Macroeconomic Volatility and Economic Growth: Evidence from Selected African Countries.

Onyimadu, Chukwuemeka

Michael Okpara University of Agriculture Umudike, Nigeria

2016

Macroeconomic Volatility and Economic Growth: Evidence from Selected African Countries.

Onyimadu Chukwuemeka Onyebuchi

onyimaduchukwuemeka@yahoo.com

Affiliation: Michael Okpara University of Agriculture Umudike, Nigeria

+2348179911078

Abstract

This paper investigates the relationship between macroeconomic volatility and long run economic growth in a panel of 40 African countries over the period 1980 – 2014. The paper re – examines the postulates of both Ramey and Ramey (1995) – where investment was the primary link between volatility and growth - and Aghion et al (2005) – where financial credit constraints was the primary link - , that there is a negative and significant correlation between macroeconomic volatility and long run economic growth. The findings in the paper refutes this negative relationship between volatility and economic growth, with the conclusion that there exist a significant and positive correlation between volatility and economic growth with reference to the sample data set used. The findings of this paper are robust to controls for investment, different and appropriate measures of financial development, level of openness, government size and each countries initial level of real per capita GDP.

KEYWORDS: Macroeconomic Volatility, Economic Growth, Financial Development, Investment

JEL CODE: E40, O40, C33.

1. Introduction

Traditional economics suggests that there should be a separation between macroeconomic policy – money supply, budget deficit, and taxation – whose aim is to ensure the stabilization of the economy and long run economic growth, which is taken to be exogenously determined or assumed to rely on some economy defined structural characteristics (Aghion and Howitt, 2009). However, it is intuitive that both concepts – macroeconomic policy and long run growth – should have some explicit link. Prior to the emergence of endogenous growth models, especially the real business cycle (RBC) theory, long run economic growth and macroeconomic volatility was seen by most economist as independent and separate issues. Conventional economic theory like the IS-LM framework were of this opinion. With the prominence of RBC theory in modern economic theory (Kydland and Prescott, 1982), cyclical fluctuations and long run economic growth is being studied within a unified framework that overcomes the division of macroeconomic theory between trends and business cycles.

In an effort to highlight any possible relationship between macroeconomic volatility and long run economic growth, the seminal paper by Ramey and Ramey (1995) documented an empirical relationship that has been generally accepted by economists. Ramey and Ramey (1995) concluded that macroeconomic volatility and long run economic growth are negatively correlated. This conclusion is very important to economic theory, for it shows that policies and exogenous shocks that affect macroeconomic volatility can also influence long run economic growth. This implication highlights the possibility of macroeconomic volatility having indirect welfare implications for an economy.

Despite the postulates of Ramey and Ramey (1995), the literature is inconclusive on the link between macroeconomic volatility and economic growth. This concern, heralded a wave of endogenous growth model studies that provided possible linkages. The AK model by Jones, Manuelli and Staccetti (2000) provided economic literature with the idea that, macroeconomic volatility can affect long run economic growth both negatively and positively through savings and investment. Higher volatility will induce individuals to save more for precautionary motives, thereby increasing savings. Conversely, higher volatility will also reduce the demand for investment because of volatility's reducing effects on rate of return on investments. Other studies based on endogenous growth theories, have postulated different empirical relationships between macroeconomic volatility and long run economic growth. For example, Hnatkovska and Loayza (2005), Koren and Tenreyro (2007), Loayza et al, (2007), and Afonso and Furceri (2010), all found that volatility hurts economic growth. On the other hand, there is the possibility of risk – macroeconomic volatility – being positively correlated to returns on investments, which can induce economic growth (Posch and Walde, 2011; Ranciere et al, 2008).

Also, with advanced financial sectors, the negative relationship between macroeconomic volatility and long run economic growth ceases not occur (Loayza and Raddatz, 2007; Guillaumont, 2010 and Cariolle, 2012).

Given the central role of economic growth towards achieving economic welfare in the long run, the aim of the paper is to investigate the effects of macroeconomic volatility on economic growth among selected countries in Africa. More specifically, the paper will re - examine the Ramey and Ramey (1995) empirical conclusion of a negative relationship between macroeconomic volatility and economic growth as well as try to provide plausible links between volatility and economic growth by re – examining the Aghion et al (2005) growth regression. The estimated models will focus on the diverging empirical postulates on the possible positive or negative casual effects of macroeconomic volatility on economic growth. The rest of the paper is as follows: section 2 provides a detailed literature review on the relationship between volatility and growth. Section 3 and 4, provides the method of study and the empirical results respectively. In section five, the paper concludes.

2. Literature Review

The empirical and theoretical literature on the existing relationship between macroeconomic volatility and long run economic growth is relatively voluminous but controversial. Economic analysts are concerned with the relevance of volatility and its effects on long term welfare losses or gains. They are interested in understanding the possible links between trends and cycles, which before the introduction of endogenous growth models, were dichotomous. With the introduction of endogenous growth models, macroeconomic volatility was termed to influence long run growth through its effects on savings and investment. Volatility therefore became an important factor in determining welfare gains or losses in the long run.

The starting point for all empirical findings into the relationship between volatility and economic growth is the observed relationship in Ramey and Ramey (1995), which they concluded was negative. Ramey and Ramey (1995) used a cross section data from 92 countries and regressed average growth rate on average volatility. They found that the negative relationship persist when they controlled for the level of investment but the relationship became negligible for OECD countries. A negative relationship is consistent with the neoclassical growth model, when emphasis is on the dual effects of risk on both investment and saving i.e when risk – as measured by macroeconomic volatility – discourages investment more than it encourages the supply of savings in an economy (Angeletos, 2007). It is in this sense, that Phelps (1962), emphasised the household's elasticity of inter-temporal substitution as the determining factor of which of the two effects were dominant. However, the implication of this dual effect is that, if risk's positive effect on savings dominates,

then volatility and economic growth is positively related. On the other hand, if risk's negative effects on investment dominates, then there will be a negative relationship between volatility and economic growth.

Other empirical results that complement the results of a negative relationship between volatility and growth found by Ramey and Ramey (1995) include: Chong and Gradstein (2009) who showed that unexpected changes in economic and fiscal policies could explain the negative correlation between volatility and economic growth. Jaimovic and Siu (2009) arrived at the same negative correlation but they controlled for the age composition of the labour force within a Ramey and Ramey type regression. Lin and Kim (2014) investigated the relationship between output volatility and growth using a simultaneous equation system with a panel of 158 countries. They found a negative relationship and also significant feedback between volatility and economic growth. However, this feedback is doubtful as Jetter (2014) and Baker et al (2011) provided evidence that volatility tends to affect growth and not vice versa.

Posch and Walde (2011) used a model of growth with endogenous innovations and distortionary taxes to show how economies with different tax levels differ in their volatility and growth process. Their analysis implies that, there should be controls for taxes in the standard volatility – growth regressions because their results show that the negative relationship between volatility and economic growth in the conventional Ramey and Ramey (1995) does not exists. There are other significant literature that has presented evidence that there exists no link between output volatility and economic growth (Solow, 1997; Dawson and Stephenson, 1997; Posch and Walde, 2011). Theoretical foundations for a positive relationship between output volatility and economic growth also exist. Following a model of creative destruction (Schumpeter and Fels, 1939; and Philippe and Peter, 1992) and an opportunity cost effective of conducting research in recessions (Aghion and Saint-Paul, 1998), literature has shown a positive correlation between volatility and growth.

Jones et al (2000) presented a theoretical explanation using an overlapping generation's model where individuals live for two periods, to show how volatility and economic growth are negatively correlated. Aghion et al (2010; 2005) tested the Jones et al (2000) postulates, with a control for investment and the introduction of financial constraints. In their model, financial constraints provides a link between volatility and economic growth. In a recession, firms may not be able to borrow to fund innovation. This reduced ability implies lower financial development and will ultimately discourage investments in innovations which will reduce growth. Recessions will therefore have a damaging effect on economic growth. Using a cross country data for 92 countries, they found that, volatility is negatively correlated with growth for countries with low financial development even when they controlled for investment as a fraction of GDP.

Kharroubi (2007) expanded on the Aghion et al (2005) work to include liquidity crises in understanding the relationship between macroeconomic volatility and economic growth. Kharroubi (2007) was of the opinion that, when financial credits are constrained in an economy, a bias towards short term debt can arise in financing long term investments. This will generate mismatches and may lead to a liquidity crisis. Using a cross country growth regression of 87 countries for 1997 – 2001, Kharroubi (2007) found that the frequency of liquidity crisis (abnormal volatility) and the volatility of growth (normal Volatility) have independent negative effects on economic growth.

Koren and Tenreyro (2007) were interested in understanding why GDP growth was more volatile in poor countries than in rich ones. Emphasising on the role of sectorial composition of the economy as the main reason for volatility, they postulated that a high degree of specialization in a high risk sector translate to higher volatility. Using a cross section of countries, they found that; poor countries specialise in fewer and more volatile sectors, poor countries experience more severe aggregate shocks, and poor countries macroeconomic fluctuations were more correlated to the shocks affecting the sectors they specialise in. Also, distortionary taxes have found to be a link between volatility and growth.

Moro (2015) showed how structural changes within an economy can serve as the link between volatility and economic growth. According to him, from cross country evidence, the fact that (i) per capita GDP of high income economies grows slower than that of middle income economies; (ii) high income economies display lower per capita GDP volatility than middle income ones; and (iii) the share of services in GDP increases with income per capita; suggested that both growth and volatility are related to an economy's productive structure. Using a two sector general equilibrium model of structural change, with data from the United States manufacturing and service sector, the study found that an increase in the share of services in GDP reduces both total factor productivity growth and macroeconomic volatility.

While much of the existing literature focuses on cross country analysis, Chong and Gradstein (2009) provided some complimentary evidence for the negative relationship between volatility and economic growth using a large disaggregated data set of more than five thousands firms across countries. They test for a possible institutional channel through which volatility impacts on economic growth. They found a negative relationship between volatility and economic growth and provide evidence that institutional obstacles magnified the effects of volatility of firm growth. The effects of political development – political stability and democracy – have been put forward as a plausible link between the effects of output volatility and economic growth. Edwards and Thames (2009) found that higher levels of democracy reduces volatility and higher levels of economic development affects volatility negatively. Using a panel of 73 countries, they found that the effect of higher levels of democratic institutions on growth volatility is conditioned by the level of economic development.

With respect to Sub-Saharan African economies, Aghion et al (2009) has shown that the negative correlation between volatility and economic growth remains for developing economies with less developed financial system unlike the OECD economies. Delechat et al (2010) and Kraay and Ventura (2007) argued that expansion in international trade, and global integration has made the economies more susceptible to external shocks. Unlike more developed economies with robust macroeconomic structures to cope with external shocks associated with international trade and global commerce, the Sub Saharan economies might not be well equipped.

3. Method of Study

This process of empirically espousing any existing relationship between macroeconomic volatility and economic growth, will use a sample of African countries drawn from The World Bank's data base of 2014. Some African countries

in the sample were dropped because of lack of sufficient data or missing data. Out of the 53 countries in Africa, the sample used is made up of 40 African countries.

Table 1. Countries in the Sample Data set.

List of African Countries in the Data Set.	
Algeria	Kenya
Angola	Lesotho
Benin	Madagascar
Botswana	Malawi
Burkina Faso	Mali
Burundi	Morocco
Cameroon	Mozambique
Central African Republic	Mauritius
Chad	Namibia
Congo	Niger
Congo Republic	Nigeria
Cote d'Ívorie	Senegal
Djibouti	Serra Leone
Egypt	South Africa
Equatorial Guinea	Sudan
Ethiopia	Tanzania
Gabon	Togo
Gambia	Tunisia
Ghana	Uganda
Guinea Bissau	Zambia

For each country in the data set, the following annual data series were collected and will be used as variables in the study: i) Real per capita GDP; ii) Annual growth of real per capita GDP; iii) Financial development – measured by domestic credit by the financial sector and money supply (M2) as a fraction of GDP; iv) Trade Openness – measured by the difference between imports and exports as a fraction of GDP; v) Government size – measured by government final consumption expenditure. Macroeconomic volatility is defined for each country in our sample as the standard deviation of the annual growth rate of real per capita GDP across the period 1980 – 2014. However, our measure of volatility as well as other variables will be sub – divided into smaller periods spanning 5 years, with the starting point being 1980 – 1985. Real per capita GDP is measured in constant 2005 US dollars, and our measure of financial development, openness, government size and initial real per capita GDP, are all averages for every 5 year sub – period. GDP data, as well as other variables used in this study, are drawn from the World Development Indicators (2014) database, which is published by the World Bank.

Abstracting from the Ramey and Ramey (1995) model, macroeconomic volatility was found to be negatively correlated with economic growth, given their sample data set. However, their hypothesis shows that the existing relationship depends on the dual effects of risk on investments and savings. Thus, if risk's discouraging effects on investments are greater than risk's encouraging effects on savings, then the negative relationship between macroeconomic volatility and economic growth persists. On the other hand, if risk's discouraging effects on investment is less than its encouraging effect on savings, then there will be a positive relationship between macroeconomic volatility and economic

growth. Thus investment (or savings), may provide a good link towards understanding the relationship between macroeconomic volatility and economic growth.

Secondly, the theoretical model of Aghion et al (2005) postulated the possibility of there being a positive relationship between macroeconomic volatility and economic growth. They argued that, investment alone cannot sufficiently explain the link between volatility and growth. This arises because volatility affects firm's choices between short run capital investments and long term productivity enhancing investments (example is investments in Research and Development). Volatility will affect a firm's choice of type of investment, especially when the firm is financially constrained. They introduced financial constraints in their model, showing that the negative correlation between macroeconomic volatility and economic growth is more evident in economies that have a less developed financial sector as compared to countries that are more financially developed.

With respect to the hypothesis that the integration of less developed economies through integration and international trade (See Delechat et al (2009) and Kraay and Ventura (2007), the literature supports the use of openness as a proxy for global integration through trade. The intuition supporting the introduction of this variable, is based on how integration and globalization has made Sub – Saharan economies more responsive, possibly negatively or positively, to macroeconomic volatility. Thus, countries that are less developed and are increasingly globalised through international trade should have an even more detrimental effects of macroeconomic volatility on their growth rates. Lastly, government size may provide us with an understanding between volatility and economic growth. The introduction of government size is grounded on the heavy influences of governments in country markets. The idea is premised on the huge influence that governments is Sub – Saharan African countries possess in determining the allocation of resources. To some researchers, this influence could be a source for both positive and negative correlation between volatility and economic growth (see Plosser, 1993). Log of real per capita GDP, openness and government size will be used as control variables, when trying to espouse any possible relationships between volatility and economic growth using this specific data set of Sub – Saharan African countries.

The paper will estimate the following model using a panel regression with cross section fixed effects;

$$g_t = \alpha_1 VOL_t + \eta Z_t + \beta X_t + c_i + \mu_t \qquad 1$$

Where, g_t represents the annual growth rate of real per capita GDP, VOL_t represents our measure of volatility – which is the standard deviation of the annual growth rate of per capita GDP, Z_t is a vector which consists of the main explanatory variables – investment (INV) and financial development (FD1 and FD2). As already stated, the paper will be using two definitions of financial development – domestic credit by the financial sector as a fraction of GDP and M2 as a fraction of GDP. X_t is also a vector of variables that consists of the control variables – Openness (OP), government size (GS) and the log of initial real per capita GDP (Ly). c_i controls for country specific fixed effects, which does not impose any assumptions on the dependence between itself and the remaining set of independent variables (see Wooldridge, 2010). The paper does not provide the results from the pooled ordinary Least Square (OLS) method because, the Hausman test indicates that the fixed effect model is appropriate.

4. Empirical Results

Before presenting the regression results and interpreting the findings, the paper provides a casual look at the descriptive sample statistics and correlation of both macroeconomic volatility and economic growth. Table 2 shows the averages of volatility and growth over our sample period. The cross correlation between the two variables is 0.457 which shows a moderate positive volatility and economic growth in the sample.

Table 2: Sample statistics of Volatility and Economic Growth.

Statistic	Economic Growth	Volatility
Mean	1.267749	3.806818
Median	1.154773	2.706402
Maximum	45.53696	50.52501
Minimum	-10.35599	0.408935
Std. Dev.	4.168853	4.010470
Observations	276	275

The empirical results of the growth – volatility regressions are summarised in table 3, where the growth regression is estimated with volatility as the main explanatory variable and investment as a fraction of GDP as a possible link. The a priori expectations following the Ramey and Ramey (1995) results is a significant negative relationship between volatility and growth our measure of investment being positive and significant.

Thus we first estimate a Ramey and Ramey type growth regression of the form:

$$g_t = \alpha_1 VOL_t + \beta_1 INV_t + \beta_2 OP_t + \beta_3 GS_t + \beta_4 Ly_t + c_i + \mu_t \qquad 2$$

With the expectation of $\alpha < 0$ *and* $\beta_1 > 0$.

The estimation was carried out in a step wise manner, where the effects on the dependent variable, of the introduction of a new variable is clearly seen. Results of the estimation of equation 2 are reported in table 3.

Table 3: Relationship between Growth and Macroeconomic Volatility with Investment

Dependent Variable: Annual Growth rate of real Per capita GDP			
Independent variable	Estimation 1	Estimation 2	Estimation 3
Constant	-0.510068 (-1.52)	-4.928952 (-9.45)***	-20.74224 (-6.19)***

Volatility	0.467676 (6.98)***	0.203764 (3.28)***	0.131809 (2.55)**
Investment		0.249784 (10.01)***	0.115517 (4.39)***
Government Size			-0.190937 (-4.95)***
Openness			0.097408 (8.08)***
Initial GDP			2.256179 (4.73)***
R^2	0.36	0.56	0.71

Note: *Estimation of equation:* $g_t = \alpha_1 VOL_t + \beta_1 INV_t + \beta_2 OP_t + \beta_3 GS_t + \beta_4 Ly_t + c_i + \mu_t$
*The dependent variable gt is the growth rate of per-capita real GDP of each country in our data set for each sub period of 5 years from 1980 – 201. Estimation is done by Panel OLS with fixed effects on cross section effects. Significance at 1%, 5% and 10% levels are denoted by ***, **,* respectively.*

The a priori expectations for this form of Ramey and Ramey growth model is a negative relationship between volatility and economic growth. The re - estimation of the Ramey and Ramey (1995) type growth regression for a sample of 40 African countries, show a counterfactual. From our estimates, there is a positive relationship between macroeconomic volatility and economic growth for the sample data set used. This gives credence to the role of risk's encouraging effects on savings, with the effects inducing economic growth, which depends heavily on the household's elasticity of inter-temporal substitution. Therefore, there is ample evidence to suggest that a positive relationship between macroeconomic volatility and economic growth exists for our sample data set. With controlling for investment as a fraction of GDP, the positive and significant relationship between volatility and economic growth still persists. The complete control variables set, has only a marginal effect on the estimated relationship between volatility and economic growth. While we still find a strong positive and significant relationship between volatility and economic growth with the introduction of our complete control variables, the estimated positive effect is reduced by 35%.

The paper also estimates the model by Aghion et al (2005) in order to find robust estimates for the relationship between volatility and economic growth as well as provide a model that inculcates the link of financial development to any possible existing relationships between volatility and economic growth. In their model, Aghion et al (2005) estimated the model:

$$g_t = \alpha_1 VOL_t + \alpha_2 1FD + \alpha_3 (FD^* VOLt) + \beta_1 INV_t + \beta_2 OP_t + \beta_3 GS_t + \beta_4 Ly_t + c_i + \mu_t \qquad 3$$

where all the parameters to be estimated remain as defined, with FD being a measure of financial development. For this estimation two measures of financial development were used; Domestic credit by the financial sector and money supply (M2) as a fraction of GDP. From the results of Aghion et al (2005), the interaction term $\alpha_2 (FD^* VOLt)$ is of particular interests as it puts financial development as a direct link between the casual relationship of volatility and economic growth. Their prediction is that α_3 should be positive and significant while α_2 should be negative and significant. This a priori

expectations imply that volatility will be negatively correlated with growth in countries in their data set and more so in countries with lower developed financial sectors.

Table 4: Relationship between Growth and Macroeconomic Volatility with Financial Development

Dependent Variable: **Annual Growth rate of real per capita GDP**					
Independent Variable	Estimation 1	Estimation 2	Estimation 3	Estimation 1	Estimation 2
	Domestic Credit by Financial Sector			**Money Supply (M2)**	
Constant	-0.51006 (-1.52)	-0.5298 (-0.88)	-13.73133 (-3.81)***	-1.694 (-2.23)**	-17.78 (-5.56)
Volatility	0.4676 (6.98)***	0.8906 (9.52)***	0.3237 (3.9)***	1.2788 (13.39)***	0.4572 (4.67)***
Financial Development		0.0199 (1.03)	-0.0105 (-0.72)	0.0904 (3.87)***	-0.0253 (-1.22)
Financial Dev* Volatility		-0.0224 (-5.56)***	-0.01006 (-2.87)***	-0.0480 (-10.03)***	-0.0187 (-4.26)***
Investment			0.1320 (5.14)***		0.1181 (4.78)***
Government Size			-0.1692 (-4.23)***		-0.1556 (-4.02)***
Openness			0.0887 (7.32)***		0.0822 (6.79)***
Initial GDP			1.268 (2.42)**		2.084 (4.46)***
R^2	0.36	0.48	0.74	0.58	0.76

Note: *Estimation of equation:* $g_t = \alpha_1 VOL_t + \alpha_2 1FD + \alpha_3 (FD^* VOLt) + \beta_1 INV_t + \beta_2 OP_t + \beta_3 GS_t + \beta_4 Ly_t + c_i + \mu_t$. *The dependent variable gt is the growth rate of per-capita real GDP of each country in our data set for each sub period of 5 years from 1980 – 201. FD is the measure of financial development. Financial development is measured as domestic credit by the financial sector and Money supply (M2) as a fraction of GDP. Estimation is done by Panel OLS with fixed effects on cross section effects. Significance at 1%, 5% and 10% levels are denoted by ***, **,* respectively.*

Table 4 presents our results for the re-estimation of the Aghion et al (2005) model. From the results, there exists a positive relationship between volatility and economic growth for both our measures of financial development. This results is not in tandem with the a priori expectations. It rather validates the postulates of Posch and Walde (2011) from the literature. The coefficient of the interaction term for both measures of financial development is negative and significant. Unlike the findings of Aghion et al (2005), the sample data set used in this paper shows that there is a significant positive relationship between volatility and economic growth for some selected African countries and that this positive correlation is stronger for countries with lesser developed financial sectors. The paper further estimates the regression with the inclusion of direct and indirect effects as control variables. With the introduction of the control

variables, the coefficient of the volatility measure dropped by 30% while still remaining positive and significant when domestic credit by the financial sector was used as a measure of financial development. Whereas, the coefficient of volatility drooped by only 2% when money supply as a fraction of GDP was used. The results show that the positive and significant relationship between volatility and growth still persist, as well as the negative relationship for the interaction term.

5. Conclusions

The understanding of the relationship that exists between macroeconomic volatility and long run economic growth, is still up for debate among researchers. On the one hand some researchers postulated a negative relationship between volatility and growth (Ramey and Ramey, 1995; Aghion et al, 2005), others have accounted for a positive relationship (Posch and Walde, 2011; Aghion and Saint-Paul, 1998).

Using a sample data set of 40 African countries over the period 1980 – 2014, this paper repudiates the Ramey and Ramey (1995) postulates of a negative correlation between macroeconomic volatility and long run economic growth. Secondly, using the same data set, the paper was able to find counterfactual evidence that supports a positive correlation between macroeconomic volatility and long run economic growth for some selected African countries with lower financial development. The estimated positive relationship found can be accounted for when considering the theoretical underpinnings of the Jones et al (2000) model. In Jones et al (2000), a positive relationship may exist between macroeconomic volatility and economic growth when risk's encouraging effects on savings outweigh risk's discouraging effects on investment.

References

Afonso, A., and D. Furceri (2010). Government size, composition, volatility and economic growth. *European Journal of Political Economy,* vol. 26, No.4, pp. 517-532.

Aghion, P.,Angeletos, G.-M., Banerjee,A., and Manova,K. (2010). Volatility and growth: Credit constraints and the composition of investment. *Journal of Monetary Economics*, 57(3), 2 46-265.

Aghion, P., and P. Howitt. (2009). *The Economics of Growth*. MIT Press: Cambridge.

Aghion, P., G. M. Angeletos, A. Banerjee, and K. Manova. (2005). *Volatility and Growth: Financial Development and the Cyclical Behavior of the Composition of Investment*. Mimeo, Harvard University.

Aghion, P., and G. Saint-Paul. (1998). Uncovering Some Causal Relationships between Productivity Growth and the Structure of Economic Fluctuations: A Tentative Survey. *Labour*, 12, 279– 303.

Angeletos, G. M. (2007). Uninsured Idiosyncratic Investment Risk and Aggregate Savings. *Society for Economic Dynamics, meeting Papers 596.*

Baker, S.R., Bloom, N., Davis, S.J., and Reenen, J. (2011). Economic Recovery and Policy Uncertainty. *CEP US Analysis Papers 002.*

Cariolle, J. (2012). Measuring Macroeconomic Volatility: Applications to Export Revenue Data, 1970 – 2005. *Fondation pour les Etudes et Recherches sur le Developpement International working paper series* 114.

Chong, A., and Gradsteing, M. (2009). Volatility and Firm Growth. *Journal of Economic Growth*, 14(1): 1 – 25.

Dawson, J.W., and Stephenson, E.F., (1997). The link between volatility and growth: evidence from the States. *Economic Letters*. 55 (3), 365–369

Delechat, R.W., and Wakeman, L. (2010). How Global Financial Markets Affect Sub-Saharan Africa. *IMF Staff Papers, 57*(1), 172-208.

Edward, J. A., and Thames, C.F. (2009). Growth Volatility and the Interaction between Economic and Political Development. *Journal of Empirical Economics*, 39: 183 – 201.

Guillaumont, P. (2010). Assessing the Economic Vulnerability of Small Island Developing States and the Least Developed Countries. *Journal of Development Studies*, Vol.46, No.5, 828-854.

Hnatkovska, V and Loayza, N. (2005). Volatility and Growth." In J. Aizenman, and B. Pinto eds., Managing Economic Volatility and Crises: A Practitioner's Guide. Cambridge: Cambridge University Press.

Jaimovich,N.,and Siu,H . E. (2009). The young, the old, and the restless: Demographics and business cycle volatility. *American Economic Review*, 99(3),8 04-826

Jones, L. E., and R. E. Manuelli. (2005). Neoclassical Models of Endogenous Growth: The Effects of Fiscal Policy, Innovation, and Fluctuations. In P. Aghion and S. N. Durlauf (Eds.). *Handbook of Economic Growth*. Amsterdam: Elsevier North-Holland.

Jones, L., R. Manuelli, and E. Stacchetti. (2000). Technology and Policy Shocks in Models of Endogenous Growth. *Federal Reserve Bank of Minneapolis Working Paper* 281.

Jetter, M. (2014). Volatility and Growth: Governments are Key. *European Journal of Political Economy*, 36: 71 – 88.

Kharroubi, E. (2007). Crises, Volatility, and Growth. *The World Bank Economic Review*, 21(3), 439 – 460.

Koren, M., and Tenreyro, S. (2007). Volatility and Development. *The Quarterly Journal of Economics,* 122(1): 243 – 287.

Kraay, A., and Ventura, J. (2007). *The Dot – Com Bubble, the Bush Deficits and the US Current Account*. University of Chicago press: Chicago.

Kydland, F. E., and E. C. Prescott. (1982). Time to Build and Aggregate Fluctuations. *Econometrica*, 50, 1345–1370.

Lin, S.C., and Kim, D. H. (2014). The Link between Economic Growth and Growth Volatility. *Journal of Empirical Economics*, 46, 43 – 63.

Loayza, N.V., R. Rancière, L. Servén and J. Ventura (2007). Macroeconomic Volatility and Welfare in Developing Countries: An Introduction, *World Bank Economic Review*, 21(3), 343-357.

Loayza, N.V., and C. Raddatz (2007). The Structural Determinants of External Vulnerability. *World Bank Economic Review*, Vol.21, No.3, pp.359-387.

Moro, A. (2015). Structural Change, Growth, and Volatility. *American Economic Journal: Macroeconomics, 7(3): 259 – 294.*

Phelps, E. S. (1962). The Accumulation of Risky Capital: A Sequential Utility Analysis. *Econometrica*, 30, 729–743.

Philippe, A, and Peter, H., (1992). A model of growth through creative destruction. *Econometrica* 60, 323–351.

Plosser, C. (1993). The Search for Growth. *Federal Reserve of Kansas City Symposium Series, Policies for Long run Growth*, 57 – 86. Kansas City, MO.

Posch, O., and Wälde, K., (2011). On the link between volatility and growth. *Journal of Economic Growth*, 16 (4), 285–308.

Ramey, G., and V. Ramey. (1995). Cross-Country Evidence on the Link between Volatility and Growth. *American Economic Review*, 85, 1138–1151.

Ranciere, R., Tornell, A., and F. Westermann (2008). Systemic crises and growth. *Quarterly Journal of Economics*, Vol.123, No.1, pp.359-406.

Schumpeter, J.A., Fels, R., (1939). *Business Cycles*, vol. 1. Cambridge University Press.

Solow, R.M., (1997). Is there a core of usable macroeconomics we should all believe in? *American Economic Review*, 87 (2), 230–232.

World Bank. 1980–2014. "World Development Indicators." http://data.worldbank.org/data-catalog/World-development-indicators.