EVIDENCE OF STRUCTURAL BREAKS IN SELECTED MACROECONOMIC VARIABLES IN KENYA.

(1) Hutton Ndombi Wanyama (2) Consolata Ngala (3) John Byaruhanga

Department of Economics, Masinde Muliro University of Science and Technology
P. O. Box 190-50100 Kakamega, Kenya

Abstract: Structural breaks often occur in macroeconomic data due to either change in government policies, directives or natural calamities. This article provides evidence of structural breaks observed from 2007-2017 quarterly time series macroeconomic variables. Augmented Dickey Fuller test and Clemente-Montañés-Reyes Unit-Root test revealed presence of structural breaks. Real estate had structural breaks in both quarter II of 2010 and 2011. These breaks were explained by increasing middle income earners and urbanization after promulgation of 2010 constitution that guaranteed citizens a right to affordable housing with proper sanitation. Foreign direct investment recorded structural breaks in quarter IV of 2010 and quarter II of 2013. These breaks were associated with the implementation of the first Medium Term Plan (2008-12), promulgation of the new constitution and drastic drop in the number of foreign investors scared of 2013 general elections and Kenya VAT Act 2013 that saw the cost of construction materials rise. External debt experienced structural breaks in quarter II of 2015 and quarter II of 2017 caused by huge government borrowing to finance expansion of roads and on-going development projects. The government should issue a risk guarantee and political risk insurance to caution foreign direct investors to enable smooth running of the economy.

Keywords: Structural Breaks, Unit roots

1. Introduction

This article investigated the structural breaks associated with macroeconomic determinants of real estate development in Kenya. According to Perron (2008) Structural breaks are changes in a particular trend caused by either calamity like earthquake, famine, disease outbreaks, war, and change in government policies or a certain government directive. Globally, Structural breaks have been a common phenomenon in most countries as a result of government intervention or war (Perron, 2008). There has been notable structural breaks in real estate investments in American and Asian continent caused by construction of mega infrastructures and residential properties mainly attributed to government policies in favor of investors (New York Times 2016). On the other hand Bangladesh, North Korea, Iran and Iraq have experienced negative significant structural breaks in most of their economic sectors particularly in the real estate and construction sectors due to persistent destruction of properties caused by war (Swerts and Denis, 2014) and threats to war (Smith, 2006) that scared most of the investors from investing in those countries. In Africa significant structural breaks in the real estate sector have been recorded in Nigeria, Egypt, Tanzania and Cameroon as a result of rapid growth in urban population (Andrea, 2010) and favorable bilateral and multilateral trade policies with other countries (ECA, 2017). According to the Real Estate Report by Cytonn Investment (2018), Kenya has experienced significant structural breaks in the real estate and construction sector particularly the transport sector following government investment goals and objectives of cementing Kenya as a regional hub for trade. The highest growth in different sectors of the economy was reported by the construction and Real estate sector at 14.1% ahead of agriculture which reported 7.1% and financial service which reported 10.1% in 2015 (Barnes, 2015).

According to Hayman and Godo (2005) Foreign Direct investment (FDI) is a major contributor to investment in real estate, manufacturing sector and job creation. It also confers foreign exchange stability in the host country (Hayman and Godo, 2005). Globally, significant positive government directives, favorable bilateral and multilateral trade agreements have been linked to positive and significant structural breaks in the FDI inflows in both the developed and developing countries (Swerts & Denis, 2014). However, the African continent has been experiencing a drastic negative structural breaks in FDI inflows from $19 billion in 2001 to $11 billion in 2012 (World Bank,
2014). This according to the World Bank was encountered in 23 countries out of the continent’s 53 countries which adversely affected the growth of various economic sectors (World Bank, 2014). UNCTAD (2009) attributes this negative structural breaks in FDI to perennial problems associated with underdeveloped nations; political instability, war and institutional weakness. However, the North and West African countries amongst them Angola, Algeria, Chad, Nigeria and Tunisia experienced positive significant structural breaks in the year 2005-2016 (UNCTAD, 2015). These structural breaks according to UNCTAD have largely contributed to the growth of North and West African economies through emergence of new infrastructural, telecommunication facilities and industries. The industries have been set up to boost the economic welfare amongst those nations (Rusike, 2007). In Kenya a significant negative structural break in the foreign direct investment inflows was recorded between 2007 -2009. This structural break was mainly due to the post-election violence in 2008 that led to massive destruction of properties. The negative structural break caused a drop in the FDI inflows by $613 million (KNBS, 2015). However, from 2010-2017 significant positive structural break was recorded as noted by a total sum of $6.5billion FDI inflows from 2010-2017 (KNBS, 2018). The increase in FDI inflows in Kenya has had a significant positive effect in the manufacturing and real estate sectors (Jamea, 2017).

Globally, the Debt ratio which is a combination of both external and internal debt in OECD countries rose from 70% in the 1990s to almost 110% in 2012 (World Bank, 2013). It was projected to increase to 112.5% of GDP by 2014 and even rising higher in the years to follow (World Bank, 2013). The trend is seen not only in countries with a past of debt problems such as Italy, Japan, Belgium, and Greece - but also in countries where the debt ratio was low including the United States, United Kingdom, France, Portugal and Ireland (World Bank, 2013). Many economists saw this increased level of debt as a negative structural break which in the long-run affects the economic expansion and development of a nation (Basit and Ansari, 2012). In Africa many Countries are facing rising levels of un-serviced debt (World Bank, 2015). Kenya’s total debt burden averaged 5.9% from 2003-2007, 15.1% from 2008-2012 and 21.3% from 2013-2017 indicating that public debt has been growing at an increasing rate over the years (KNBS, 2017). This external debt has contributed to the expansion of the economy through infrastructural development; roads, railways, air and sea ports which tremendously influenced the rates of real estate development in Kenya (Anderson & Mwelu, 2013). On the other hand shortfall in tax revenue has resulted in a wide budget deficit despite goals to reduce this to 3.4% of GDP by the fiscal year 2020/21; the deficit, which currently stands at 56% of GDP(KNBS, 2017) was being plugged in through borrowing both locally and from the external market (Kaimenyi & Ndung’u, 2015). According to IMF/World Bank (2019) report on Debt Sustainability Analysis and International Development Association in Kenya, there has been a drop in the economic growth rate in Kenya. The fall is attributed to raising the level of tax and interest rates by the government in order to increase revenue. This enables the government to service its ballooning public debts.

A closer look into urbanization as a macroeconomic variable indicated that the rural population is declining slowly. United Nations (2014) stated that the number of rural populations was around 3.4 billion and was expected to decline to 3.2 billion by the year 2050.United Nations HABITAT (2018) predicted that by the year 2050, 64.15% and 85.9% of the developing and developed world respectively will be urbanized. Urbanization is closely linked to modernization, industrialization and the sociological process of rationalization (UNDESA, 2014). Urbanization is considered a positive structural break to growth of real estate, trade and industrialization. Urbanization enables the emergence of more infrastructural facilities such as roads, railways, airports and sea ports in order to meet the needs of the growing population (Runde, 2015). Similarly housing units and other social amenities are likely to expand in order to provide essential services to the people. All these coupled together tremendously expand the development of the economy and are viewed as significant structural breaks in the growth of various economic sectors with real estate sector being dominant (Swerts and Denis, 2014). Over the past four decades, between 1970 and 2010, the urban population of Eastern Africa soared from 11.2 million to 77.2 million with the urban proportion increasing from 10% to 24% during the same period (UN-HABITAT & UNEP, 2015). According to Kenya Housing and Population Censuses reports (2009) Kenya’s total population increased from 10.9 million in 1969 to 38.6 million in 2009 at an annual average inter-censal growth rate ranging from 2.9%-3.4% (KPHC, 2009). This urbanization process has been viewed as positive structural break as it is linked to the immense construction of social amenities, major infrastructural facilities among them the Thika Super Highway, Mombasa Port Modernization and Lamu Port-South Sudan-Ethiopia-Transport (LAPSSET) project (Anderson and Mwelu, 2013).
Foreign Direct Investment (FDI), external debt and urbanization have influence on real estate development in Kenya. This study sought to analyze the existence of structural breaks in these macroeconomic variables over a period of 11 years from 2007–2017 in Kenya. From the literature review it was evidence that there was a dearth of study that has analyzed structural breaks associated with these variables in Kenya. Studies done on structural breaks have focused on inflation, exchange rates, interest rates and horticulture exports (Kiprono, 2019); Consumer price index and Inflation (Gil-Alana and Mudida, 2017); Nominal effective exchange rate (NEER), real effective exchange rate (REER), inflation, exchange rate, consumer price index (CPI), current account balance (CAB) with and without oil component, lending rate, domestic credit and domestic credit growth, international reserves, money supply, stock market prices (SMP), 91days treasury bill (TB91) rate, Gross Domestic Product (GDP) real and nominal, GDP growth, GDP deflator, exports, imports, gross capital formation (GCF), gross fixed capital formation (GFCF), gross domestic savings (GDS), and consumption expenditure (Ndirangu et al, 2014). This study therefore sought to examine the existence of exogenous changes in the economy that influenced foreign direct investment, external debt and urbanization as determinants of real estate development.

2. Methodology

This study was conducted in Kenya for the period spanning from 2007 to 2017. This ten-year period gave sufficient data and information for the analysis of structural breaks associated with macroeconomic determinants of Real estate investment in Kenya; Foreign Direct Investments, external debt and Urbanization. Kenya was chosen for study as it is one of the largest and growing economies in East and Central Africa Kenya Investment Authority (2014). According to Kenya Investment Authority (2014) there is a rising trend towards urbanization caused by the growth in population at a rate of 2.7 percent per annum. The size of Kenya’s middle class is equally growing as evidenced by the growth in its gross national income per capita over the past ten (10) years Kenya Investment Authority (2014). Secondly its locational advantage as the main gateway to many countries presents an opportunity for growth (Kimenyi & Ndung’u, 2015). The study adopted analytical research design to provide empirical evidence suggesting two or more variables are related and also the direction of relationship (Burns & Groove, 2013). Similarly the analytical research design was used in order to gain a better understanding and more insightful interpretation of the results. Data for this study were exclusively collected from secondary sources using document analysis methods. The study used time series data from Kenya National Bureau of Statistics (KNBS) publications as well as economic surveys and World Bank website. The study carried out unit root test, Augmented Dickey-fuller test and Clemente-Montañés-Reyes Unit Root Test with Two Structural Breaks.

3. Results and Discussion

Augmented Dickey Fuller test results revealed that the macroeconomic variables exhibited unit root at levels, RES (p-value 0.2731 > 0.05), FDI (p-value 0.2731 > 0.05) EXD (p-value 0.9989 > 0.05) and URB (p-value -2.656 > 0.05) but when these non-stationery variables were subjected to first difference they became stationery (refer to table 1).

Table 1: Dickey-Fuller Unit Root Test

| Variables | Z(t)  | Prob>| |t| | Critical values | Conclusion |
|-----------|-------|-------|-------|-------|----------------|------------|
|           |       |       |       |       | 1%      | 5%      | 10%    |          |
| RES       | -1.54 | 0.2731| -3.628 | -2.950 | -2.6080 | Unit root |
| FDI       | -2.03 | 0.2731| -3.628 | -2.950 | -2.6080 | Unit root |
| EXD       | 2.203 | 0.9989| -3.628 | -2.950 | -2.6080 | Unit root |
| URB       | -2.656| 0.0820| -3.628 | -2.950 | -2.6080 | Unit root |
RES- Real Estate, FDI – foreign Direct Investment, EXD-External Debt, URB-Urbanization,


When Clemente-Montanés-Reyes Unit-Root Test with Two Structural Breaks was done (refer to table 2). Results revealed that Real estate had two significant structural breaks in second quarter of 2010 (2010q2) and second quarter of 2011 (2011q2). The positive and significant structural break in quarter two of 2010 could be explained by the fact that there is growing number of middle income earners. Second, large numbers of young people are moving to urban centers in search for job opportunities and better life. This has been fueling the demand for housing across all asset classes. In addition, construction was seen to be the economy’s fastest growing sector in the second quarter of 2010. On the other hand the positive significant structural break in the second quarter of 2011 (2011q2) was influenced by the promulgation of the new constitution in 2010 that guaranteed every citizen a right to accessible, adequate and affordable housing with reasonable standard of sanitation (RoK, 2011). As a result Kenya partnered with international institutions such as World Bank and African Development bank to acquire loans to develop slum upgrading programs for instance, Kenya Informal Settlement Improvement Program (KISIP) and Kenya Slum Upgrading Program (KENSUP) in major towns (Anderson and Mwelu, 2013).

Foreign direct investment on the other hand (FDI) had two significant structural breaks (refer to table 2). The first structural break occurred in quarter four of 2010 (2010q4). This structural break in FDI was associated with the implementation of the first Medium Term Plan of 2008–12 and promulgation of the new constitution. During this time more contractors from foreign nations came in bid for construction of new government structures and housing units, roads and other telecommunication structures (RoK, 2011). However, the second structural break experienced in quarter two of 2013 (2013q2) was as result of a drastic drop in the number of investors in Kenya from abroad who were willing to invest in the real estate sector (refer to table 2). The drastic drop in foreign direct investment and capital inflow by 18.94% in 2013 from US$1.381 billion in 2012 was attributed to uncertainties of the impending 2013 general elections (Amondi, 2016). Similarly, the structural break in (2013q2) has also been linked to the Kenya VAT Act 2013, which came into force on June 2013. This VAT act of 2013 brought about a new construction materials pricing regime that saw the cost of key building materials rise (Mwega & Ngugi, 2017). This set drastically the construction sector on an inflationary path, thereby causing foreign real estate developers to go slow on their construction activities (Mwega & Ngugi, 2017).

Table 2: Unit Root Tests with Structural Breaks

<table>
<thead>
<tr>
<th>Variables</th>
<th>Breaks</th>
<th>Coef</th>
<th>T-Stat</th>
<th>P-Value</th>
<th>Optimal Break Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>RES</td>
<td>D1</td>
<td>1.30714</td>
<td>4.1010</td>
<td>0.0000</td>
<td>2010q2</td>
</tr>
<tr>
<td></td>
<td>D2</td>
<td>1.23462</td>
<td>4.890</td>
<td>0.0000</td>
<td>2011q2</td>
</tr>
<tr>
<td>FDI</td>
<td>D1</td>
<td>2.05747</td>
<td>7.783</td>
<td>0.0000</td>
<td>2010q4</td>
</tr>
<tr>
<td></td>
<td>D2</td>
<td>1.9216</td>
<td>-7.0940</td>
<td>0.0000</td>
<td>2013q2</td>
</tr>
<tr>
<td>EXD</td>
<td>D1</td>
<td>4.91923</td>
<td>7.2105</td>
<td>0.0000</td>
<td>2015q2</td>
</tr>
<tr>
<td></td>
<td>D2</td>
<td>5.09000</td>
<td>6.633</td>
<td>0.0000</td>
<td>2017q2</td>
</tr>
<tr>
<td>URB</td>
<td>D1</td>
<td>1.48644</td>
<td>8.270</td>
<td>0.0010</td>
<td>2011q2</td>
</tr>
<tr>
<td></td>
<td>D2</td>
<td>1.39324</td>
<td>7.343</td>
<td>0.0010</td>
<td>2014q2</td>
</tr>
</tbody>
</table>

Source: Researcher, 2020

It was also observed that external debt (EXD) recorded a significant structural break in quarter two of 2015 (2015q2) and quarter two of 2017 (2017q2) (refer to table 2). The significant and positive structural break in quarter two of 2015 (2015q2) was caused by huge government borrowing of US$2.8 billion in 2015. In 2015 International Finance Corporation lend US$1.5 billion under the ‘Kenya’s annuity funding road Program me’ to finance expansion of both major and small roads all over the country (Shem,2015). “Under this Annuity Programme,2,000 km of small roads was completed within 2014/2015 financial year, followed by construction of
3,000km in 2015/2016. This made up of 80% small roads, and 20% highways (Shem, 2015). Similarly, the external loan of US$3.6 billion, of which 90% was borrowed from the Exim Bank of China (Ayanzwa, 2015) which was used to finance the construction of Mombasa – Nairobi phase of the standard gauge railway attributes to the structural break experienced in quarter two of 2015. On the other hand, the structural break that occurred in 2017 quarter two (2017q2) was caused by increased borrowing to finance major ongoing development projects including SGR phase two which caused $1.5bn and Construction of additional berths causing $ 1.6 billion under the LAPSSET projects (Mwega & Ngugi, 2017).

Similarly Urbanization recorded two significant structural breaks in quarter two of 2011 (2011q2) and quarter two of 2014 (2014q2). The first structural break in 2011 (2011q2) is attributed to key infrastructural development, majorly the construction of the US$360 Million Thika Super Highway in Nairobi Metropolitan Region which was finished in 2011q2 (Buke, 2015). On the other hand in April 2014, the World Bank invested KSh17bn ($193.8m) in key roads works, including a project linking Bachuma Gate at the Eastern Tsavo National Park to Maji ya Chumvi on the Coast (Omondi, 2017) as well the 160-km Kisumu-Kakamega-Webuye-Kitale link running across the country's north-west (Omondi, 2017). This has been associated with the increased rates of urbanization in the northern and western parts of the country (Gichanaa, 2013). The JKIA-Rironi project, that began in April 2014 and the construction of the first three berths at the port under the LAPSSET project from 2014-2016 are majorly linked to the positive and significant urbanization structural break in quarter two of 2014 (2014q2). Figure 1 show structural breaks as evidenced in macroeconomic variables; FDI, External debt, urbanization and real estate.

![Figure 1: Clemente-Montañes-Reyes Unit Root Test with Two Structural Breaks](image)

**Source:** Researcher, 2020

4. **Conclusions and policy Implications**

Kenya is one of the developing countries and is prone to economic shocks which can both be external and internal. The main objective of this paper was to analyze the structural breaks associated with foreign direct investment, external debt, real estate and urbanization in Kenya using quarterly time series data for the period 2007-2017. To consider the effects of structural breaks the study used conventional unit root such as Augmented Dickey Fuller test and further utilized Clemente-Montañes-Reyes unit Root test with two structural breaks to cater for structural breaks in cases where the variables experienced fractional disintegration. The findings showed that foreign direct investment, external debt, real estate and urbanization experienced structural breaks during the period 2007 – 2017 which were associated with different economic phenomena. Specifically, foreign direct investment and capital inflow dropped due to uncertainties of the impending general election of 2013 which scared investors out of the country. The break was also caused by the VAT act of 2013 which escalated the cost of key construction materials. Such negative structural breaks that interfere with the smooth running of the economy.
should be curbed through policy. The government should issue a risk guarantee and political risk insurance to caution the foreign direct investors during electioneering periods. In addition, the government through the fiscal policy should spell it out in procurement of goods that investors are allowed to renegotiate the cost of construction materials and that a new VAT act should not interfere with an ongoing project. Finally, the government should factor in the effect of structural breaks when designing economic policies relating to foreign direct investment, external debt, real estate and urbanization in Kenya.

References


35. UNCTAD. (2009). Effectiveness of Foreign Direct Investment Policy Measures, Policy Note,


38. UNDESA (United Nations Department of Economic and Social Affairs) (2012) World investment reports 2012


