

Macroeconomic Models and the Challenge of Growth in African Economies: The Context

Oduh, Moses O^{1*} Nwosu, Emmanuel O² Urama Nathaniel E³.

1. Debt Management Office (DMO), Abuja Nigeria
2. Department of Economics, University of Nigeria, Nsukka
3. Department of Economics, University of Nigeria, Nsukka

* E-mail of the corresponding author: oduhmoses@yahoo.com; oduhmoses@gmail.com

The Authors are grateful to Banco Central do Brazil, Central Bank of Nigeria, and African Institute for Applied Economics, Enugu. We also wish to thank Prof. Eric Eboh, Dr. Chukwuma Agu, Oliver Ujah, and Ito Diejomaoh for their useful comments

Abstract

This study addresses the challenges of theorizing the economy of Africa in the context of using macroeconomic models to reshape the future of its non-inclusive growth. It argues that the catastrophic policy summersault of economies that rely on theoretical macro models is traceable to the fact that such models rather than represent the uniqueness of every economy sees all economies as having the same characteristics. Thus it avers for eclectic African models that can redefine economic theory rather than use economic theory to define the economies of Africa. This calls for portfolio of complementary models through constant refinements rather than portfolio of outcompeting models.

Keywords: Africa, challenge of growth, eclectic model, macroeconomic model

1. Introduction

Africa, the second largest continent with a population fairly above one billion, about 15 per cent of world's population is the world's poorest regions with a multi-faceted crisis economically, socially and politically. It accounts for 90% of the world's cobalt and platinum, 50% of its gold, 98% of its chromium, 70% of its tantalite, 64% of its manganese, and one-third of its uranium. The bumpy economy is occasionally faced with constant external shocks, resulting from its precarious reliance on agriculture, which accounts for two-thirds of the labour force, 35% of GNP and 40% of foreign exchange earnings. Available statistics from the World Bank (WB) shows that the continent has well over 63% rural population, and agricultural land area covering over 45%.

In spite its abundant natural resources; the continent shockingly remains the world's poorest and most underdeveloped continent. Since independence, the economy of Africa has been battling in the euphoria of poverty occasioned by poor infrastructural development, unemployment, policy truncation and inconsistency, import dependency, structural imbalance, and endless civil wars. According to the United Nations Human Development Report in 2011, of the bottom 46 ranked nations (142nd to 187th) 34 (about 74%) of them were all African. Currently, it controls only about 2.3% of the world economy, fairly higher than Oceania that accounts for about 1.6%, while Americas, Europe and Asia accounts for 36%, 35% and 25% respectively. Today, poverty, heavy reliance on primary commodity sector, high vulnerability to external shocks, jobless growth and slow progress towards social development goals, illiteracy, malnutrition and inadequate water supply and sanitation, as well as poor health, affect a large proportion of the people, per capita of \$1 250, 63% of them live in rural area (World Bank, 2011). The Economic crisis was further aggravated by civil war, ethnicity crisis and political instability that engulfed the continent. They ranged from the humanitarian crisis in the Darfur region of Sudan, strife in Zimbabwe and conflict in Côte d'Ivoire; and the most recent (2010-2011) people-power revolution in Tunisia, Sudan, Egypt, and Libya. These events further pushed the economy into a population poverty head count ratio of more than 74% in 2005 at \$2 per day, table 1(appendix A).

Nonetheless, after this trying period, the economic prospect of the continent suggested a light in the tunnel as all the four sub regions of Africa (East Africa, Central Africa, Southern Africa and West Africa) posted a game like "consolidated prices" of economic growth, averaging about 5% in 2005. The study by (Leke, Lund, Roxburgh, & Wamelen, 2010) shows a fast growing trend in the expansion and vibrancy of the economies of Africa, though without traces or sources of such growth; with the real GDP rising by 4.9% a year from 2000 through 2008, more than twice its pace in the 1980s and 1990s. The growth recovery which started after the global meltdown was further strengthened (with east and west Africa holding the sway to the growth path) with growth rate of about 5% in 2011 rising from 2.3% and 4.7% in 2009 and 2010 respectively, against the negative growth rate (2009)

recorded by other regions after the global crisis (UNECA, 2011). Though the growth was skewed with the oil exporting sub-regions posting average growth of 5.2% as against the 4.5% posted by the oil importing countries in the continent; but generally these prospects were notably driven by increases in oil prices and metals with strong macroeconomic stability anchored on ODA, the rebound of export demand and commodity prices; increased inflows of FDI.

In spite of this far-reaching progress, lack of diversification remains the bane of economic development in Africa. As the emerging economies continue to grow from strength to strength with constant economic diversification, most African countries continue to depend on single products, with shrinking manufacturing sector. The global crisis has singled out the continuing challenge of diversifying the continent's economies to achieve greater competitiveness and wider employment. In the beginning, no one had thought that Africa was not insulated from the crisis because the impacts of African countries have been marginal to these markets. But in the end, this expectation proved not to hold and the contagions was quickly transmitted to Africa through the mechanisms of second round effects of trade and investment.

Obviously, the problem of Africa is not the problem of growth per se, as can be seen from figure 1. The question is, how has the growth posted by the continent translated into economic wellbeing and improvement in the socioeconomic conditions of Africa? Naturally, economic growth should translate into poverty reduction because of its trickle down effects on the commons. The fact is, in spite of what looks like a temporary economic shock absorber of the recent good growth, Africa remains a desperately poor continent - an economic growth-poverty-paradox. Table 1 shows that in spite of the growth posted by Africa the socioeconomic conditions in the continent are not palatable, particularly in SSA with incidence of poverty-growth paradox.

2. Research problem and Policy gap in perspective

In all these, one could not but asked curiously the place of macroeconomic modelling as a veritable tool in reshaping Africa's future. This is also followed by the second question, how do we resolve econometrically, the drivers or factors that account for Africa's growth in the last decade since the economy is growing in a vacuum? In this context, one will not but mention that the difference between African and the developed economies is the reliance on evidence based policies. While Africa is still wondering and wallowing in the mesh of ad hoc approach to policy issues, the developed economies are already using portfolio of models to have a full insight into their future economic potentials, irrespective of the ability of the models to exactly and accurately forecast future economic directions, like the global financial crises of 2007. Though Africa cannot be said to be ignorant of the importance of macroeconomic models as inputs into policy formulation and decision-making or that researchers are not attempting to rise up to these challenges. Consistently, modellers in Africa both at home and diaspora are rising up to the challenges; but are these models true reflection of the continent of Africa or just models designed in accordance with the default minds of international community about what Africa 'should be'?

When one thinks of modelling the economies of Africa, to at least help us bring its tomorrow economic fortunes into today's planning, one thinks of the frustration arising from within (conflicts between political expediencies and economic rationality on one hand, and a regime-motivated model whose live span depended on the political regime it served on the other hand; poor quality data and time lag on data updates) and without (the mental image of the international development partners and donor agencies about the ideal Africa, politicising of model building and theoretical alignment), the fear that the model will fail, and the temptation of model tinkering to address the default minds of diehard theorists on how a model "should" work. Having participated in various macroeconomic building projects, either as an observer, reviewer, team member or on the driving seat, one cannot but recount the frustrations and the fear of building a model that will not only run, but not being able to forecast or predict the mimicked economies of Africa – because of the assumptions casted on the model equations. An economy likened to what the bible called formless and empty; an eclectic structured sectors; a dualistic economy that is consistently inconsistent with economic theory. In fact on several occasions, there were temptations of tinkering with the outcome of models to follow a known textbook theory; or act the script of a particular political regime or the sponsoring agency; and in the end tell policy makers what they want to hear – the model is working. In all, the model and the economy are set world apart; and for the use of the model, you bet; it lasts as long as the model builders departs the premises where it was developed and presented.

Nonetheless, one simply takes solace in the word of Thomas Alva Edison who invented the light bulb in 1879. Before then he tested no fewer than 6,000 vegetable growths, and ransacked the world for the most suitable filament material without success. Instead of dropping the idea, he acknowledged himself and said that he had not failed to invent light bulb like other of his predecessors, but had uncovered more than 6 000 ways of not making light bulb. Today, the modern world is an electrified world which has profoundly changed human existence by illuminating the night and making it hospitable to a wide range of human activity (The Great Idea Finder, 2007).

The fact is that the developing economies have special features (not in any way used in derogatory form) that cannot be captured by the textbook theories; and Africa modellers should not be ashamed or cold feted in preaching and advancing them. For example, how does one develop a theoretical model that answers the growth-poverty-paradox (GPP) question in Nigeria and Africa generally where poverty is positively and consistently related with economic growth; what theory explains the contradiction of demographic feature that in Nigeria affluence is associated with large households and extended families; how does one develop a theoretical model to show that there is a positive relationship between affluence and demand for food in Nigeria; how does one develop a theoretical model where increase in oil revenue decreases consumer confidence; how does one develop a model that shows a regimented demand pattern driven by cultural and religious values, how does one develop a theoretical model that shows inequality in corruption and marginalization at crime in Nigeria etc.

The idea that every model should rely at least in principle, or known theory left much to be desired and continue to generate controversies as at what macroeconomic models should do to economy policymaking in Africa. In an attempt to possibly resolve this economy-model lock jam, models continue to emerge with each leaving more questions than it answered. From Adaptive Expectation (AE) where men were given dog-like brain to Rational Expectation (RE) where men are seen as gods capable of being Nostradamus, has anything changed? From theoretical-based models to a theoretical/structural models, are we better-off? Standard macroeconomic models have failed, by all the most important tests of scientific theory: They did not predict that the financial crisis would happen, and even when it did, they miscalculated its effects and provided little guidance on how to respond (Stiglitz, 2011). Since models work from abstraction to real life it is almost near impossible to perfectly replicate an economy, hence the inability of theoretical models to predict an economy that is void of theoretical understanding- still searching for Africa model ideal.

3. State of African models - the journey so far

The use of macro-econometric models (MEMs) for policy analysis and forecasting dated back to World War II (Valadkhani, 2004), yet there is no consensus on the appropriate analytical framework for the study or developing African macroeconomic model issues. Typical of most developing countries, individual models suitable for different tasks have proliferated with different, and often conflicting, assumptions about a wide range of crucial aspects of these economies (Haque, Lahiri, & Montiel, 1990).

Early stage of formal modelling (generically grouped) in Africa shows that about 160 models were used between the periods 1964 to 1994. Apart from Namibia, Papua New Guinea, Rwanda and Samoa New Guinea all other African countries surveyed have used a macro model. These models were mainly developed by international organization and development partners like World Bank (WB), International Monetary Fund (IMF), United Nations Conference on Trade and Development (UNCTAD), Organization for Economic Co-operation and Development (OECD); and other few models from developed countries' MDAs such as planning commission and ministry of finance. Most of these models were replicated across countries without due consideration to the structure and characteristics of the economies. Just to cite few instances, the Futures of Global Interdependence Model (FUGI) used in Algeria was also used for other countries like Bahrain, Iran, Iraq, Kuwait, Libya, Oman, Qatar, Saudi Arabia, United Arab Emirates and Venezuela, while the macro econometric model was replicated for countries like Ecuador, Gabon, Indonesia, Iran, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates, and Venezuela. Figure 2 shows lists of models used in Africa.

Though there are mixed reactions about the performance of these models, today they do stand as a departure point for series of refinement and shaping of macroeconomic models in Africa and other developing economies. For instance (Valadkhani, 2005); and (Soludo, 2002) reviewed the deficiencies of these models to include, insufficient sample size, multicollinearity, specification problems, and defective both in terms of addressing many of the policy questions that policy makers care most about, and their contemporariness. In fact (Sastri, 1975) gave these models soft-landing as fairly exhibiting a measure of stability and providing a reasonable basis for projections; and that these deficiencies may not only be true in the context of developing countries, but might also be relevant in the case of developed countries. In spite of this, it is impracticable to rely on imported models whether in Africa or elsewhere because no two economies exhibit the same structure.

Within this context, a question will be asked as to the main lessons that can be learned from past experience since macroeconomic modelling in Africa is still undergoing a restructuring. The work of (Soludo, 2002) was quick to observe that macro-modelling in Africa skewed towards academic and research papers with PhD desertion constituting about 80%. This trend however may have changed, but still far from what is obtainable in other developed regions of the world. African models could still be described as "models in the mind" as highlighted by (Bishop Akolgo, 2005) Acting Executive Director of the Integrated Social Development Centre (ISODEC) in the case of Ghana. He emphasised that African models at best can be described as models in the minds of people; imperatively there is need to domesticate what we can call our own on paper, black and white

to make inform decisions, rather than rely on the Breton Woods Institutions' model, which had proven ineffective and unreliable.

The agitation for an African model raises the question of whether to join the bandwagon of theoretical models or maintain the eclectic approach that is associated with its structural rigidities. Answers to this mind-bending issues resulted in the search for African model ideals, whose outcome will be the replications of the economy. The search for model ideals that would form a holy marriage with African economic realities continue to expand the scope of macroeconomic model thinking as there continue to be a wide variation between the model ideals, realities, dynamism and the structures of the economy the models try to mimic and forecast. In all, what we have is proliferations of models with different assumptions to justify model designs.

3.1 Rising to the challenge - the uncovered ground

While African countries would be said to have risen up to the challenges of having domestically designed macro models; today in Nigeria for example, we can boast of the NPC, CBN, and CEAR, but whether they are still working is another question entirely. Nonetheless there are still immense challenges. There are possibly six challenges modellers in Africa face in modelling African economy. These are (1) tinkering and aligning African economy to theory (2) relying on imported models (3) model complementarities versus model substitutability (4) data availability, (5) regular model update, and (6) the dualistic nature of the economies of Africa and the attendant poor sectorial linkage.

The problem of data is a serious hindrance to the credibility of models from Africa. Data availability, update/database management, obsolescence of models due to the non-availability of high frequency data has always been a reoccurring decimal, and hence their failure in policy analysis and forecasting. This is a serious restrictive factor, which makes model-building an arduous task since there are relatively few reliable databases and they are often subject to frequent revisions (Valadkhani, 2005). The problem of data in Africa was also highlighted in (Matlanyane, 2005) that major shortcomings of macro-econometric models built in Lesotho were their obsolescence due to the non-availability of high frequency data, and hence their failure in policy analysis and forecasting; the inadequate recognition of the critical role of the supply side of the economy in their models; the high aggregation and the inability of the models to forecast relevant key economic variables like unemployment rates and others. The same problem is also identified in Nigeria where existing models either follow the Keynesian demand side model, not necessarily for data fitting reasons, but because there is no data on employment sector.

There is also the problem of model substitutability as against model complementarity. In an attempt to either follow theoretical pathways or rely on economic structure, modellers in Africa have always found themselves designing models that are competing with one another instead of complementing the existing model through model refinements. Unlike the developed economies where portfolios of models are complementary, models in African, understandably (because of its rudimentary stage, level of acceptability and the search for model ideals) were designed to compete with one another. While it is obvious that no one model is capable of addressing all the challenges of the economy's policy issues, portfolio of models are better envisaged, provided they are complementary. An attempt to substitute existing models either because of data related problems, including data frequencies or issues that bother on model theorizing have engulfed the environment of macroeconomic modelling in Africa.

Another problem that is of immense important in modelling African economy is the issue of political expediency and economic rationality. Existing models in Africa are subject to political regimes which do not live beyond the regime it was designed to address. Another related problem is political interference and acceptability of models. There is little awareness about the ability of models to benchmark and resolve policy issues especially when such models came from outside political circle. When the outcomes of these models run contrary to the policies of government they are sacrificed for political gain. It is against this backdrop that modelling has received little or no attention among African political elites. Thus, policies are designed by ad hoc means while model based policy evidences are relegated unless when such models are designed to support a particular political acceptability and credibility.

4. Threshold of history – does macroeconomic model replicate an economy of theory?

The early stage of macroeconomic research program at Cowles was a combination of direct measurement, econometrics, and non-formalized study of economic evolution (Malinvaud, 1988). Economic theory was later considered part of economic science of econometric modelling and has till today dominated the entire body of modelling in the world. Since then economic-based models particularly in the developing countries whose economies in most cases run contrary to the general underpinning of typical economic theory are still struggling for recognition and international buying. Ideally, the single most important input into macroeconomic modelling is the known or existing structure of the economy without which the economy cannot be mimicked or replicated.

Externally, the challenge perhaps we face when developing or attempted to domesticate African models is the conflict between the actual and ideal impact of models - struggle to uncover what models ought to do and what they do based on what the existing economic theory and other international economic and political interest agencies have defined as a benchmark for Africa. For Africa and its disjointed sectorial structures, models as abstractions of real life situation could be described as an art than a science. It is a herculean task trying to replicate or mimic an imagined a typical African economy by simply specifying some equation as a representation of the economy. Despite this, we continue to theorize Africa. After all Africa needs aid and as such the models that come from Africa must address and answer the question of Africa in the heads of donor agencies.

Objectively, the design of a model for an economy could liken to the sketching of a human being whose image is imagined to be between the range of the *hominidea* and a beauty queen through a simple art work of drawing (modeling). If the actual image of the person in question lies very close to a beauty queen, thus ruling out the probability that the person is an ape, then the magnitude of the error the artist will commit lies between the two extremes of a *hominidea* and beauty queen. The accuracy or otherwise of the art work is dependent on the ability of the artist to perfectly or near perfectly replicate the person he is mimicking. The closer the output is to the person been replicated (beauty queen) the lesser the variation between the actual person and the output and the lesser the error committed by the artist. The ability to paint a queen instead of an ape depends much on the information given to the artist, tools and methods available to him, the changing or dynamic structure of the being been replicated, and the evaluation and acceptability of the accuracy of the artist's final output. One will be quick to observe that all these factors but one could be directly influenced and controlled by the hypothetical artist – tools and methods. Exogenous factors influencing the ability of the artist to mimic the person in question are overwhelming. Under such circumstances, information is a very vital tool in an attempt to replicate any existing structure, including information of the changing character or the dynamic nature of the image been replicated. Once information is wrong or limited, the variance between what is and what ought to be, will widen. This is the story of Africa; that is why models designed to answer the domestic problems have never and may not work unless its peculiarity is respected.

4.1 What models do and what they ought to do

The long years of history of macroeconomic modelling and its acceptance has not reduced the scepticism about the usefulness and performance of many of these models in policy making and analyses. This results from questions that bother on understanding the economic structure to be modelled, theoretical versus eclectic models, the changing structure of economies, political acceptability of these models and the inability of existing models from forecasting the future, especially the recent global recession that heat the world in 2007. Responding to the need of having a perfect relationship between macroeconomic models and the actual workings of the economy resulted in the theorizing and proliferation of various models, some based on the size or scale, theoretical and a theoretical, and others on the structure of the economy. The traditional large macroeconomic models often referred to as Keynesian models are built on the tenets that prices fail to clear markets, at least in the short run. This framework suggests that in a market economy there is a gap between supply and demand; and that output is not a constraint but, deficient demand resulting to unemployment. This contradicts the outstanding property of the then classical dominance which rests on Say's assumption that supply will always create demand.

Irrespective of the school of thought, the broad objectives of using macroeconomic models among other things remains the estimation and tracking of the relationship between economic policy variables and objectives variables; and in the light of movements in the past economic fundamentals, provide an insight into amount of uncertainty that face the economy. To be able to play these roles, macroeconomic models for policy simulation requires historical understanding of particular policy variable as yardsticks to measuring and tracking the movements in major economic fundamentals. Theoretically, models, capturing the interactions of variables and the feedback of one endogenous variable on another are ideally suited for answering the "what if" questions necessary for policy analysis. However, the quest to expand the original borders of econometric models to look beyond "the if" has resulted in designing large scale models beyond what simple models can answer. Study by (McNown, 1986) traced the impetus behind the growth in econometric model size to come from client demand for more detailed information, not from any evidence that increasing size leads to greater forecast accuracy. The question however is, has the role originally envisaged by Tinbergen about macroeconomic models changed in an attempt to use macroeconomic models to answer every question of policy-making?

The use of macroeconomic model as a tool for policy-making treats the global economy as if it is one simple economy. Common wisdom will readily suggest that no economy is the same, and as such models are supposed to be country specific, mimicking the characteristics of the intended economy. The catastrophe and policy summersault of economies that rely on theoretical macro models is traceable to the fact that such models rather than represent the uniqueness of every economy sees all economies as having the same characteristics. Who is to be blamed? The idea that every model should rely at least in principle, on known theory left much to desired and

continue to generate controversies as at what macroeconomic models do to economy policy making. In an attempt to possibly resolve this economy-model lock jam, models continue to emerge with each leaving more questions than it answered.

In the 1970s and 1980s the question of not considering rational expectation of economic agents as part of the structure of an economy and the question of building theoretical models dominated the reasons for huge variations between macroeconomic models and its actual impact. The Lucas critique was an attempt to address the laxity in the existing models to reflect microeconomic foundations and economic realities to a robust predictive accuracy, while Sims model was a response to the perceived non-robust estimates of large scale models and the problem of endogenizing some variables which constrains their performances in a model. Currently, the New Keynesian –Augmented Philips Curve, (NKAPC) model has addressed the monetary policy challenges in various economies, and providing a missing link between the real and the monetary sector.

Thus, it is often a big debate tracing what macro model is “supposed to be doing and what it is actually doing”. In (Nakashima, 2008) the comparison of an ideal policy path implied by a policy rule and an actual policy enables the historical assessment of policy decisions and an exploration of the timing of policy mistakes. Perhaps within the concept of the ideals, the major impact of macroeconomic models is by setting a standard framework for achieving optimal economic policy by maximizing the welfare function under constraints supplied by the econometric model. Under this framework, the reliability of the optimal economic policy is dependent on how much the model is able to replicate and mimic the intended economy and the explanatory power of the designed model.

The work of (Meyer, 1997) further summarized the impact of economic models as mathematical representations of the economy that are designed to be simplifications of a complex reality. What he termed “virtual economies” combine the behavioural relationships that are thought to cause most macroeconomic fluctuations, while omitting those deemed less important. He outlined different roles economic models play in policy circle starting with selection of the models. First, the selection process helps economists to understand how the economy works and to use this understanding to predict future economic outcomes.

Secondly, by using an economic model, a policy-maker can assess the impact of a particular economic development (e.g., higher world commodity prices) or policy choice (e.g., lower taxes or interest rates) on the economy without having to actually face the shock or implement the policy. But more importantly, economic models impose structure and eliminate fuzzy thinking by forcing economists to formalize views that may be based largely on intuition. Cast in this light, economic models can be interpreted as reflecting a set of thoughts about how a particular economy functions. But models are much more than just a catalogue of what we think we already know. They are also a means by which researchers can validate their beliefs. For instance, by simulating the virtual economy over a particular period of history, given the policy choices made during that period, and then comparing the outcome with actual events, researchers can evaluate how well their model describes reality.

Furthermore, once created, models help eliminate misunderstanding by forcing researchers to communicate in a common language. In this way, models encourage fruitful debate by forcing those with opposing points of view to explain and defend the logic of their views in a common language. Models thus help to isolate the source of disagreements about a forecast by allowing those involved to separate the differences in their assumptions regarding factors determined outside the model (e.g., geopolitical developments, oil prices, etc.) from any differences in their view about the structure of the economy.

Finally, economic models help settle debates that cannot be settled by theory alone. Economic theory often suggests that potentially offsetting influences are at work in the economy. When combined with statistical methods, models help economists quantify the relative importance of each factor, thereby providing an estimate of the net impact of these offsetting influences. For example, suppose we want to estimate the effect of a tax cut on government revenues. Although a tax cut has a direct negative effect on tax revenues it also has a positive indirect effect, because lowering taxes tends to stimulate economic activity, and tax revenues are positively related to economic activity. An economic model can be used to help quantify these two offsetting factors.

In practice, one will quickly ask if the major target set for economic models to be able to use instrument variables to achieve economy’s optimal policy objectives is achievable. The answer to this question is readily supplied by Frisch and Tinbergen, the two founders of the framework. Frisch in particular, was worried about the reliability of the econometric model for the purpose of giving policy advice. He felt that the behavioural equations could be unnecessarily restrictive for finding the best policy. If it is to be used for supporting policy decision making, a model should contain only “autonomous relations”, defined as relations which can be expected to remain invariant under any change in the rest of the model. Because many behavioural equations cannot be expected to remain invariant under fundamental changes in institutions, these equations are unreliable if such institutional changes are among the policy decisions that one is willing to consider (Don, 2004).

Though they both have divergent views about how to address these shortcomings, the consensus is that relying on the use of models without human judgment will be a costly mistake. The question of (Don, 2004) about the actual impact and practice of macroeconomic models illuminates more on how the ideas of Frisch and Tinbergen apply to a realistic policy problem in the context of a “large” empirical econometric model; and the dilemma and choices policy makers face. He came to the conclusion that the real world macroeconomic model used to support policy choice can claim only limited reliability. Secondly that, a mechanical optimization procedure to find the best economic policy is likely to be misleading, if not entirely out-of-order; but the model can be very helpful in assessing the likely consequences of different policy options, provided it is used by knowledgeable experts, who are well aware of the limitations of the model at hand and can contribute creative ideas on handling any shortcomings of the model in a particular policy analysis. Thus, the interaction between the policy maker and the model-cum-expert system then takes the form of an iterative trial-and-error procedure.

In reality, no one model answers all things and the need for multiple models arises. In response to why the bank of Canada prefers to use several economic models rather than just one, (Meyer, 1997) was particular about the uncertainty regarding the correct economic paradigm. In economics, there is no laboratory (as there is in physical sciences) in which researchers can alter key economic variables one at a time (e.g., external economic conditions, domestic monetary policy) and then directly observe their impact on the economy. As a result of this inability to run controlled experiments, there is considerable debate in academic and policy circles about which economic paradigm best represents the way in which monetary policy affects inflation. By using several models, based on competing paradigms, as tools to provide alternative policy recommendations, it helps guard against large policy errors that could result from relying on a single economic paradigm that might be incorrect.

The second reason for a pluralistic approach to economic modelling stems from the fact that, being a simplification of a complex reality, no one model can answer all questions. A model’s structure varies according to its intended purpose. For example, pure forecasting models are designed exclusively to exploit regularities in the historical data, and they typically fail to identify the underlying forces of equilibration in the economy. Provided historical correlations remained unchanged, these models often perform quite well as short-term forecasting devices. Over a longer term horizon, however, the economy’s underlying equilibrating forces become important. Thus, the usefulness of these purely statistical models tends to diminish with the length of the forecast horizon.

4.2 Working from abstraction to actual forecast

Experiences have shown that theoretical models are far from being implemented if the actual workings of the economy are to be replicated. In practice the impact of macroeconomic models is to augment human judgment in understanding the virtual economy. Since theoretical models cannot perfectly replicate structure of the economy model adjustment based on this, human knowledge is required. There are two types of adjustments in the theoretical models to be able to carry out any meaningful forecast: market participation and model calibration.

Incorporating market participation analysis into macro models is one way of introducing the actual workings of the economy into model simulation and forecasts. Economic forecasting is achieved by combining mathematical models with knowledge of the market or the behaviour of economic agents. According to (McNown, 1986) in actual forecast, human judgment is introduced in three ways. First, values of the exogenous variables driving the model must be estimated, based on the modeller's best guesses of government policy actions, foreign economic activity, and other factors external to the model. Second, individual equations may be adjusted to compensate for the persistence of errors over time. Third, if the forecast based on the estimated exogenous variables and the add-factors appears unreasonable to the modeller, then additional subjective adjustments are made in the equations and/or the exogenous variables until a reasonable forecast emerges.

The importance of market participation in generating information about the economy is very vital in information economics (Stiglitz, 2002) talked of information economics as having a profound effect on how we think about economic policy, and are likely to have an even greater influence in the future. The world is, of course, more complicated than our simple – or even our more complicated models – would suggest. And that some of the huge mistakes which have been made in policy in the last decade, for instance the management of the East Asia crisis or the transition of the former communist countries to a market, could have been avoided if there had been a better understanding of issues, like bankruptcy and corporate governance, to which the new information economics call attention. Also the Washington consensus policies, which have predominated in the policy advice of the international financial institutions over the past quarter century, have been based on market fundamentalist policies which ignored the information-theoretic concerns, and this explains at least in part their widespread failures.

Experience of a country like Brazil shows that there are two possible ways of incorporating market participation in forecasting: one of the ways is by encouraging private research institutions to get involved in the process of determining forecast thresholds. Central Bank of Brazil on regular basis opens up an interactive web

link with private research organizations where they are allowed to make input into monthly inflation forecasting, by making their own independent forecast. At the end of the month research institute whose monthly inflation is closer to the actual inflation is rewarded, and is publicly acknowledged. This public acknowledgement and reward in most occasions are used by the research institution as a means of advertising and promoting the services of their organization. In this way they are encouraged to voluntarily participate in the exercise, an input into the monthly inflation targeting of the central bank. The second and complementary approach to the first is by involving big organizations who monitor price movement in the country to make input into the process of inflation forecasting. Blue chip companies are involved in the bank's web forecast interactive session filling on line their expected monthly inflation. The bank uses the information provided by the research institutions to determine the forecast bound by averaging these sources of inflation forecast. In this manner, the public (market participation) is incorporated in forecasting process by using it as benchmark for model calibration.

Writing about model calibration, (Sourcebook2, 2009), shows that the usefulness of macroeconomic models lies in their ability to practically capture the behavioural relation among the policy variables. That is, macro models need to be calibrated using actual data. Calibration is defined as a standardization of measuring instrument – checking of a measurement against an accurate standard to determine any deviation and correct error. In economic modelling, calibration is assignment of values to represent an estimated parameter and it requires an a priori knowledge of the variable of interest. Since it relies on the judgment of the modeller derived from theoretical or practical knowledge, to improve the quality of the calibration and have the results accepted by outside organizations, it is desirable for the calibration and subsequent measurements to be "traceable" to the internationally defined measurement units. The calibration procedure involves choosing functional forms for the utility and production functions, and assigning values to the parameters of the model based on either micro-evidence or long run growth facts (Gomme & Rupert, 2005). This ensures that the properties of the calibrated model emulate, or replicate, the properties of the real economy being studied. It highlighted on two main approaches used to calibrate macro models. The first uses econometric techniques in conjunction with historical data. Econometric techniques range from simple regression analysis (e.g., ordinary least squares) to much more sophisticated techniques. The more sophisticated methods attempt to address the problems associated with the mathematics of behavioural relationships, i.e., ensuring that the calibration is capturing a "true" underlying pattern of behaviour and not just random effects. When such techniques are used, it is necessary to have long time series of historical data (say, over 30 annual observations) and behavioural relationships that have fairly simple and stable functional forms.

A second approach to calibration is to step aside from conventional econometrics on the model behavioural equations, but to draw on existing empirical research to fix key parameters at values that are considered to be "reasonable" on an a priori basis. This approach can usually be applied to very large and structurally complex models and has the advantage that the key behavioural properties are known (since they are imposed) and are consistent with collective research knowledge. While some small-scale models can be calibrated using pure econometric techniques, in practice policy models are calibrated using a mixture of techniques. Indeed, too rigid an application of econometric techniques can often become an obstacle to policy modelling since they may reject all possible theoretical formulations and result in an agnostic outcome.

Coping with these rigors of managing theoretical model ideals and economic realities is dependent on the understanding of the economy. Understanding how economies function requires a systemic representation of the economy in form of a model. In many cases these models remain implicit and intangible and are not incorporated as computer-based models. Indeed, all explanations advanced by economists are based on models, derived from the background in theory that forms an essential element of their education and training. However, it is unsatisfactory to leave the models implicit, since arguments cannot be focused on the validity of implicit models. We need to build models in an explicit way, by setting out as precisely as possible a description of economic processes, and using econometrics as a means of selecting "good" models and rejecting "bad" models.

One way of overcoming these challenges is by drawing a line between theory consistent and data admissible models. This point was also stressed in (Leeper & Zha, 2001) that policy analysts face tough challenge of choosing between a model where the economic behaviour is stripped down and easy to understand, but whose fit to data is crude and a model whose fit and forecast performance are good, but with economic behaviour that is not very detailed. In (F.Wallis, 1989) there are reasons for adjustments in models irrespective of the fact that the model represents a complete framework for analysis. One of the reasons is the continuing presence of data discrepancies and delays, often expressed through process of adjustment to model-based forecast. They are regularly used in spite of the fact that the model for which they apply represents a complete set of framework. In (Allsopp, 2002) there is a gap between the practice of model and model ideals because of the large uncertainty about key economic parameters. These results to deviation of model forecast or the inability of models to tract down the actual behaviour of the economy resulting from systematic forecast errors, which are observed, to 'deterministic shifts'. Thus, for full realization of the potentials of macroeconomic models, theoretical

foundation as well as knowledge of the economy is required.

5. Conclusion

The importance of drawing a line between the practice of models and model ideals; as well as the incorporation of market information has been emphasised. Ideally, the approach to modelling African economy can at best be described as eclectic; what model does is dependent on who is designing it and what it is intended to achieve. In practice, the impact of macroeconomic models is to augment human judgment in understanding the virtual economy, but cannot replace it. Africa has a lot to learn from the Central Bank of Brazil in model refinements based on human knowledge and information; in addition to the subjective adjustments until a reasonable forecast emerges. Thus, for full realization of the potentials of macroeconomic models in Africa emphasis should be on its economic structure. In this way we can produce an eclectic model of Africa's economy that redefines economic theory, rather than use economic theory to define the economies of Africa.

We suggest a complete African model that incorporates a higher proportion of economy's peculiarity than a complete theoretical inclination. Avoid the temptation of using one model to answer every economic question – no one single model “answereth” all things. We should not be ascetic in developing non-theoretical African models as long as they can give us acceptable knowledge of the dynamic and versatile nature of African economy. Documentation of the Justification and domestications of these models are required for future consistency and reliability checks, and moreover for updating. To achieve this we need to overcome our fear that models will fail or have failed. Thus, there is need for constant and consistent model refinements.

References

- Allsopp, C. (2002). Macroeconomic Policy Rules in Theory and Practice. *Policy Rules—The Next Steps* (pp. 1-31). Cambridge University, Cambridge UK: Monetary Policy Committee, Bank of England.
- Bishop Akolgo. (2005, January 27). *Ghana must develop its own macroeconomic model*. Retrieved from Modern Ghana (MG): <http://www.modernghana.com/news/70936/1/ghana-must-develop-its-own-macroeconomic-model-iso.html>
- Don, H. (2004). *How econometric models help policy makers: Theory and Practice*. Van Stolkweg 14; P.O. Box 80510, 2508 GM The Hague, the Netherlands: CPB Netherlands Bureau for Economic Policy Analysis; Discussion Paper 27.
- F.Wallis, K. (1989). Macroeconomic Forecasting: A Survey. *The Economic Journal; Volume 99, Issue 394*, 28-61.
- Gomme, P., & Rupert, P. (2005). *Theory, measurement, and calibration of macroeconomic models*. Federal Reserve Bank of Cleveland; Working Paper, 05, 05.
- Haque, N., Lahiri, K., & Montiel, P. (1990). *A Rational-Expectations Macroeconometric Model for Developing Countries*. International Monetary Fund, 37(3), 537.
- Leeper, E. M., & Zha, T. (2001). Assessing Simple Policy Rules: A view from a Complete Macroeconomic Model. *Federal Reserve Bank of St. Louis review*, 83-110; Vol. 83, No. 4, pp. 83-110.
- Leke, A., Lund, S., Roxburgh, C., & Wamelen, A. v. (2010, June 20). *What's driving Africa's growth*. Retrieved September 1, 2012, from McKinsey Global Institute: http://www.mckinsey.com/Insights/MGI/Research/Africa_Europe_Middle_East/Driving_African_growth
- Malinvaud, E. (1988). Econometric Methodology at the Cowles Commission: Rise and Maturity. *Econometric Theory; Volume 4, Issue 02*, 187-209.
- Matlanyane, A. (2005). *Theoretical Base for Macroeconometric Modelling*. Pretoria: University of Pretoria etd.
- McNown, R. (1986). On the uses of econometric models: A guide for policy makers. *Policy Sciences - POLICY SCI, vol. 19, no. 4*, 359-380.
- Meyer, L. H. (1997). The role for structural macroeconomic models in the monetary policy process. *Review Literature and Arts of the Americas*, 1-6.
- Nakashima, K. (2008). Ideal And Real Japanese Monetary Policy: A Comparative Analysis Of Actual And Optimal Policy Measures. *Japanese Economic Review; Volume 59, Issue 3*, 345-369.
- Sastry, V. (1975). The Use of Macroeconomic Regression Models of Developing Countries, A Comment. *Oxford Economic Papers; New Series, Vol. 27, No. 1*, 156-165.
- Soludo, C. C. (2002). *Macroeconomic modelling and economic policy making: A survey of experience in Africa*. Nairobi: African Economic Research Consortium; AERC Research Paper 201.
- Sourcebook2. (2009, November 24). *Evaluating Socio Economic Development: Methods & Techniques*. Retrieved September 2, 2012, from Europa: [http://ec.europa.eu/regional_policy/sources/docgener/evaluation/evalsed/sourcebooks/method_techniques/modelling/macroeconomic_models/index_en.htm]
- Stiglitz, J. E. (2002). Information and the Change in the Paradigm in Economics. *The American Economic*

Review; Vol. 92 No. 3, 460-501.

Stiglitz, J. E. (2011). Rethinking Macroeconomics: What Went Wrong and How to Fix It. *JEEA; Volume 9 Issue 4*, 1-2.

The Great Idea Finder. (2007). *Troy MI*. Retrieved August 29, 2012, from The Great Idea Finder: <http://www.ideafinder.com>

UNECA. (2011). *Economic and Social Conditions in Africa in 2010 and Prospects for 2011*. United Nations Economic Commission for Africa.

Valadkhani, A. (2004). History of macroeconomic modelling: Lessons from past experience. *Journal of Policy Modeling*, 265–281, 26.

Valadkhani, A. (2005). Macroeconomic Modelling: Approaches and Experiences in the Developing Countries. *Applied Econometrics and International Development. AEID*, 5.24, Vol 5-1.

World Bank. (2011). *Sub-Saharan Africa*. The World Bank.

Table 1: Selected macroeconomic and welfare indicators of SSA

Time	GDP growth (annual %)	GNI growth (annual %)	Number of poor at \$2 a day (PPP) (millions)	Poverty gap at \$2 a day (PPP) (%)	Poverty headcount ratio at \$2 a day (PPP) (% of population)	Poverty headcount ratio at \$4 a day (PPP) (% of population)	Mortality rate, under-5 (per 1,000 live births)	Life expectancy at birth, total (years)	Household final consumption expenditure (constant 2000 US\$)	Gross savings (% of GDP)	Gross savings (% of GNI)	GNI per capita growth (annual %)	GNI per capita (constant 2000 US\$)
1981	2.3	5.8	287.6	37.3	72.2	89.8	190.9	48.3	7.8	19.7	19.5	2.9	558.8
1984	2.4	3.6	323.8	39.9	74.7	90.7	183.6	49.0	6.3	18.0	18.3	0.7	532.8
1987	2.3	2.8	350.4	39.7	74.3	90.8	178.4	49.5	3.9	17.4	16.8	0.0	511.5
1990	1.2	-0.2	389.2	41.2	76.0	91.7	174.6	49.5	0.7	15.9	15.8	-2.9	500.8
1993	0.6	1.5	434.0	43.3	78.1	92.8	171.8	49.4	1.6	14.5	14.6	-1.1	465.9
1996	5.0	5.4	465.9	42.2	77.5	92.7	166.5	49.3	5.0	16.8	17.9	2.6	483.9
1999	2.5	2.4	502.8	42.1	77.4	92.4	157.9	49.5	1.9	14.7	15.2	-0.2	486.6
2002	3.3	3.4	533.3	40.6	76.1	92.1	148.4	50.3	3.4	16.1	16.4	0.8	495.9
2005	6.0	5.6	559.1	38.2	74.1	91.5	138.6	51.6	7.2	16.2	17.5	3.0	526.8
2008	5.0	4.1	562.3	35.2	69.2	89.8	127.9	53.2	3.8	15.4	17.3	1.6	565.1
2011	4.1	3.8										1.2	576.8

Source: World Bank development indicators and Global Development Finance online database, 2012

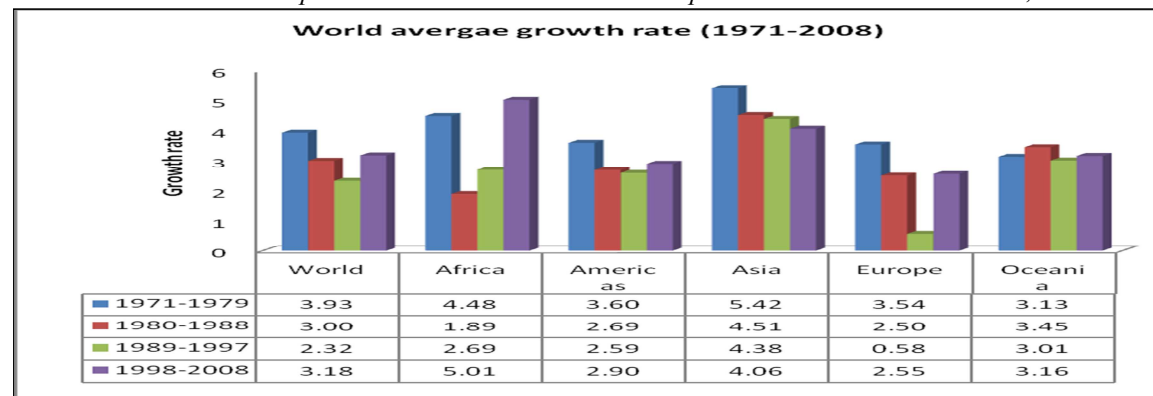


Figure 1: Average Growth Performance across the regions and world.

Source: Computed based on data from UNDP

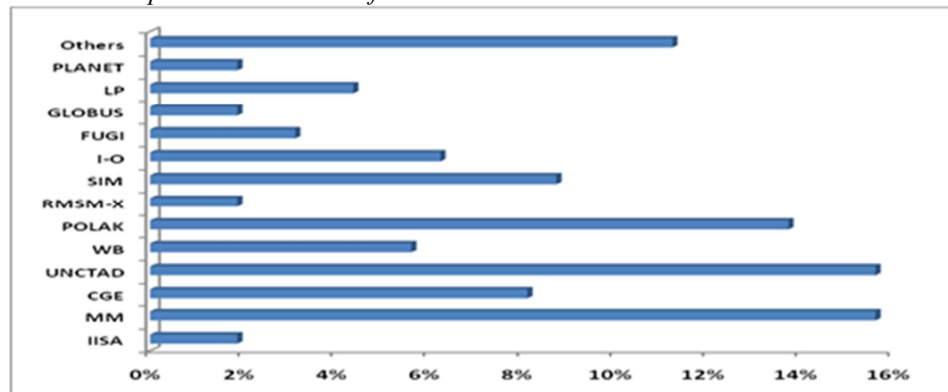


Figure 2: Generic topology of macroeconomic models used in Africa 1964-1995

Source: Based on GÖTZ UEBE <http://www2.hsu-hh.de/uebe/modelle/titelseite.html>