022. IRD notional outstanding leaped up by 3.2% compared to the end 2021 and fell by 2.4% compared to mid-year 2022 (see graph 6). Interest rate swaps (IRS) notional outstanding rose by 2.1% to $405.54 trillion and accounted for 82.7% of total IRD notional outstanding at year-end 2022. Forward rate agreement (FRA) notional outstanding rose by 14% to $45.0 trillion and options notional outstanding was $39.9 trillion (see Figure 6).

Gross market value of IRD leaped up by 70% to $14.64 trillion at year-end 2022 compared to $8.61 trillion at year-end 2021. IRS gross market value rose to $13.25 trillion at year-end 2022. FRA and options gross market value grew by 38.5% and 46.0%, respectively (see Figure 6).

Figure 6: «Interest rate derivatives»

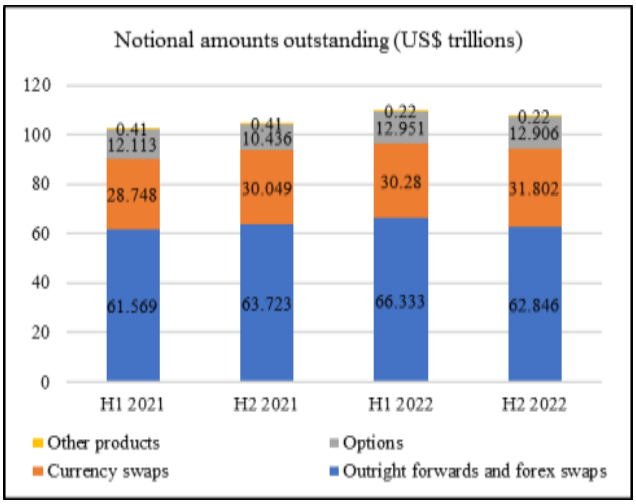


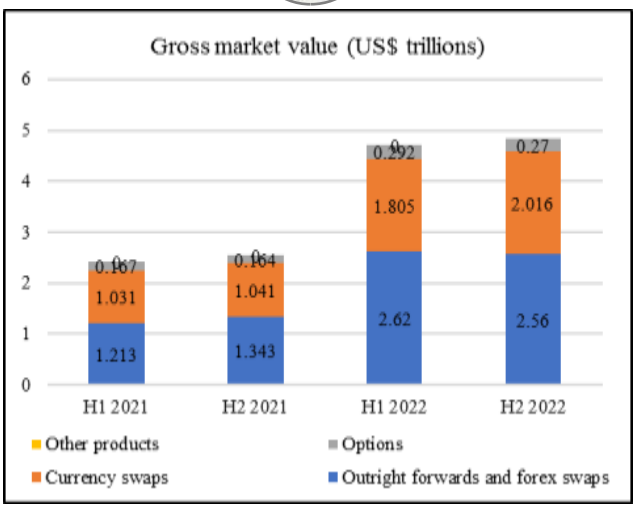


Source: Prepared by the researcher based on: (BIS)

2.2. Foreign exchange derivatives: Foreign exchange derivatives notional outstanding totaled $107.6 trillion which is 17.41% of global OTC derivatives notional outstanding at end 2022. Foreign exchange derivatives notional outstanding leaped up by 3.2% compared to end of 2021 and fell by 1.8% compared to mid-year 2022 (see Figure 7). Outright forwards and forex swaps notional outstanding totaled $62.8 trillion and accounted for 58.4% of total foreign exchange derivatives notional outstanding at year-end 2022. Currency swaps notional outstanding was $31.8 trillion and options notional outstanding was $12.9 trillion (see Figure 7).

Figure 7: «Foreign exchange derivatives»



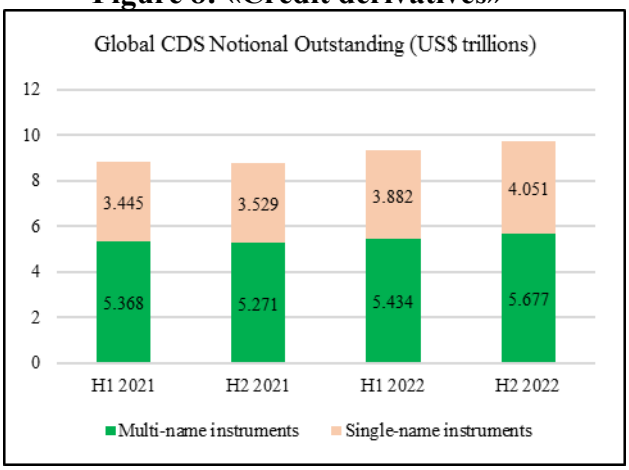


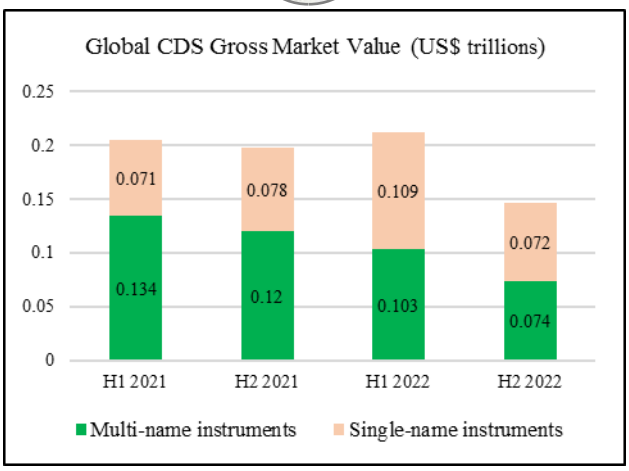
Source: Prepared by the researcher based on: (BIS)

Gross market value of foreign exchange derivatives leaped up to $4.8 trillion at year-end 2022 compared to $2.5 trillion at year-end 2021. Outright forwards and forex swaps gross market value increased to $2.56 trillion at year-end 2022, up by 90.6% compared to $1.34 trillion at the end of 2021. Currency swaps and options gross market value grew by 93.7% and 64.6%, respectively (see Figure 7).

2.3. Credit derivatives: Credit default swaps (CDS) notional outstanding leaped up to $9.7 trillion at end of 2022 compared to year-end 2021 and was up by 4.3% compared to mid-year 2022 (see graph 8). Single-name CDS notional outstanding rose to $4.1 trillion at end of 2022 versus to $3.5 trillion at year-end 2021, while multiple-name CDS notional increased to $5.7 trillion. Credit default swaps was for 1.57% of global OTC derivatives notional outstanding.

Figure 8: «Credit derivatives»



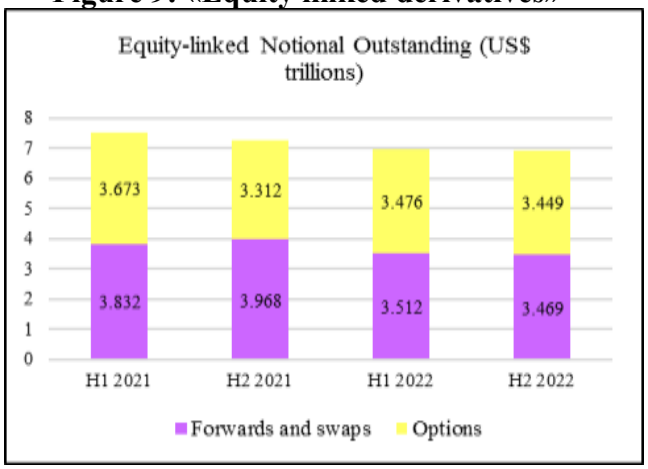


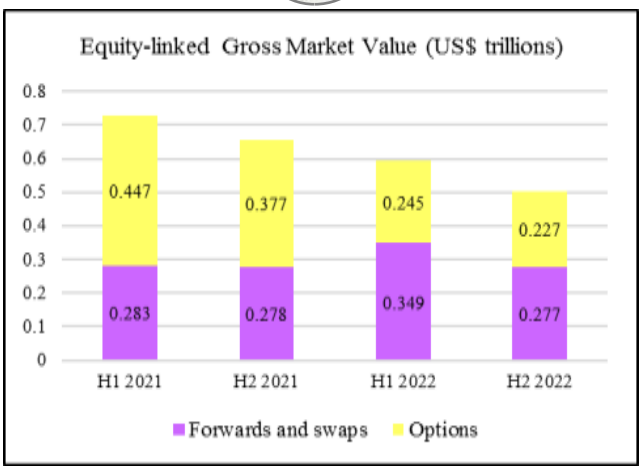
Source: Prepared by the researcher based on: (BIS)

The gross market value of CDS fell to $0.146 trillion at year-end 2022 from $0.198 trillion the year before (see graph 8). Single-name CDS gross market value dropped to $0.072 trillion at year-end 2022 compared to $0.078 trillion at the end of 2021. Multiple-name CDS gross market value was $0.074 trillion at year-end 2022 and $0.12 trillion at year-end 2021.

2.4. Equity linked: Equity linked derivatives notional outstanding was $6.92 trillion and accounted for 1.12% of global OTC derivatives notional outstanding at year-end 2022. Equity linked derivatives notional outstanding fell by 1% compared to mid-year 2022 (see graph 9). forwards and swaps notional outstanding was $3.47 trillion and accounted for 50.16% of total equity linked derivatives notional outstanding at year-end 2022. Options notional outstanding was $3.45 trillion (see Figure 9).

Figure 9: «Equity linked derivatives»



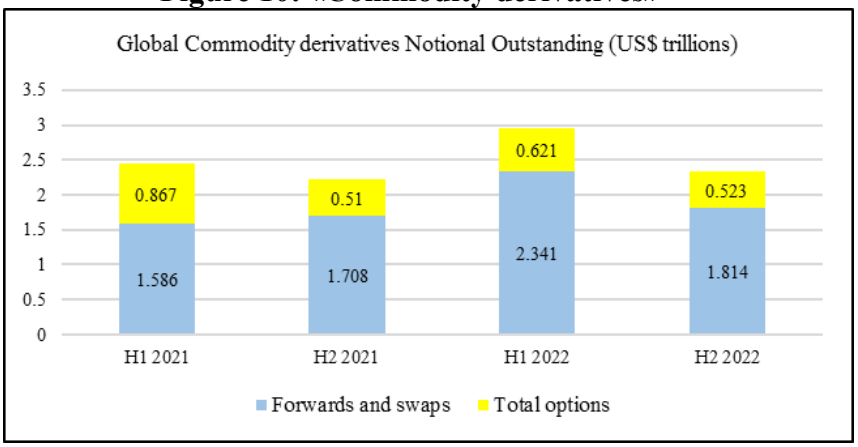


Source: Prepared by the researcher based on: (BIS)

The gross market value of equity linked derivatives fell by 23% to $0.5 trillion at year-end 2022 from $0.66 trillion the year before (see Figure 9). Forwards and swaps gross market value was $0.277 trillion at year-end 2022. Options gross market value declined to $0.227 trillion at year-end 2022 compared to $0.377 trillion at year-end 2021.

2.5. Commodity derivatives: Commodity derivatives notional outstanding was $2.337 trillion which is 0.38% of global OTC derivatives notional outstanding at end of 2022. Commodity derivatives notional outstanding leaped up by 5.4% versus end of 2021, and fell by 21.1% versus mid-year 2022 (see graph 10). forwards and swaps notional outstanding totaled $1.814 trillion and accounted for 77.6% of total commodity derivatives notional outstanding at year-end 2022. Total options notional outstanding were $0.523 trillion (see Figure 10).

Figure 10: «Commodity derivatives»



Source: Prepared by the researcher based on: (BIS)

IV. Empirical study on the effect of exchange traded derivatives on economic growth in three regions in the world (North America, Europe, Asia and pacific)

1. Data and methodology:

1.1. Data sources:

The data used in this paper were sourced from the International Monetary Fund and the Bank of international settlements. The GDP Per Capita (GDPPC) and inflation rate (INF) were obtained from IMF Statistics while the volume of the exchange traded derivatives (DER) was taken from the BIS database. This work is based on a sample of three major regions world economics: (North America, Europe, Asia and pacific), the observation period for the sample is on 30 years (from 1993 to 2022), which allows us to track the dynamics of the development of the derivatives markets over a long period. The work is carried out using a balanced panel data analysis for the period under study.

1.2. Descriptive statistics and correlation matrix:

Table (2) shows the variables used in this research as well as their averages, standard deviations, and maximum and minimum levels.

Table (2): «Statistics for the analyzed economics 1993-2022»

	GDPPC	DER	INF
Mean	9.598121	8.933046	5.445556
Median	10.01031	8.712582	3.500000
Maximum	10.96319	11.14624	66.60000
Minimum	7.736307	6.992096	0.300000
Std. Dev.	0.988431	1.282162	7.990277
Skewness	-0.603691	0.083575	5.712029
Kurtosis	1.963290	1.516822	41.07258
Jarque-Bera	9.497023	8.354090	5925.113
Probability	0.008665	0.015344	0.000000
Sum	863.8309	803.9742	490.1000
Sum Sq. Dev.	86.95267	146.3107	5682.163
Observations	90	90	90

Source: Researcher computation using EViews 12.

From table (2), GDPPC ranges from 7.73 to 10.96 with a mean of 9.59 and a standard deviation of 0.98, DER has a minimum value of 6.99 and a maximum of 11.14, with an average value of 8.93 and a standard deviation of 1.28, INF ranges from 0.3% to 66.60% with a mean of 5.44 and standard deviation of 7.99.

Table (3): «Correlation between variables»

Variables	GDPPC	DER	INF
GDPPC	1		
DER	0.874627	1	
INF	-0.184167	-0.318545	1

Source: Researcher computation using EViews 12.

This exercise serves two important purposes. First is to determine whether there are bivariate relationship between each pair of the dependent variable and independents variables. The second is to ensure that the correlations among the explanatory variables are not so high to the extent of posing multi-collinearity problems.

As we see from table (3), there is a high positive relationship between GDPPC and DER, and low negative relationship between GDPPC and INF, while the relationship between DER and INF was weak.

2. Empirical Results and Discussion:

2.1. Unit-root tests:

To investigate how the development of the derivatives market, especially the trading of exchange, affects economic growth and before estimating the model, we began by testing whether the variables were stationary and whether they had a cointegrated relationship. First, to consider the stationarity, we adopted three unit-root tests: (1) LLC test proposed by Levin, Lin & Chu, 2002, (2) IPS test proposed by Im, Pesaran and Shin, 2003, (3) MW test proposed by Madala & Wu, 1999 which is based on ADF test (Augmented Dickey Fuller test) and PP test (Phillips-Perron test), (see the appendices 1, 2, 3, 4, 5, 6).

The results of these tests can be summarized in the following table.

Table (4): «Results of panel unit root tests»

	LLC Test		IPS Test		MW Test			
					ADF Test		PP Test	
	Statistic	Prob.**	Statistic	Prob.**	Statistic	Prob.**	Statistic	Prob.**
GDPPC (At level)	-0.02957	**0.4882**	1.81007	**0.9649**	1.18984	**0.9774**	1.34269	**0.9693**
GDPPC (At 1st difference)	-4.85616	0.0000	-4.40871	0.0000	29.9392	0.0000	34.7208	0.0000
DER (At level)	-1.74196	0.0408	-0.83225	**0.2026**	7.69692	**0.2612**	6.83287	**0.3366**
D(DER) (At 1st difference)	-1.75204	0.0399	-4.14264	0.0000	28.1155	0.0001	53.8663	0.0000
INF (At level)	-1.17802	**0.1194**	-4.85551	0.0000	35.1936	0.0000	28.9346	0.0001
INF (At 1st difference)	-2.97098	0.0015	-5.56745	0.0000	38.9831	0.0000	68.9698	0.0000

Source: Researcher computation using EViews 12.

The results of unit root tests showed that all variables are non-stationary at level, while the output of the unit root tests in 1st difference showed that GDPPC, DER and INF were significant at a 5 percent critical value and achieved stationary at first difference.

Since all variables are first-order integrated, this means the possibility of a long-run equilibrium relationship between the variables. This is tested by conducting cointegration tests.

2.2. Co-integration Test:

As advised by Pedroni (1999) and Kao (1999), for the I(1) variables, Pedroni and Kao panel cointegration tests were used for the purpose of investigating the long-run relationships between the variables. Pedroni's within and between dimension results of the panel cointegration test and Kao test results are summarized in table (5) and (6) respectively.

Table (5): «Results of Pedroni co-integration test»

Pedroni Residual Cointegration Test							
	Alternative hypothesis: common AR coefs. (Within-dimension)				Alternative hypothesis: individual AR coefs. (Between-dimension)		
	Statistic	Prob.	Weighted Statistic	Prob.		Statistic	Prob.
Panel v-Statistic	-1.123804	0.8695	-0.806841	0.7901			
Panel rho-Statistic	1.508844	0.9343	1.195822	0.8841	Panel rho-Statistic	1.122247	0.8691
Panel PP-Statistic	2.109983	0.9826	1.536628	0.9378	Panel PP-Statistic	1.296213	0.9025
Panel ADF-Statistic	2.452315	0.9929	1.990379	0.9767	Panel ADF-Statistic	2.132544	0.9835

Source: Researcher computation using EViews 12.

Table (6): «Results of Kao co-integration test»

Kao Residual Cointegration Test		
	t-Statistic	Prob.
ADF	1.205938	0.1139
Residual variance	0.004935	
HAC variance	0.006325	

Source: Researcher computation using EViews 12.

The null hypothesis is that the variables are not cointegrated. Under the null hypothesis, all the statistics are distributed as normal. The finite sample distribution for the seven statistics has been tabulated in Pedroni (Pedroni, 2004).

As we see from table (5) and (6), both test types (Pedroni and Kao) do not reject null hypothesis (most p-value > 0.05), this means the I(1) variables are not cointegrated. With this outcome, we can run panel VAR model (not panel VECM).

2.3. Estimate the model:

The panel data regression model is as follows:

$GDP_{it} = \alpha 0 + \beta_1 DRV_{it} + \beta_2 INF_{it} + \varepsilon_{it}$

i: 1, 2, 3 (Regions: Noth America, Europe, Asia and Pacific).

t: 1, 2, …..,30 (Period of study: 1993-2022).

GDP_{it}: Gross domestic product for region i in time t (Dependent variable).

DRV_{it}: Exchange traded derivatives for region i in time t (Independent variable).

INF_{it}: Inflation rate for region i in time t (control variable).

ε_{it}: Error term.

There are two VAR models which can be developed: Fixed effects model and Random effects model

a. Fixed effects least square dummy variable (LSDV) model

In Fixed effects model (FEM), the intercept in the regression model is allowed to differ among individuals to reflect the unique feature of individual units. This is done by using dummy variables, provided we take care of the dummy variable trap. The FEM using dummy variables is known as the least squares dummy variable model (LSDV). FEM is appropriate in situations where the individual-specific intercept may be correlated with one or more regressors (Gujarati, 2011, p. 303).

From the Fixed effects least square dummy variable (LSDV) model (see appendix 10), we see that DER is statistically significant at the 5% level, while INF is statistically insignificant.

b. Random effect model:

An alternative to FEM is random effects model (REM). In REM we assume that the intercept value of an individual unit is a random drawing from a much larger population with a constant mean. The individual intercept is then expressed as a deviation from the constant mean value. REM is more economical than FEM in terms of the number of parameters estimated. REM is appropriate in situations where the (random) intercept of each cross-sectional unit is uncorrelated with the regressors. Another advantage of REM is that we can introduce time-invariant regressors. This is not possible in FEM because all such variables are collinear with the subject-specific intercept (Gujarati, 2011, p. 303).

The outcome for random effects model shows that all variables are statistically significant (see appendix 11).

To check which one is the best model FEM or REM, we use the Hausman test. Table (7) presents the results of this test.

Table (7): «Hausman Test»

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	160.261754	2	0.0000

** WARNING: estimated cross-section random effects variance is zero.
Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
DER(-1)	0.255945	0.709489	0.001284	0.0000
INF(-1)	-0.006197	0.013857	0.000003	0.0000

Source: Researcher computation using EViews 12.

The result of Hausman test show that P-value is less than 0.05, hence, we reject the null hypothesis and accept the alternative, which means that the fixed effects model is the appropriate model.

As we see from the Fixed effects least square dummy variable (LSDV) model (see appendix 10), INF is statistically insignificant, while DER is statistically significant at the 5% level.

2.4. Panel Causality Findings:

We perform granger causality test to determine if the exchange traded derivatives cause the economic growth. The null hypothesis is that DER do not Granger cause GDPPC. We perform join test of the coefficients of all lag terms of explanatory variables using Wald test.

Table (8): «Wald Test»

Wald Test: Equation: Untitled			
Test Statistic	Value	df	Probability
F-statistic	28.41894	(2, 82)	0.0000
Chi-square	56.83787	2	0.0000
Null Hypothesis: C(2)=C(3)=0 Null Hypothesis Summary:			
Normalized Restriction (= 0)		Value	Std. Err.
C(2)		0.255945	0.043780
C(3)		-0.006197	0.004340

Source: Researcher computation using EViews 12.

The result of Wald test reveal that the null hypotheses of DER do not Granger cause GDPPC can be rejected at the 5% level, implying that the variations in exchange traded derivatives in the North America, Europe, Asia and Pacific significantly lead to changes in economic growth.

To determine if the economic growth cause the exchange traded derivatives, we re-estimate the FEM and REM (where DER is treated as the dependent variable and GDPPC as the independent variable) (see appendices 12, 13). Next, we run Hausman test the choose the best model, then we conduct Wald test for causality reason (see appendices 14, 15). The result of Wald test showed that GDPPC does Granger cause DER.

We found evidence of bi-directional short-run causality between GDPPC and DER.

Conclusion:

The broad objective of this study was to examine the influence of exchange traded derivatives on the economic growth in three regions (North America, Europe, Asia and Pacific) during the period from 1993 to 2022. The study utilized GDP Per Capita as a measure of economic growth, while the volume of exchange traded derivatives was employed as the independent variable, and the inflation rate was included in the model as a control variable.

The results of panel data analysis revealed that fixed effect model was the appropriate model for the study data. Empirical findings indicated that inflation was statistically insignificant. While the exchange traded derivatives variable was

statistically significant. The results revealed that the exchange traded derivatives contribute positively to economic growth in the short run, but the influence disappears in the long run for the study sample and period, so, we accept the study hypothesis. The empirical findings confirmed also the existence of bi-directional short-run causality between GDPPC and DER.

The results of the study support both: the findings of previous studies presented in the current research, as well as the theoretical contributions that suggest a positive impact of financial derivatives markets on economic growth, by hasting the accumulation of capital, which encourage investment by providing the possibility of diversification and due to their role as a hedging tool.

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