

Egbuna, Ngozi Eunice et al.

Research Report

Uncertainty and economic performance in the West African Monetary Zone (WAMZ): A fixed effect panel threshold approach

WAMI Occasional Paper Series, No. 19

Provided in Cooperation with:

West African Monetary Institute (WAMI), Accra

Suggested Citation: Egbuna, Ngozi Eunice et al. (2020) : Uncertainty and economic performance in the West African Monetary Zone (WAMZ): A fixed effect panel threshold approach, WAMI Occasional Paper Series, No. 19, West African Monetary Institute (WAMI), Accra

This Version is available at:

<https://hdl.handle.net/10419/264230>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

**WEST AFRICAN
MONETARY INSTITUTE**

**INSTITUT MONETAIRE DE
L'AFRIQUE DE L'OUEST**



**UNCERTAINTY AND ECONOMIC PERFORMANCE IN THE WEST AFRICAN
MONETARY ZONE (WAMZ): A FIXED EFFECT PANEL THRESHOLD
APPROACH¹**

WAMI OCCASIONAL PAPER SERIES NO. 19

Prepared by:

Ngozi E. Egbuna (PhD)
Maimuna John-Sowe
Dauda Mohammed (PhD)
Hissan Abubakari
Eric L. Sambolah
Kormay Adams

JUNE 2020

¹The views expressed in this paper are those of the authors and do not reflect the official position of the West African Monetary Institute (WAMI). Corresponding authors: Dauda Mohammed (dmohammed@wami-imao.org) and Hissan Abubakari (habubakari@wami-imao.org).

TABLE OF CONTENTS

1.0	INTRODUCTION	4
2.0	LITERATURE REVIEW	6
3.0	STYLIZED FACTS ON UNCERTAINTY AND RISK RATING	10
3.1	Uncertainty.....	10
3.2	Composite Risk Rating in the WAMZ.....	12
3.3	Correlation Analysis of Risk and Uncertainty	13
4.0	DATA AND METHODOLOGY	17
4.1	Model Choice and Specification	17
4.2	Fixed Effect Panel threshold.....	18
4.3	Summary Statistics and diagnostic tests	21
4.4	Panel Unit Root Test.....	21
4.5	Fixed effect Panel Threshold Model.....	22
5.0	DISCUSSION OF RESULTS.....	25
5.1	Conclusion and Policy Recommendations.....	26
	REFERENCES	28
	APPENDICES	32

List of Tables

Table 1:	Uncertainty Synchronization in the WAMZ.....	11
Table 2:	Pairwise Correlation of Uncertainty in the WAMZ.....	12
Table 3:	Summary (Descriptive) Statistics	21
Table 4:	Result of Panel Unit Root Test	22
Table 5:	Estimated Results of Static Panel Models	23
Table 6:	Panel Threshold Results for Uncertainty and Economic Performance of WAMZ Member States	24

List of Figures

Figure 1:	Movements in Uncertainty Index Across the World.....	10
Figure 2:	Movements in Uncertainty Index Across the World (quarterly data)	11
Figure 3:	Response of Investment inflows to Shocks in Uncertainties in the WAMZ	14
Figure 4:	Response of Growth in GDP of the WAMZ to Movement in Uncertainty	16

UNCERTAINTY AND ECONOMIC PERFORMANCE IN THE WEST AFRICAN MONETARY ZONE (WAMZ): A FIXED EFFECT PANEL THRESHOLD APPROACH

Ngozi E. Egbuna (PhD), Maimuna John-Sowe, Dauda Mohammed (PhD), Hissan Abubakari, Eric L. Sambolah and Kormay Adams

Abstract

Concerns about the impact of the general global uncertainty on economic performance have dominated academic debate in the aftermath of the Global Financial Crisis leading to huge body of empirical studies on ways of measuring and quantifying countries uncertainty and its impact on GDP, investment flows and employment. The paper utilized the Global Uncertainty Index - a metric developed from the quarterly Economic Intelligence Unit reports from 1996 to 2018. The paper adopted fixed-effect threshold model to determine whether uncertainty does affect economic performance in the WAMZ and to test for the presence of at least a threshold effects that would justify the consideration of nonlinear regression in estimating the nexus between uncertainty and economic performance in the WAMZ. The overall results confirmed the presence of both single and double threshold effects thus justifying the acceptance of a nonlinear panel regression model against a linear one. The paper brought to the fore, the negative consequences of ignoring the role of uncertainty when member countries are making growth projections. The paper recommends policy actions that may reduce uncertainty, boost investment, and pare-up economic activities in the Zone.

JEL Classification: C13, C33, C58

Keyword: *Uncertainty, Growth, West African Monetary Zone, Global Uncertainty Index, Panel Threshold*

1.0 INTRODUCTION

This study relates to major theoretical literature on the impact of uncertainty on general economic performance. Uncertainty refers to situations involving imperfect or unknown information. It applies to predictions of future events where some possible outcomes have an undesired effect or significant loss (Laffont, 1980). This definition shows that any decision taken amidst uncertainty involves risk. Classical financial theorists Modigliani and Miller (1958) have identified risk as the fundamental factor considered in investment decision making, given that the value of an investment depends on its risk-return characteristics. Investors are concerned about uncertainties emanating from both macroeconomic and monetary indicators including inflation, interest rates and other country specific factors that poses some element of risk. Risk can also be in the form of financial and non-financial risk. Each category of risk, economic, (fiscal crises, regulatory, assets price collapse), geopolitical risk (environmental pollution, election violence, corruption, organised crimes, terrorism) regardless of its underlying characteristics exposes the investor to the possibility of losses and by extension affect the overall economic performance. Uncertainty as defined in this study comprise of all risk inherent in the West African Monetary Zone member countries including government actions (fiscal and monetary) and their inter-related activities that affect the economy. Concerns over policy uncertainty have intensified in the wake/aftermath of the Global Financial Crisis, series of crises in the Eurozone, and partisan policy disputes in the United States. The International Monetary Fund argues that uncertainty in

the U.S. and European fiscal, regulatory, and monetary policies contributed to the steep decline in economic performance during the period 2008–2009, and to the slow recoveries afterwards (IMF 2010). Europe, the United States and a host of other countries frequently cite uncertainty as the major reason for their slow recovery from the crisis (Fernández Villaverde *et al*, 2011; Moore, 2017). Uncertainty affects investment decisions and clouds predictability of the future. This often result in the abandonment, reduction or postponement of investment, hiring or consumption depending on the risk appetite of the economic agents thereby depressing aggregate demand and output.

The desirability of measuring how uncertainty explains fluctuations in economic performance is particularly important to the emerging and underdeveloped economies in Sub-Saharan Africa. These countries are plagued by several developmental challenges such as underdeveloped financial market and payments system, low private sector growth, and poverty, climate change, which altogether affect their economic growth.

The huge dependence on primary commodity exports whose prices are subject to vagaries of the world economies and developments in the advanced economies make the WAMZ/ Economic Community of West African States (ECOWAS) economies vulnerable to external shocks. To this end, foreign capital flows are highly required for stimulating the process of economic growth in the WAMZ. In this case, foreign direct investment (FDI) inflows become

the variable candidate. On the other hand, investors (both foreign and domestic) are influenced by uncertainties arising from macroeconomic and monetary indicators. Studies have shown that economic uncertainty tends to be associated with declines (or slower growth) in real GDP and in real business fixed investment (Goulas and Zervoyianni (2013)). Consequently, empirical study on how uncertainty affects economic performance of the WAMZ becomes crucial given the regional integration agenda of the region.

The main objective of this study is to determine whether uncertainty does affect economic performance in the WAMZ and to test for the presence of at least a threshold effect that would justify the consideration of nonlinear regression in estimating the nexus between uncertainty and economic performance in the WAMZ. Hence, the paper adopted the Hansen (1999) static panel model with threshold effects, which has been widely used in empirical research due to its advantages

over the classical fixed effect (Abebe, 2020; Afeez *et al.*, 2020; and Asimakopoulos, 2015) among others.

The major contribution of this paper is that it identifies the conditions under which uncertainty has a negative impact on the region's economic performance. This will help governments in the WAMZ to reduce uncertainty/risk by reducing policy inconsistencies, addressing geopolitical conflict, improving institutional quality, and building a resilient financial system in member countries. This should be a top priority for policy makers in the Zone in order to guarantee investment inflows that would contribute to WAMZ economic development.

The rest of the paper is organized as follows: Section two, provides the review of literature while section three explains the data, methodology and results. Section four presents the discussion of our findings and section five provides summary, conclusion and policy recommendations.

2.0 LITERATURE REVIEW

Classical financial theorist Modigliani and Miller (1958) have identified risk as the fundamental factor considered in investment decision making, given that the value of an investment depends on its risk-return characteristics. Investors are concerned about uncertainties emanating from both macroeconomic and monetary indicators including inflation, interest rates and other country specific factors that pose some elements of risk and come in the form of financial and non-financial. Each category of risk economic (fiscal crises, regulatory, assets price collapse), geopolitical risk (environmental pollution, election violence, corruption, organised crimes, terrorism) regardless of its underlying characteristics exposes the investor to the possibility of losses and by extension affect overall economic performance.

Uncertainty in this context refers to a lack of clarity about future economic policies thereby incorporating some risk elements. This includes risks - where the probabilities of the potential outcomes are known (Schwartz, 2019; Cagliarini and Heath, 2000), and *Knighian uncertainty* - where neither the probabilities of outcomes nor the eventual outcomes are known knight 1921).

In general, uncertainty is difficult to quantify. However, studies have utilized the reports of data and text analytics to quantify it for various countries using an index of some of the key components of risk according to countries, regions, size of the economies and prevalent economic activities (see Steinberg, 2019; Hassan *et al.*, 2017; Baker *et al.*, 2015; and Keith 2012)². Early empirical work on risk/uncertainty (Bernanke, 1983) utilized the same index to examine the effect of uncertainty on investment and pointed out that when investment projects are expensive to cancel or workers are costly to hire and fire, high uncertainty gives firms an incentive to delay investment decisions. Further studies (Gilman, *et al.* 2010, Fernandez-Villaverde *et al.* 2011; and Pastor and Veronesi 2013) showed that the depressing effect of uncertainty include pushing up the cost of finance and increasing managerial risk-aversion. Other studies, (Amber & Waheed, 2013; Ayinash *et al.*, 1994, McDonald and Siegel 1986), adopted similar index in their study. On their part, Carballo *et al.*, (2018) used data and text analytics to quantify economic policy and uncertainty.

In their study, Baker, *et al* (2015) quantified economic policy uncertainty (EPU) using a set of words appearing in newspaper articles covering economic

² The index is a GDP weighted Average of EPU indices for 20 countries in all continents except Africa and account for 70.0 percent of global output (PPP Adjusted). They are Australia, Brazil, Canada, Chile, China, France, Germany, Greece, India, Ireland, Italy, Japan, Mexico, the Netherlands, Russia, South Korea, Spain, Sweden, the United Kingdom, and the United States. The EPU index was

created by an automated news-based on 10 leading newspapers in each of these countries on economic uncertainty and policy, including federal tax codes and forecaster disagreement on government purchases and CPI.

policy uncertainties and used index to measure uncertainty. The index mirrored the incidence of newspaper articles that contained the following: economic or economy; uncertain or uncertainty; and one or more of policy related words: fiscal policy, monetary policy, and parliament. They opined that, the difficulty with a straight newspaper search index is changing volumes of news articles produced by each paper, as well as differing amounts catalogued online. They, however, overcome the challenge by normalizing the raw counts of EPU-related articles by the total number of monthly news articles in the same newspapers; and normalizing each newspaper index to have a standard deviation. They provided empirical evidence that high levels of economic policy uncertainty explain the lower output, investment and employment both in the U.S. economy and in other international settings. They also showed that uncertainty shocks induced quick drop and subsequent rebound in both output and employment.

Another existing category/indicator used by researchers is stock market volatility, commonly used proxy for uncertainty. For example, Caggiano, *et al* (2014) used stock volatility to assess the effects of uncertainty because it is available in real time and reasonably comparable across countries. Bekaert, *et al* (2013) decomposed it into risk aversion and uncertainty to test for monetary policy effects.

Moore (2017) opined that the main benefit of stock market volatility study is that it provides a long time series that capture various scenarios. He, however, submitted that because uncertainty is about the future, forward-looking measures of stock

volatility are preferable. The major drawback of these measures is that they show an inverse relationship with economic performance (Shiller 1983; Cochrane 2011). The factor may relate to economic uncertainty, but the connection to economic performance is not immediately clear. These measures are also asymmetric in nature, that is, increases in measures accompany large falls in stock prices.

Keith (2012), Banerjee and Lakshimi. (2005) studies considered dispersion in forecast as another finance related measure of uncertainty as they are closely and conceptually related to economic performance. However, (Colquitt, *et al.*, 2012) argued that dispersions do not adequately measure uncertainty particularly, when the time span is short. On the other hand, Handley and Limao (2015) used dispersion in Consumer Price Index (CPI) as forecast variable to proxy uncertainty about future monetary policy and government purchases of goods and services. They found that uncertainty has a statistically significant negative relationship with economic performance.

Attempts by researchers to assess the impact of economic and financial crises have so far been restricted to calibration within the DSGE models. The first attempt was by Gourinchas, *et al* (2017), when they stated that the large fiscal consolidation and the increase in funding costs are the main culprits of the crisis while economists like Economides; *et al* (2017) emphasized institutional quality as the major cause of the economic crisis. These economists gave good perspectives into the various crisis yet restricted the analysis to the maximization assumptions underlining the DSGE models. However,

criticizing these earlier works, Blanchard and Summers (2017) who pointed out that fiscal policy, monetary policy, banking policy, pension policy or structural reform policy are not the results of optimizing agent's decisions, but rather targets imposed by lenders.

In an effort to evaluate the correlation of policy uncertainty with macroeconomic and financial variables, Gikas, *et al* (2018) used a series of structural autoregressive models, and estimated monthly and quarterly frequencies. The VAR results showed that policy uncertainty shocks have expected intuitive, statistically significant and economically negative relation with industrial production, employment, bank retail deposits, the stock market and economic sentiments, and simultaneous positive relationship with domestic bond yields. Equally, the quarterly VAR results suggested a significant and persistent negative relationship with economic activity and investment. Their approach agrees with the findings of Baker, *et al* (2015), which theorized a negative association of economic effects with uncertainty shock.

Ahir, *et al* (2018) applied a VAR model to an international panel data of 46 countries to examine the association between the World Uncertainty Index (WUI) and GDP growth. In their study, they measured the correlation between the WUI and existing measures of volatility such as stock market price and bond yield volatility. The result showed that the cross-country correlation between the WUI and the measure of volatility is positive, statistically significant and sizable for stock market price and bond yield. According to their VAR analysis, the panel regression was repeated using annualized quarterly GDP

rate growth as the dependent variable, the result indicated that the WUI was statistically significant and negatively related with growth.

In a related study, Asimakopoulos (2015) adopted threshold model to examine the impact of government size on economic growth and found statistically significant non-linear relationship by identifying the optimal threshold of government spending that maximizes growth. In particular, they uncover an asymmetric impact of government size on economic growth in both the developed and developing countries. In addition, Adetou and Fiodendji (2019) used dynamic panel threshold model to estimate remittances thresholds for long-term economic growth in the ECOWAS. Their findings showed that the impact of remittances on economic growth depends on the level of financial development and the institutional environment. Most recently, Abebe (2020) applied the fixed effect threshold to examine the relationship between income inequality and economic growth in a broad panel of countries over the period from 1965 to 2014. He found a threshold effect of inequality on economic growth, and further uncovered that the threshold was higher for developing economies than for the developed economies.

There are also other empirical papers on policy uncertainty that incorporates political uncertainty including Julio and Yook (2010), who found that corporate investment drops around national elections. Durnev (2010) also reports that corporate investment is 40 percent less sensitive to stock-prices in election years. Brogaard and Detzel (2015) discovered that policy uncertainty reduces asset returns; Handley and Limao (2015) also

showed that trade-policy uncertainty delays firm entry decisions, and Gulen and Ion (2016) found that policy-uncertainty index reduces firm investment.

In summary, the above literature review provides evidence that uncertainties across countries differ within the context of economic realities, with negative consequences for economic growth and other key economic variable.

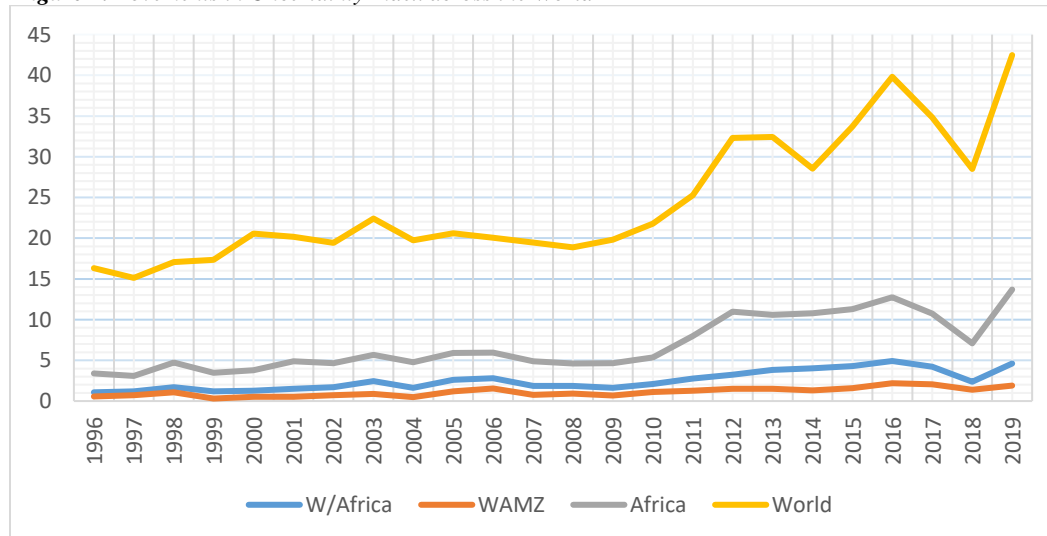
3.0 STYLIZED FACTS ON UNCERTAINTY AND RISK RATING

3.1 Uncertainty

Fact 1: Globally, major world events have been sensitive to uncertainty and often with lags in the outcomes. On average, uncertainty has been on the rise since 2012. As depicted in Figure 1, global uncertainty spiked in response to the 9/11 attacks on the US with the effects seen in 2002q1, the phasing out of that period saw a sharp drop in uncertainty until the SARs outbreak in China and the Gulf War II rescaled it up. Contrary to expectations, the 2007/2008 financial crisis did not heighten the existing uncertainty; rather, it was the Eurozone debt crisis in 2012q2 that facilitated an elevation in uncertainty as shown in the EIU reports. Other episodes of uncertainty included the El-Nino

incident of 2015 in most parts of Eastern Africa and the Europe Border control crisis. The spikes of 2016q3 may be due to the Brexit referendum in the United Kingdom whilst the 2017q1 may correlate to the US presidential elections in which President Trump emerged victorious with a right wing ideology (*see Figure 1*). On average, the WAMZ constituted 44.69 percent of uncertainty in the West African sub-region, 16.37 percent in Africa and only 4.56 percent in the world. The WAMZ also correlated positively with all the geographical comparators within the period. Uncertainty in Ghana, Guinea and Nigeria³ follows the WAMZ's average significantly, relative to Sierra Leone, Liberia and The Gambia (See Appendix 1 and 2 for more details).

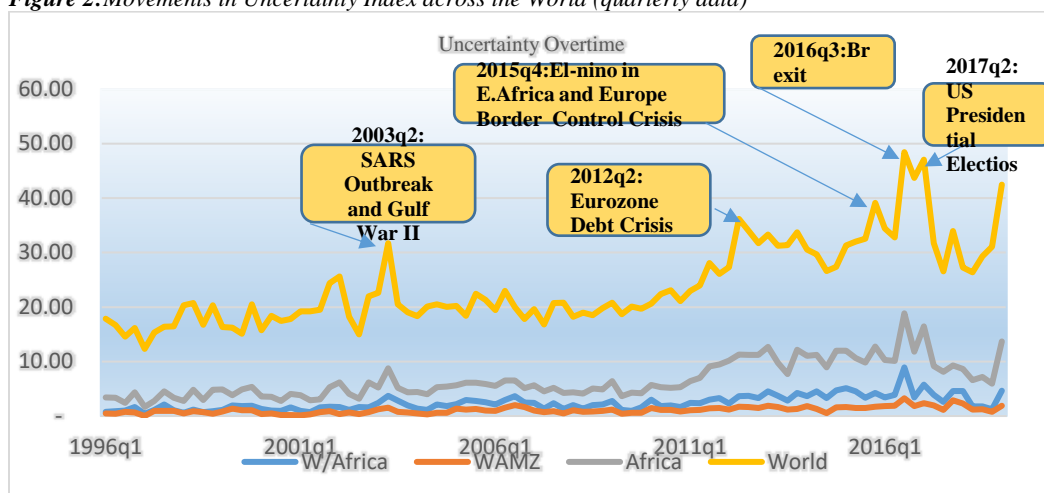
Figure 1: Movements in Uncertainty Index across the World



Source: Authors' Construct

³ These 3 countries are the economic power houses of the Zone

Figure 2: Movements in Uncertainty Index across the World (quarterly data)



Source: Authors' Construct

Fact 2: Uncertainty spikes are synchronized in all countries of the Zone. Table 1 is a report on the average synchronization of the uncertainty following Kalemli-Ozcan, *et al* (2013) approach in computing business cycle synchronization, we measure synchronization in uncertainty between country *i* and *j* at time *t* as: $\phi_{i,j,t} = -|U_{i,t} - U_{j,t}|$, where *U* denotes the WAMZ uncertainty index. On average, whilst

countries synchronize with each other at varying levels, complete synchronization appeared between Liberia and Sierra Leone and they both least synchronize with Nigeria. The Gambia synchronizes more significantly with Sierra Leone and least synchronizes with Nigeria. Ghana and Guinea bilaterally synchronizes with each other more significantly. The least countries they synchronize with is The Gambia. Nigeria synchronizes more with Guinea and less with The Gambia

Table 1: Uncertainty Synchronization in the WAMZ

Countries	GMB	GHA	GIN	LIB	NGA	SLE
GMB	0	-0.15	-0.16	-0.08	-0.22	-0.07
GHA	-0.15	0	-0.01	-0.07	-0.07	-0.08
GIN	-0.16	-0.01	0	-0.09	-0.06	-0.09
LIB	-0.08	-0.07	-0.09	0	-0.15	0
NGA	-0.22	-0.07	-0.06	-0.15	0	-0.15
SLE	-0.07	-0.08	-0.09	0	-0.15	0

Source: Author's Construct.

Note: The analysis follows Kalamli-Ozcan, Papaioannou and Peydro (2013) approach in computing business cycle synchronization. Synchronization in uncertainty between country *i* and *j* at time *t* as: $\phi_{i,j,t} = -|U_{i,t} - U_{j,t}|$, where *U* denotes the WAMZ uncertainty index. GMB denote the Gambia, GHA represents Ghana while GIN, LIB, NGA, and SLE denotes Guinea, Liberia, Nigeria and Sierra Leone

Fact 3: On a country-to-country basis (WAMZ), the correlation coefficients are extremely low and below 0.50 except for that between The Gambia and Liberia at 0.55, there was a significant⁴ positive co-movement of uncertainty in all countries of the Zone. Liberia (0.618) and The Gambia (0.577) correlated with the WAMZ the most, followed by Ghana (0.573) and Nigeria (0.523). Sierra Leone (0.405) and Guinea (0.488) were the least, which could be a result of their geographical proximity (see graphs in Appendix 2). The pairwise correlation indicate similar result showing synchronization with statistically significant positive. Ghana and Nigeria correlated more positively with each other than any other pair of countries. The least

correlation for Ghana was with Guinea, which may be due to both geographical distance and differences in languages. The Gambia and Sierra Leone correlated more positively with Liberia; but there is least correlation between The Gambia and Guinea. Ghana and Guinea have a relatively stronger correlation with Nigeria. Liberia also correlated more with The Gambia and had a negative correlation with Nigeria. The same negative relationship revealed between Nigeria and Sierra Leone. Sierra Leone's strongest positive relationship was with Liberia indicating their synchronicity, perhaps due to their geographical closeness (see Table 2).

Table 2: Pairwise Correlation of Uncertainty in the WAMZ

Countries	GMB	GHA	GIN	LIB	NGA	SLE
GMB	0	0.315***	0.065***	0.556***	0.013***	0.177***
GHA	0.315***	0	0.058	0.159***	0.334***	0.163***
GIN	0.065***	0.058	0	0.015***	0.176***	0.096***
LIB	0.556***	0.159***	0.015***	0	-0.012***	0.197
NGA	0.013***	0.334***	0.176***	-0.012***	0	-0.018***
SLE	0.177***	0.163***	0.096***	0.197	-0.018***	0

*Source: Author's Construct: follows Pearson Correlation. Note: ***, indicates significance at 5 percent.*

3.2 Composite Risk Rating in the WAMZ

We picked out the WAMZ risk rating and classification from the International Country Risk Guide developed by PRS Group⁵ (see Appendix 3 for information on the Guide). The composite risk rating is a combination of all the major risk

components (Financial, Political and Economic). As per the PSR Group convention, political risk rating contributes 50 percent of the composite whilst financial and economic ratings contribute 25 percent each. This section examined the composite risk rating in the Zone from the 1996 to 2018 (Appendix 4).

⁴ At 5 percent significant level

⁵ The ICRG rating system is a system developed by the PRS Group, which covers 140 countries using 22 attributes clustered into the major categories of political, financial and economic risks. Political risk alone contains more than half of the components, whilst financial and economic risk have five components each. Each attribute has a risk point, higher points indicates lower potential of risk, whereas lower point suggests higher

potential risk. The maximum points awarded to each risk reflects its importance to the overall risk of a country. It is however, noted that, a poor rating of any of these categories can be compensated by the other categories.

Composite Risk Rating-1996 - 1999: In the 1990s, the composite risk rating categorized the Zone as high-risk with an average score of 53.7 percent. Controlling for Liberia (39.0 percent) and Sierra Leone (38.0 percent), the position of the Zone averaged at 60.5 percent with a better moderate risk categorization. The Gambia and Ghana were in the moderate risk category with average ratings of 67.3 percent and 61.0 percent, respectively. In the high-risk category were Nigeria and Guinea, with average rating of 56.0 percent and 58.0 percent, respectively (see Appendix 4).

Composite Risk Rating-2000 -2009: Average composite risk rating in the 2000s, increase slightly to 59.0 percent for the Zone (high risk), but not significant enough to place it into the moderate risk bucket. Except Guinea and The Gambia that had slight declines in their average composite ratings, all countries had improved their positions with Sierra Leone graduating to high risk rating from very high risk. Even though Liberia also had its ratings improved to 48.43 percent it however, remained rated as very high risk (see Appendix 4).

Composite Risk Rating- 2010 -2018: Post 2010, the composite risk categorization of the Zone was still at high risk with a marginal improvement in average rating to 59.0 percent. No country fell into very high risk as Liberia had average rating of 54.0 percent, which was better than Guinea's 52.0 percent. Generally, Guinea and The Gambia were the only countries with a reduction in their ratings even though they maintained their former

categorizations of high-risk and moderate risk respectively. Ghana had the highest rating among the countries within the moderate risk category followed by Nigeria (see Appendix 4).

3.3 Correlation Analysis of Risk and Uncertainty

Since risk and uncertainty are interrelated, we try to establish whether the relationship is a positive one using information from the PSR Group- risk rating. In line with the result in Appendix 4 except for economic risk, it shows that on average, uncertainty in the WAMZ positively correlates with political and financial risks. This demonstrates that the WAMZ uncertainty index duly captures significant portions of risk variations. Interestingly, the correlation with risk is lower than with other measures of volatility and thus the results is a validation that risk and uncertainty are related (Appendix 4 and 5).

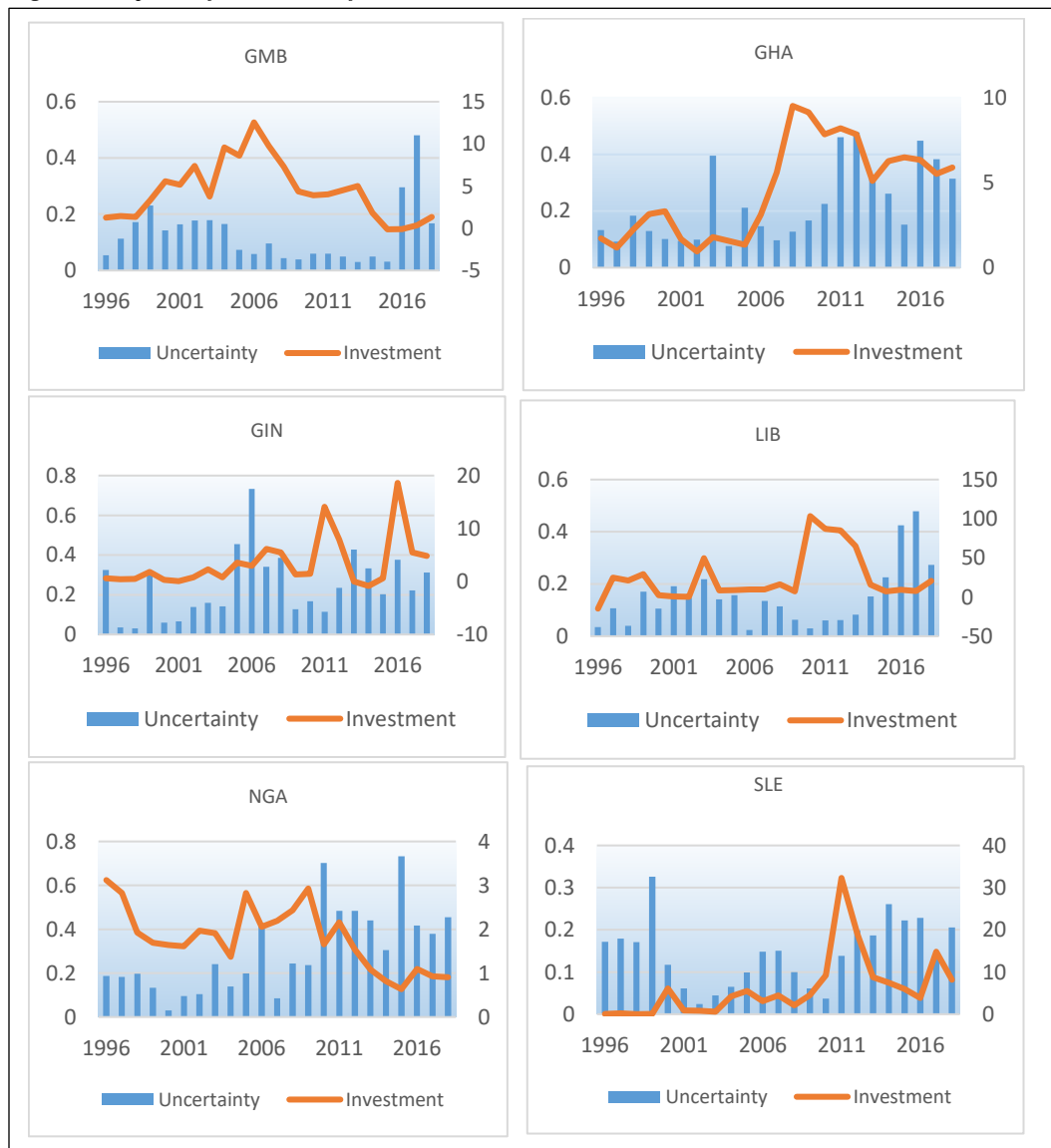
We further examine the correlation between the WAMZ uncertainty index and other indicators such as exchange rate volatility, macroeconomic vulnerability⁶ and inflation. The average historical level of each of these factors were measured against the average WAMZ uncertainty index. In the cross-country analysis, the results showed a strong positive and statistically significant correlation between WAMZ uncertainty and exchange rate volatility at 0.76 and inflation volatility at 0.73 percent. On the other hand, the macroeconomic vulnerability is not, however, statistically significant. (Appendix 6)

⁶ Measured by adding the twin deficit i.e. Current Account deficit and Fiscal Account deficit. Data sourced from WEO.

The graph below shows how investment inflows co-move (co-vary) with movements in uncertainty in the individual WAMZ member countries. The graph, indeed, confirms that uncertainties appeared to have strong correlation with investment inflows to the Zone. The graph showed an inverse relationship between

the two - implying that investment inflows declined as uncertainty increased in the countries. By extension, economic performance would also fall, consistent with the proposition by Modigliani and Miller (1958) theory that uncertainty (risk) diminishes investment inflow.

Figure 3: Response of Investment inflows to Shocks in Uncertainties in the WAMZ



The graph below shows the response of investment inflows to movements in uncertainty in the individual member countries. The graph indeed confirms that uncertainties, strongly correlates with Figure 3 shows the response of investment inflows to uncertainties in the member countries. The graph showed an inverse

relationship between the two thus, investment inflows declined as uncertainty increased in the countries and by extension economic performance is also expected to drop in consistent with the Modigliani and Miller (1958) that uncertainty (risk) diminishes investment inflow.

Figure 4: Response of growth in GDP to Fluctuations in Investment Inflow to WAMZ

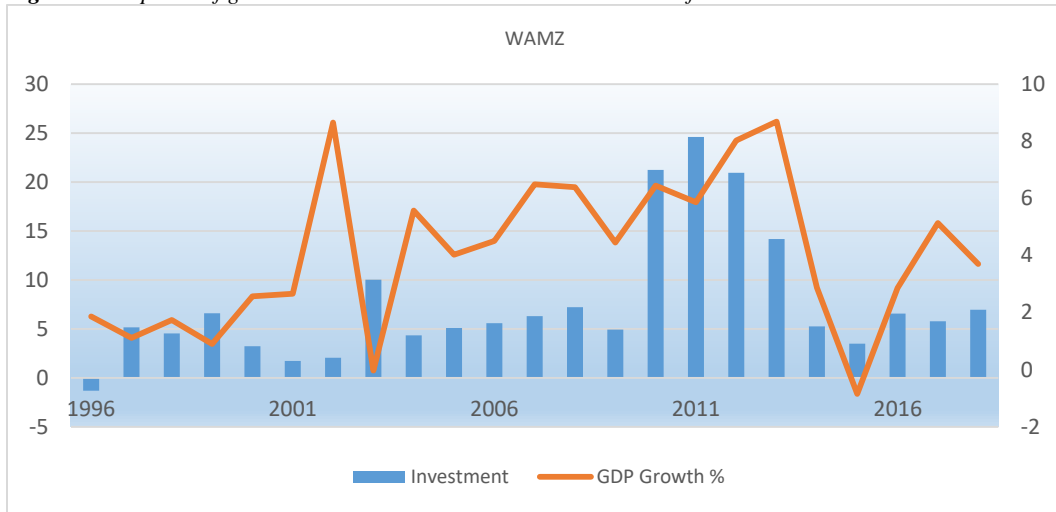
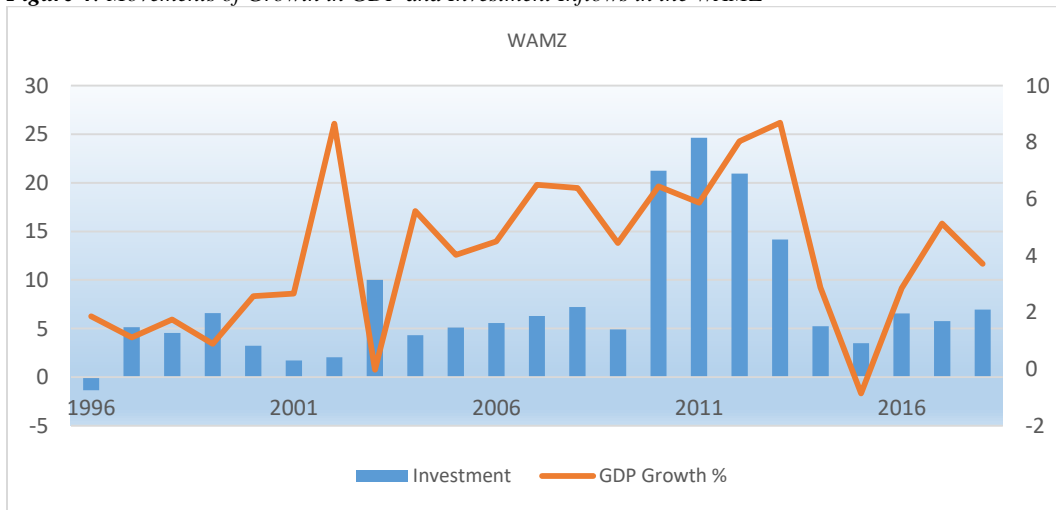


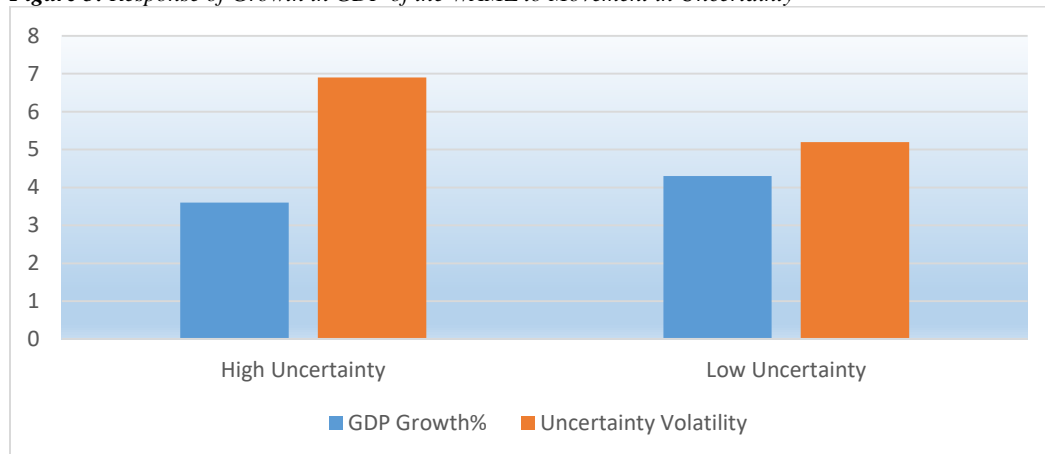
Figure 4: Movements of Growth in GDP and Investment Inflows in the WAMZ



Similarly, figure 4, shows how economic performance (measured by growth in GDP (co-move with investment inflows to the WAMZ. It indicates a remarkable economic growth during the period, 1996 – 2001/02, before it sharply declined in 2003 despite improved investment inflows. The significant growth in GDP is perhaps attributable to the favorable commodity prices given that the major economies in the region are commodity dependent, and susceptible to global price shocks. However, the economy began to recover to a steady state from 2003/04 and

peaked in 2014 then dramatically slipped into recession with a negative growth in 2015. This later showed declining investment inflow to the Zone and a period of economic depression in the biggest member country. However, the economic growth in the Zone began a gradual recovery process in 2016 accompanied by increased investment inflows. The growth however, showed signs of a declining trend in 2017, which could also be ascribed to commodity price, and general global economic shocks that spilled over to the Zone.

Figure 5: Response of Growth in GDP of the WAMZ to Movement in Uncertainty



Source: Computed by the authors

It was observed that economic performance, measured by growth in GDP responds to the impact of various movements in uncertainty. As uncertainty increases above the mean, economic performance drops thus suggesting a causal relationship between uncertainty and economic performance.

The stylized fact suggests that the uncertainty index in the WAMZ mimicked global events. For example, the September 11 attack on the US in 2001, the Euro Debt crisis of 2012, and the 2016 Brexit

referendum. The analysis of the composite risk rating on financial, economic, and political risk in the Zone also showed that the risk rating levels in the 2000s were considerably better than the post 2010 perhaps suggesting lower uncertainty during the 2000s. It further revealed that composite risk correlated positively with political and financial risk, while it did negatively with economic risk.

4.0 DATA AND METHODOLOGY

We use the World Uncertainty Index (WUI) developed by Ahir, *et al* (2018) as proxy for Uncertainty in the WAMZ. The index emanates from the Economic Intelligence Unit (EIU) report for 143 countries including both the developed and developing economies. Generally, the EIU present regular reports for a 189 countries with special emphasis on economic policy, trade, politics and domestic economy where uncertainty is defined as comprising all risks inherent in a country. The absence of uncertainty index in member countries of the WAMZ along with the credibility of the WUI index given its wide-outreach, accuracy and uniformity across countries and continents motivated our adoption of the index in this study.

We further sourced data from the World Development Indicators (WDI) covering the six (6) WAMZ Member States from 1996 – 2018. Interestingly, the period coincided with increased inter and intra trade relationship in the Zone which was amplified by episodes of globalization characterized by deregulation and privatization of state enterprises. In addition, the removal of barriers to movement of labour and capital across the globe further opened the region to global trade leading to the growth of capital flows in both foreign direct investment and portfolio investment.

4.1 Model Choice and Specification

We used panel data to model the relationship between economic growth measured by growth in GDP of WAMZ Member States and uncertainty index while controlling for other factors such as investment and exchange rate that

indirectly affect GDP. Panel data technique is appropriate in our case because it is a regional study comprising of countries in the WAMZ. This provides us with a large sample due to the pooling of individual and time dimensions, thereby, allowing for more degrees of freedom, more variability, and less collinearity among the variables (Green 2003). It also allows for individual effects due to the intercept, slope or both, hence providing more reliable estimates and accurate inference of the model (Olubusoye *et al* 2016)

We first explored the static fixed panel model on annual panel data of the six (6) WAMZ countries for the period 1996 – 2018 and left out the dynamic panel because the number of cross-sections is substantially small. The fixed effect model is specified as:

$$y_{i,t} = \alpha + \beta X_{i,t} + \varepsilon_{i,t} \dots \dots \dots (1)$$

where $i = 1,2,3 \dots \dots N$ and $T = 1,2,3, \dots \dots T$ and i represents the cross-sectional unit and t is the time. In our case $N = 6$, (countries) and $T = 23$ (years). $y_{i,t}$, is the dependent variable, $X_{i,t}$ is the vector of explanatory (independent) variable, α and β are the common intercept and slope coefficients, respectively, and $\varepsilon_{i,t}$ is the error term, assumed to satisfy the usual classical assumptions, i.e. $\varepsilon_{i,t} \sim iid(0, \sigma^2)$. Equation 1 assumes homogeneity both in the intercept and slope coefficients. If this restrictive assumption holds, then equation 1 can be estimated with Ordinary Least Squares (OLS). However, for countries in the WAMZ with evidence of variations in

macroeconomic performance, this assumption of strict homogeneity may not be appropriate. Moreover, studies such as Mukherjee, *et al.* (1998) and Hasio (2003) show that pooled regressions of panel data that disregard cross-sectional error correlation and the inequality of parameter coefficients in model specification, could lead to inconsistent estimates of the slope coefficients of the explanatory variables of interest. Consequently, we corrected for the estimation errors introduced by the presence of country's specific effects, endogeneity, and cross and within group correlation by using the fixed effect estimation technique specified as:

$$Ggdp_{i,t} = \alpha_{1-4} + \beta_1 Lncuidx_{i,t} + \beta_2 Lnexr_{it} + \beta_3 Lninvest_{it} + \beta_4 Lninfl_{it} + \mu_{it} + \varepsilon_{it} \dots \dots \dots (2)$$

Where *Ggdp* represents economic performance measured by growth rate of GDP of individual country included in the model, α represents the (common) intercept of the equation, *Lncuidx* denotes country's uncertainty index measure. The *Lnexr* represents the log of annual average of country's exchange rate, while *Lninvest* denotes foreign direct investment inflow into each of WAMZ Member States measured by the net investment inflow, while *Lninfl* is the log of inflation, $\beta_{1,2,3,4}$ symbolize the parameters to be estimated, μ_i represents the country-specific effects i.e. individual heterogeneity. *N* is the 1 to 6 countries included and *T* is the time period (1996 – 2018) which is 23 years. The fixed effect in equation 2 relaxes the strict homogeneity assumption in the pooled regression as it allow the specific fixed effect to be correlated with the explanatory

variable i.e. $Cov(\mu_t, X_{it}^{(j)}) \neq 0$. The ε_{it} , is the disturbance term with the following assumption:

$$\begin{aligned} E(\varepsilon_{it}) &= 0 \\ \mathcal{V}(\varepsilon_{it}) &= \sigma_n^2 \\ Cov(\varepsilon_{it}, \varepsilon_{js}) &= 0 \text{ for } i \neq j \text{ or } t \neq s \\ Cov(\varepsilon_{it}, X_{it}^{(j)}) &= 0 \text{ for all } i, j, t \text{ and } s \end{aligned}$$

4.2. Fixed Effect Panel threshold

We adopted the Hansen (1999) panel model with threshold effects because of our assumption of nonlinearity between Uncertainty and economic performance of the WAMZ member countries which follows the doctrine of new growth theories. The theory postulates that there are good reasons to expect the existence of nonlinearities in cross-country data. This is due to the presence of macroeconomic mechanisms by which multiple steady states and convergence clubs can emerge in a cross-section of countries. (Duffy and Papageorgiou, 2000; Azariadis and Drazen 1990), Cohen-Cole, *et al* (2012) opined that nonlinearities could also arise for other reasons such as deviations of the aggregate production function in the neo-classical growth model from the traditional specification of Cobb–Douglas.

The threshold model is appropriate for panel data analysis particularly, for non-dynamic panel model with individual specific fixed effect. The threshold effect in the model allows for the asymmetric effect of the exogenous variables, depending on whether the threshold variable is above or below the unknown threshold (Seo, *et al*, 2019). The economic model usually guides the choice of threshold variable. In our case, we considered Investment inflow into the WAMZ as the threshold variable. Hansen

(1999) applied the panel threshold model using a 15-year sample of 565 US firms to test the investment decision of firms under financial constraints. Other empirical studies such as (Khan and Senhadji, 2001) study on the relation between inflation and growth, and (Adam and Bevan 2005) on fiscal deficit and economic growth. More recently, Afeez, *et al* (2020) used the panel threshold model on a panel of cocoa exporting and importing countries over the period of 1999 -2018 to document the heterogeneous behavior of the inflation hedging property of cocoa.

Following Hansen (1999); Afeez *et al* (2020), we specified our panel threshold model as:

$$\Psi_{it} = a + X_{it}(q_{it} < \gamma)\beta_1 + X_{it}(q_{it} \geq \gamma)\beta_2 + \mu_i + \varepsilon_{it} \dots \dots \dots (3)$$

$i = 1, 2, \dots, N$; and $t = 1, 2, \dots, T$

where Ψ_{it} represents countries economic performance proxied by growth in GDP (*ggdp*) while X is exchange rate computed as the log of average annual exchange rate and denoted by (*ln exr*). q_{it} is the threshold variable represented by the ratio of FDI to GDP (*ln invest*) whereas γ uncertainty index (*ln cuidx*) which is the threshold parameter that divided the equation into two regimes with β_1 and β_2 , and ε_{it} is the country effect. Equation 1 can be compressed and re-written as:

$$\Psi_{it} = a + X_{it}(q_{it}, \gamma)\beta + \mu_i + \varepsilon_{it}$$

$$X_{it}(q_{it}, \gamma) = \begin{cases} X_{it}I(q_{it} < \gamma) \\ X_{it}I(q_{it} \geq \gamma) \end{cases}$$

Where

In order to test whether the coefficients are same for each regime which also mean testing for the presence of threshold effect in the relationship between economic performance and uncertainty under the null of no threshold effect versus the presence of threshold effect:

$$H_o : \beta_1 = \beta_2; H_1 : \beta_1 \neq \beta_2,$$

and the F can be constructed as:

$$F_1 = \frac{(S_0 - S_1)}{\hat{\sigma}^2}$$

The null (H_o) here is that the threshold is not identified and F has no nonstandard asymptotic distribution. Bootstrap is used on the critical values of the F statistics to test the significance of the threshold. S_0 , is the residual sum of squares (*RSS*) of the linear model (restricted) model, while S_1 is the unrestricted model under the alternative hypothesis, (H_1); $\hat{\sigma}^2$ is the estimated variance for the unrestricted model which also explains the degree of freedom. Consequently, rejecting the H_o , implies the presence of threshold effect while non-rejection connotes otherwise. Panel data specification under the null ignores the threshold effect hence can be described as linear panel model. Similarly, the presence of threshold is presumed under the alternative hypothesis (H_1) hence, for panel data threshold to be

appropriate, we must reject the null (H_0) of no threshold effect.

As mentioned earlier, S_0 is the residual sum of squares (RSS) of the linear model

(restricted) model, while S_1 is the unrestricted model (panel threshold model). Hansen (1999) bootstrap is used on the critical values of the F statistic to test for the significance of the threshold effect given that the threshold parameter γ

, and F_1 have nonstandard asymptotic distribution (Hansen 1999; Wang 2015).

Note that the panel threshold models can have up to three threshold levels (see Wang, 2015, Afeez, *et al* 2020) hence our panel threshold equation (4) expands to accommodate the double threshold level and specified as;

$$\Psi_{it} = a + X_{it}(q_{it} < \gamma_1)\beta_1 + X_{it}(\gamma_1 \leq q_{it} < \gamma_2)\beta_2 + X_{it}(q_{it} \geq \gamma_2)\beta_3 + \mu_{it} + \varepsilon_{it} \dots \dots \dots (4)$$

Here γ_1 , and γ_2 are the thresholds that separate the equations into three regimes

with coefficients β_1, β_2 and β_3 .

Similarly, our triple panel data threshold is specified as:

$$\Psi_{it} = a + X_{it}(q_{it} < \gamma_1)\beta_1 + X_{it}(\gamma_1 \leq q_{it} < \gamma_2)\beta_2 + X_{it}(\gamma_2 \leq q_{it} < \gamma_3)\beta_3 + X_{it}(q_{it} \geq \gamma_3)\beta_4 + \mu_{it} + \varepsilon_{it} \dots \dots \dots (5)$$

Where γ_1, γ_2 and γ_3 are also thresholds that separate the equations into four regimes with coefficients

$\beta_1, \beta_2, \beta_3$ and β_4 .

We can follow similar approach of the single threshold in using the F statistics to determine the existence of double and triple threshold effect. We suppressed this process as the presence of single threshold validates our threshold panel data model for uncertainty and economic performance.

The characteristics of the data were examined. The summary statistics along with some diagnostic tests are presented in section 4.3.

4.3 Summary Statistics and diagnostic tests

Table 3, presents the descriptive statistics of our series in their primary form before undergoing transformation.

Table 3: Summary (Descriptive) Statistics

VARIABLES	(1) N	(2) Mean	(3) Sd	(4) Min	(5) Max	(6) Skewness	(7) Kurtosis
Ggdp (%)	138	4.07	5.835	-30.15	26.42	-1.61	14.09
Uidx (%)	138	0.20	0.149	0.0238	0.733	1.33	4.75
Exr	138	1352.00	2,264	0.164	9,088	1.75	5.04
cpi	138	11.47	9.133	-5.677	66.92	2.50	13.44
Fdi (\$Bn)	138	111.50	188.50	-132.10	88.41	2.20	7.63
No of Groups	6	6	6	6	6	6	6
No Period	23	23	23	23	23	23	23

Source: Authors' computation

The mean values reported in the summary statistics indicate positive average growth of both GDP and economic performance in the WAMZ Member States. The mean exchange rate was high due to variation in member countries exchange rate given that we pooled the series into a panel, which overclouded the individual country exchange rate. The average inflation of the WAMZ indicate a moderate double digit of 11.47 but closer analyses uncover high inflation in some countries revealing a maximum of 66.92 per cent. This could be ascribed to social and political unrest in some member countries even though, some countries recorded negative inflationary trend during the review period. Table 3 also indicates that the asymmetry of the distribution of all the variables are positively skewed meaning that the distribution has a long right tail except for the growth in GDP, which, is negatively

skewed. Similarly, all the distributions of the series are leptokurtic indicating peaked relative to the normal. Given that it is a panel data, we do not expect the series to have a normal distribution.

4.4 Panel Unit Root Test

To determine the properties of our time series, we conducted a panel unit root tests to determine the stationarity of the series involved. We expect them to be stationary at level given that they have gone through transformation; however, formal test is required for confirmation (Afeez, *et al* 2020). We employed three alternative panel unit root tests beginning with the null hypothesis of unit root with common process (Levin, Lin, *et al*, 2002; Breitung, 2000; and Harris & Tzavalis, 1999 tests). We performed another set of unit root tests under the null of unit root with individual

process (Im, Pesaran, & Shin, 2003; Maddala & Wu, 1999). Lastly, Hadri (2000) tests with the null of no unit root

with common process and present the results in Table 4 below.

Table 4: Result of Panel Unit root test

Unit root tests	Variables		
Null hypothesis: Unit root with Common unit root Process			
Levin Li and <i>Chu t*</i>	-1.776**	-2.076***	-2.142***
Bretung <i>lamda</i>	3.671***	-2.213***	-4.109***
Harris-Tzavalis <i>rho</i>	0.473***	0.735***	0.477***
Null hypothesis: no unit root with individual unit root process			
Im, Pesaaran & Shin <i>Zt-bar</i>	2.269***	-2.346***	-1.631**
ADF Fisher <i>Chi-sq</i>	24.884**	23.642**	18.183
Phillip-Perron <i>Z stat</i>	6.931***	-4.688***	-4.084***
Null hypothesis: no unit root with common unit root process			
Hadri <i>Z-stat</i>	2.022**	2.658***	4.879***
No of cross section (N)	6	6	6
no of periods (T)	23	23	23
Total no of observations (NT)	138	138	138

Note: ***, ** and * indicates significance at the 1 percent, 5 percent and 10 percent levels, respectively.

Results of the unit root test and all the major tests roundly rejected the null of unit root with common and individual process thereby indicating the stationarity of the series.

4.5. Fixed effect Panel Threshold Model

Having examined the characteristics of our series and along with some diagnostics tests, we transformed the data into natural logarithm for normality and went ahead to estimate our static panel models. We present the results in Tables 5 and 6 below:

Table 5: Estimated Results of Static Panel Models

	(1)	(2)
VARIABLES	OLS	FE
Dep Var ggdp		
Lnucidx	-0.510 (0.688)	-0.926 (0.719)
lnexr	0.0397 (0.170)	0.486 (0.928)
lninvest	0.643*** (0.230)	0.666* (0.361)
lninfl	-0.0223 (0.721)	-0.122 (0.812)
Constant	-9.425* (5.390)	-12.48* (6.622)
R-squared	0.060	0.061
firm effect	NO	NO
year effect	NO	NO
rmse	5.485	5.379
F-test	2.014	1.951
Prob > F	0.0964*	0.106*
Hausman P-Value		
No of cross-section	6	6
Observations	138	138

Note: *Ggdp* represent economic performance measured by growth of GDP of individual country included in the model, α represent the slope of the equation, *Lnucidx* denotes countries' Uncertainty index measure. The *Lnexr* represents the log of annual average of countries exchange rate, while *Lninvest* denotes foreign direct investment inflow into each of WAMZ Member States measured by the net investment inflow, while *Lninfl* is the log of inflation. Similarly, *rmse* represents root mean square error, the *F-test* statistics is measured by the probability value where ***, **, * denote *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$, i.e. 1 percent, 5 percent and 10 percent significance levels respectively.

Results from the fixed effect model (FE) in Table 5, show the relationship between uncertainty and economic performance where some of the explanatory variables have the expected signs however, not statistically significant. For example, the relationship between uncertainty and economic performance, average annual exchange rates and Investment, which indicate a statistically positive relationship. It should however, be understood that the classical fixed effect

model estimated above reflects only heterogeneity in the intercept. In view of the fact that heterogeneity is a common problem in panel data, hence structural relationship may also vary across the cross-sections. As mentioned earlier, we adopted the fixed effect threshold model because of its robustness as it allows for any inherent heterogeneity, nonlinearity, jumping character or structural breaks, and the estimated results are presented in Table 6 below:

Table 6: Panel Threshold results for Uncertainty and Economic Performance of WAMZ Member States

VARIABLES	(1) Single Threshold	(2) Double Threshold	(3) Triple Threshold
uepw_0	0.0725** (0.0346)	0.0888*** (0.0316)	27.76*** (5.642)
uepw_1	-0.349*** (0.0916)	-0.630*** (0.0986)	0.0911*** (0.0302)
uepw_2		0.235* (0.138)	-0.566*** (0.0937)
uepw_3			0.136 (0.130)
Constant	4.310*** (0.536)	3.528*** (0.506)	3.461*** (0.487)
Threshold effect	19.64**	19.32***	19.16***
N	6	6	6
T	23	23	23
NT	138	138	138

Note: This table reports estimates for the static panel threshold regression model of uncertainty and economic performance (denoted as uepw in the table as specified in equation 6). Investment inflow measured by FD is the threshold variable. It provide a good measure of response of economic activity to uncertainty in WAMZ economies if at least, $\beta > 0$ and statistically significant. The estimation considers three (3) threshold points using F-statistic to test the null of “no threshold effect”. ***, **, * denote 1percent, 5percent and 10percent significance levels respectively. Standard errors of the respective coefficients are expressed in round parenthesis “()”. N is the number of cross sections, T is the time series dimension and NT is the total number of observations. The codes uepw_0 is the linear part of the threshold model while uepw_1, uepw_2, uepw_3, and uepw 4 are the nonlinear components representing the response of investment to uncertainty at different regimes under single, double and triple thresholds respectively.

5.0 DISCUSSION OF RESULTS

First, we tested the threshold effects of investment inflows using the F-test and found a highly significant threshold effect at the 5 percent confidence level thereby, rejecting the null hypothesis of a linear model against the alternative hypothesis of a nonlinear model. The result confirmed the presence of at least, a single threshold effect, which is sufficient to accept the consideration of a nonlinear panel regression model. We thus, fitted our single, double, and triple threshold models based on the results of the threshold effect test in Column 1 -3 of Table 6. In the threshold-effect test, single threshold relates to the null of a linear model, double connotes a null of no single threshold model and the triple corresponds to no double threshold model. The alternative hypothesis is the presence of at least single threshold, while double and triple represent the existence of double and triple thresholds respectively. The overall F-test statistic for the threshold-effect test is statistically significant, implying the presence of single and double threshold effects; hence, justifying that a standard panel data linear regression model would not be appropriate to our study.

The evidence of significant threshold effect with three (triple) threshold for the WAMZ is suggestive of the presence of four regimes in the relationship between uncertainty and economic performance. The *uepw_0* coefficient is the coefficient of uncertainty on investment in the first regime considered as the steady state, while *uepw_1*, 2, and 3 represents the coefficients of uncertainty on investment in the second, third and fourth regimes and, so forth.

Our result shows that at first regime when risk is considered as normal market risk along with the incentives (favourable business environment) where the cost of capital, and return on investment meet the intrinsic value of the investors, which also corresponds with the risk that they are willing to take, then FDI flows into the Zone. The positive and statistically significant coefficients of the first regime (*uepw_0*) for the single double and three thresholds confirmed the assertion indicating an inflow of 0.07, 0.09 and 27.7 percent respectively.

In the second regime (*uepw_1*) considered as period of heightened uncertainty, the coefficients are statistically significant but the sign changed to a negative in the first and second threshold implying that when uncertainty heightens, investors would not be motivated to push their capital to the Zone. Thus, FDI will drop for example; at 1percent, increase in uncertainty in the first and second regimes would cause investment inflows in the WAMZ to drop by 0.36 per cent and 0.63 per cent respectively, *ceteris paribus*. However, the negative impact of uncertainty on investment declined in the third regime thus, suggesting that either the level of uncertainty has normalized or the cost of capital commensurate with the prevailing uncertainty hence motivating reversal from declining investment to the positive of 0.09 percent.

The underlying economic intuition behind the analyses allows us to see in the first two scenarios how the relationship is responsive to external investment shocks in the WAMZ. It also confirms that declining investment can affect economic

activities in the Zone, as investment appears to be overly sensitive to uncertainty as discussed in the theoretical review. We, therefore, concluded that there is substantial evidence of the presence of single and double threshold effects to affirm that the relationship between uncertainty and economic performance in the WAMZ is nonlinear and that uncertainty influences economic performance in the Zone.

5.1 Conclusion and Policy

Recommendations

The study utilizes the World Uncertainty Index (WUI) developed by Ahir, *et al* (2018) from the Economic Intelligence Unit (EIU) reports for 143 countries around the world including the WAMZ. Uncertainty as captured by the index is composed of all risks emanating from economic policy, trade, politics and domestic economy of the countries. The absence of reliable uncertainty index in member countries along with the credibility of the WUI index given its wide-outreach, accuracy and uniformity across countries and continents motivated our adoption of the WUI index and it was able to provide plausible explanation of uncertainty and economic performance in the WAMZ. The index showed that uncertainty in West Africa and indeed the WAMZ mimicked global events. Like other regions, the index rose in response to heightened tension arising from global events such as the September 11 attack on the US in 2001, the Euro Debt crisis of 2012, the 2016 Brexit referendum among others. The study adopted the static panel Fixed Effect (FE) threshold model and the overall results confirmed the presence of both single and double threshold effect thus justifying the acceptance of a

nonlinear panel regression model against a linear one. Our study brought to the fore the negative impact of uncertainty on economic performance by influencing investment inflow, especially FDI to the Zone. This by extension impedes member countries ability to meet the primary convergence criteria, which is key to the economic integration of the Zone.

This finding is crucial for governments in the WAMZ as it goes to confirm that there are severe consequences ignoring the role of uncertainty when member countries are making growth projections. Therefore, measuring and taking into account factors that cause uncertainty that affect investments inflow to the Zone should be a top priority for policy makers, as it would help in the economic development. Some policy actions that may reduce uncertainty, boost investment and pare-up economic activities in the zone include:

Monetary authorities in the Zone are encouraged to provide improved forward guidance in their monetary policy decisions given that the proposed monetary policy framework for the ECOWAS single currency program is inflation targeting. Policy cycles should provide a forward guidance to assist investors' decision-making. For instance, many central banks across the world provide information about the expected future path of short-term interest rates while others communicate the policy outlook by means of brief qualitative statements.

Member Countries need to develop and strengthen fiscal and monetary policy collaboration by creating a forum for regular high-level

interactions between the representatives of the fiscal authorities whose operations impact on domestic liquidity and the monetary authorities to achieve macroeconomic objectives. For example, Nigeria has a Fiscal Liquidity Assessment Committee (FLAC) whose membership consist of both the monetary and the fiscal authorities. The following Ministries Departments and Agencies (MDAs) represent the fiscal side. They are: (i) Federal Ministry of Finance, (ii) Debt Management Office (DMO), (iii) Office of the Accountant-General of the Federation (OAGF), (iv) Budget Office of the Federation (BOF), (v) Nigerian National Petroleum Corporation (NNPC), (vi) Nigeria Customs Service (NCS), (vii) Federal Inland Revenue Service (FIRS) and, (viii) the Department of Petroleum Resources (DPR). The forum provides the platform for regular interaction with relevant (MDAs) of government that meet once every week to assess the level of liquidity in the system. This has helped in reducing fiscal surprises in terms of debt

issuance, and spontaneous expenditure by the fiscal authorities.

Governments of the WAMZ need to engage relevant agencies such as Ministries of Finance, Trade and Investments, Central Banks, and other relevant MDAs to develop sub-uncertainty indices covering parameters such as exchange rate, interest rate, inflation, trade, fiscal and tax policies. These sub-indices would subsume into a broader framework of national composite uncertainty index that can serve, as input for policy making that would respond to uncertainties as they emerge. The index would regularly be updated and monitored for robustness.

Member countries need to step up political stability in the Zone particularly during build-ups to national elections. Given that, Member States of the Zone respond differently to global uncertainties, which often disrupts investment inflows thereby affecting the economic performance of the Zone.

REFERENCES

- Abebe, H. (2020) Income Inequality and Economic Growth: Heterogeneity and Nonlinearity. *Studies in Nonlinear Dynamics & Econometrics*, vol. (24), 3, pp. 15.
- Adam, C and Bevan, D (2005). Fiscal Deficits and Growth in Developing Countries. *Journal of Public Economics*, (89) 4, pp. 571-597.
- Adetou, A.E. and Fiodendji K. (2019): Finance, Institutions, Remittances and Economic growth: New Evidence from a Dynamic Panel Threshold Analysis. *Journal of Applied Finance & Banking*. (9) 2.
- Afeez, A.S. *et al* (2020). The heterogeneous Behavior of the Inflation Hedging Property of Cocoa. *The North American Journal of Economics and Finance*, 51, 101093.
- Ahir, H., Bloom, H., Furceri, D (2018). The World Uncertainty Index” Available online at <https://papers.ssrn.com> accessed on 15/09/2019.
- Amber F. & Abdul, W. (2013) Economic Uncertainty and Growth Performance: A Macroeconomic Modeling Analysis for Pakistan. *Quality and Quantity* 48(3).
- Asimakopoulous, S. (2015): The impact of government size on economic growth: a threshold analysis. Discussion Papers, Granger Centre for Time Series Econometrics, University of Nottingham.
- Ayinash K. D., Dixit, R.K., Pindyck D. (1994), *Investment under Uncertainty*. Princeton: University Press.
- Azariadis, C., Drazen, A., (1990). Threshold externalities in economic development. *Quarterly Journal of Economics* (105), pp. 501–526.
- Baker, S. Bloom, N; Davis, S. J. (2015) Measuring Economic Policy Uncertainty National Bureau of Economic Research Working Paper.
- Banerjee, A., Lakshmi, I. (2005), “History institutions and Economic Performance: the Legacy of Colonial Land Tenures System in India, *American Economic Review*, (95) 4, 1190-1213.
- Bekaert, G. Marie, H., Duca, Marco .L (2013), “Risk, Uncertainty & Monetary Policy. *Journal of Monetary Economics*, 60 (7) 771 -788.
- Bernanke (1983), “Irreversibility, Uncertainty, and Cyclical Investment. *The Quarterly Journal of Economics*, 98 (1). 85–106.
- Blanchard, O., Summers, L. (2017). Rethinking Stabilization Policy: Back to the Future. Peterson Institute for Economics available online <https://pdfs.semanticscholar.org>.
- Bonn, B., and Pfeifer, J. (2011), Policy Risk and Business Cycle. *Journal of Monetary Economics*, (68), pp. 68-85.
- Breitung, J. (2000). The local power of some unit root tests for panel data. In B. H. Baltagi (Ed.). *Non-stationary Panels, Panel Cointegration and Dynamic Panels* (pp. 161–177). Amsterdam: Elsevier.
- Brogaard J., and Detzel, A. (2015). The Asset Pricing Implications of Government Economic Policy Uncertainty. *Management Science*, 61(1) 1-227.
- Caggiano, G., Castelnuovo, E., Nicolas, G. (2014), “Uncertainty Shocks & Unemployment Dynamics in US Recessions, *Journal of Monetary Economics*. (67) C, 78-92.
- Cagliarini, A, Heath, A. (2000), "Monetary Policy-making in the Presence of Knightian Uncertainty, available online at <https://www.semanticscholar.org/paper/Monetary->

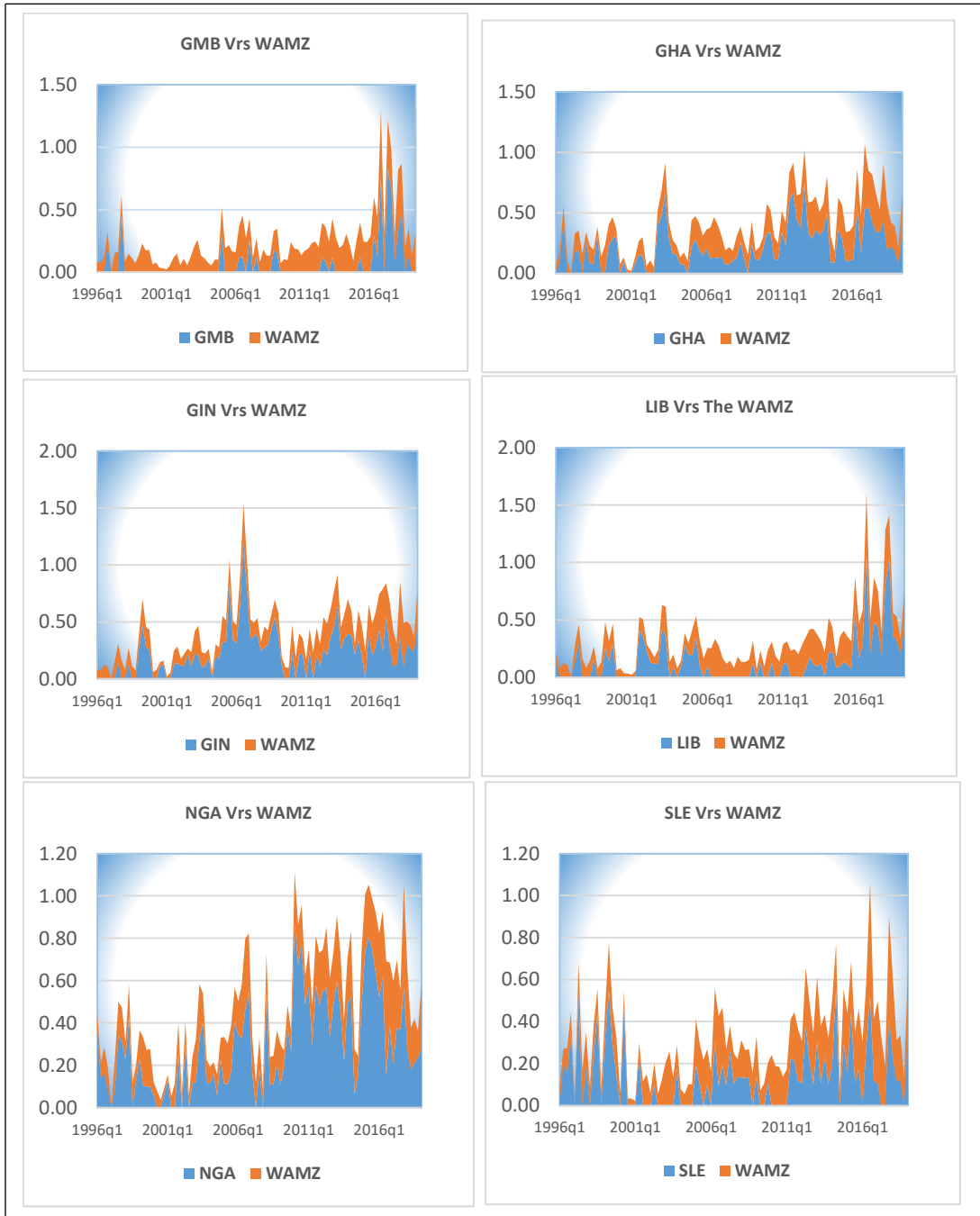
- Policy-making-in-the-Presence-of-Knightian [RBA Research Discussion Papers](#) rdp2000-10, Reserve Bank of Australia accessed 02/10/2019.
- Carballo, J., Handley, K., Limão, N. (2018), *Economic and Policy Uncertainty: Export Dynamics and the Value of Agreements*. National Bureau of Economic Research, Working Paper 24368 accessed on 03/01/2020 from <http://www.nber.org/papers/w24368>.
- Cochrane, J. (2011). Presidential Address: Discount Rates. *The Journal of Finance*, 66 (4) 1047 – 1108.
- Cohen-Cole, E. B; Durlauf, S.N; Rondina, G (2012). Nonlinearities in growth: From evidence to policy (2012). *Journal of Macroeconomics*, (34), pp. 42-58.
- Colquitt, J. A., LePine, J., Piccolo, R. F., Zapata, C. P., & Rich, B. L. (2012). Explaining the justice-performance relationship: Trust as exchange deepener or trust as uncertainty reducer? *Journal of Applied Psychology*, 97(1), 1-15. <https://doi.org/10.1037/a0025208>.
- Davis, S. J. (2016). *An Index of Global Economic Policy Uncertainty*. National Bureau of National Bureau of Economic Research Working Paper No. 22740.
- Duffy, J., Papageorgiou, C., (2000). A cross-country empirical investigation of the aggregate production function specification. *Journal of Economic Growth*, (5), pp. 87–120.
- Durnev, A. (2010). *The Real Effects of Political Uncertainty: Elections and Investment Sensitivity to Stock Prices*. Available online at SSRN: <https://ssrn.com/abstract=1549714>.
- Economides, G., Papageorgiou, D., and Philippopoulos, A (2017) .*The Great Greek Depression: A General Equilibrium Study of its Drivers* available online at https://link.springer.com/chapter/10.1007/978-3-319-63706-8_9 accessed 04/10/2019.
- Fernandez-Villaverde, J., Gueeron-Querron-Quintana, P., Rubio-Ramirez, J.F., Uribe, M. (2011). Risk Matters: The Real Effects of Volatility Shocks. *American Economic Review*, 101 (6), 2530 -2561.
- Gikas. H. A., Georgios, K., Dimitrios, K.,Panagiotis, K.(2018). *Economic Policy Uncertainty, Political Uncertainty and the Greek Economic Crisis*. Available at SSRN: <https://ssrn.com/abstract=3155172> or <http://dx.doi.org/10.2139/ssrn.3155172> .
- Gilman, S.E., Urban, M. C., Tewksbury, K., Gilchrist, G.W., E.; Holt, R.D (2010).A Framework for Community Interactions under Climate Change, *Trends in Ecology and Evolution*, 25 (6), 325 – 331.
- Goulas, E. & Athina Zervoyianni (2013) Economic growth and crime: does uncertainty matter? *Applied Economics Letters*, (20) 5, pp.420-427.
- Gourinchas, P., Phillippon, T., Vayanos, D. (2017). The Analytics of the Greeks Crisis, *NBER Macroeconomic Annual* 31(3).
- Green, W. (2003). *Econometric Analysis*. London: Prentice Hall.
- Gulen, H., and Ion, M. (2016), Policy Uncertainty and Corporate Investment. *The Review of Financial Studies*, 29 (3), 523–564.
- Hadri, K. (2000). Testing for stationarity in heterogeneous panel data. *Econometrics Journal*, 3, 148–161.

- Handley, K., Limão, N. (2015). Trade and Investment under Policy Uncertainty: Theory and Firm Evidence. *American Economic Journal: Economic Policy*. (7)4, pp. 189-222.
- Hansen, B. E. (1999). Threshold effects in non-dynamic panels: Estimation, testing, and inference. *Journal of Econometrics*, 93, 345–368.
- Harris, R. D., & Tzavalis, E. (1999). Inference for unit roots in dynamic panels where the time dimension is fixed. *Journal of Econometric*, 91(2), 201–226.
- Hsiao, C. (2003). *Analysis of Panel Data*: Cambridge University Press Second Edition.
- Hassan, T. A., et al (2017). *Firm-Level Political Risk: Measurement and Effects*.” NBER Working Papers 24029, National Bureau of Economic Research, Inc. URL accessed on 03/01/2020 from <https://ideas.repec.org/p/nbr/nberwo/24029.html>.
- Higgs, R. (1997), “Regime Uncertainty- Why the Great Depression Lasted so Long and Why Prosperity Resumed After the War. *The Independent Review* 1 (4), 561 – 590.
- Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometric*, 115(1), 53–74.
- IMF (2010). International Monetary Fund: Annual Report 2010. Available online at <https://www.imf.org/external/index.htm> accessed on 05/10/2019.
- Julio, B. and Yook. Y. (2010), Political Uncertainty and Corporate Investment Cycles. *The Journal of Finance*, 6 (1), 45-83.
- Kalemli-Ozcan, S., Papaioannou, E., Perri. F. (2013): “Global banks and crisis transmission. *Journal of International Economics*, 89 (2), 495–510.
- Keith, S. (2012). Measuring Economic Uncertainty, Using Survey of Professional Forecaster, *Business Review*, available online at <https://www.phil.frb.org>, assessed on 15/09/2019.
- Khan, M. S. and Ssnhadji, A. S. (2001) Threshold Effects in the Relationship between Inflation and Growth. *IMF Staff Papers* Vol. (48) 1, pp. 1-21.
- Knight, Frank H. (1921) *Risk, Uncertainty and Profit*. Illinois: University of Illinois Available at SSRN: <https://ssrn.com/abstract=1496192> accessed 20/10/2019.
- Laffont J. (1980). *Essays in the Economics of Uncertainty*, Harvard University Press. Chapter-preview
- Levin, A., Lin, C. F., & Chu, C. S. J. (2002). Unit root tests in panel data: Asymptotic and finite sample properties. *Journal of Econometric*, 108(1), pp.1–24.
- Maddala, G. S., & Wu, S. (1999). A Comparative Study of Unit Root Tests with Panel Data and a New Simple test. *Oxford Bulletin of Economics and Statistics*, 0305 - 9049.
- McDonald, R., and Siegel, D.R. (1986). The Value of Waiting to Invest, *The Quarterly Journal of Economics*, 101 (4), pp. 707–727.
- Modigliani, F., & Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *American Economic Review*, 76, pp. 323-329.
- Moore, A. (2017). Measuring Economic Uncertainty and its Effects in Australia. *Economic Record* 93 (303) 550 -575.
- Mukherjee, C., White, H., & Wuyts, M. (1998). *Econometrics and Data Analysis for Developing Countries*. London and New York: Routledge.
- Olubusoye, O.E; Afeez, A.S.; Olofin, O. (2016) *Applied Panel Data Analysis*. Centre for Econometric and Allied Research (CEAR). Ibadan: University of Ibadan.

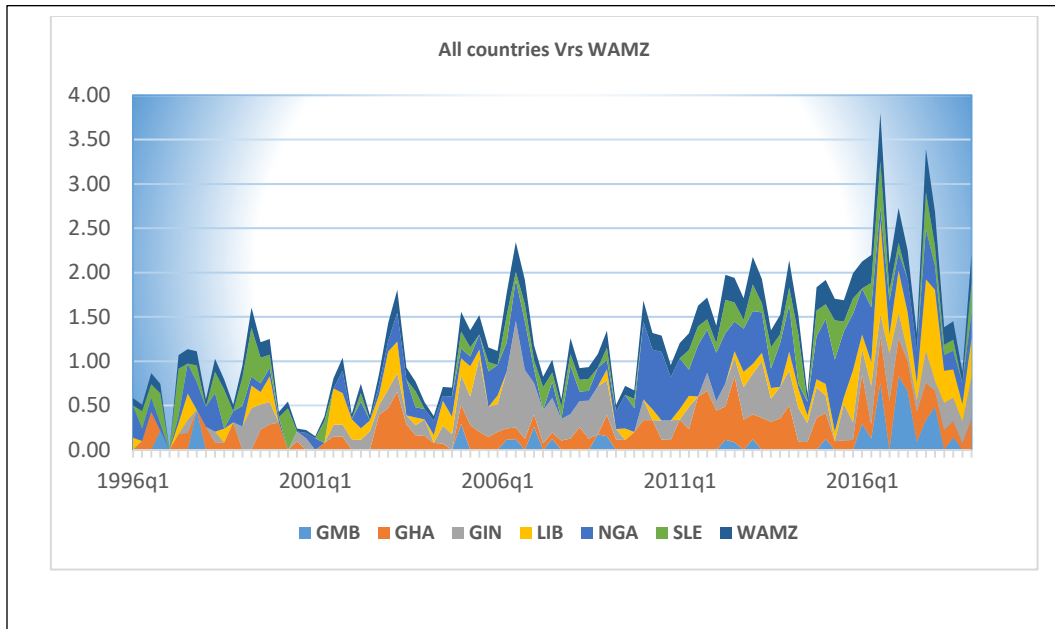
- Pastor, L. and Veronesi, P. (2013). Political Uncertainty and Risk Premia. *Journal of Financial Economics*, 110 (3), 520-545.
- Seo, M.H.; Sueyoul Kim, S.; Kim, Y (2019) Estimation of dynamic panel threshold model
- Shiller, R. J, (1983). Do Stock Prices Move Too Much to Be Justified by Subsequent Changes in Dividends? *American Economic Review*, American Economic Association, 73(1), 236-237.
- Steinberg, J. B. (2019). “Brexit and the macroeconomic impact of trade policy uncertainty.” *Journal of International Economics* (117), 175 – 195.
- Wang, Q. (2015). Fixed-effect panel threshold model using Stata. *The Stata Journal*, 15(1), 121–134.

APPENDICES

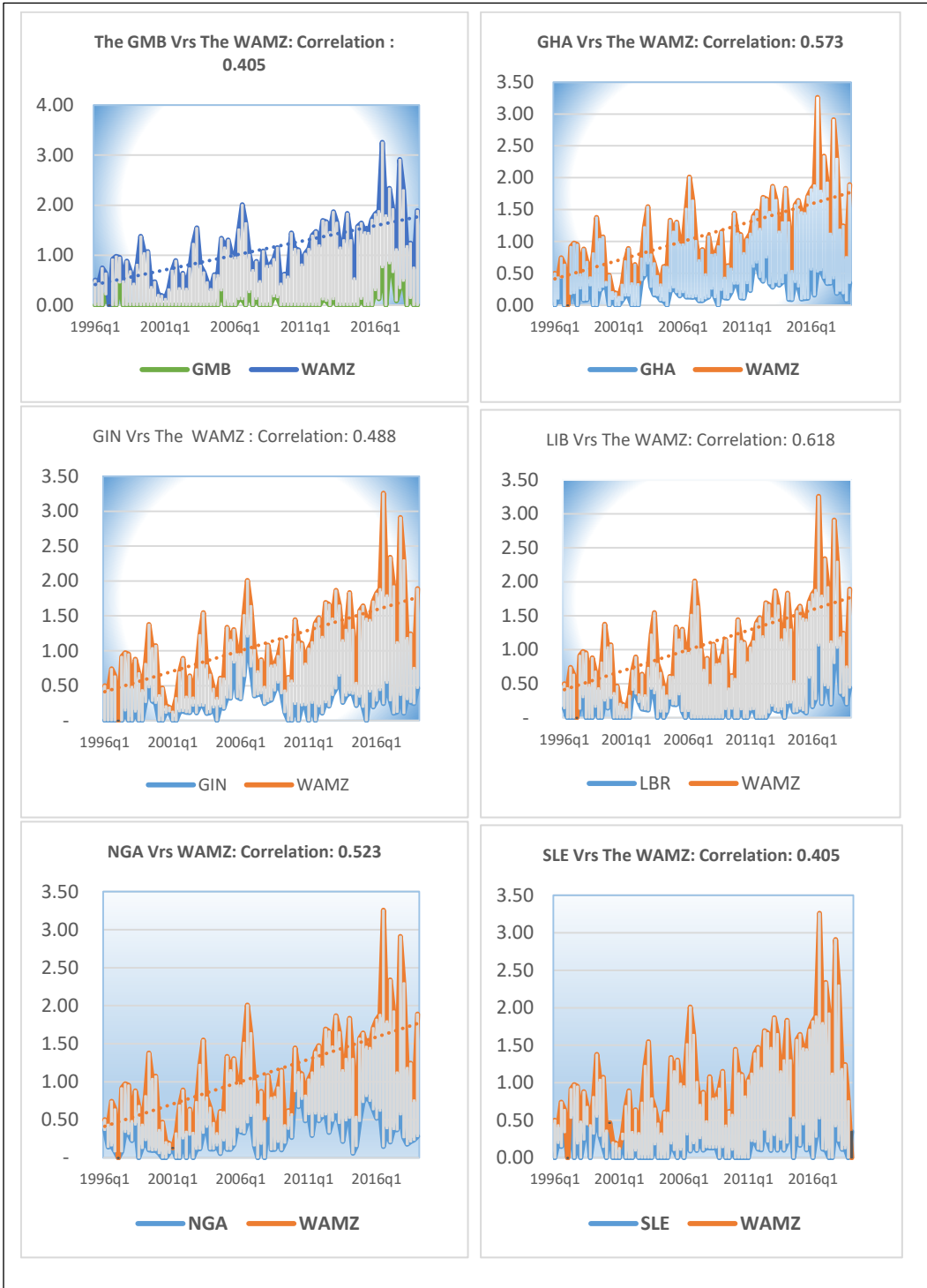
Appendix I: Contributions to Uncertainty in the WAMZ



Appendix 2: WAMZ Uncertainty Index Correlation



Appendix 3: WAMZ Uncertainty Index Correlation



Appendix 4: PSR-ICRG Ratings Criteria (Financial, Economic, Political and Composite)

Economic and Financial Risk Rating

Risk Category	Points
Very High Risk	0.0 percent to 24.5 percent
High Risk	25.0 percent to 29.9 percent
Moderate Risk	30.0 percent to 34.9 percent
Low risk	35.0 percent to 39.9 percent
Very Low Risk	40.0 percent or more Very Low Risk

Political Risk Rating

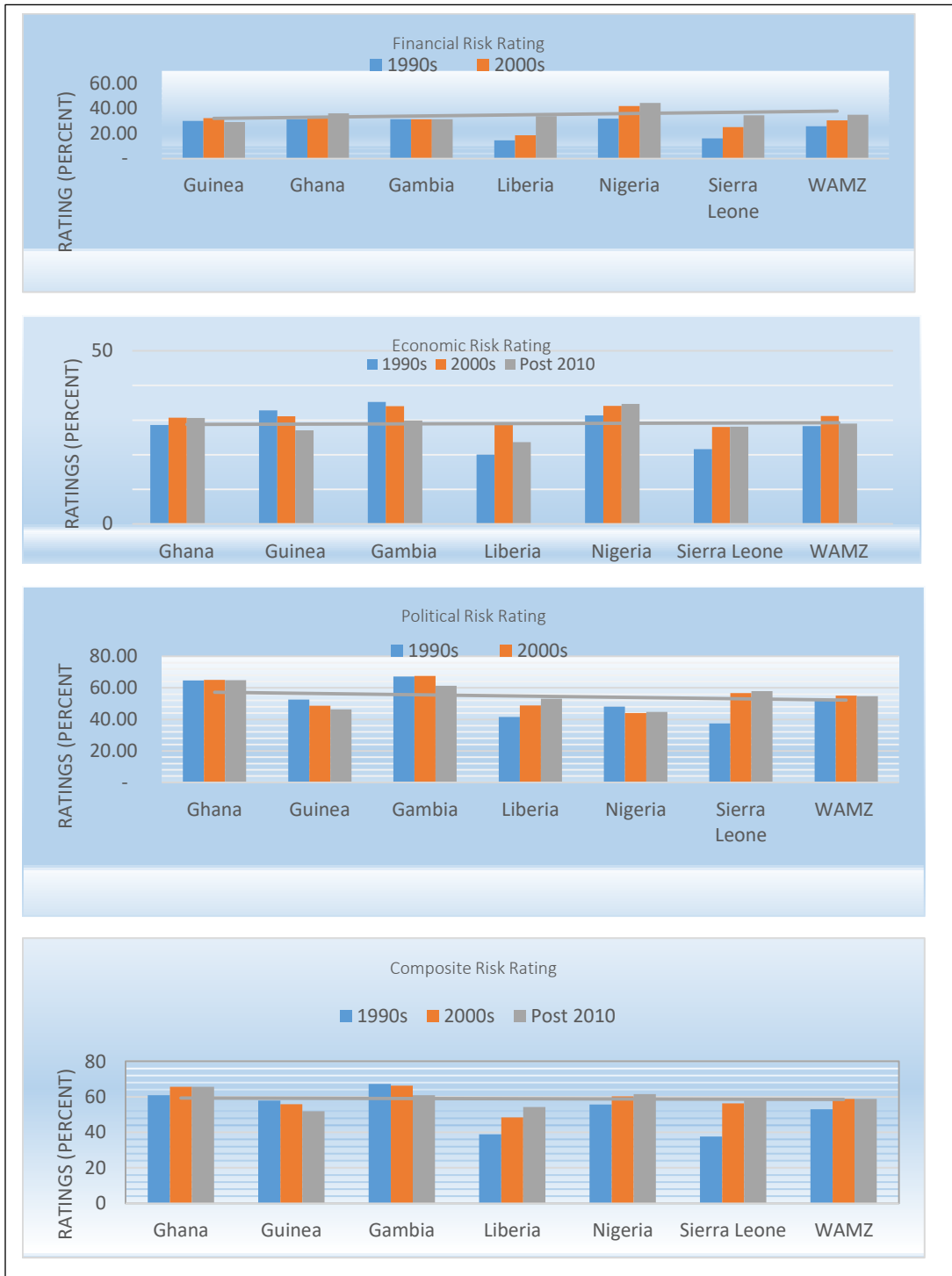
Risk Category	Points
Very High Risk	0.0 percent to 49.9 percent
High Risk	50.0 percent to 59.9 percent
Moderate Risk	60.0 percent to 69.9 percent
Low risk	70.0 percent to 79.9 percent
Very Low Risk	80.0 percent or more Very Low Risk

Composite Risk Rating

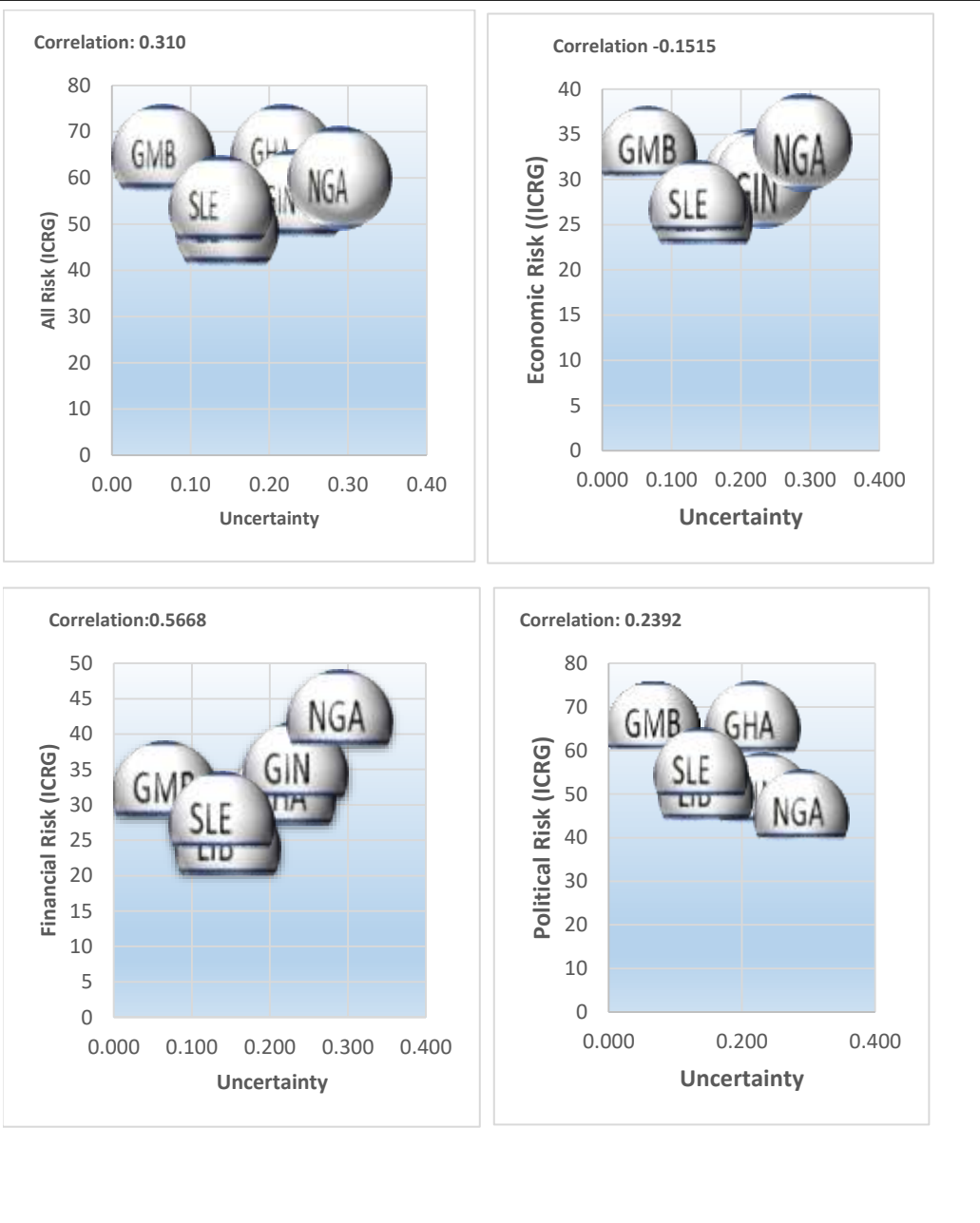
Composite Risk Rating (country X) = 0.5 (Political Risk + Financial Risk + Economic Risk)

The highest overall rating (theoretically 100) indicates the lowest risk, and the lowest rating (theoretically zero) indicates the highest risk.

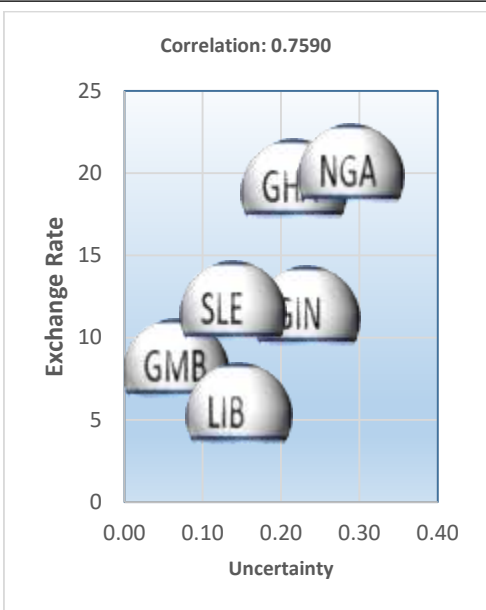
Appendix 5: Evolution of WAMZ Risk Ratings (Financial, Economic, Political and Composite)



Appendix 6: Uncertainty Index Vrs Risk Rating



Appendix 7: Uncertainty Index Vrs Volatilities



00

