IBN HALDUN UNIVERSITY
SCHOOL OF GRADUATE STUDIES
DEPARTMENT OF FINANCIAL ECONOMICS

MASTER THESIS

THE IMPACT OF WORLD GOLD PRICES ON THE STOCK MARKET INDICES OF EMERGING MARKETS: A PANEL DATA ANALYSIS

MURTALA MUSTAPHA BABA

THESIS SUPERVISOR: ASST. PROF. NİHAT GÜMÜŞ

ISTANBUL, 2020

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by

MURTALA MUSTAPHA BABA

A thesis submitted to the School of Graduate Studies in partial fulfillment of the requirements for the degree of Master of Science in Financial Economics

THESIS SUPERVISOR: ASST. PROF. NİHAT GÜMÜŞ

ISTANBUL, 2020

APPROVAL PAGE

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science in Financial Economics.

Thesis Jury Members

Title - Name Surname	Opinion	Signature
_____	_____	_____
_____	_____	_____
_____	_____	_____

This is to confirm that this thesis complies with all the standards set by the School of Graduate Studies of Ibn Haldun University.

Date of Submission Seal/Signature

ACADEMIC HONESTY ATTESTATION

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

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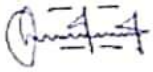
Signature: 

ÖZ

DÜNYA ALTIN FİYATLARININ GELİŞMEKTE OLAN PİYASALARIN HİSSE SENEDİ ENDEKSLERİ ÜZERİNDEKİ ETKİSİ: BİR PANEL VERİ ANALİZİ

Yazar Murtala Mustapha Baba
Finansal Ekonomi Yüksek Lisans Programı
Tez Danışmanı Dr. Öğr. Üyesi Nihat Gümüş
Eylül 2020, 76 Sayfa

Uluslararası finansal piyasaların entegrasyonu ve finansal ve ekonomik değişkenler arasındaki bağlantıların, politika yapıcıları bu değişkenlerin bazılarının davranışları üzerinde politikalar aracılığıyla etkili ve kontrol etmeye ve yatırımcılar da bilinçli yatırım kararları almak için teşvik etmiştir. Bu değişkenler arasında borsalarda işlem gören hisse senetleri bulunmaktadır. Ekonomide hayati bir işlev görür ve kolayca alıp satılabilir. Bu nedenle, diğer ekonomik ve mali değişkenlerle olan ilişkisinin bilinmesi ve bu doğrultuda bilinçli kararlar verilmesi elzemdır. Bu çalışmada, 01/2004-12/2019 dönemi için gelişmekte olan 19 ekonomi ülkesinin altın, döviz, enflasyon, faiz oranları ve borsa endekslerine ilişkin aylık veriler, bağımlı bir değişken olarak hisse senedi ile olan ilişkisini araştırmak için kullanılmıştır. Analiz için dinamik panel ARDL modeli kullanılmıştır. Sonuçlar hisse senedi endeksleri, altın, döviz, enflasyon ve faiz oranları arasında uzun vadeli bir ilişki olduğunu göstermiştir. Uzun vadede enflasyon ve faiz oranları oldukça önemli katsayılara sahip. Hem enflasyon hem de faiz oranları hisse senedi fiyatları ile negatif bir ilişkiye sahiptir. Altın ve döviz kurunun uzun vadede hisse senedi endeksleri üzerinde önemli bir etkisi yoktur. Ancak kısa vadede enflasyon dışında tüm değişkenler anlamlıdır. Portföy teorisi kısa vadede geçerliyken, geleneksel teori uzun vadede geçerlidir. Altın, uzun vadede bir riskten korunma veya çeşitlendirme işlevi görmez, ancak kısa vadede hisse senetleri için bir çeşitlendirici görevi görür, enflasyon yalnızca uzun vadeli hisse senedi fiyatları üzerinde etkilidir. Faiz getiren varlıklar hem kısa hem de uzun vadede hisse senetlerine alternatif bir yatırım merkezi olarak işlevi görür.

Anahtar Kelimeler: finansal piyasalar; hisse endeksi; altın; enflasyon; gelişen piyasalar; ARDL.

ABSTRACT

THE IMPACT OF WORLD GOLD PRICES ON THE STOCK MARKET INDICES OF EMERGING MARKETS: A PANEL DATA ANALYSIS

Student Name Murtala Mustapha Baba

MSc in Financial Economics

Thesis Supervisor: Asst. Prof. Nihat Gümüş

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The integration of international financial markets and linkages between financial and economic variables have instigated policymakers to try to influence and exercise control over the behavior of some of these variables through policies and investors to make informed investment decisions. Among such variables are stocks that are traded on stock markets. It performs a vital function in the economy and is easily tradeable. It is therefore prudent that its relationship with other economic and financial variables be known for making informed decisions. This research employed monthly data on gold, exchange, inflation, interest rates, and stock market indexes of 19 emerging economy countries for the period 01/2004-12/2019 to scrutinize the relationship between them with stock as a dependent variable. The dynamic panel ARDL model is employed for the research. The results showed the presence of a long-term relationship between stock indices, gold, exchange, inflation, and interest rates. In the long-term, inflation and interest rates are having highly significant coefficients. Both inflation and interest rates have a negative relationship with stock prices. Gold and exchange rate do not have any significant impact on stock indices in the long-term. However, in the short term, with the exception of inflation, all the variables are significant. Traditional theory holds in the long-term whilst in the short-term, portfolio theory holds. Gold does not serve as a hedge nor a diversifier in the long-term but serves as a diversifier for stocks in the short-term, inflation only has an impact on stock prices in the long-term and interest-bearing assets serve as an alternative investment hub to stocks both in the short and long-term.

Keywords: financial markets; stock index; gold; inflation; emerging markets; ARDL.

DEDICATION

This thesis is dedicated to my late dad Sheikh Mustapha Baba who would have loved to witness my achievements, my mom Hajia Umayatu Iddrisu, my lovely wife Mariam Alhassan, my beautiful daughter Minnatullah, Hajj Alhassan Mohammed, Hajia Ayishetu Ibrahim and my family at large.

ACKNOWLEDGEMENT

"...If you give thanks, I will give you more...." (Qur'an 14:7).

"He who does not thank people is not thankful to Allah" (Sunan Abi Dawud).

All praise and thanks are due to Allah who in HIS infinite mercy and blessings I have been able to write this thesis to completion. I thank my supervisor Nihat GÜMÜŞ for his help, constructive criticisms, and patience throughout the thesis writing period. I thank especially Ayuba Napari and Iddrisu Mohammed Kambala for their assistance in analyzing the data. My final thanks go to all who have prayed and/or helped in one way or the other in the accomplishment of my master's degree.

Murtala Mustapha Baba

ISTANBUL, 2020

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LIST OF SYMBOLS AND ABBREVIATIONS

ARDL Autoregressive distributed lag

AUD Australian dollar

BRICS Brazil, Russia, India, China, and South Africa

CAD Canadian dollar

CAPM Capital Asset Pricing Model

CHF Swiss franc

CPI Consumer price index

DM Deutsche mark

ECT Error Correction Term

EUR Euro

GBP Pound sterling

GDP Gross Domestic Product

GFC Global Financial Crisis

G7 Group of seven

IFC International Finance Corporation

IFS International Financial Statistics

JPY Japanese yen

NOK Norwegian krone

PCE Personal Consumption Expenditure

USD United States dollar

VIF Variance Inflation Factor

WPI Wholesale price index

CHAPTER I

INTRODUCTION

The integration of international financial markets and the linkages between financial and economic variables have instigated investors to make informed investment decisions and policymakers to try to influence and exercise control over the behavior of some of these variables through policies. This cannot be achieved without understanding the relationship between these variables. Additionally, the aftermath of the global financial crisis has seen the continuous increase in the GDP of emerging countries and also their growth more than in developed countries. This has prompted the increase in attention especially of investors in these countries who obviously want to earn high returns on their investments. These events have instigated researchers and policymakers alike to conduct several studies on the dynamics of economic and financial variables and their relations with each other.

The significance of the stock market is certainly indisputable. In truth, it is hard to envisage a globe devoid of a stock market since it performs a crucial function in the economy of all countries and contributes to economic development, but which can also cause a significant negative impact when not regulated. In September 1929, the stock market collapsed due to incredibly huge amounts of trading volumes which contributed to the Great Depression of 1929. The Great Depression is considered the lengthiest and worst economic crisis in modern times. This is a demonstration of the importance of intervention by policymakers when necessary (Al-Ameer, Hammad, Ismail, & Hamdan, 2018).

Most of the studies conducted in the literature make use of time-series data and the results are somewhat mixed. The methodology used in this study makes it possible to see changes in the relationship between these variables over time. For example, this

research has found that exchange rates and inflation have different relationships with the prices of stock in the long and short-term. This research employs monthly data on gold, exchange, inflation, interest rates, and stock market indexes of 19 emerging economy countries for the period 01/2004-12/2019 to scrutinize the relationship between them with stock as a dependent variable. In accomplishing the aim of the study, I make use of the dynamic panel ARDL model.

The results showed that the error correction term (ECT) is negative and highly significant which is an indication of the existence of a long-term relationship between stock indices, gold, exchange, inflation, and interest rates. In the long-term, inflation and interest rates are having highly significant coefficients. Both inflation and interest rates have a negative relationship with stock prices. Gold and exchange rate do not have any significant impact on stock indices in the long-term. However, in the short term, with the exception of inflation, all the variables are significant. Traditional theory holds in the long-term whilst in the short-term, portfolio theory holds. Gold does not serve as a hedge nor a diversifier in the long-term but serves as a diversifier for stocks in the short-term, inflation only has an impact on stock prices in the long-term and interest-bearing assets serve as an alternative investment hub to stocks both in the short and long-term.

Following this section is a discussion on Emerging markets, stocks, and gold. Chapter 2 follows and is concerned with studies available in the literature. Discussion of the data used and methodology of the study is done in chapter 3. Chapter 4 contains the results, discussion, and conclusion of the study.

1.1. Emerging Markets

Emerging markets are countries that have some features of developed countries and are candidates for becoming developed nations. Such countries are moving away from a closed business environment to an open market system while designing plans for policy change and are noticing a growth in local and international investment. These countries have low to medium per capita income, growth potential, liquidity of stock markets, a growing economy, and a consumption population. They are characterized by high returns but also high volatilities thus making it risky to invest in. Emerging economies form about 80% of the world's economy-including some of the world's biggest countries such as China, India, and Russia. Emerging economies frequently have a faster growth rate than developed ones, but are hampered by greater socio-political uncertainty and volatility. The term was coined by World Bank's International Finance Corporation's (IFC) Antoine van Agtmael in 1981 (IFC, n.d; Heakal, R., 2019; Amadeo, K., 2020; Sraders, A., 2020).

On the list of emerging countries, there is no consensus about specifically which countries are called developing markets. There exist differences in the emerging economies list of different institutions. This is so because each institution has specific criteria in considering a country as an emerging economy. Dow Jones, the IMF, the MSCI, the S&P, and Russell are among institutions with a list of emerging countries and there exist variations in the lists.

Nonetheless, emerging economies are also exposed to price fluctuations (such as oil or food commodities) or reserve currencies-most especially the USD. They generally produce less industrial output than advanced economies. Compared to developed countries, they also have unstable capital markets that provide investors with some risk. Since the markets of emerging economies are still evolving, they still do not have a lot of exchange knowledge for trading firms, and selling securities (such as bonds) is also more difficult (Sraders, A., 2020). These characteristics of emerging economies makes it prudent for investors and policymakers to know the relationship that exists

between financial variables in these emerging markets to make informed decisions in the quest for investment, diversifying their portfolios and hedging.

The share of emerging markets in the GDP of the world has seen an essential increment in the past decade. Emerging economies are expected to be the drivers of economic growth since they recorded strong economic growth after GFC in contrast to developed economies. Financial institutions in charge of controlling funds of oil-exporting countries in the past years started buying assets of emerging economies (Turhan, Hacihasanoglu, & Soytas, 2013).

Figure 1.1 GDP of Emerging economies 2009-2021

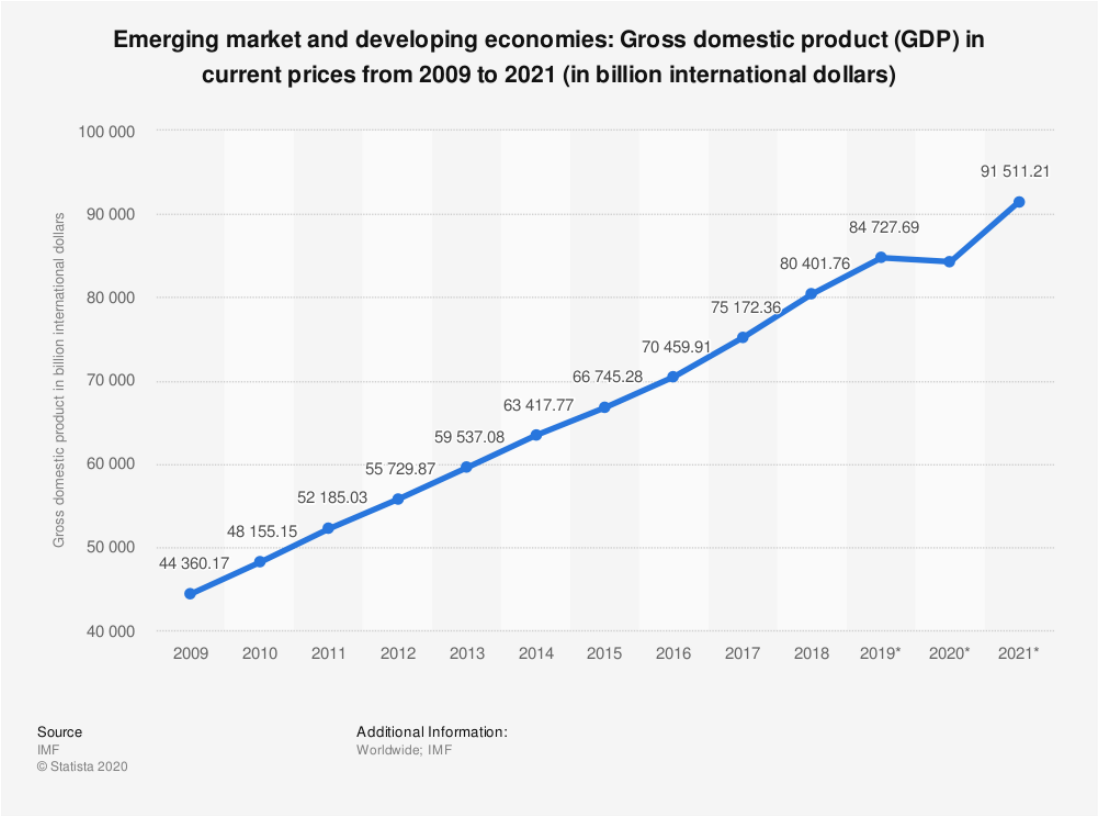
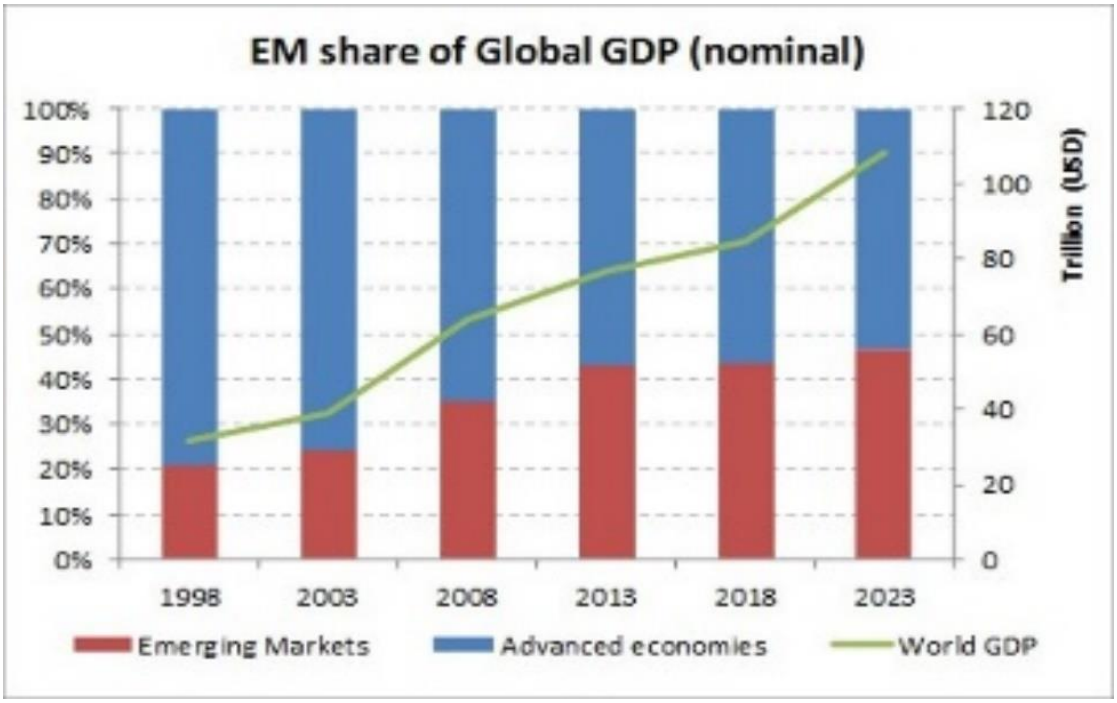


Figure 1.2 GDP share of Emerging economies in global GDP 1998-2023



Source: JP Morgan research

As evident in Figure 1.1 and Figure 1.2, the GDP of emerging economies has been increasing since 1998 and projected to continue increasing.

1.2. Stock Markets

The stock market is a term used to refer to general markets that exist for the issuing, purchasing, and selling of stocks trading on a stock exchange or over the counter which function within a given regulatory framework. Stocks, otherwise called equities, reflect partial equity of a firm, and the stock market is a venue where buyers are able to purchase and sell shares of these investment assets. In a nation or area, there may exist several stock exchange platforms that allow stock trading and other types of securities. An effectively working stock exchange is considered crucial to economic growth because it awards firms the opportunity to easily access financial resources (Corporate Finance Institute, n.d; Chen, J., 2020).

London stock exchange is considered the world's first equity market. The foundation of it was started in a coffeehouse in 1773, which served as a meeting place for merchants to exchange shares. In the year 1790, the first-ever stock exchange in the USA was opened in Philadelphia. The Buttonwood Agreement called so for the fact that the signings were done under a buttonwood tree, characterized the founding of Wall Street in New York in the year 1792. Twenty-four merchants signed the agreement, and it became the 1st American company of its kind to do trading in securities. In 1817, their company was changed to New York Stock and Exchange Board by the merchants (Chen, J., 2020). There exist two (2) types of stock market; primary and secondary market.

1.3. Primary Market

This is a market in which the selling of new shares on an exchange for businesses, states, and other entities to receive capital by shares dependent on debt or equity takes place. The stock exchange as a main platform facilitates companies to make public and offer their allotments for sale to the general public for the first time via what is known as the initial public offering (IPO) process. This practice aids firms in the collection of needed investment capital from the people with extra funds known as investors. This market plays the role of a facilitator for this capital raising process, and it gets paid for its services from the corporation and institutions partnering with it in its financial dealings. When the original transaction is made, additional trades take place on the secondary market, where the majority of stock activity happens every day (Chen, J., 2020).

1.4. Secondary Market

This is the market where securities already owned by investors are bought and sold. Secondary market transactions are called secondary simply because they are one step away from the transaction which originally produced the securities in question. Prices in this market are induced by the fundamental forces of demand and supply. If most investors believe a stock will grow in value and rush to buy it, the price of the stock

will typically rise. When a company lacks favor with creditors or does not gain enough, the stock price declines as demand for the defense declines. (Chen, J., 2020).

1.5. Stock Market Index

Stock indices are made up of a set of stocks constructed to show the aggregate performance of the diverse stocks and the index movement is the net result of the movements of every single variable. Indices of the stock market are exchanged in futures and options contracts form and are also sold on controlled markets. Overall stock market performance is typically traced and mirrored in the accomplishment of stock market indices. Major market indices in the world include Dow Jones Industrial Average (DJIA), the Financial Times Stock Exchange 100 Index (FTSE 100), the Hang Seng Index, the NASDAQ Composite Index, the Nikkei 225 Index, and the Standard & Poor's 500 Index (S&P 500) (Corporate Finance Institute, n.d; Chen, J., 2020).

1.6. Stocks Investment

Many studies have proven that stocks produce returns on investment over extended periods which are higher than those of any other asset class. Investing in capital markets is considered the cheapest way to earn returns that over time surpass inflation, and the expected returns outstrip those of other portfolios, such as shares or commodities. Returns on equity come from dividends and capital gains. A dividend is a percentage of income paid by a company to its owners and a capital gain emerges when you sell a stock at a price greater than the price you bought it at (Chen, J., 2020; Amadeo, K., 2020).

1.7. Value Investment

These are investments that are normally done in firms that are well-established and have demonstrated long-term stable performance and can deliver consistent dividend earnings. Value investment is more based on reducing risk than investing in growth,

though value investors tend to purchase stocks when they see the price of the stock as underestimated (Corporate Finance Institute n.d).

1.8. Growth Investment

Growth investment involves searching for businesses with an extraordinarily high growth outlook, in the expectation of generating full share price appreciation. Growth investors seem to be less confident in dividend earnings and most likely to take the risk in investing in rather young businesses. Growth investors usually prefer technology stocks due to their high growth prospects (Corporate Finance Institute n.d).

1.9. Gold

Gold has been used for different purposes throughout history since its discovery. It has performed the roles of money as a means of exchange and a store of value for ages. Various forms of jewelry in use today were already been worked on by goldsmiths as far in the Sumerian civilization. Gold as a monetary standard was in use in Egypt as of the year 1400BC. It is used as a reserve by central banks today as a way of protecting the value of their currencies. It has some social-cultural importance in some societies. It is a representation of wealth in India which together with China are the largest consumers of this valued metal. Gold has an inherent value as a physical asset. It is principally used in jewelry however, it is also used for dental and industrial purposes. Gold investment has no default risk. (Baur & McDermott, 2010; O'Connor, Lucey, Batten, & Baur, 2015).

Gold stands out among any lone, precious metal and the most common investment option. It stood the test of time and proven to be performing well in crisis conditions including market downturn, currency collapse, high inflation, war, etc. (Shakil, Mustapha, Tasnia, & Saiti, 2018). Gold is also said to be the greatest preservative purchasing power in the long term. Gold in addition offers high liquidity; it is easily traded for cash whenever the owners wish. Investing in gold has the capability of being employed as a shield against inflation and depreciation of the currency. Through

financial and an economic standpoint, gold price fluctuations are both interesting and significant. It is also suggested that gold investing is traditionally related to concerns about increasing inflation and/or political risk (Sujit & Kumar, 2011b).

1.10. Gold Standard

This was a monetary structure where gold acted as the basis for the value of currencies and was prevalent in the advanced world in the 19th century. The value of currencies were connected directly to gold. A country could also link its currency to that of a country that linked its currency to gold. This system was in existence from the 1870s till 1914, a year that witnessed the First World War. Before World War I, trade between nations was carried out using physical gold as a way of settlement. There was no constraint on the importation and exportation of gold and also, domestic currencies could be converted into gold freely at a fixed value. Gold coins were in circulation with other coins made from other forms of metals. The composition was variable by country. Though there existed places that used silver, it was indirectly indexed to gold. British and America had left the system in 1931 and 1933 respectively due to persistent economic, political, and social unrest (Capie, Mills, & Wood, 2005). When the gold system collapsed, an agreement was reached among nations to develop the Bretton Woods system.

1.11. Bretton Woods system

This is a system that was developed for use after the Second World War as the new monetary system. This was designed in 1944 in the US at a conference called the Bretton Woods Conference where the system derives its name from. This system replaced the gold standard as a framework for currencies. This saw the dollar to be attached to gold and all other world currencies attached to the US dollar because of the economic and political dominance of the US. For this, some see it as the dollar standard. Gold was 35$ per ounce. No matter how this system appears to be different, it was the indirect continuation of the gold standard. Contrary to the previous system, capital controls were allowed to empower regimes to trigger economies and not endure

financial market punishments. This system was also abandoned in 1971 with the closing of the gold window allowing the free trade of gold. The end of this system has seen gold prices rising and a lot of researches conducted on the determinants and influencers of innovations in the gold prices (O'Connor et al., 2015).

While gold, following the fall of the Bretton Woods system in 1971, no more has a principal function in the monetary system, its conventional role as a store of value in most Asian countries has been preserved. So much as those countries in which gold serves a smaller function, it still will remain symbolically significant value, by its function in the history of the monetary system (Wang, Lee, & Thi, 2011).

When these systems where in place, it meant that gold prices were not influenced by the decisions of central banks and government but rather relied on its demand and supply. Under these systems, there was stability in the price of gold which was automatic in the sense that, a hike in prices of goods meant a fall in the price of gold. This fall in price reduced the motivation to produce gold and saw a diversion of existent stock to other uses say jewelry. However, a rise in gold price meant an impulse for gold production (Capie et al., 2005).

1.12. Demand and Supply of Gold

Gold can be demanded for different purposes. It could be demanded for jewelry, industrial production, dental, or investment as an asset. It is used to produce jewelry, coins, medals, etc. Jewelry production portrays a fixed long-run origin demand of gold and is considered the earliest uses of gold. Because of the socio-cultural status of gold in Asian societies like China and India (representing major markets), they constitute the main origins of demand for jewelry. Jewelry demand is determined by the purchasing power of consumers. For industrial purposes, gold is demanded for use in electronics and dentistry. However, the demand for these purposes has declined as a result of increasing prices of gold pushing for alternatives in its use. Gold has mainly been used in electronics for binding wires but has been replaced with copper. Gold is replaced in dentistry use with inexpensive non-metallic underlayer like plastics. Gold

as an asset class has special properties. It has been shown that small allocations to gold secure and boost the efficiency of an investment portfolio. Even now, gold nevertheless only accounts for less than one percent of investment portfolios worldwide. That is evolving, though, and all sorts of investors have continued in their recognization of gold as a stable, durable long run interest store that has shifted separately of different investments. In the last three decades, the average amount of gold purchased by consumers rose by at least 235 percent. Analysis reveals that gold in portfolios can be used to preserve buying power, reduce uncertainty, and mitigate market shock losses. Gold used for investment stems from the view held by investors that it provides some form of protection against financial market uncertainties (Baur & McDermott, 2010, 2010; Capie et al., 2005; Ghosh, Levin, Macmillan, & Wright, 2004). Supply of new gold is done through two (2) major sources: scrap and mines. Other sources through which it is discharged into the market are hedging by producers and bank sales by the authoritative sector (O'Connor et al., 2015).

Scrap supply for gold is done through the recycling of electronics to some extent and aged jewelry by individuals. Electronics having a small amount of gold present in it makes it uneconomical to restore leading to permanent loss from the available stock though restoration rate is still more than 50%. Recycling is the most instantly sensitive form of gold supply to the gold price and the economic shocks. The bulk of recycled gold-about 90%-comes from jewelry, with the remaining 10% being gold derived from mining (O'Connor et al., 2015).

Mines production contributes the largest part of the gold supply– usually 75 percent annually. The mining of gold and its related operations do not answer rapidly to price innovations. There is typically a very lengthy lead period between discovering new gold reserves and mines entering service and locating them. Annual demand, however, needs more gold than is freshly extracted, so recycling makes up the shortfall. Almost all of the gold ever mined, since it is practically indestructible, is technically still reachable in one form or another and probably accessible for recycling. Overall mine output rates have risen dramatically over the past decade, but major new finds are

relatively rare and production levels remain increasingly limited (O'Connor et al., 2015).

There has been a continuous shift in the market's demand profile towards emerging economies. The past 10 years have seen a fundamental switch in the central banks' behavior toward gold, incited by a reassessment of their role and relevance following the 2008 financial crisis. Central banks of emerging markets have expanded their official purchasing of gold even though banks of Europe have stopped sales, and the industry is now a significant origin of annual gold demand. Apart from the USA, key countries that buy gold are the developing economies; Saudi Arabia, Turkey, Indonesia, India, and China. (Levin & Wright, 2006).

Figure 1.3 Supply of Gold from different sources

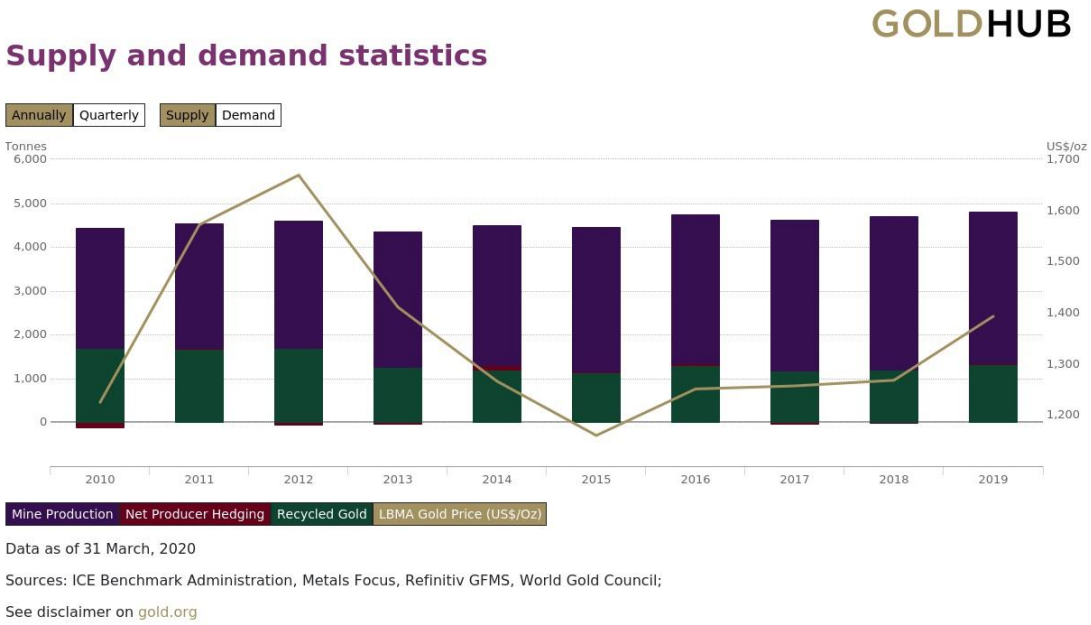
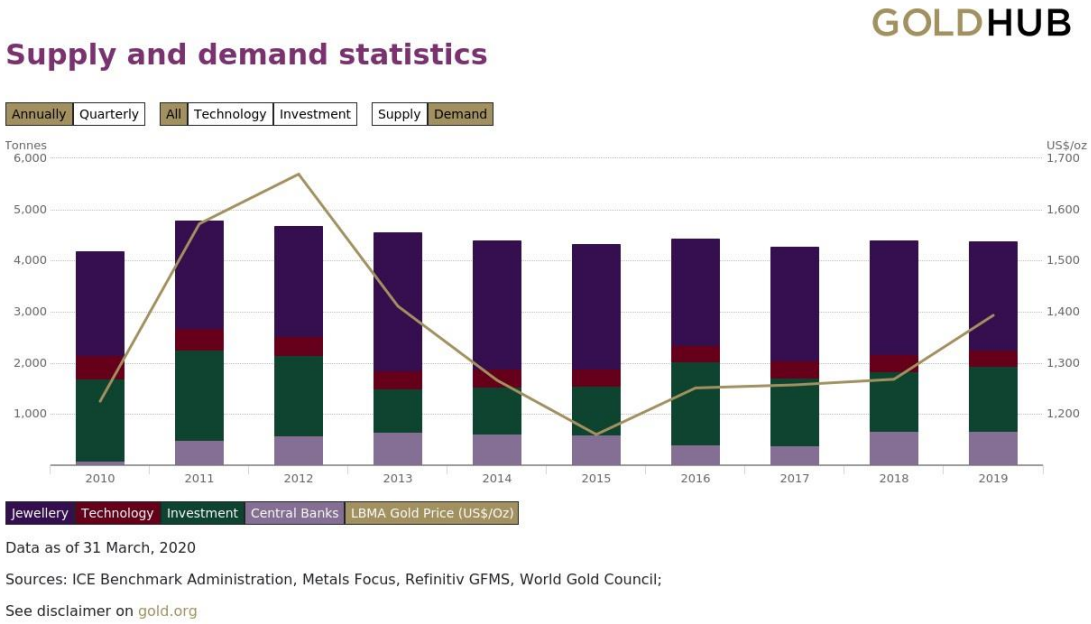


Figure 1.4 Demand for Gold by different sectors



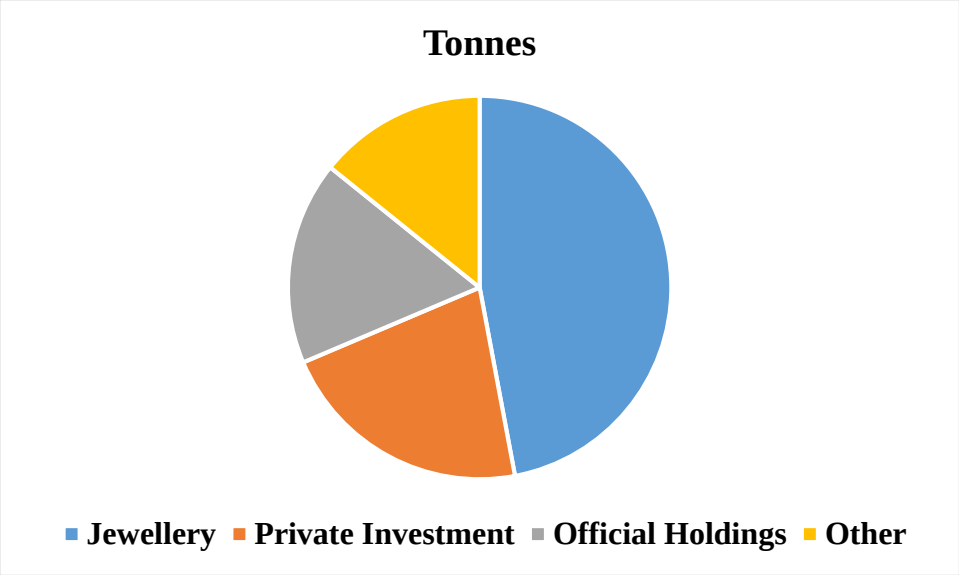
The sources of annually demanded and supply of gold is presented in Figure 1.3 and 1.4 respectively. As evident from figure 1.3 most of the gold supply is from mining and then from reused gold and the least comes from net producer hedging. From figure 1.4, the highest demand is from jewelry, then investment, followed by a demand from central banks and the least demand is from technology.

1.13. Gold Production through Mine

The mining of gold is a multinational industry with activities on all continents, with the exception of Antarctica, and it is mined from mines with many different forms and sizes. Mines and gold mining activities have been highly diverse globally, distant from the centralized supply of about 4 decades ago when most of the gold in the world originated from South Africa. Current available best estimate suggests that about 197,576 tons of gold have been mined in the whole of history and since 1950, about 2/3 of this have been mined. And because gold is practically indestructible, this means that in one shape or another almost all of this metal is still around (World Gold Council, n.d).

Gold mining globally adds roughly 2,500-3,000 tons to the general gold-stock above the ground each year. Although the production of gold in recent years has seen an increasing trend, this is anticipated to subside in the years forthcoming. The response of gold production to the prices is very slow. The timeframe for project creation and the mine lifecycle is a very lengthy one – going from exploration to production always takes decades (World Gold Council, n.d).

Figure 1.5 Total above ground-stocks as at the end of 2019 (197,576 tonnes)



Source: Metals Focus; GFMS, Thomson Reuters, US Geological Survey, World Gold Council

The composition of above the ground gold stock as at the end of 2019 is presented in figure 1.5. Jewelry comprises the majority totaling 47%, followed by private investment constituting 22%, official holdings constitute 17% and others constitute the least 14%.

Table 1.1 Gold production by countries as at 2018

NATION	TONNES
China	404.1
Australia	314.9
Russia Federation	297.3
United States	221.7
Canada	189.0
Peru	158.4
Indonesia	136.9
Ghana	130.5
South Africa	129.8
Mexico	115.4
Brazil	97.1
Uzbekistan	92.5
Sudan	76.6
Papua New Guinea	69.1
Kazakhstan	68.4
Mali	61.2
Argentina	60.0
Burkina Faso	59.3
Tanzania	47.7
Democratic Republic of Congo	44.9
Colombia	43.0
Zimbabwe	42.2
Cote d'Ivoire	40.9
Philippines	36.8
Chile	36.5
Suriname	34.3
Dominican Republic	31.6
Guinea	27.3
Guyana	25.6
Turkey	24.9
Bolivia	24.1
Venezuela	23.0
Mongolia	22.6
Kyrgyz Republic	22.1
Senegal	17.5
Egypt	14.7
Nigeria	14.0
Ecuador	11.5
Iran	11.0
Ethiopia	11.0
New Zealand	9.3
Finland	8.3
Sweden	7.9
Bulgaria	6.8

Source: World Gold Council

Clearly, from Table 1.1, it can be observed that the production of gold is not concentrated in one continent but spread across all continents. As of 2018, China is the highest producer of gold producing 404.1 tonnes, then Australia producing 314.9. Russia places 3rd on the list followed by the United States. South Africa, where most of the world's gold came from is placed 9th behind Ghana.

1.14. Gold as a portfolio diversifier, hedge, and a safe-haven

Several studies in the literature analyze the capability of gold as a financial asset to play certain roles. Among the roles that gold plays as a financial asset in connection to other financial assets are diversification, hedging, and safe-haven. Most of the features that are attributed to gold are a result of how investors perceive and their faith regarding gold (O'Connor et al., 2015). Below are the definitions of these roles by Baur & Lucey (2010).

A diversifier is an "asset that is positively correlated (but not perfectly correlated) with another asset or portfolio on average".

A hedge is an "asset that is uncorrelated or negatively correlated with another asset or portfolio on average".

A safe-haven is an " asset that is uncorrelated or negatively correlated with another asset or portfolio in times of market stress or turmoil".

Both a hedge and a diversifier are not able to decrease losses in terms of market chaos. This property is only attributed to a safe-haven asset. In normal market situations, the safe-haven asset can be linked positively or negatively to other investments. Under unfavorable conditions of the market, however, the safe-haven asset has the capability to offset losses that are incurred in other assets since it is related negatively to the other assets (Baur & Lucey, 2010). The quality of an asset as a safe-haven is only proven in times of market stress. Several studies have confirmed these properties of gold against other assets.

Jaffe (1989) stated that while gold is uncertain in its own right, it has the potential to deliver useful features for diversification. Jaffe examined the role of gold in a broad portfolio, its relations with different assets, and the relation between gold and inflation. The conclusions for the period 1971 to 1987 suggest that gold displays potential for hedging with a variety of other assets including currencies, government bonds, small stocks, treasury bills, and corporate bonds. If 5% of gold is applied to each portfolio, with a contraction in the keeping of other assets retained, each portfolio's return increases as risk decreases. Most specifically, this is also the case when 10 percent is added to each portfolio. Jaffe (1989) argues that not only does the use of gold bullion in a portfolio mitigate risk but it also raises projected returns (Ciner, Gurdgiev, & Lucey, 2013).

Gold is been used for hedging for two (2) reasons; the availability of a variety of products making it easy to buy it without necessarily having to take the custody of the commodity. Additionally, gold can offer protection against variations in currencies, unlike other hedging methods that only offer protection against specific currencies (Capie et al., 2005). The principal purpose of diversification of portfolios by most investors is reducing the volatility of return on their assets and hedging risks. This conduct tends to preserve a favorable rate of return while consumer intelligence differs greatly. Guidelines for allocating portfolios suggest that portfolios with inverse or minimal correlation assets may minimize uncertainties and maintain a sound rate of return. In general, the rationale behind investors including gold in their investment baskets is owing to the fact that gold is a precious metal that plays roles that a currency plays; and the most important of all functions is the purchasing power (Wang et al., 2011).

Although portfolio diversification will typically allow investors to minimize the likelihood of major losses on their portfolios, during times of financial market volatility specific asset classes seem to co-move strongly, even when high interdependence does not imply macroeconomic fundamentals (Baur & McDermott, 2016b). These contagion impacts and expanded co-movement throughout asset classes, industries, and countries through times of recession fuel the quest for a safe-

haven asset that is not changing in unison alongside different commodities and preserves its worth in these particular periods (Baur & McDermott, 2016b). Risk-averse investors still have faith in gold serving as a safe-haven asset that alleviates the consequences of several financial crises. Gold investment counter the effects of currency depreciation and inflation and additionally functions as an alternate source of savings provided a weak stock market (Nguyen, Bhatti, Komorníková, & Komorník, 2016).

Despite the tremendous value of gold, the relationship between gold and different variables, that is consumer price index, exchange rate, oil prices, interest rate, and stock market index, is not adequately empirically established. Factually, most experiments were done primarily from a foreign viewpoint, although little focus was given from a domestic perspective. In addition, previous research on this subject is limited, and the results are contradictory (Shakil et al., 2018).

Financial markets are integrated globally with gold being one of the most traded commodities internationally. In its trade, it is either used for investment, for diversification, or hedging purposes. For these properties and uses of this treasured metal, a lot of studies have been conducted on it. Most of the studies are concerned with its relationship with other financial or economic variables to which this study is not an exception.

CHAPTER II

LITERATURE REVIEW

The performance of gold price has many drivers. Uncertainty of market and growth of the economy (growth of income, the confidence of consumers, inflation, interest rates) and currencies especially reserve currencies like the US dollar (an appreciation of the dollar means depreciation of other currencies and vice versa) are among the drivers (World Gold Council n.d.). Factors that play a significant role in gold price change include seasonality, bond prices, exchange rates, revenue, inflation, oil prices market performance, and business cycles (Shakil et al., 2018). Functioning as a financial commodity, gold is prone to capital market progresses. A spike in interest rate, for example, creates a decrease in the demand for gold as investors know that the opportunity cost of owning gold is rising. Centered on the quantitative theoretical and analytical literature, it is shown that the gold price is related to a variety of variables, such as exchange, inflation, and interest rates (Giannellis & Koukouritakis, 2019).

2.1 Gold price versus Exchange Rates

In equal measure, the coupling between the valuation of the US dollar (USD) and the prices of gold has long intrigued financial institutions, investors, and scholars. Gold has gained a reputation as a special financial commodity for several years, providing diversification advantages against currency fluctuations and maintaining market stability against significant currency changes. When employing gold as an option in the management portfolio risk, the reality that gold retains its worth in periods of poor dollars plays into the interests of the investor (Reboredo & Rivera-Castro, 2014b).

A lot of principal banks include gold in the basket of currency and hold the asset portfolio mutually to control the exchange rate in addition to rising uncertainty, likewise raising the risk and return balance (Shakil et al., 2018). Like every other asset,

gold values are proving to be unpredictable. Focusing on gold's financial attributes we can quickly grasp that gold rates are prone to global economic conditions. For instance, investors continue investing in gold in periods of financial uncertainty, since they are worried about financial uncertainty. Likewise, the opposite relation between the price of gold and the exchange rate means that consumers tend to invest in gold rather than in a currency that depreciates. This equally indicates that the demand for gold is decreasing as currencies are appreciating. There seem to be a negative, but a forthright relationship between the price of gold and effective exchange rates (Giannellis & Koukouritakis, 2019).

Gold is mostly employed as a hedge against the US dollar owing to the fact that gold is traded in the US dollar. Gold, traded in the US dollar implies that a decrease in the price of the dollar will make the price of gold rise resulting in a negative relationship. In this sense, investors having dollars can make use of gold in hedging against exchange rate risks (Baur & McDermott, 2010). Pukthuanthong & Roll (2011) argue that the supposed negative relation between gold and the US dollar is not specific to the dollar. They argue that it is the case for all other currencies. If gold is priced in any currency, the fall in the price of that currency will mean a rise in the price of gold. Kunkler & MacDonald (2016) suggest that the confirmed negative relationship in the literature is as a result of the dollar (and any other currency) appearing in the two (2) variables.

Of course, there are diverse ways of hedging against the risk of currency. Why could gold be employed as a shield or safe-haven, despite the available options? The explanations for that are numerous. As a financial commodity, gold is liquid, available, priced in US dollars, and tradable on a futures market. Furthermore, while gold as a hedge can not be built for the same objective as foreign-exchange derivatives, the efficacy of even customized hedging strategies is less than ideal (Joy, 2011).

In days gone by where gold was acting as the base for the system money, gold’s feature as a hedge against currency risk was undoubtedly since all currencies were directly or indirectly pegged to it Capie et al. (2005). However, as to whether or not gold has

continued to be acting as hedge after the system, has been the concern of several studies. In this regard, there exists two (2) group of findings in the literature. Studies that confirm the hedging role of gold and studies that claim the contrary.

Capie et al. (2005) use a weekly data range of 1971-2004 to examined the hedging property against exchange rates of Sterlin-dollar and yen-dollar. They justify their choice of data period by the termination of the system called the Bretton Woods system which dictated that the US dollar be attached to gold and other currencies be pegged to the US dollar thereof. This means the performance of gold was not going to be determined by any official activity. They found gold to be a hedge against movements of the US dollar however there were variations in the hedging property of gold during the study period dependent on political events. Joy (2011) tried to find an answer to the question of the possibility of gold serving as a hedge or safe-haven against the US dollar in their studies. They made use of 16 main dollar paired exchange rates and a weekly data span of 23 years to find an answer to the question. They also found gold to be a hedge but not a safe-haven. The hedging property of gold against currency risk was assessed over different time horizons by Reboredo & Rivera-Castro (2014b). They employed daily data spanning from 2000 to 2013 of currencies like; AUD, CAD, CHF, EUR, GBP, JPY, and NOK. They found gold to be acting as a hedge against currency risk with varying degrees. Shakil et al. (2018) argue that gold prices rise when Saudi Riyals is weakening making gold against the USD. Sjaastad & Scacciavillani (1996) examine the relationship between the gold price and major currencies with a daily data span of 1982-1990. Exchange rates between the USD and the DM, the GBP and the JPY were used. They observed that the gold market was monopolized by the European currency bloc, therefore, a rise/fall in these currencies had a serious effect on the price of gold in other currencies, the dollar had a little influence on the price of gold and movements in the exchange rates of major currencies contributed to almost 50% of the variation in the spot price of gold during the study period. However, in a later study by one of the authors using data on the same currencies for the period 1991-2004 had opposite findings. Sjaastad (2008) found the USD bloc together with JPY to be dominant in the gold market. Hence a fall/rise in the USD tends to have a heavy impact on the price of gold in other currencies. Wang & Chueh (2013) argue that a depreciation of the USD instigate investors to go in for gold. Hence a negative

relationship. This negative relationship was confirmed by Arfaoui & Ben Rejeb (2017) in their studies. Tully & Lucey (2007) also observed a negative relation between gold and the US dollar and argue that the US dollar is the only macroeconomic variable affecting gold. Pukthuanthong & Roll (2011) employ the EUR, GBP, JPY, and the USD a study to ascertain whether or not the negative relationship between USD and gold is peculiar. They conclude that it is not peculiar to the USD and this inverse relationship holds for all other currencies.

Gold together with other four (4) assets were analyzed by Ciner et al. (2013) to determine their capability to serve as a hedge or safe-haven against each other. Gold was found to be functioning as both a hedge and a safe-haven against the dollar. Sujit & Kumar (2011a) found exchange rates to have a direct effect on gold prices. Singh & Sharma (2018) by dividing their study sample period into pre-crisis, during crisis and post-crisis observed the US dollar to be influenced by its lag and that of gold across the whole sample period of study in India. Gold was found to be influenced by the lag of the US dollar in the post-crisis period. Dooley, Isard, & Taylor (1995) in an attempt to investigate the short and long term impacts of gold prices on exchange rates dependent on real macroeconomic and monetary variables, they discovered gold price fluctuations to have an interpretive power regarding exchange rates.

Reboredo (2013b) and Reboredo & Rivera-Castro (2014a) investigate the capability of gold to act as a hedge or safe-haven against the USD. This was done by employing the exchange rates between the USD and currencies of Australia(AUD), Canada(CAD), Europe(euro), Japan(JPY), Norway(NOK), Sweden(CHF) and the UK(GBP) of a weekly data for the sample period 2000-2012. Gold was found to be a hedge against the USD and also served as a safe-haven against the severe movement of the USD. The diversification role of gold was also confirmed in this analysis. The hedge and safe-haven feature of gold against currency risk was examined by Iqbal (2017). In doing so, daily and monthly data on India, Pakistan, and the U.S were employed. Gold was found to be acting as a hedge and a safe-haven in both India and Pakistan. This is also the finding of Akbar, Iqbal, & Noor (2019) in Pakistan.

A study was conducted by Wang & Lee (2016) to investigate whether or not the hedging role of gold was universal. To achieve this, the sample countries were grouped into three (3) namely; gold producer, gold consumer, and key currency countries. In all eighteen (18) countries were involved. A conclusion was reached that the hedging role of gold was larger in major gold-consumer countries than in major gold-producer countries. The hedging role was also examined against the JPY. Wang & Lee (2011) suggest that the function of gold as an effective hedge is influenced by the JPY depreciation. He, Guo, & Yu (2020) also, confirm the negative relationship and hence the hedging feature of gold against the dollar exchange rate. There was however a note that there sometimes exists a positive relationship dependent on the threshold process of the two (2).

In contrast to all the above studies, Chang, Huang, & Chin (2013) in an effort to analyze the relationship between oil, gold, and exchange rates in the Taiwanese context found no relationship between these variables and therefore argue that financial and energy policies should be independent of each other. Additionally, Kunkler & MacDonald (2016) find no correlation between fluctuation in the universal price of gold and the fluctuation in the universal price of any currency. The currencies used in their analysis were the reserve currencies; USD, EUR, JPY, GBP. They arrived at a finding that gold is not a hedge against individual currencies and therefore should not be employed for hedging against currency risk. Singhal, Choudhary, & Biswal (2019) find gold to have no significant influence on exchange rates. Erb & Harvey (2013) also, suggest that gold is not a hedge against currency risk.

2.2 Gold price versus Inflation

Gold's function as a hedge against inflation is among the most studied themes. Most of these studies consider the gold prices in the US dollar and representing inflation with CPI. The argument is built on the money like function of gold. The stock of gold is limited and is comparably inelastic in supply in the short-term. In the near term, the production can not be raised like fiat money, making gold seem a hard currency. The percentage of the gold produced physically in the yearly global supply can be around

2% hence its production is likely not to have effects on its price movements. Its value is maintained when the purchasing power of currencies is declining in the event of an increasing inflation rate. In the face of global economic uncertainty, the monetary market shows gold as the perfect hedge for inflation and a holding portfolio. To ensure a balance between the soft and hard properties, most individual and institutional investors have gold in their portfolio (Hassani, Silva, Gupta, & Segnon, 2015; O'Connor et al., 2015; Shakil et al., 2018).

Worthington & Pahlavani (2007) analyze a long-term relationship between the prices of gold and inflation in the US with two (2) data samples of different spans. The samples were from 1945 to 2006 and from 1973 to 2006. Their findings point to the fact that there prevails a long-term cointegration between gold and inflation supporting the fact that gold can serve as an efficient hedge against inflation. Ghosh et al. (2004) also, discover gold to be a long-term inflation hedge in the US with a monthly data from 1976 to 1999. McCown & Zimmerman (2006) also conducted studies on the US making use of CAPM to analyze the investment performance of two (2) precious metals; gold and silver. Their findings show an indication that both gold and silver act as a hedge against inflation. However with gold being a strong hedge and silver a weak one. Shahbaz, Tahir, Ali, & Rehman (2014) analyze the hedging capability of gold against inflation under Pakistani context with data spanning from 1997 to 2014. They suggest that gold serves as a hedge against inflation both in the short and long term. Saraç & Zeren (n.d) argue that gold is an efficient hedge against inflation in Turkey. Shakil et al. (2018) argue that gold is not influenced by CPI thereby making gold an efficient hedge against inflation. Also, they find oil prices to be negatively related with gold prices making gold a hedge against oil prices and also a beneficial portfolio hedge. Hassani et al. (2015) also argue in favor of gold being a hedge against inflationary risk.

A study over the period 1971-2010 on the US and Japan to examine the short run and long run inflation hedging efficiency of gold was done by Wang et al. (2011). They argue the inflation hedging ability of gold is not absolute but rather dependent on time and the market. They establish that the hedging capability of gold, in the long run, is

affected by the stickiness between the price of gold and CPI. They argue that this price stickiness causes gold prices to be identified with market instability hence making gold incapable of responding to innovations in CPI. To investigate the short term hedging capability of gold, an examination of the price stickiness is conducted in a low and high regime. Gold does not act as an inflation hedge under a small momentum regime both in the US and Japan. Under the high momentum regime, gold serves as an efficient hedge in the US and partially inflation hedge in Japan.

An investigation of the capability of gold to serve as a hedge against inflation was conducted by Van Hoang, Lahiani, & Heller, 2016; Wang et al. (2011) with a data span of sixty (60) years for China, France, India, Japan, the UK, and the US. They employ local monthly prices of gold for the analysis. They find gold not to be acting as a hedge against inflation in each of the countries in the long term. In the short-term, however, it plays a hedging role in India, UK, and the US. A long run equilibrium between gold and CPI was not found in China, France, India. However Aye, Carcel, Gil-Alana, & Gupta (2017) discover gold to be acting as a hedge in the UK in their analysis to explore the inflation hedging capability of gold. They employ an annual data ranging from 1257 to 2016 in conducting their analysis.

A study conducted by Tully & Lucey (2007) to analyze the impacts of macroeconomic variables (of which inflation is included) on gold employing monthly data for the period 1984-2003, observed that there exist no statistical relation between gold and inflation. In the view of Erb & Harvey (2013) gold is not an effective short-term nor long-term hedge against inflation. Iqbal (2017) argues that gold is not a hedge nor a safe-haven against inflation in Pakistani context but it is a hedge in India. It is suggested to be both a hedge and safe-haven in the U.S. Kumar (2017) also analyzes the relation between inflation and gold in an Indian context with a data span of thirty-three (33) years using WPI to represent inflation. No long-term relationship was found between the variables. Employing data ranging from 1979 to 2011, Baur (2011) tries to confirm the roles that are frequently attributed to gold. An argument is presented that gold is not a hedge for consumer price inflation.

Shahzad, Mensi, Hammoudeh, Sohail, & Al-Yahyaee (2019) by employing data on six (6) countries considered to be having large gold markets; China, France, India, Japan, UK, and the US, investigate the hedging capability of gold against inflation. A positive relationship was found between the two (2) variables. Their finding suggests that the hedging feature of gold against inflation is subject to economic conditions. There exist a similar finding in the studies of Aye, Chang, & Gupta (2016) conducted on the US with annual data from 1833 to 2013. A long-term relationship was found to prevail between gold and inflation, with gold acting as a hedge, however, varying and influenced by structural innovations affecting the gold market. Levin & Wright (2006) discover a positive relation between gold prices and innovations in US inflation in the short-term. A long run relation is also suggested to be present between gold price and US price level and that the two (2) variables move together making gold a long-term hedge against inflation.

A recent comparative study investigating the inflation hedging abilities of gold, stock, and real estate was conducted in the US by Salisu, Raheem, & Ndako (2020). They suggest that these assets have a varying market attribute and hence need to behave individually towards inflation. A monthly data was employed and the full sample separated into pre and post-global financial crisis to ascertain whether or not the relationship varies with time. They discovered stock and real estate to be effective hedges although varying with time and gold not a hedge against inflation. Lucey, Sharma, & Vigne (2017) also, discover a relation between gold and inflation that is varying with time. They analyze the relationship between gold and inflation employing a data span of forty (40) years in Japan, the UK, and the US. They discover gold not to be a hedge in Japan. In their investigation of the dynamic relation between the price of gold and CPI, Batten, Ciner, & Lucey (2014) argue that there is no constant relation between the two (2) variables. This support studies suggesting that the relationship between gold and inflation is not constant but varies with time. They employ monthly data over the period 1985-2012. They make an argument that an exclusion of the unstable period of the early 1980s from the data will mean no correlation between gold and inflation.

The study of Salisu, Ndako, & Oloko (2019) considers two (2) precious metals (gold and palladium) to examine their ability to act as inflation hedges. This study was conducted on a total of thirty-two (32) OECD countries. Gold was found to be a hedge for inflation in eleven (11) countries (Austria, Belgium, Canada, Czech Republic, France, Italy, Korea, Luxemburg, Slovak, Turkey, and the US) whilst palladium acts as a hedge against inflation in twelve (12) countries (Belgium, Canada, Czech Republic, Denmark, Germany, Hungary, Italy, Luxemburg, Slovak, Turkey, UK, and US). A point worth noting is that gold displayed a partial hedging role in some of the eleven (11) countries whilst palladium displayed complete hedging ability in all the twelve (12) countries indicating that palladium is a better hedge. A sample division into the pre and post-global financial crisis was done to determine whether or not there is a change in the hedging role. Both gold and palladium were found to be better inflation hedges post the global financial crisis thereby supporting the finding of studies that argue that the inflation hedging role of gold is varying with time. Beckmann & Czudaj (2012) also, suggest that gold is a partial hedge against inflation in the long-term.

2.3 Gold price versus Interest Rate

Investors want to invest their excess funds to gain benefits. Their primary interest is to get benefits out of investments made in financial assets. One can choose to invest in gold or other alternatives like bonds and treasury. The deciding factor here will be the benefit each investment offers. As Homo economicus, they will always invest in assets that offer the highest benefit.

Interest rate is considered as the benefit that an investor would gain if he makes his investment decision in favor of an investment asset say bond instead of gold. In other words, interest rates are regarded as an opportunity cost of keeping gold. With this argument, there is an expectation therefore that there should exist a negative relationship between gold and interest rates (O'Connor et al., 2015).

There exist no many studies in the literature considering the relationship between the interest rate and gold only like the other variables. There are however studies conducted on gold and other macroeconomic variables that include interest rate in the model. We take a look at some of those studies below.

With quarterly data spanning from 1973 to 1980 on long-term yields of US bonds, Fortune (1987) argues that a hike in expected interest rates has negative effects on gold prices and hence a negative relationship. They opine that investors are motivated to sell their gold holdings and buy assets providing interest benefits whilst discouraging the buying of gold when there is a rise in expected interest rates. Wang & Chueh (2013) argue that there prevails a price transference relationship from interest rates towards gold prices and also interest rates impact the future price of gold negatively. The international gold price, however, has a feedback effect on interest rates. Akbar et al. (2019) argue that a rise in interest rate instigate investors to transfer their investments into bank deposits, thus implying a negative effect on gold investment. Therefore a negative relation between gold and interest rate. Shakil et al. (2018) discover a long run relation to be existing between gold prices and interest rates. Kumar (2017) suggests that both short-term and long-term innovations in interest rates aid in predicting the WPI beta of gold. Also, the study argues that an inverse relationship exists between the WPI beta of gold and interest rate innovations. A long run inverse relation is noticed between gold and interest rates by Erb & Harvey (2013).

Research to investigate the possible causes of alterations in the price of gold was conducted by Abken (1980). He argues that there is the existence of a positive relationship between interest rate and gold. He suggests that an expected rise in inflation will be factored in the nominal interest rate alike. This then causes gold to also rise at the same rate. An investigation of the connection between the interest rate and gold with a data span from 1975 to 2016 on G7 countries was conducted by Apergis, Cooray, Khraief, & Apergis (2019). The sample period was divided into two (2): boom regime and recession regime. A significant positive relationship is discovered to prevail between gold prices and real interest rates. An inverse relationship is said to prevail between innovation in the lagged value of real interest

rates and the innovation in the lagged value of gold prices in both periods, with the effect being stronger in the recessionary period and thus a conclusion that gold is playing a strong hedging role against real interest rate. An inverse relationship was found between gold prices and real interest rates Abdullah & Abu Bakar (2015). In an investigation to ascertain whether or not gold's beta can be projected, hence aiding in deciding when gold can act as an inflation hedge, Batten et al. (2014) suggests that both short-term and long-term interest rates innovations projects innovations in gold's beta. They further present an argument that innovations in interest rate has negative effects and the aggregate of which is perceived in nearly six (6) months. Baur (2011) observe that the price of gold tends to rise with a higher short-term interest rate and fall with a higher long-term interest rate implying the insignificance of the cost of holding gold in the short run. This indicates a difference in the relation between gold and short and long term interest rates. Having a positive relationship with the short-term interest rates and a negative relationship with the long-term interest rates.

An investigation of the relationship between gold and economic variables was conducted with data of the US over the period 1975-2001 by Lawrence (2003). No statistically significant relation was found between gold returns and innovations in variables such as GDP, inflation, and interest rates, and also, the influence innovations in these variables tend to have on gold is much lesser in comparison to other commodities. This observation was also made by Tully & Lucey (2007). In a research to analyze the influence of macroeconomic variables (including interest rates) on gold, employing a monthly data ranging from 1984 to 2003, they observed a no existence of statistical relation between interest rates and gold.

2.4 Gold price versus Stocks prices

Gold and stock are frequently used in a dynamic market as alternatives to one another. The inverse relation between gold and stock prices is well established, as gold prices increase, investors choose to invest in undervalued stocks while stock prices decline, and vice versa. Separating the impacts of gold and volatility helps a BRICS equity investor judge whether a gold position can effectively diversify their equity portfolio.

This is claimed that since the financial crisis, the connection between capital markets and commodities has risen due to commodity financialization (Hood & Malik, 2013; Pandey, 2018).

Gold is an agreed premium quality, which is not subject to the same systemic threat to which the financial market is vulnerable. So as the economic cycle collapses, stock prices and the currency are going down and becoming less appealing but gold is getting more beautiful and its worth is still rising. In reality, the stock market communicates the soundness of domestic capital to decide how big the nation's companies are. Nonetheless, this inverse relationship is also considered to be unsteady (Arfaoui & Ben Rejeb, 2017).

This negative relationship can be interpreted in two separate forms; the first is attributed to investor behavior because if the stock market falls (or vice versa, meaning gold), investors get panicked immediately and most of them will not wait until the stock market (or gold) recovers their wellbeing, they just remove their investments from the stock market (or gold) and begin looking for a safe-haven or an investment avenue with an increased earning which is mostly the alternative that is either stock market or gold. Secondly, they respond to economic variables differently. Their response is contrary to each other. To illustrate more, gold only appears to answer in an adaptable manner to the forces that appear to give agitate to the stock market resulting in its crash; thereby keeping it safe and sound at times when the stock market crashes, and vice versa (Al-Ameer et al., 2018).

Several studies have proven that there prevails an inverse relationship between gold and stocks both in normal times and in market stress thereby making gold both a hedge and a safe-haven against stocks. However, there exist studies that claim the contrary. They discover a positive relationship to be existing between gold and stocks.

The relationship between gold and stocks is among the most conducted researches in literature. There are numerous studies both on developed and emerging economies

most of which are concerned with the hedging or safe-haven feature of gold against stocks (Baur & Lucey, 2010; Baur & McDermott, 2010; Baur & McDermott, 2016a; Bekiros, Boubaker, Nguyen, & Uddin, 2017; Bredin, Conlon, & Potì, 2015; Ciner et al., 2013; Gencer & Musoğlu, 2014; Hood & Malik, 2013; Nguyen et al., 2016; Reboredo, 2013a; Sabry & Masih, 2019; Shakil et al., 2018).

Al-Ameer et al. (2018) in their quest to ascertain the relationship between gold and Frankfurt Stock Exchange (FSE), twelve (12) years of monthly data is used. The data was separated into three (3) periods; pre, during and post-financial crisis to observe the change in relationship over time. They found different results for each of the periods. A positive relationship was found for the pre (strong) and during (weak) financial crisis period but a negative relationship for the post (strong) financial crisis period. A balanced positive relationship was found for the whole period. Singhal et al. (2019) find gold prices to have a positive impact on the stock prices of Mexico. A significantly positive relationship was discovered to exist between gold and stocks in Malaysia Ibrahim (2012). This contrasts with the study conducted by Raza, Jawad Hussain Shahzad, Tiwari, & Shahbaz (2016). They find gold prices to have a negative influence on the stocks of Malaysia. They also find the volatility of gold to have an inverse impact on stock markets of emerging countries. The negative relationship between gold and equity making it a hedge against equity is confirmed in Malaysia Sabry & Masih (2019). Ziaei (2012) find a negative relationship to exist between the gold price and equity and hence a hedge however not a safe-haven.

An examination of volatility overflow from gold to stock markets of BRICS countries was done by Pandey (2018). A volatility overflow from gold to BRICS stocks was found. Further analysis to investigate the nature of the spillover before and after the 2008 financial crisis showed that, the spillover was not significant before but became significant after the crisis. An analysis during the crisis was not made hence nothing is said. However, Chiang, Lin, & Huang (2013) have done a “during crisis” analysis. They also discover an overflow effect (weak) from the gold market to the stock market for their whole sample period but a strong and significant spillover during the financial crisis period in the US context. The relationship of gold, oil, US dollar, and stock in

the Indian context has been examined by Singh & Sharma (2018). The sample was separated into three (3) periods; pre-crisis, during the crisis, and post-crisis to observe the relationship in each period and whether or not a change has occurred. Stocks were found to be dependent on gold's lag in the pre-crisis period but on its lag in the post-crisis period. However, Afsal & Imdadul Haque (2016) in their study, found no interaction between the gold market and the stock market under the studied period. They argue that the absence of spillovers between the two (2) markets might be due to a neutralization process occurring between them such that an innovation in one is canceled by an innovation in the other.

With daily returns data of 10 years, Baur & Lucey (2010) examine the safe-haven feature of gold against stocks and bonds of the United States, the United Kingdom, and Germany. An argument is presented that an asset can be uncorrelated, positively, or negatively correlated with another asset on average and it can be uncorrelated or negatively correlated with another asset during market turbulence. This forms the basis for their classification of gold as either a diversifier, a hedge, or a safe-haven in relation to bond and stock. They found gold to be both a hedge and safe haven for stocks of the US and UK but not for bonds. It was found to be a hedge against bonds only in Germany. The safe-haven feature of gold is found to prevail for only a short period, precisely 15 days. Chiang et al. (2013) confirm the findings of hedging however contrast the finding in relation to bonds. They discover gold to be a safe-haven for bonds. Ghazali, Lean, & Bahari (2019) also, discover gold to be a safe-haven always in India and the US. Gold was found to be a hedge against equity risk by Hassani et al. (2015).

The finding of Baur & Lucey (2010) on the duration of the safe-haven of gold is also in contrast with the studies of Bredin et al. (2015) which found gold to act as a safe-haven for a long period of up to a year. Surprisingly both studies have the same sample countries however with different sample periods. They also found gold to be acting as a hedge for both bonds and equities contrary to the conclusion of Baur & Lucey, (2010). It is worth noting that crises like the economic recession of the 1980s, 'Black Monday' crash of 1987, and the financial crisis of 2008 were considered to analyze

the safe-haven capability of gold. A conclusion was reached that gold does not act as a safe-haven for all crises. Expanding their sample period and countries to include Australia, Canada, France, Italy, Japan, Switzerland, and BRIC nations, Baur & McDermott (2010) also analyze the capability of gold to act as a safe-haven against stocks. They used daily, weekly and monthly data of stock returns of the countries in local currencies for 30 years ranging from 1979 to 2009. They went further to differentiate between a strong and weak safe-haven by looking at the degree to which gold serves as a safe-haven. They arrived at the conclusion that gold serves as a weak safe-haven for some emerging markets thus investors opt for the stocks of developed economies when suffering losses in emerging market stocks. They discover gold to be both a hedge and safe haven for most developed countries like France, Germany, Italy, Switzerland, the UK, and the US. However, it is not the case for Australia, Canada, Japan, and BRIC nations. Specific crisis periods that were examined include; October 1987, the Asian Crisis of 1997, and the financial crisis of 2008. In contrast, Chiang et al. 2013) discovered gold not to be a safe-haven for stocks. Conducting their research on eight (8) countries from both developed and developing economies, Nguyen et al. (2016) analyze the feature of gold as a safe-haven against stocks. The countries included in the research were; Indonesia, Japan, Malaysia, Philippines, Singapore, Thailand, the UK, and the US. The safe-haven role of gold was found for the stocks of Malaysia, Singapore, Thailand, the UK, and the US but not for Indonesia, Japan, Philippines.

Gürgün & Ünalmış (2014) examine the hedge and safe-haven feature of gold against stocks from two (2) angles; domestic and foreign by using data in domestic and foreign currency (the US dollar). Their research focused on emerging and developing economies. They discover gold to be acting as a hedge and safe-haven for most countries in domestic currency and vise versa in foreign currency. Though the data used ends on 20/09/2013, the starting date for the sample period varies for the countries depending on the availability of data according to the researchers. Ciner et al. (2013) analyze five (5) assets; stocks, bond, oil, gold, and the dollar to ascertain their capability to act as a hedge or safe-haven against each other. Gold was found to be acting as a safe-haven for equities.

Wen & Cheng (2018) investigate the possibility of gold or the US dollar serving as a safe-haven for stocks of nine (9) countries namely; Brazil, China, Chile, Czech Republic, India, Malaysia, Russia, South Africa, and Thailand. Daily data from January 2000 to July 2016 is used for the analysis. Both gold and the US dollar were found to be a safe-haven for stocks of emerging markets. The US dollar was found to be a better safe-haven than gold. F. Dicle & D. Levendis (2017) compared gold and US treasuries to determine their hedging or safe-haven feature against returns of major indices and volatility. Gold was found to be both a hedge and a safe-haven. However, the US treasury was discovered to be a better safe-haven asset. Another comparative study was conducted on gold and bitcoin by Hussain Shahzad, Bouri, Roubaud, & Kristoufek (2020). The study was conducted on the stocks of G7 countries. Gold was found to be most effective for hedging against the stocks of France, Germany, Italy, Japan, the United Kingdom, the United States whereas bitcoin was most effective for Canada. Though both were found of offering aid in terms of diversification that of gold was higher. Gold is also found to be superior in terms of serving as a safe-haven. Hood & Malik (2013) also made a comparison between three (3) precious metals namely; gold, silver, platinum, and volatility to ascertain which is a hedge and/or a safe-haven for the stock market of the US. Employing daily data that ranges from November 1995 to November 2010, they found silver and platinum not to be either a hedge or a safe-haven against stocks. However, gold and volatility were found to be both a hedge and a safe-haven with volatility been superior to gold in both its hedging and safe-haven property.

Bulut & Rizvanoghlu (2019) also recently examined the hedge and safe-haven feature of gold against stocks using daily data comprising of 34 developing economies from January 2000 to November 2016. They concluded that gold is a hedge for all the countries involved but a safe-haven for some countries. The safe-haven feature was found to be existing for twenty (20) countries with strongness present for nine (9).

H_0: A negative relationship exists between the stock market index and gold prices.

2.5 Stock prices versus Exchange Rates

On the relationship between stock prices and exchange rates there exist two (2) theoretical arguments: traditional and portfolio approach. The traditional approach suggests that if the currency of a nation drops in value, residential manufacturers' exports would become more profitable, raising the stock prices of manufacturing firms; thus, the weakening of the currency of a nation could increase stock prices in that nation. On the contrary, the portfolio approach suggests that increasing stock prices indicate that there is a rise in the demand for a country's assets by investors. As a result, the demand for national currency would rise, resulting in the appreciation of the national currency against foreign ones. The traditional theory suggests that exchange rates and stock prices are correlated positively as the exchange rate is expressed as a proxy of international currencies with respect to the national currency, while the portfolio theory claims that the two are negatively correlated Lee & Wang (2015).

Broadly speaking, there are various impacts that the stock market has on exchange rates. For example, as the U.S. stock market continues to show significant gains higher, it is expected that a massive influx of foreign investment flow into the U.S. as overseas investors hurry to invest there. This inflow would have a positive impact on the US dollar. However, if gains in the stock market start to decline, these overseas investors are likely to give up on their stock investments by selling it and converting their dollars into national currencies leading to extremely adverse consequences for the US dollar. This finding applies to all other currencies and stock markets worldwide. This is perhaps the most common way to exchange rates with equity-market flows Arfaoui & Ben Rejeb (2017).

Employing monthly data between 01/1995-10/2015, Arfaoui & Ben Rejeb (2017) investigates the interrelationship between gold, oil, the USD, and stock prices from a global perspective. They argue that the US dollar is significantly and negatively influenced by gold, oil, and stock prices. They suggest that exchange rates are driven by the mechanisms of the stock market. The relationship between these variables was

conducted from the Indian perspective under different periods; pre, during, and post-crisis by Singh & Sharma (2018). A long-term relationship is suggested to exist among the variables. A consistent negative correlation is argued to exist between USD-Rupee and the stock market whilst crude oil and gold exhibit the opposite of this relationship that is a correlation that is positively consistent in all three (3) periods. They argue that the relationship between the variables has changed significantly as there exists a long-run equilibrium among them in pre and during the crisis period but not in the post-crisis period. This relationship is explored by Sujit & Kumar (2011b) with daily data ranging from 02/01/1998 to 05/06/2011. There is an indication from the results that, exchange rates have a direct impact on the stock market index. The other variables considered in the study are said to have an impact on exchange rates with gold having the largest effect.

The short and long term impacts of exchange rates on the stock market of Nigeria were investigated using quarterly data for the period 01/1985-04/2009 by Olugbenga (2012). The exchange rate is found to have a significant impact on the stock market of Nigeria both in the short and long-term. However, the impact is not the same for the short and long term. Whilst exchange rate has a positive impact on the stock market in the short term, it turns to have a negative impact in the long term. He attributes this negative impact to the considerable depreciation of the Nigerian Naira due to the introduction of a program known as the 'structural adjustment program' in 1980. He further argues that exchange rates volatility can aid in the forecasting of the stock market performance. The interdependence between the stock exchange of the Philippines and the US dollar exchange rate was examined using monthly data for the period 07/1997-07/2010 by Wu, Lu, Jono, & Perez (2012). Through a cointegration test, it is established that a steady long term relationship exists between them. However, the influence of the USD exchange rate on the stock market index is not significant.

A study conducted on the US to examine the impact the volatility of exchange rates have on the stock returns was done by Sekmen (2011) with a data period of 1980-2008. A statistically significant negative relationship is found to be existing between

exchange rate volatility and the returns on U.S. stocks. Spillover between exchange rates and Islamic stock markets in India, Malaysia, and Turkey was examined employing daily data ranging from 2013 to 2019 by Erdogan, Gedikli, & Çevik, (2020). An existence of spillover is found only in Turkey from the Islamic stock market to exchange rates. An examination of the time-varying nature of the spillover revealed that the spillover was unidirectional and occurred in particular periods. The association between oil prices, exchange rates, and the stock market under the Mexican economy is investigated by Areli Bermudez Delgado, Bermudez Delgado, & Saucedo (2018) through the employment of monthly data covering the period 01/1992-06/2017. Employing a VAR model, the exchange rate is said to have a statistically significant negative influence on the stock market index which is an indication that the appreciation of the Mexican currency positively influences the stock market.

The relationship between global oil prices, exchange rates, and the stock markets of emerging economies was examined by employing monthly data ranging from 01/1988 to 12/2008 Basher, Haug, & Sadorsky (2012). It is observed that shocks of positive form from exchange rates exert a pressure in a downward form on the prices of emerging market stocks though statistically not significant. A weak dollar encourages investment in stocks of emerging markets. An identical study was conducted by Jain & Biswal (2016) through the employment of data on the global price of gold, crude oil, the exchange between the dollar and Rupee, and the Indian stock market-Sensex. A rise in investment in the stock market will cause an appreciation in the Indian currency whilst the depreciation in the currency is a result of the fall in investment in the stock market. The relationship between gold, the Rupee, and Sensex is found to be negative in the short term whilst crude oil has a positive relationship with the two variables. The relationship observed between gold, Indian Rupee, and Sensex is attributed to a possible movement of investors from risky assets hereby Rupee and Sensex to gold which is viewed as a safe-haven. Akbar et al. (2019) argue that exchange rates respond negatively to shocks in stock prices indicating a negative relationship.

H_0: A negative relationship exists between stock market index and exchange rates.

2.6 Stock prices versus Inflation

Although asset appraisals are calculated mainly by particular firms' financial stability and other characteristics, fluctuations in overall economic circumstances are often a significant stimulus of stock prices. If these valuations represent the actual return of owning these securities, then it follows from money neutrality that real market values will not be permanently influenced by inflationary shocks — whether they arise from shifts in customer tastes, company feelings, or monetary policy. Although inflationary shocks can have no long-term effect on actual stock returns, stock prices are usually accepted to be inflation-sensitive in the short and medium-term (He, 2006; Lee, 2010; Rapach, 2001) as cited by Valcarcel (2012).

An investigation of the relationship between financial variables that included oil prices, exchange rates, consumer price index, and stock market index in the Mexican context is conducted by Areli Bermudez Delgado et al. (2018). CPI is discovered to have a negative influence on the stock market index. The variables were however not related in the long term. A monthly data ranging from 01/1992 to 06/2017 was used for achieving the objective of the study. An examination of the relationship between inflation, interest rates, and stock prices of Greece was conducted by employing data ranging from 1988 to 1999 by Apergis & Eleftheriou (2002). They argue that inflation leads the Athens Stock Exchange (ASE) irrespective of nominal interest rate changes. They suggest that the sustained reduction in inflation in Greece is likely to lead to a more significant rise in market prices and thus to higher economic growth, as lower inflation means lower inflation volatility and lower risk for the Greek economy.

In a study to assess the long-term reaction of real stock prices to a persistent inflation shock, Rapach (2002) employ data on 16 individual developed countries to accomplish the objective of the study. The countries under study include; Australia, Austria, Belgium, Canada, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Spain, United Kingdom, and the United States. According to Rapach (2002), an examination of impulse responses suggest that forecasts of long-term real stock price reaction to a persistent negative inflation shock are highly

unlikely in each country. However, long-term real stock price reactions to persistent positive or zero inflation shock are highly possible in each of the countries. It is found that a rise in pattern inflation does not induce a prolonged actual decline in share prices in a significant number of developed countries.

The impacts of macroeconomic structural shocks on US stocks and how these impacts have been altering overtime are investigated by Valcarcel (2012). It is suggested that although the relationships between inflation and stock markets remained relatively stable — both variables have seen major increases in fluctuations in addition to production. A weak correlation is found between inflation of US and stock prices and it is argued that this relationship exists because of the balancing impacts of monetary policy and fluctuations on financial asset demand. They employed monthly data in the analysis. An investigation of the time-varying associations of stocks and inflation in the US for the period 1791-2015 has been conducted by Antonakakis, Gupta, & Tiwari (2017). An annual data has been employed to accomplish the objective of the study. The relationship in the 1840s, 1860s, 1930s, and 2011 was positive and significant and otherwise strongly negative. They argue that generally there exists an opposite relationship between inflation and return on real stock, however, this relation does not guarantee that lower inflation will improve stock market safety. In contrast, a study to examine how the variation in US stock market returns could be explained by economic variables, Sekmen (2011) find no relationship between stock markets and inflation. A data between the period 1980 and 2008 was employed for the analysis. Oxman (2012) also find no relationship to be existing between inflation and returns on stock for the period 1984-2009.

Salisu, Ndako, & Akanni (2019) investigate the inflation hedging ability of US stock returns. They conclude that the US stock can serve as a hedge against inflation and argue that the opposite is suggested in the literature because of the measurement used for stocks. They argue that in the process of investigating the inflation hedging ability of US stocks, individual components of the US stocks should be employed rather than the index of the stocks. They employed a data covering the period 02/2009-04/2019. On the measurement of variables having an impact on the relationship between stocks

and inflation, Oxman (2012) argues that the variation in the relationship depends on the inflation measurement used. For the period 1966-2009, if CPI is employed as a measurement for inflation, then there exists a significant positive relationship with dividend yields for the period 1966-1983 and insignificant for the rest of the period (1984-2009). However, if Personal Consumption Expenditure (PCE) is employed as a measure of inflation, then no relationship prevails between the variables. In short, for the period 1966-1983, the relationship is subject to the measurement used for inflation, and for the period 1984-2009, inflation has no impact on dividend yield.

The relationship between inflation, stock prices, and output has been investigated each by Chatrath, Ramchander, & Song (1996) and Durai & Bhaduri (2009) under the Indian context. Both studies are conducted based on the hypothesis of Fama (1981). The hypothesis argues that the negative relationship between inflation and stock prices is as a result of the relationship between each with real output. Both studies partially support the findings of Fama (1981). An inverse relationship exists between real output and inflation whilst a positive relationship exists between returns on stocks and real output. Inflation changes lag real output. Nevertheless, the inverse relationship between inflation and returns on stocks is persistent even if the relationship between real output and inflation is controlled Chatrath et al. (1996). In the short and medium-term, there exist an opposite relationship between inflation and return on real stock. However, in the long term, the relationship between return on real stock and inflation is dependent on the individual relationship output has with each of them as suggested by Fama (1981) (Durai & Bhaduri, 2009).

H_0: A negative relationship exists between the stock market index and inflation.

2.7 Stock prices versus Interest Rate

Interest rates that represent the benefit derived from investing in investment assets just like gold and stocks are expected to have a relationship with these financial assets. This stems from the fact that interest-bearing assets are considered alternatives to other investment assets. Investors are looking for investments that would yield maximum return and therefore, are in the watch for assets that give them this return. It is therefore

expected that if an investment asset offers much return than the alternatives, there would be movement of investment towards that asset causing a negative impact on the alternative assets.

The relation of stock prices to nominal interest rates reflects an investor's willingness to adjust the composition of his portfolio between stocks and bonds. In fact, a rise (fall) in interest rates motivates investors to change their portfolio structure in favor (against) of bonds. Because of this, stock prices are expected to fall (rise) Apergis & Eleftheriou (2002). Negative causality coefficient flowing from interest rates to stock prices is often predicted, as a rise in interest rates decreases the current value of potential dividend earnings that would weaken stock prices; instead, low-interest rates result in lower borrowing opportunity costs; and lower interest rates stimulate investment and market-induced economic activity (Mok, 1993) as cited by Andrieș, Ihnatov, & Tiwari (2014).

Through the employment of monthly data ranging from January 2001 to December 2014, the relationship between economic and financial variables like gold, stocks, exchange rates, and interest rates is investigated by Akbar et al. (2019) under the Pakistani economy. The impulse response graph shows that interest rate response negatively to positive shocks in stock prices whilst a positive shock in interest rate results in the decline of both stock and gold prices. Shocks in exchange rate results in a rise in interest rate as policymakers respond to a depreciation of the Pakistani Rupee by raising interest rates. The negative effect of interest rates on gold and stock prices is attributed to the fact all are investment assets and as Homo economicus, as investors are, they would always opt for investments that would yield much return and therefore, an increase in interest rate would induce them to move their investments away from gold and stocks and invest in interest-bearing assets causing a negative effect on gold and stocks.

The effects of interest rate on traditional and Islamic bonds and stocks is investigated by Akhtar, Akhtar, Jahromi, & John (2017) through the employment of data on the

forecast and announcement of interest rate, daily data on bonds and stocks of three (3) Islamic; Indonesia, Malaysia, and Turkey, and eight (8) Non-Islamic countries; Australia, Canada, France, Germany, Italy, Japan, UK, and, US. It is observed that a considerable proportion of interest rate shocks have a substantial impact on the volatility and returns of equity and bond prices, but that the path and extent of the effect vary greatly across countries. In Malaysia, it is observed that shocks of interest rate may have a smaller effect on Islamic bond volatility and returns in comparison to traditional bonds. This is a result of the structure of Islamic bonds-designed to avoid interest rates explicitly. Surprisingly, Interest-rate fluctuations tend to have the same or greater effect on Islamic stock indices compared to traditional stock indices. The impacts of volatility of interest rate and exchange rate on the returns and volatility of stocks of banks in Turkey are examined by Kasman, Vardar, & Tunç (2011) by employing daily data ranging from 07/1999 to 04/2009. The findings of this paper indicate that interest rates and adjustments in exchange rates have a negative and important effect on the conditional return on bank stocks. Additionally, the findings show that the volatility of interest rate and exchange rate is considered to be a significant determinant in the volatility of conditional bank stock return. The sensitiveness of returns of stock of banks is however, discovered to be higher for market returns than interest rates and exchange rates, suggesting that market returns play a significant function in deciding the dynamics of bank stock conditional returns.

The relationship between exchange rates, interest rates, and equity prices has been investigated each by Andrieș et al. (2014)-India, Gupta, Chevalier, & Sayekt (2000)-Indonesia, and Hamrita & Trifi (2011)-US. Through the employment of monthly data for the period 07/1997-12/2010, Andrieș et al. (2014) find an association between the variables. However, the path and form of the relationship is dependent on the recurrence bands and over the duration of the analysis. Their findings show that equity price changes lag behind changes in the exchange rate and interest rate. The interest rate leads over the fluctuations in stock prices becomes much clearer, particularly after 2006, and it indicates that the stock market follows the signals of interest rates. Hamrita & Trifi (2011) also, through their results, argue that there exists a strong evidence of interest rate return leading return on the stock index. However, the relationship between exchange rate and interest rate does not vary substantially from zero in any

leads and lags and at any scale making room for an argument that exchange rate and interest rate are independent generally. They made use of data for the period 01/1990-12/2008. Contrasting all, the results of Gupta et al. (2000) suggest that there is no clear causal association between stock price and interest rate or exchange rate in most cases. However, a weak causal relationship between stock and interest rate are found in sub-period analysis. They also make an argument just like Hamrita & Trifi (2011) that interest rate and stock prices, exchange rate and stock prices are independent generally.

H_0: A negative relationship exists between the stock market index and interest rate.

CHAPTER III

DATA AND METHODOLOGY

3.1 Data

The purpose of this study is to explore the relationship between gold and certain financial variables of emerging market countries namely; exchange rates, inflation, interest rate, and stock market index. As prevalent in the literature, the Consumer Price Index (CPI) is employed as a representative of inflation. The exchange rates are the price of dollars in local currencies. The banking lending rates are employed as a proxy to the interest rate. Stock indices of countries are chosen based on the representation and availability of data. Gold is converted into national currencies using the exchange rates making all the variables represented in local currency. Countries in the emerging country list of Morgan Stanley Capital International (MSCI) as of May 2018 is employed. In total there are 24 countries on the list. However, Chile, Qatar, Peru, Taiwan, and the UAE which are part of the country list, are excluded from the study due to the non-availability of sufficient data.

The data used in the study and its sources are presented in table 3.1, the model specification used to accomplish the objective of the study is presented and discussed in section 3.2. From 3.3 to 3.5 the steps involved in the estimation of the model are discussed. Following the approach of Giannellis & Koukouritakis (2019) and Shakil et al. (2018), the natural logarithm of each variable is calculated for achieving stationarity in the variance.

Table 3.1 Variables and Data Sources

Variable(s)	Representation	Data Frequency	Data Source	Data Points
Exchange rates	EXR	Monthly	International Financial Statistics (IFS)[1]	01/2004-12/2019
Gold	GLD	Monthly	investing.com	01/2004-12/2019
Inflation	INF	Monthly	IFS	01/2004-12/2019
Interest	INT	Monthly	IFS[2]	01/2004-12/2019
Stock index[3]	STI	Monthly	investing.com	01/2004-12/2019

A sub-sample analysis was done to ascertain the changes in the relationship before and after the global financial crisis (GBF). This necissated the division of the data into two (2) samples. Following (Pandey, 2018), January 2004-June 2008 is considered as the pre crisis period and July 2008-December 2019 cosidered the post crisis period.

3.2 Methodology

The employment of panel analysis in this study is due to the numerous advantages present in panel data models. Among them is that heteroscedasticity is not an issue in panel analysis which means noise from time-series data is reduced (total number of observation and their variations is increased), heterogeneity (differences) is present among units in a panel, these heterogeneities among units are taken into consideration by allowing for subject-specific variables and suitable for studying dynamic changes due to repeated cross-sectional observations. For these reasons, a heterogeneous dynamic panel data model known as the ARDL model is employed to accomplish the objective of the study.

The General Autoregressive Distributed Lag (ARDL) model is specified below in equation (1);

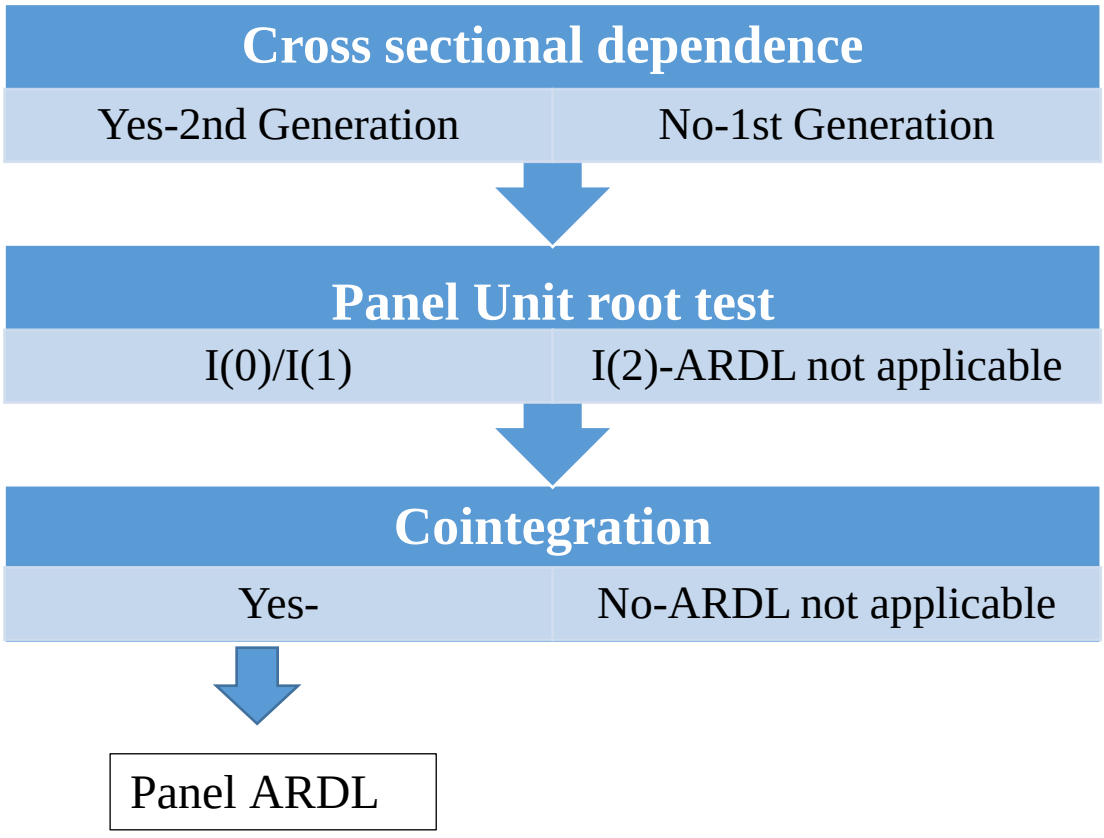
[1] That of Greece is from investing.com
[2] That of Greece, Poland and Turkey is from their central banks
[3] The Stock index of each country is presented in Appendix A

$$\Delta sti_{it} = \theta_i \left(sti_{i,t-1} - \beta_{i,1} exc_{i,t-1} - \beta_{i,2} gld_{i,t-1} - \beta_{i,3} inf_{i,t-1} - \beta_{i,4} inf_{i,t-1}\right) + \sum_{j=1}^{p-1} \xi_{i\,j} \Delta sti_{i,t-j} \sum_{j=0}^{q-1} \beta'_{ij} \Delta exc_{i,t-j} \sum_{j=0}^{q-1} \beta''_{ij} \Delta gld_{i,t-j} \sum_{j=0}^{q-1} \beta'''_{ij} \Delta inf_{i,t-j} \sum_{j=0}^{q-1} \beta''''_{ij} \Delta int_{i,t-j} + \varphi_i + e_{it} \quad (1)$$

where i = 1,…., 19 and t = 01/2004, ..., 12/2019. $\beta_{i,1}$, $\beta_{i,2}$, $\beta_{i,3}$and $\beta_{i,4}$ are long-term coefficients and $\xi_{i\,j}$, β'_{ij}, β''_{ij}, β'''_{ij} and β''''_{ij} are the coefficients of the short-term.

Before the estimation of the model, the data used for the study has to satisfy certain conditions. These conditions are checked using certain tests. Basically, the steps followed until the estimation of the model are summarised in figure 3.1, and an explanation of the steps are presented from section 3.3 to section 3.7.

Figure 3.1 Steps of Empirical Analysis



3.3 Correlation and Variance Factor Analysis

Correlation analysis is performed to determine whether or not there is linear dependence among the variables under study. The correlation coefficient should be less than 0.80. Except for gold and exchange rate, there is no linear dependence among the regressors. The gold-exchange rate dependence occured as a result of using the exchange rate to convert the dollar price of gold into national currencies.

Variance inflation factor is a test performed to ascertain the degree of multicollinearity among the independent variables. According to Belsley, Kuh, & Welsch (1980) as cited by Robinson & Schumacker (2009), the VIF should not be greater than 10. Except for inflation none of the regressors has an uncentered VIF of more than 10.

3.4 Cross-Sectional Dependence Analysis

This is a test conducted to determine whether or not there is multicollinearity between the variables under consideration. The independent variables should not have a linear representation of one another. The conduction of this test is crucial for the decision making of the appropriate panel unit root test to employ. There exist two (2) groups of unit root tests; first and second generation. The first generation does not account for cross dependence whilst the second generation tests do. This test was conducted using GAUSS with various cross-section dependence tests namely; Breusch, Pagan 1980, Pesaran 2004 CDlm, Pesaran 2004 CD, and Bias-adjusted CD test. The null hypothesis under these tests is that there is no cross-sectional dependence. For this study, the null hypothesis was rejected for all the tests.

3.5 Panel Unit root test

This test is performed to examine the integration order of the variables. For the ARDL model to be considered appropriate for application, the variables should not be integrated of order 2 that is I(2). Meaning none of the variables should be stationary at

the second difference. However, the variables can be stationary at different levels. The unit root test to be applied depends on the cross-sectional dependence test result. As stated in the cross-section dependence test, the data is not cross-sectionally independent. For this reason, first-generation unit root tests cannot be used. Therefore we employ second-generation unit root tests. Of the second generation panel unit root tests, we employ CIPS, $\boldsymbol{Z}_{\boldsymbol{A}}^{\boldsymbol{SPC}}, and\ \boldsymbol{Z}_{\boldsymbol{A}}^{\boldsymbol{lA}}$ tests developed by Pesaran (2007) and Hadri & Kurozumi (2012).

3.6 Cointegration test

The ARDL can only be conducted if the variables are cointegrated. Series of cointegration tests are available. The choice of cointegration test would be based on the results obtained from the unit root test. The results showed that the series were stationary at different levels. The appropriate cointegration test that should be employed is the Durbin–Hausman Panel (DHp) test developed by Westerlund (2008). This test is the most appropriate test when the series are integrated of different orders and there is cross-sectional dependence.

3.7 Hausman (1978) Ttest

This test, proposed by Hausman (1978) is performed to determine the appropriate model for the estimation. There are teo (2) of estimation under the ARDL mode. The Pooled Mean (PM) and the Pooled Mean Group all proposed by Pesaran, Shin, & Smith (1999). The result of the hausman test showed that the PM estimator is appropriate for the data.

CHAPTER IV

EMPIRICAL ANALYSIS AND RESULTS

Table 4.1: Descriptive statistics

STATISTIC	STI	EXC	GOLD	INF	INT
Mean	15179.72	790.4384	879617.0	108.7818	10.58366
Median	3955.580	21.42200	22083.53	105.1424	8.660000
Maximum	119528.8	15227.00	21643799	295.7601	56.60000
Minimum	119.9300	0.634100	317.3582	49.91433	0.706571
Std. Dev.	21098.18	2511.972	2999683.	30.96135	8.945076
Skewness	1.918327	3.939368	4.502221	1.823058	3.047925
Kurtosis	6.669432	17.95465	23.38731	9.582734	13.22251
Jarque-Bera	4282.890	43416.95	75481.13	8604.877	21526.28
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	55360451	2882729.	3.21E+09	396727.4	38598.61
Sum Sq. Dev.	1.62E+12	2.30E+10	3.28E+16	3495075.	291732.4
Observations	3647	3647	3647	3647	3647

The summary statistics of the data are presented in Table 4.1. Gold has the highest value in all the statistics. The exchange rate has the least value and gold the highest value. The interest rate has the lowest mean and the least maximum value. Gold has the highest deviation and interest rate the least. It is clear from the skewness that non of the series is normally distributed as the skewness of a normal distribution is zero. All are positively skewed implying that long right tail. All the series are leptokurtic. A normal distribution has a kurtosis value of 3.

Table 4.2: Correlation Analysis

	STI	EXC	GOLD	INF	INT
STI	1.000000				
EXC	-0.206010	1.000000			
GOLD	-0.175862	0.985824	1.000000		
INF	0.281329	0.046197	0.162446	1.000000	
INT	0.422909	-0.030287	-0.055512	0.020861	1.000000

The results of the correlation analysis shown in Table 4.2, shows that there is no linear dependence among the variables except gold and exchange. The high correlation coefficient of gold-exchange rate is as a result of using the exchange rate to convert the dollar prices into national currencies of the countries under study.

Table 4.3: Variance Inflation Factors

Variable	Coefficient Variance	Uncentered VIF
LEXC	0.041121	6.350066
LGOLD	0.019367	10.07240
LINF	0.100275	13.66985
LINT	0.014196	1.507152

The VIF result displayed in Table 4.3 shows that only the inflation variable has VIF greater than 10. The results show that there is no multicollenearity among the variables.

Table 4.4: Cross-Sectional Dependence

Null hypothesis: No cross-section dependence (correlation) for all tests

Variable	Breusch, Pagan 1980	Pesaran 2004 CDlm	Pesaran 2004 CD	Bias-adjusted CD test
LSTI	6851.671 (0.000)***	361.249 (0.000)***	77.621 (0.000)***	1618.217 (0.000)***
LGOLD	18156.566 (0.000)***	972.548 (0.000)***	133.109 (0.000)***	1733.686 (0.000)***
LEXC	5931.488 (0.000)***	311.492 (0.000)***	68.851 (0.000)***	1707.346 (0.000)***
LINF	907.327 (0.000)***	39.816 (0.000)***	19.521 (0.000)***	1663.520 (0.000)***
LINT	358.765 (0.000)***	10.153 (0.000)***	6.403 (0.000)***	1655.632 (0.000)***

* imply the rejection of the null of no cross-section dependence at the 10% level.

** imply the rejection of the null of no cross-section dependence at the 5% level.

*** imply the rejection of the null of no cross-section dependence at the 1% level.

The results for the cross-sectional dependence tests are displayed in table 4.2. The null hypothesis of no cross-section dependence is rejected in all the tests employed. This implies that there exists a strong correlation between the variables.

Table 4.5: Panel Unit Root Test

Variables	CIPS Intercept	CIPS Intercept + Trend	Z_A^{SPC} Intercept	Z_A^{SPC} Intercept + Trend	Z_A^{lA} Intercept	Z_A^{lA} Intercept + Trend
LSTI	-1.755	-2.1371***	9.180***	10.519***	38.082***	20.596***
LGOLD	-1.9069	-2.8292***	6.441***	-1.732	3.143***	-0.525
LEXC	-1.8813	-2.7090***	23.308***	-0.253	83.886***	6.258***
LINF	-1.8212	-2.6550***	21.763***	6.728***	85.940***	23.920***
LINT	-1.7112	-1.6749	17.253***	59.193***	336.274***	1037.00***

For the CIPS test the null hypothesis is non-stationarity and for the Z_A^{SPC} and Z_A^{LA} tests the null hypothesis is stationarity. Critical values for the CIPS test are obtained from Pesaran (2007). The distribution of the Z SPC A and Z LA A statistics are asymptotically normal.

* implies that statistics are significant at the 10% level of significance.

** implies that statistics are significant at the 5% level of significance.

*** implies that statistics are significant at the 1% level of significance.

For the CIPS test with intercept, the null hypothesis of non-stationarity cannot be rejected and with intercept and trend, the null hypothesis is rejected for all variables except for interest rates. Under the Z_A^{SPC} test with intercept, the null hypothesis of stationarity is rejected for all variables and with intercept and trend, except for gold and exchange rates, the null hypothesis is rejected for all the variables. Under the Z_A^{LA} test, however, the null hypothesis of stationarity is rejected for all variables with intercept. The same results exist with intercept and trend except for gold.

Table 4.6: Westerlund (2008) Durbin-Hausman Panel Tests of cointegration

Null hypothesis: No cointegration

DH(g)	**-1.925 (0.973)**
DH(p)	**2.040 (0.021)****

* implies that statistics are significant at the 10% level of significance.

** implies that statistics are significant at the 5% level of significance.

*** implies that statistics are significant at the 1% level of significance.

The DH(g) is the group mean test and the DH(p) represents the panel test. The group mean test cannot be rejected but the panel test is rejected at a 5% level of significance and that is our interest. The results indicate that there exists a cointegration between the variables giving a green light for the estimation of an ARDL panel model.

Table 4.7: Hausman (1978) Test

Null hypothesis: difference in coefficient not systematic

	Coefficients			
Variable	**(b)** **mg**	**(B)** **pmg**	(b-B) Difference	**S.E**
LEXC	0.1537967	-0.0646996	0.2184963	0.7044562
LGOLD	3.870825	0.8888485	2.981976	3.530775
LINF	-9.202356	0.1824052	-9.384761	6.444915
LINT	-9.170457	-0.6527664	-8.51769	8.388536

chi2 (4) = 16.16
prob>chi2 = 0.0023

The result of the Hausman test shown in Table 4.7 indicates the rejection of the null hypothesis at a significance level of 1%. This is an indication that PM is the appropriate estimator to use.

Table 4.8: Estimation Results of the ARDL Model for the whole period

Variable	Coefficient	Std. Error	z-Statistic	Prob.*
Long Run Equation				
LEXC	0.831953	0.7182101	1.16	0.247
LGOLD	0.4299504	0.3281792	1.31	0.190
LINF	-3.061321	1.266438	-2.42	0.016
LINT	-2.318173	1.347011	-1.72	0.085
Short Run Equation				
COINTEQ01	-0.0596903	0.0121148	-4.93	0.000
C	1.122777	0.5432244	2.07	0.039
D(LEXC)	-0.8701984	0.0998768	-8.71	0.000
D(LGOLD)	0.1125149	0.0351382	3.20	0.001
D(LINF)	0.1395221	0.2115953	0.66	0.510
D(LINT)	-0.1173066	0.0649451	-1.81	0.071

The results of the ARDL estimation model shown in Table 4.8, indicate that the error correction term (ECT) is negative and highly significant which is an indication of the existence of a long-term relationship between stock indices, gold, exchange, inflation, and interest rates. In the long-term, inflation and interest rates are having highly significant coefficients at significant level of 5 and 10% respectively. Thus an indication that they are the only variables having an impact on the stock indices. Gold and exchange rates do not have any significant impact on stock indices in the long-term. However, in the short term, inflation has no influence on the stock indices. In addition to interest rates, exchange rate and gold are highly significant in the short run.

The relationship between exchange rates and stock prices in the long-term is positive and in the short-term, negative. However, the exchange rate coefficient is not significant in the long term. Thus, the portfolio theory holds in the short term whilst the traditional theory holds in the long-term. This finding is in line with that of Lee & Wang (2015) but contrasts that of Olugbenga (2012). The long-term relationship implies that an increasing exchange rate (decrease in value of a national currency and an increase in the value of the US dollar) is favorable for home exports. With domestic exporters' earnings rising, the domestic stock market will be positive with an upward pattern. The short-term relationship is an indication that investors are anticipated to be increasingly able to invest in the national stock market in expectation of growing returns in the future, which would lead to an increase in demand and domestic currency

appreciation. The national equity market is showing a growing trend in light of future expectations Lee & Wang (2015).

Gold prices is positively related to stock prices both in the short and long-term. However, gold prices coefficient is not significant in the long run. Gold has a significant impact in the short-term and positively related to stock prices. This means that gold and stock prices move in the same direction both in the short and long-term which is an indication that gold cannot play the role of a hedge against stocks but rather it plays a diversification role. This finding conforms with that of Al-Ameer et al. (2018), Singhal et al. (2019) and Ibrahim (2012). This could be as a result of equity investors moving towards equities of developed markets rather than gold as an alternative investment. The relationship staying positive in the long-term is an indication of the stability of the relationship which is in opposition to the argument proposed by Al-Ameer et al. (2018) that the relationship is unstable.

Inflation has a negative impact on stock prices both in the short and long-term as evident from its coefficient and the significance of the coefficient at 10% level. This findimg is inline with that of Areli Bermudez Delgado et al. (2018) and supports the argument of both Antonakakis et al. (2017) and Apergis & Eleftheriou (2002). This finding, however, contradicts that of Sekmen (2011) and Oxman (2012).

The relationship between interest rate and stock prices both in the short and long-term is negative and significant at a 10% level. The relationship shows that when interest rates are rising stock prices would be falling and vice versa. This is expected because investors are interested in earning high returns on their investment and since interest-bearing investments serve as an alternative investment to stocks, investors would opt for such investment assets if interest rates are high. They would opt for stock investment where they would earn better when interest rates are low. This finding conforms with that of Akbar et al. (2019).

Table 4.9: Country Specific Estimation Results

	ECT	C	D(LEXC)	D(LGOLD)	D(LINF)	D(LINT)
Brazil	-0.0353315 [0.0197721] (0.074)*	0.1527335 [0.1881128] (0.417)	-0.9933841 [0.0959098] (0.000)***	0.2831983 [0.0792057] (0.000)***	-0.342398 [0.681096] (0.615)	-0.2584335 [0.1191169] (0.030)**
China	-0.0363659 [0.020056] (0.070)*	0.9499399 [0.8620135] (0.270)	-1.259814 [0.6760765] (0.062)*	0.2587898 [0.1248304] (0.038)**	0.7394493 [0.9564236] (0.439)	0.4345548 [0.2971991] (0.144)
Columbia	-0.0821555 [0.025588] (0.001)***	0.7720457 [0.2918283] (0.008)***	-0.6555464 [0.1169969] (0.000)***	0.192784 [0.0818925] (0.019)**	-1.853815 [0.742104] (0.012)**	0.0795945 [0.1017187] (0.434)
Czech Republic	-0.0867686 [0.0257133] (0.001)***	3.135443 [1.169079] (0.007)***	-0.4674967 [0.1299307] (0.000)***	-0.0351515 [0.0850381] (0.679)	-0.0336697 [0.6756516] (0.960)	0.059214 [0.423593] (0.14)
Egypt	-0.0579476 [0.0175929] (0.001)***	0.1564636 [0.3550654] (0.662)	0.0803325 [0.1795091] (0.655)	0.3943009 [0.1316125] (0.003)***	0.7217777 [0.5730976] (0.208)	-0.1951903 [0.3550654] (0.583)
Greece	-0.2452712 [0.0462309] (0.000)***	10.30535 [4.260592] (0.016)**	-1.243663 [0.6404379] (0.052)*	0.3929182 [0.3913525] (0.315)	1.570057 [1.45102] (0.279)	0.3583055 [0.2814808] (0.203)
Hungary	-0.0489403 [0.0227035] (0.031)**	0.218818 [0.5884804] (0.710)	-0.7329188 [0.1129918] (0.000)***	-0.0174514 [0.0876632] (0.842)	1.441247 [0.6797724] (0.034)**	-0.0415176 [0.0314667] (0.187)
India	-0.0412128 [0.0253788] (0.104)	0.2096264 [0.2881814] (0.467)	-1.451768 [0.1684995] (0.000)***	0.0749741 [0.0805519] (0.352)	0.3490072 [0.4625151] (0.450)	-0.0505019 [0.1204984] (0.675)
Indonesia	-0.0202087 [0.0295913] (0.495)	-0.4253974 [0.7197234] (0.554)	-1.316303 [0.1270064] (0.000)***	0.0755064 [0.0675552] (0.264)	-0.4397459 [0.3786071] (0.245)	-0.6888003 [0.2559255] (0.007)***
Korea	-0.0985662 [0.0419303] (0.019)**	2.00803 [0.7170505] (0.005)***	-0.6426632 [0.1167076] (0.000)***	0.0533886 [0.0687872] (0.438)	0.8889744 [0.6015871] (0.139)	-0.0751516 [0.1491499] (0.614)
Malaysia	-0.0122887 [0.0237746] (0.605)	0.6947655 [0.257523] (0.007)***	-0.6492424 [0.1096405] (0.000)***	0.0261514 [0.0496401] (0.598)	-0.599467 [0.3845595] (0.119)	-0.2248073 [0.170372] (0.187)
Mexico	-0.042331 [0.0201819] (0.036)**	0.5072482 [0.1432082] (0.000)***	-0.7068243 [0.1023497] (0.000)***	0.0905031 [0.0617981] (0.143)	0.5159347 [0.5043191] (0.306)	-0.1277363 [0.0704745] (0.070)**
Pakistan	-0.0404502 [0.0242223] (0.095)*	0.2626572 [0.2916101] (0.368)	-0.7125188 [0.3343467] (0.033)*	-0.1193877 [0.103823] (0.250)	0.1555972 [0.5363978] (0.772)	-0.6654381 [0.3220906] (0.039)**
Philippines	-0.0849648 [0.0261422] (0.001)***	-0.0474402 [0.2828851] (0.867)	-1.360618 [0.1997392] (0.000)***	0.0316335 [0.0746922] (0.672)	-1.780948 [0.663525] (0.007)***	0.0278122 [0.0587725] (0.636)
Poland	-0.0491918 [0.0274596] (0.073)*	0.775324 [0.7639535] (0.310)	-0.8385582 [0.1013243] (0.000)***	0.0445814 [0.0757549] (0.556)	-0.1874325 [0.6518513] (0.774)	-0.1204442 [0.1872896] (0.520)
Russia	-0.04872 [0.0213629] (0.023)**	0.1143309 [0.1681008] (0.496)	-0.685605 [0.1534301] (0.000)***	0.3034342 [0.1004954] (0.003)***	0.8159335 [0.7487543] (0.276)	-0.1150266 [0.1043807] (0.270)
South Africa	-0.0035701 [0.0215127] (0.868)	0.5242838 [0.1855898] (0.005)***	-0.3161882 [0.0808358] (0.000)***	0.1542548 [0.0673797] (0.022)**	-0.1698303 [0.5686769] (0.765)	-0.1098071 [0.1643234] (0.504)
Thailand	-0.0130329 [0.0207947] (0.531)	-0.1121094 [0.4945679] (0.821)	-1.708426 [0.202263] (0.000)***	0.0325722 [0.0769384] (0.672)	0.9252707 [0.5298707] (0.081)*	-0.4863853 [0.2128884] (0.022)**
Turkey	-0.0867985 [0.0286369] (0.002)***	1.130649 [0.2888457] (0.000)***	-0.8725613 [0.1234263] (0.000)***	-0.0992143 [0.0970687] (0.307)	-0.0650224 [0.4755341] (0.891)	-0.0290667 [0.0751546] (0.699)

* implies that statistics are significant at the 10% level of significance.

** implies that statistics are significant at the 5% level of significance.

*** implies that statistics are significant at the 1% level of significance.

The ECT for all countries is negative and highly significant except for India, Indonesia, Malaysia, South Africa and Thailand. Except for Egypt, the exchange rate has a significant impact on the stock index in the short term and except for Egypt, the exchange rate has a significantly negative relationship with stock prices. The finding for Pakistan contradicts the finding of Akbar et al. (2019). The traditional theory holds in Pakistan and the portfolio theory holds in all other countries in the study. The finding conforms with that of Granger, Huang, & Yang (2000) for Malaysia, the Philippines, and Thailand but contradicts for Korea. The finding for Turkey conforms with the study of Aydemir & Demirhan (2009).

The coefficient for gold is significant for Brazil, China, Colombia, Egypt, Ruassia and South Africa. In the Czech Republic, Hungary, Pakistan, and Turkey, gold has a negative relationship with stock prices and a positive relationship with it in the remaining countries. The finding of this study on Turkey conforms with the study of Tursoy & Faisal (2018). In countries where it is negatively related to stock prices, gold can serve as a hedge against stocks and a diversifier in countries it is positively related to stock prices. Gold plays a diversification role in all gold producing countries in the study except for Turkey where it serves as a hedge against stocks.

The inflation coefficient is not significant except for Columbia, Hungary, Philippines, and Thailand. Inflation is negatively related to stock prices in Brazil, Columbia, Czech Republic, Hungary, India, Indonesia, Malaysia, Philippines, Poland, South Africa and Turkey and has a positive relationship with stocks in the remaining countries. The countries with significant positive inflation impacts are Hungary and Thailand and those significant negative inflation impacts are Columbia and Philippines.

The interest rate has a significant coefficient for Brazil, Indonesia, Mexico, Pakistan and Thailand. The interest rate has a negative relationship with stock prices in all countries except China, Columbia, Czech Republic, Greece, and Philippines. Interest bearing assets serve as an alternative investment to stocks in countries where it has a negative relationship stocks and moves in the same direction with stocks in countries where it is positively related. The finding of this study on Pakistan conforms with the study of Akbar et al. (2019).

Table 4.10: Estimation Results of the ARDL Model for Pre GFC

Variable	Coefficient	Std. Error	z-Statistic	Prob.*
Long Run Equation				
LEXC	-5.762768	9.395729	-0.61	0.540
LGOLD	-10.29349	5.68864	-1.81	0.700
LINF	45.79878	26.93938	1.70	0.089
LINT	-9.82736	7.371756	-1.33	0.182
Short Run Equation				
COINTEQ01	-0.1258328	0.0245047	-5.14	0.000
C	1.429916	1.291767	1.11	0.268
D(LEXC)	-0.6279149	0.2693766	-2.33	0.020
D(LGOLD)	0.2151762	0.0425184	5.06	0.000
D(LINF)	-1.068303	0.35381	-3.02	0.003
D(LINT)	0.0269175	0.1283427	0.21	0.834

The estimation results for the pre GFC presented in Table 4.10 also shows that there exist a long-term relationship between the variables under study evident from the negative coefficient of the error correction term and its significance. In the long-term, non of the variables is significant except inflation. However, in the short-term, in addition to inflation, exchange rates and gold are significant. The diversification role of gold is seen in the short-term. The portfolio theory on exchange rates holds both in the short and long-term.

Table 4.11: Estimation Results of the ARDL Model for Post GFC

Variable	Coefficient	Std. Error	z-Statistic	Prob.*
Long Run Equation				
LEXC	-0.6025625	0.3262224	-1.85	0.065
LGOLD	0.2956355	0.1745818	1.69	0.090
LINF	0.3728298	0.5315526	0.70	0.483
LINT	-0.5385762	0.1908447	-2.82	0.005
Short Run Equation				
COINTEQ01	-0.1734507	0.0268331	-6.46	0.000
C	1.763608	1.046716	1.68	0.092
D(LEXC)	-0.7263893	0.1062931	-6.83	0.000
D(LGOLD)	0.0692185	0.0371057	1.87	0.062
D(LINF)	0.487462	0.2369571	2.06	0.040
D(LINT)	-0.1131763	0.0684015	-1.65	0.098

Just like the pre GFC estimation results, the ECT is negative and highly significant. An indication of a long-term relationship among the variables. In the long-term, all the

variables except inflation is significant. This finding is the direct opposition of the finding in the pre GFC where inflation is the only variable with a significant coefficient in the long-term. All the variables are having significant coefficients after the GFC.

The portfolio theory holds for exchange rates both in the pre and post GFC in the short-term. Gold maintains a positive relation with stock prices thereby being a diversifer. The impact of inflation on stock prices changes from negative in the pre crisis to positive in the post crisis period in the short-term. Interest rate became significant in the post crisis period having a negative impact thus making interest bearing investment assets an alternative to stock investment.

4.1 Conclusion

The integration of international financial markets and linkages between financial and economic variables have instigated policymakers to try to influence and exercise control over the behavior of some of these variables through policies, and investors to make informed investment decisions. This cannot be achieved without understanding the relationship between these variables. Additionally, the aftermath of the global financial crisis has seen the continuous increase in the GDP of emerging countries and also the growth more than the developed countries. This has prompted the increase in attention especially of investors in these countries for obviously to earn high returns on their investments. These have instigated researchers and policymakers alike to conduct several studies on the dynamics of economic and financial variables and their relations with each other.

This research employs monthly data on gold, exchange, inflation, interest rates, and stock market indexes of 19 emerging economy countries for the period 01/2004-12/2019 to explore the relationship between them with stock as a dependent variable. In achieving the aim of the study, I make use of the dynamic panel ARDL model.

The results showed that the error correction term (ECT) is negative and highly significant which is an indication of the existence of a long-term relationship between

stock indices, gold, exchange, inflation, and interest rates. In the long-term, inflation and interest rates are having highly significant coefficients. Both inflation and interest rates have a negative relationship with stock prices. Gold and exchange rate do not have any significant impact on stock indices in the long-term. However, in the short term, with the exception of inflation, all the variables are significant.

Traditional theory holds in the long-term whilst in the short-term, portfolio theory holds. Gold does not serve as a hedge nor a diversifier in the long-term but serves as a diversifier for stocks in the short-term, inflation only has an impact on stock prices in the long-term and interest-bearing assets serve as an alternative investment hub to stocks both in the short and long-term.

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APPENDIXES

APPENDIX A

Table A.1. Country Indexes

	STOCK INDICES	
Brazil	Bovespa	Brazil Stock Market
China	Shanghai Index	Shanghai Stock Exchange
Colombia	FTSE Colombia	Financial Times Stock Exchange Colombia
Czech Republic	PX INDEX	Prague Stock Exchange
Egypt	EGX 30	Egyptian Exchange
Greece	FTSE Athex	Athens Stock Exchange
Hungary	BUX	Budapest Stock Exchange
India	BSE Sensex	Bombay Stock Exchange
Indonesia	IDX	Jakarta Stock Exchange Composite Index
Korea	KOSPI	Korea Composite Stock Price Index
Malaysia	FTSE BM KLCI	Bursa Malaysia Kuala Lumpur Composite Index
Mexico	BMV IPC	Bolsa Mexicana de Valores Índice de Precios y Cotizaciones
Pakistan	Karachi 100	Karachi Stock Exchange
Philippines	FTSE Philippines	Financial Times Stock Exchange Philippines
Poland	WIG 20	Warszawski Indeks Giełdowy
Russia	MOEX Russia Index	Moscow Exchange
South Africa	South Africa Top 40	Johannesburg Stock Exchange
Thailand	SET index	Stock Exchange of Thailand
Turkey	BIST 100	Borsa Istanbul

APPENDIX B

Table B.1. **Country Specific Estimation Results Pre GFC**

	ECT	C	D(LEXC)	D(LGOLD)	D(LINF)	D(LINT)
Brazil	-0.4423128 [0.1267236] (0.000)***	1.97598 [3.259562] (0.544)	-0.9820826 [0.2752194] (0.000)***	0.4572105 [0.1631542] (0.005)***	-0.7829797 [1.3528] (0.563)	-0.7070858 [0.3563225] (0.047)**
China	0.0047321 [0.0572262] (0.934)	2.296817 [9.537632] (0.810)	3.188116 [2.833755] (0.261)	0.073316 [0.3028446] (0.809)	2.622929 [2.167277] (0.226)	1.001723 [0.9671379] (0.300)
Columbia	-0.1237497 [0.0666093] (0.063)*	19.66096 [5.868148] (0.001)***	-0.1380892 [0.4429563] (0.755)	0.4223284 [0.2329913] (0.070)*	-4.161828 [1.667932] (0.013)**	1.182249 [0.3937652] (0.003)***
Czech Republic	-0.1295514 [0.0816272] (0.112)	7.487139 [4.836152] (0. 122)	0.240131 [0.3156893] (0.447)	0.2923813 [0.2057087] (0.155)	-1.331297 [1.140722] (0.243)	0.1085702 [0.6761055] (0.872)
Egypt	-0.1406729 [0.0838723] (0.093)*	1.279571 [4.605559] (0.781)	-0.1613794 [1.044108] (0.877)	0.4855478 [0.314841] (0.123)	-1.481529 [1.544481] (0.337)	-0.7084794 [1.755487] (0.687)
Greece	-0.0109615 [0.0828829] (0.895)	-1.04446 [2.845914] (0.714)	0.0242133 [0.5027364] (0.962)	-0.0798643 [0.2434677] (0.743)	-0.0087177 [0.9031548] (0.992)	0.0941204 [0.5663548] (0.868)
Hungary	-0.1331699 [0.0993216] (0.180)	-1.804515 [2.717551] (0.507)	-0.5743916 [0.3129969] (0.066)*	0.271367 [0.2006867] (0.176)	-0.5825361 [1.343666] (0.665)	0.1562522 [0.2799585] (0.577)
India	-0.0026541 [0.1009335] (0.979)	-2.006322 [2.158529] (0.353)	-1.652535 [0.5429335] (0.002)***	0.1704371 [0.223862] (0.446)	-2.465737 [1.386096] (0.075)	-0.5985544 [0.8215233] (0.466)
Indonesia	-0.0199976 [0.0979124] (0.838)	4.524671 [3.091279] (0.143)	-1.263654 [0.3725767] (0.001)***	0.2173051 [0.1884405] (0.249)	-0.9744433 [0.6179465] (0.115)	0.2656863 [0.6603047] (0.687)
Korea	-0.0658568 [0.1065] (0.536)	-2.227629 [3.617485] (0.538)	-0.7224839 [0.4617109] (0.118)	0.0708168 [0.2340798] (0.762)	0.8621148 [1.444486] (0.551)	-0.7903406 [0.5759513] (0.170)
Malaysia	-0.146618 [0.0733765] (0.046)**	-1.02831 [2.049944] (0.616)	-0.714867 [0.5003904] (0.153)	0.4563116 [0.1341677] (0.001)***	-1.877831 [0.9207255] (0.041)**	-0.4460908 [0.5272257] (0.397)
Mexico	-0.1268948 [0.0911724] (0.164)	-4.7710048 [4.40263] (0.285)	-0.6125663 [0.4671321] (0.190)	0.2941143 [0.164685] (0.074)*	-0.8882908 [1.360242] (0.514)	0.0247702 [0.1892356] (0.896)
Pakistan	-0.2590574 [0.1149407] (0.024)**	3.207052 [3.274023] (0.327)	-2.799181 [1.666974] (0.093)*	0.1583134 [0.2183186] (0.468)	-1.117988 [1.389074] (0.421)	-0.1899381 [0.6990116] (0.786)
Philippines	-0.0845258 [0.0770431] (0.273)	-1.747785 [1.723574] (0.311)	-1.162066 [0.5957504] (0.051)*	0.1689274 [0.1824192] (0.354)	-3.322661 [1.505632] (0.027)**	-0.0510605 [0.1657442] (0.758)
Poland	-0.1386058 [0.0845799] (0.101)	7.176805 [5.762371] (0.213)	-0.589516 [0.2757905] (0.033)**	0.1671835 [0.1953074] (0.392)	-1.943566 [1.806688] (0.282)	0.7000585 [0.4053441] (0.084)*
Russia	-0.1503594 [0.0911142] (0.099)*	-5.1385 [3.114469] (0.099)*	-0.6115758 [1.116046] (0.584)	0.4027121 [0.2885674] (0.163)	-1.145202 [1.748721] (0.513)	0.1841601 [0.2621493] (0.482)
South Africa	-0.0933997 [0.0590461] (0.114)	-2.331258 [1.698878] (0.170)	-0.3060647 [0.1865229] (0.101)	0.2481427 [0.1726692] (0.151)	-2.38213 [1.082357] (0.028)**	0.5723134 [0.3839468] (0.136)

Thailand	-0.2639408 [0.1132343] (0.020)**	0.0604147 [2.180322] (0.978)	-1.883668 [0.4218258] (0.000)***	0.1504568 [0.1533318] (0.326)	0.3593818 [0.9446702] (0.704)	-0.2286392 [0.451874] (0.613)
Turkey	-0.0632262 [0.081009] (0.435)	1.537819 [1.537819] (0.308)	-1.208723 [0.3422537] (0.000)***	-0.0008039 [0.2864961] (0.998)	0.3245544 [1.27203] (0.799)	-0.058283 [0.2155599] (0.787)

Table B.2. **Country Specific Estimation Results Post GFC**

	ECT	**C**	**D(LEXC)**	**D(LGOLD)**	**D(LINF)**	**D(LINT)**
Brazil	-0.0293341 [0.0228831] (0.200)	0.0806036 [0.3017728] (0.789)	-0.9329457 [0.1063248] (0.000)***	0.1924262 [0.0912677] (0.035)**	-0.2949619 [0.7953513] (0.711)	-0.1241512 [0.1270952] (0.329)
China	-0.1489288 [0.0405706] (0.000)***	3.364816 [1.080323] (0.002)***	-1.447374 [0.6298676] (0.022)**	0.1719557 [0.1285633] (0.181)	0.1174675 [1.000827] (0.907)	0.287719 [0.2956546] (0.330)
Columbia	-0.4839229 [0.0665488] (0.000)***	2.133678 [0.3575274] (0.000)***	-0.152836 [0.1137748] (0.179)	-0.0100537 [0.0687254] (0.884)	-0.7832025 [0.6267584] (0.211)	0.0440361 [0.0769906] (0.567)
Czech Republic	-0.1599366 [0.0466128] (0.001)***	2.090101 [1.467022] (0.154)	-0.5424287 [0.1448985] (0.000)***	-0.0609529 [0.0938909] (0.516)	0.5819538 [0.8645339] (0.501)	0.0245931 [0.7143859] (0.973)
Egypt	-0.1570566 [0.0443576] (0.000)***	0.6020531 [0.6882023] (0.382)	0.1277066 [0.1875954] (0.496)	0.3722698 [0.1444682] (0.010)***	1.272407 [0.6291744] (0.043)**	-0.3972456 [0.359866] (0.270)
Greece	-0.4425993 [0.0697631] (0.000)***	19.60419 [6.413157] (0.002)***	-0.6656079 [0.7990261] (0.405)	0.4780265 [0.4992514] (0.338)	3.067602 [1.860837] (0.099)*	0.40884 [0.3156216] (0.195)
Hungary	-0.0477022 [0.0274445] (0.082)*	0.2025822 [0.6444021] (0.753)	-0.777987 [0.1194863] (0.000)***	-0.069772 [0.0941319] (0.459)	2.421878 [0.7918009] (0.002)***	-0.0449128 [0.0303453] (0.139)
India	-0.1000793 [0.0516927] (0.053)*	0.5483485 [0.5759259] (0.341)	-1.354155 [0.1658951] (0.000)***	0.067708 [0.0786114] (0.389)	1.065489 [0.4475874] (0.017)**	0.0493989 [0.1116468] (0.658)
Indonesia	-0.0398329 [0.0484807] (0.411)	-1.46532 [0.8413425] (0.082)*	-1.234637 [0.1557367] (0.000)***	0.0237811 [0.07656] (0.756)	-0.0896701 [0.5975292] (0.881)	-0.7903106 [0.3421434] (0.021)**
Korea	-0.2158506 [0.0578701] (0.000)***	3.573655 [1.205576] (0.003)***	-0.5876803 [0.1155801] (0.000)***	0.0550174 [0.067287] (0.414)	0.739283 [0.6319441] (0.242)	0.1378881 [0.1412922] (0.329)
Malaysia	-0.1558654 [0.0467051] (0.001)***	0.7094071 [0.3043452] (0.020)**	-0.4839927 [0.1079612] (0.000)***	-0.0165227 [0.0496116] (0.739)	-0.4531383 [0.4423414] (0.306)	-0.0496505 [0.1771284] (0.779)
Mexico	-0.1397213 [0.406274] (0.001)***	0.6551118 [0.2010846] (0.001)***	-0.6257881 [0.1012636] (0.000)***	-0.0014171 [0.0657186] (0.983)	0.6955096 [0.5362466] (0.195)	-0.0920323 [0.0787161] (0.242)
Pakistan	-0.2638928 [0.0586352] (0.00)***	0.9991908 [0.4306406] (0.020)**	-0.1252533 [0.3283459] (0.703)	-0.1851771 [0.1073821] (0.085)*	0.4255153 [0.5748534] (0.459)	-0.6898778 [0.380958] (0.070)*
Philippines	-0.1406911 [0.0471448] (0.003)***	-0.3780384 [0.3957584] (0.339)	-1.199355 [0.2280964] (0.000)***	0.1270507 [0.0817118] (0.120)	-1.214339 [0.7989324] (0.129)	0.0708154 [0.0675598] (0.295)
Poland	-0.1418472 [0.0501036] (0.005)***	0.8787313 [0.8289469] (0.289)	-0.7693126 [0.1189225] (0.000)***	0.0362133 [0.0777142] (0.641)	0.5894706 [0.6600384] (0.372)	-0.1814025 [0.2219203] (0.414)
Russia	-0.1836489 [0.0395425] (0.000)***	0.2656026 [0.4528918] (0.558)	-0.5637521 [0.1466309] (0.000)***	0.1544402 [0.0991888] (0.119)	1.111947 [0.770768] (0.149)	-0.2381822 [0.1054134] (0.024)**

South Africa	-0.1587097 [0.0410148] (0.000)***	1.535309 [0.397794] (0.000)***	-0.2766567 [0.0834749] (0.001)***	0.1287218 [0.0703907] (0.067)*	0.2831203 [0.625878] (0.651)	-0.1957444 [0.1767243] (0.268)
Thailand	-0.1221929 [0.0511223] (0.017)**	-2.753702 [1.179017] (0.020)**	-1.527953 [0.2488283] (0.000)***	-0.0115029 [0.0903603] (0.899)	-0.0074826 [0.710762] (0.992)	-0.3868343 [0.28295] (0.172)
Turkey	-0.1637506 [0.0521089] (0.002)***	0.8622229 [0.4986221] (0.084)*	-0.6613877 [01434341] (0.000)***	-0.1370618 [0.1049938] (0.192)	-0.2670715 [0.5038815] (0.596)	0.016712 [0.0852263] (0.845)

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