

EFFECT OF MACROECONOMIC VARIABLES ON TAX REVENUE IN KENYA

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ABSTRACT

The major source of revenue to many governments in the world is taxation and Kenya is no exception. However, most of the revenue collection does not always meet its targets despite the implementation of many tax reforms in Kenya. This study sought to determine the effect of selected macro-economic variables and tax revenue collection in Kenya. The study adopted a quantitative research design. Secondary data was collected covering 1995 to 2016 (21 years). Autoregressive model was used to analyze the data and ANOVA to test the hypothesis of the study. Stationarity tests were carried out by employing Augmented Dickey Fuller (ADF). The findings revealed that there is no statistically significant relationship between interest rate, inflation and exchange rate and tax revenue. However, interest rate and exchange rate was important in predicting tax revenues. The general conclusion is that interest rate and exchange rate are important macro-economic factors influencing tax revenue collection in Kenya.

Keywords: Tax Revenue Collection, Interest Rate, Exchange Rate, Inflation Rate

1.0 Introduction

The objective of the government in the world is to improve the welfare of its citizens through formulation and implementation of economic policies and projects. To achieve the national objectives, the governments provide infrastructure, health, education, defence and security among other welfare programs. Since public expenditure by the government is financed primarily through tax revenues, taxes are the main source of public revenue world over (Alesina & Ardagna, 2010). Baunsgaard and Keen (2010) observed Taxation therefore becomes important to accomplish government objectives. For this reason, taxation is seen as the most important sources of revenue to the government. This is partly because it plays an essential role in economic planning and development. In Kenya, taxes are the single largest source of government budgetary resources.

According to Ajaz and Ahmed (2010), developing countries have institutional problems in tax collection. These problems include corruption in tax administration and low quality of governance. Edward (2009) found that revenue collection is a problem in many countries but his problem is more prominent in the developing countries. Tax revenue mobilization in Sub-Saharan Africa (SSA) is not only low compared to spending needs (Keen and Mansour, 2009), but also suffers from high instability (Brun et al., 2006). Further, Stotsky and Woldemariam (2007) revealed that many sub-Saharan Countries face difficulties in raising tax revenue for public use. Revenue authorities in the East Africa are also in an uphill task of trying to meet increased targets and narrow the growing deficits in their countries' budgets.

As a result, many countries have resorted to internal and external borrowings as alternative sources of revenue to finance the deficit. In Kenya, although the taxes collected have consistently grown over time, KRA has

almost always fallen short of its revenue target set by the national treasury. In 2016 KRA in the nine months of this financial year recorded a revenue shortfall of \$670 million, due to a huge shortfall in ordinary revenue collection of a \$260 million deficit in Pay As You Earn (PAYE) revenue and a \$159 million shortfall in VAT collection from imports. As at December (2016), KRA had collected \$8.42 billion against a target of \$9.11 billion. The missed target was \$880 million higher than its collection over the same period in the 2014/15 financial year. This has forced KRA to be aggressive in revenue collection in Kenya.

The Kenya Revenue Authority (KRA) is an arm of the Government of Kenya incepted in 1995 bestowed with the responsibility of administering tax on behalf of the government. Studies show that government expenditure and revenue have maintained consistent growth pattern. However, expenditures are always exceeding revenues (Okech & Mburu, 2011; Wawire, 2011; & KRA, 2013). This imbalance of expenditure and revenue has always resulted in large government deficits. Poor tax revenue collection is mainly attributed to the tax structure or an inadequate effort the side of the government, both of which are influenced by various factors (Ebeke & Ehrhart, 2012).

The factors that affect tax revenue may be classified into groups such as institutional factors, compliance factors, tax rates and structures and macroeconomic factors. According to Oliver (2000), macroeconomic variables are the factors that affect the economy at the regional or national level and affect a large population. Tax revenue is affected by some macroeconomic variables. These factors include GDP, exchange rate, inflation rates and interest rate which the government monitors and controls. Interest rate is seen as a determining factor of investment and it shows a negative influence on the level of investment. It is usually measured in percentage (Ogunleye, 2012). If a corporation takes up debt to finance its investment, it can deduct the interest payments from the tax base.

Inflation is the increase of a price index such as the consumer price index over a given year (Usman & Adegbite, 2013). Reiss (2015) found that in progressive tax systems tax revenues will increase by more than inflation. Birungi (2015) finds a negative relationship between interest rate, exchange rate and inflation rate and tax revenue in Rwanda. This study will therefore examine the effect of macroeconomic factors on tax revenue in Kenya. Analyzing tax revenues as well as determining the susceptibility of macro variables can be effective in reducing the government's budget deficits caused by exogenous changes of these variables. They can also be useful in modifying the structure of tax revenues to stabilize the tax revenue.

1.2 Statement of the problem

Studies on tax revenue collection have put across several schools of thought that try to explain the factors that determine tax revenue. These are structural factors, which include; the composition of economic activity, institutional factors that include the government policies and political economy constraints, tax rates and tax structure, compliance factors but have failed to specially study macroeconomic factors that affect tax revenue (Gupta 2007). Kenya, just like many developing countries is currently confronted with huge fiscal deficits, declining external assistance and huge debt service charges that are adversely affecting the country's development process. Public expenditure continues to grow exponentially every fiscal year such that, more often revenue growth does not match the government spending pressures (Okech & Mburu, 2011). Tax revenue in Kenya has consistently grown, however the impressive tax revenue collection has always fallen short of the targeted revenue (Wawire, 2011). Each passing year it fails to achieve its set target. This is despite the numerous tax reforms in Kenya, system reforms and upgrade in KRA, stakeholder awareness Kenya, and a stable political environment.

Numerous studies have been done but many have focused on tax noncompliance, tax evasion, structural factors that influence a country's tax effort (Gupta 2007), and institutional factors that affect the ability and efficiency of tax collection (Bird & Martinez-Vazquez, 2008), but none that the researcher is aware of has been on Kenya. Inflation rate, exchange rate, and interest have been particularly chosen since they are constant items on the quarterly KRA revenue reports and governments will seek to control these variables. Therefore the study sort to determine the effect of macroeconomic variables on tax revenue in Kenya.

1.3 Objectives of the Study

1.3.1 General objective

The general objective of this study is to determine the effect of macroeconomic variables on tax revenue in Kenya.

1.3.2 Specific Objectives

1. To determine the effect of interest rate on tax revenue in Kenya
2. To establish the effect of inflation rate on tax revenue in Kenya
3. To assess the effect of exchange rates on tax revenue in Kenya
4. The mediating effect of economic growth on tax revenue in Kenya

2.1 Theoretical framework

The study was guided by four theories namely: classical growth theory, Keynes liquidity preference theory, positive public expenditure theory and purchasing power parity theory.

2.2.1 Classical Growth Theory

This model was proposed by Adam Smith who posited a supply side driven model of growth and his production function was as follows: $Y = f(L, K, T)$. Where Y is output, L is labor, K is capital and T, is land, so output was related to labour, capital and land inputs. Output growth (gy) was driven by population growth (gL), investment (gK) and land growth (gT) and increases in overall productivity (gf). Therefore: $gy = (gf, gK, gL, gT)$. Smith argued that growth was self-reinforcing and can be seen in the increasing returns to scale. He viewed a causal relationship between savings and investment which in turn causes growth. He viewed income distribution as being one of the most important factors that determines how fast (or slow) a nation grows. He also posited that profits decline because the competition of capitalists for workers raises wages up. The link between inflation and its "tax" effects on profit levels and output were not specifically articulated in classical growth theories. However, the relationship between the two variables is implicitly suggested to be negative, as indicated by the reduction in firms' profit levels through higher wage costs. According to this theory the variable in the study will affect economic growth which will in turn affect tax revenues.

2.2.2 Keynes Liquidity Preference Theory of Interest Rate

According to Keynes (1936) money is demanded mainly for the following motives; transaction, precautionary and speculative motive. Keynes (1973), defined liquidity preference theory as the rate of interest set forth in the general theory of employment, interest, and money. The rate of interest depends on the present supply of money and the demand schedule for the present claim on money in terms of a deferred claim.

Theory of liquidity shows that the solution lies in keeping the interest rate at optimum levels. It also suggests that policymakers should have an active role of government in maintaining control (Garrison 2002) and that the government policymakers can intervene in determining the level of interest rates and also they can manage the factors that influencing the macro-economic stability of the economy. In so doing they influence the economic activity which has an effect on tax revenue collections.

2.2.3 The Positive Public Expenditure Theory

The theory of public expenditure was advanced by Peacock and Wiseman (1961) and was based on the political theory of public expenditure determination which states that the government likes to spend more money, citizens do not like to pay more taxes, and that government needs to be more attentive to the aspiration and wishes of its citizenry. The theory sought to explain the circular trend or time pattern of change in government expenditure in response to development in the political economy while at the same time, the taxable capacity of the citizens is a constraint (Kanyi, 2014).

The public expenditures theory further states that government expenditures are largely determined by government revenue and taxation. To this effect, the theorists opined that as the both economy and income grew, tax revenue would inevitably rise. This consequently enables the government expenditures to rise in tandem with Gross National Product (GDP). There is a feeling that the level of taxation that acts as a constraint is tolerated. Moreover, it is asserted that there may be discrepancies between a desirable level of taxation and government expenditure (Baghebo, 2012). In the context of customs reforms and modernization and tax revenue, the theory of public expenditure can be employed to explain the link between the government's efforts to raise the tax collected from its citizens in order to address its development agenda and its capacity to raise the desired tax revenue. According to this theory the government need to raise more taxes for expenditures and hence the importance of understanding the relationship between the study variables.

2.2.4 Purchasing Power Parity Theory

This was the Purchasing Power Parity theory or PPP, launched by the Swedish economist **Gustav Cassel** (1921). In a simple model with only one good produced both at home and abroad. The real exchange rate is equal to one when PPP holds.

Purchasing Power Parity (PPP) is a theory of exchange rate determination and a way to compare the average costs of goods and services between countries. The theory assumes that the actions of importers and exporters (motivated by cross-country price differences) induce changes in the spot exchange rate. In another vein, PPP suggests that transactions on a country's current account affect the value of the exchange rate on the foreign exchange (Forex) market. This is in contrast with the interest rate parity theory, which assumes that the actions of investors (whose transactions are recorded on the capital account) induce changes in the exchange rate. This theory affects the level of trade within and without the country, which ultimately affects tax revenue collection in the country.

2.3 Conceptual Framework

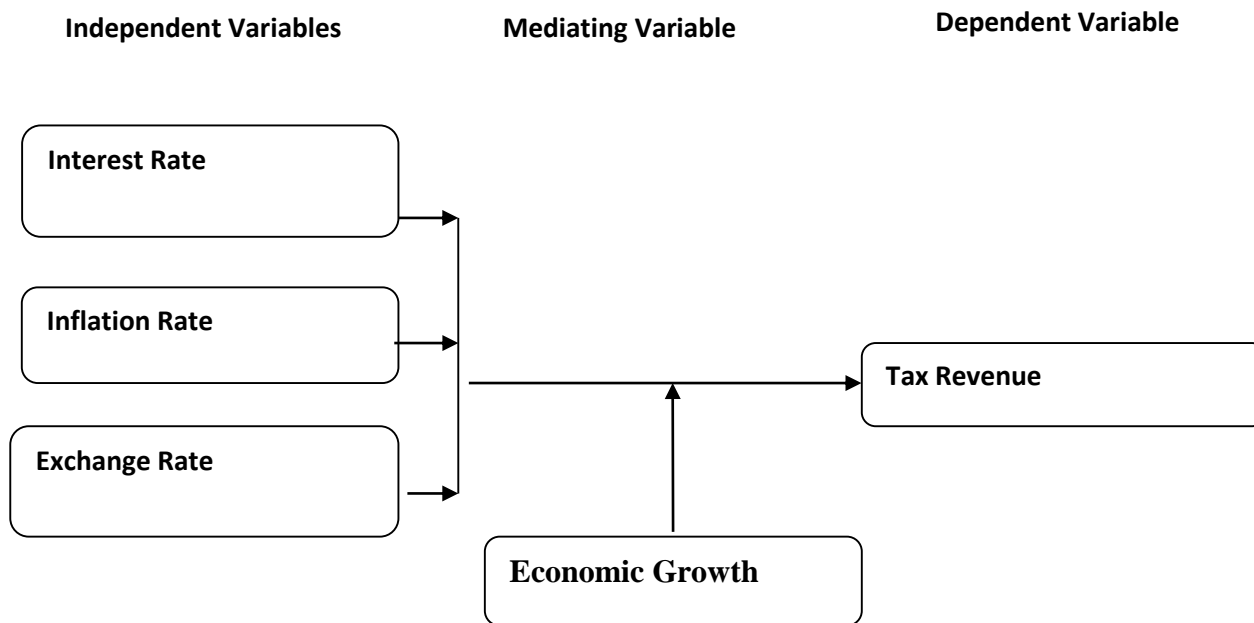


Fig 2.1: Conceptual framework

2.4 Empirical Review

2.4.1 Interest Rate and Tax Revenue

Rising interest rates in a country have the negative effects. It increases the cost of borrowing and consequently limits the aggregate investment and consumption and thus the overall economic growth in the country (Ng’etich and Wangari, 2011). Sibanda et al., (2013) examines the impact of real exchange rates on economic growth in South Africa. He used quarterly time series data for the period of 1994 to 2010. The Johansen co-integration and vector error correction model is used to determine the impact of real exchange on economic growth in South Africa. The explanatory variables in this paper are real exchange rates, real interest rates, money supply, trade openness, and gross fixed capital formation. Results of the study reveal that real exchange rates have a dampening long run impact on economic growth in South Africa.

Looking from the GDP's point of view, Udoka and Roland (2012) agrees that interest rates are one of the factors indicating economic growth of a country; however an increase in interest rates also shows a shrinking GDP. The good news is that their research shows that interest rates do not have a significant impact in economic growth. An increase in interest rates will cause a decrease in real growth rates; this research however is done in Europe (Giovanni et al., 2009). Interest rates affects economic growth which in turn affects total taxes collected in a country. Spengel and Heckemeyer (2016) find that average tax burdens are higher in times of low interest rates, which means higher tax revenues for a country.

2.4.2 Inflation Rate and Tax Revenue Collection

Mahdavi (2008) found a positive relationship between tax revenue and inflation rate. Tanzi (1992), in his research provide evidence that tax revenue is negatively affected by inflation, the so-called Olivera-Tanzi effect. When the rate of inflation increases the total tax revenues falls. There is a negative relationship. Lucotte (2010). A study carried out in Pakistan by Rasheed (2006) observed that inflation ties up money that could be

used to pay taxes by individuals and firms. Further, when inflation rises, there is an increase in tax evasion. Increase in tax revenue is greatly responsive to change in inflation Patoli et al., (2012). Inflation puts inverse impact on direct as well as on indirect taxes in Pakistan Mahdavi (2008).

In an article titled “estimating tax effort in Iran and its comparison with selected developing countries”, Ghamtari and Eslamlouian (2007) studied Iran’s tax capacity and compared it to 14 other selected developing countries. In the same article, tax ratio pattern was estimated using the Seemingly Unrelated Regression (SUR) method between 1994 and 2002 inflation rate leave negative effects on tax ratio. Hubbard & O’Brien (2008) mention that inflation disturbs the distribution of income and wealth by creating unemployment and lowering economic growth. It creates uncertainty and raises costs of production.

An increase in inflation will decrease the economic growth and investors (Barro, 1995). They also find that when nominal profitability increases due to inflation, the tax base increases. (Reiss 2015) in a study on Austria finds that in progressive tax systems tax revenues will increase by more than inflation rate.

2.4.3 Exchange Rate and Tax Revenue Collection

Exchange rate helps in the regulation of exports and imports of goods and services (Were et al. 2013) which in turn affects economic growth. Binatli and Sohrabji (2009) analyze the period 1999-2008 and have found that a depreciation of the Turkish lira has a negative effect on imports and exports. For the Romanian case, Ghiba (2010) analyze the relation between exchange rate and international trade (period 2005-2010, monthly data series) and shows that the depreciation of Romanian leu has a small effect of the exports increase and the relation with imports is extremely weak. Ebrill used a panel data of 27 countries from Asia, Africa and the Western Hemisphere, for a period between 1980 to 1992 and another panel data of 105 countries, for periods between 1980 to 1995, Ebrill (1999) examined two complementary models of the determinants of import and international trade tax revenue. He found that, in both models, depreciation of the exchange rate is significantly linked to higher trade tax revenues.

According to the traditional school of thought, the uncertainty of returns would result in the risk Tarawalie (2010) and Akpan (2008) found that there is a positive correlation between exchange rates and economic growth. While McPherson, Rakovski and Kennedy (2000), finds no direct relationship between exchange rates and economic growth. Munthali et al., (2010) found out that exchange rate volatility has negative effects on growth. Ito, Isard and Symasnsky (1999) found that high economic growth rates supported by adequate export growth, which increases the value of exchange rates due to increased demand for the national currency. GDP per capita is often considered an indicator of a country's growth. Changes in the exchange rate translate directly into changes in domestic collections from imports and exports. For a given level of imports or exports, a more depreciated real exchange rate would increase the base of trade taxes in domestic currency terms, which would in turn increase trade tax collections.

2.4.4 Economic Growth and tax revenue

Economic growth refers to an increase in the production capacity of an economy compared from a given period to another (Lipsey and Chrystal, 2007). Some Theories and past empirical studies on the relationship between inflation and economic growth have indicated no relationship (Sidrauski, 1967), others have shown negative relationship (Fisher, 1993) while their studies show positive relationship (Mallik and Chowdhury, 2001) between these two variables.

Semuel and Nurina (2015) examined the influence of inflation rate, rates of interest and exchange rates on economic growth in Indonesia between 2005 and 2013 using statistical techniques. The results show that there was a negative relationship between interest rates and GDP as well as an important positive association between exchange rates and the GDP, whereas inflation did not have a great effect on GDP. There is a significant negative relationship of interest rates on GDP and a significant positive relationship of the exchange rates on the GDP, while inflation is not a significant influence on GDP (Hatane and Nurina 2015)

Tanzi (1992) studied the relationship between tax revenue and structural factors among the developing countries using panel research method. The study findings showed that, per capita GDP was a determinant of the share of tax revenue in GDP.

Pessino and Fenochietto (2013) studied the determinants of tax effort for 113 countries using panel regression model. Their findings showed that level of development measured by per capita GNP positively affect tax effort. Mustafa (2000) observes that as the economy grows, more people and companies will be deriving higher income and would therefore be liable to pay higher taxes. Gacanja (2012) who did an empirical case study of Kenya on tax revenue and economic growth revealed a positive relationship between economic growth and tax revenues. All the tax variables indicated a positive effect on economic growth with income tax posing the highest effect. If GDP will grow, the revenues collected from taxes will increase. There is a positive correlation. A mixed results by sector was by Alm et al., (2004) studied the factors that determine the share of tax revenue in economic growth for developed and developing countries using panel research methodology. He found the coefficient of per capita GDP was negative but significant. The coefficients of the share of agriculture in GDP and share of international trade in GDP were negative but insignificant.

3.0 RESEARCH METHODOLOGY

3.1 Research Design

The research adopted descriptive research design using quantitative data collected from Central Bank of Kenya and Kenya National Bureau of Statistics official reports. The scope of the data was 21 years from 1995 to 2016. The data was converted into natural logarithms before the analysis was done. A times series multiple linear regression model was used for the analysis of the long run effects or relationship between a dependent (responsible) and the number of independent (explanatory) variables. With regard to this study, the dependent variable was Tax Revenue Collection and the independent variables were inflation, exchange, and interest rates, this is similar to the work of Antwi and Agaklega (2013). The data was tested for stationarity using augmented Dickey Fuller (ADF) test and mediation was tested using Sobel Test. The study adopted model the following model:

$$X_t = \delta + \phi_1 X_{t-1} + \phi_2 X_{t-2} + \dots + \phi_p X_{t-p} + A_t \dots \dots \dots \text{Equation (i)}$$

Where X_t is the time series,

A_t is white noise, and

$$\delta = (1 - \sum_{i=1}^p \phi_i) \mu \dots \dots \dots \text{Equation (ii)}$$

With μ denoting the process mean.

4.0 RESEARCH FINDINGS AND DISCUSSION

Table 4.1: Descriptive characteristics

		Inflation	Interest	exchange	GDP	TRV
N	Valid	92	92	92	23	23
Mean		7.81	18.40	77.30	4.13	5.54
Std. Error of Mean		.456	.566	1.415	.459	.572
Median		7.04	6.77	7.45	4.50	5.47
Mode		7	14	79	6	5.43
Std. Deviation		4.370	5.429	13.568	2.203	0.34
Variance		9.096	9.474	4.104	.852	0.12
Skewness		.596	.946	.074	-.430	0.23
Std. Error of Skewness		.251	.251	.251	.481	.481
Kurtosis		-.036	-.292	-.207	-.265	-1.25
Std. Error of Kurtosis		.498	.498	.498	.935	.935
Range		21	19	60	8	1.10
Minimum		-2	12	44	0	5.04
Maximum		19	31	104	8	6.14

Results from table 4.1 indicated that the average value for the interest rates was 18.40 while the standard error was 0.566. The standard deviation for the interest rate was 5.429. The range of interest rate was of 19 with the minimum and maximum of 12 and 31 respectively.

Regarding the inflation rates, the average value was 7.81 as described by the mean value with a standard error of 0.456. The standard deviation was 4.370. The values had a range of 21 with minimum and maximum values of -2 and 19 respectively.

Concerning the exchange rates, the average value was 77.30 as shown by the mean value and a standard error of 1.415. The standard deviation was 13.568. The values had a range of 60 with the minimum and maximum values of 44 and 104 respectively.

The researcher went ahead to determine the descriptive statistics for the mediating variable which was the economic growth which was described by the GDP growth and the results were summarized in table 4.1. In this case, according to the researcher, the "rate of economic growth" refers to the geometric annual rate of growth in GDP between the first and the last year over a period of time. The GDP growth in this case showed a mean of 4.13 while the standard error was 0.459. The standard deviation was 2.203. The values had a range of 8 which ranged from a minimum of 0 and a maximum of 8.

Tax revenue is the revenues collected from taxes on income all tax bases according to the tax laws of Kenya. Total tax revenue as a percentage of GDP indicates the share of a country's output that is collected by the government through taxes. According to this study, the tax revenue had a mean of 5.24 and a standard error of .572. The values had a range of 1.10 with the minimum and maximum values of 5.04 and 6.14.

4.1 Correlation analysis

Multiple correlation measures indicate the degree of association between two or more variables at the same time. This study sought to determine whether there is linear relation between the tax revenue and the independent variables namely Inflation Rate, Interest Rate and Exchange Rate Moderated, at 95% confidence

interval and 5% level of significance. If the significance value is less than 0.05 ($p < 0.05$) then it is considered statistically significant. If the significance value is greater than 0.05 ($p > 0.05$) the relationship is not statistically significant. The results are indicated in table 4.2.

Table 4.2: Correlation analysis

		Inflation Rate	Interest Rate	Exchange Rate	TRV	GDP
Inflation Rate	Pearson Correlation	1	-.168	.117	.011	-.046
	Sig. (2-tailed)		.109	.268	.915	.662
	N	92	92	92	92	92
Interest Rate	Pearson Correlation	-.168	1	-.559**	-.012	-.101
	Sig. (2-tailed)	.109		.000	.907	.336
	N	92	92	92	92	92
Exchange Rate	Pearson Correlation	.117	-.559**	1	.093	.120
	Sig. (2-tailed)	.268	.000		.379	.256
	N	92	92	92	92	92
TRV	Pearson Correlation	.011	-.012	.093	1	.873**
	Sig. (2-tailed)	.915	.907	.379		.000
	N	92	92	92	92	92
GDP	Pearson Correlation	-.046	-.101	.120	.873**	1
	Sig. (2-tailed)	.662	.336	.256	.000	
	N	92	92	92	92	92

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4.2 indicates the correlation between the independent variables (Inflation Rate, Interest Rate, and Exchange Rate) and Tax Revenue collection. The findings revealed that there is weak negative relationship which is not statistically significant between Interest Rate and Tax Revenue collection ($r = -0.12$, $p = 0.907 > 0.05$). There is weak positive relationship which is not statistically significant between Inflation Rate and Tax Revenue collection ($r = 0.011$, $p = 0.915 > 0.05$). This result seems to contrast with that one of Muhdavi (2008) in which he found a negative relationship, however it agrees well with Ngotho and Kerongo (2014) who found a negative relationship. There is strong positive relationship which is not statistically significant between Exchange Rate and Tax Revenue collection ($r = 0.093$, $p = 0.379 > 0.05$). This result seems to disagree with that one of Binatli and Sohrabji (2009) in which they found a negative relationship.

4.3 Regression analysis

Table 4.3 Effect of Inflation Rate on Tax Revenue collection

Model Summary

R	R Square	Adjusted Square	RStd. Error of the Estimate
.096	.009	-.002	4.371

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	16.116	1	16.116	.843	.361
Residual	1719.860	90	19.110		
Total	1735.976	91			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
Case Sequence	.016	.017	.096	.918	.361
(Constant)	7.084	.919		7.708	.000

The results showed R-Square of 0.009 this implies that 0.9% of variation in tax revenue collection is determined by inflation rate. The ANOVA test is used to determine whether the model is important in predicting the Tax revenue collection. In table 4.3, at 0.05 level of significance the ANOVA test indicated that in this model the independent variable namely Inflation Rate is not important in predicting Tax revenue collection as indicated by significance value=0.361 which is more than 0.05 level of significance (P-value=0.361<0.05). It is also observed that taking all factors constant; the tax revenue collection was 7.084. A unit increase of Inflation Rate would lead to a 0.016 increase in tax revenue. These results contrasts that of Muhdavi (2008) where he argues that inverse impact on direct as well as on indirect taxes and also Tanzi (1992) as well as Lucotte (2010).

Table 4.4 Effect of Interest Rate on Tax Revenue Collection

Model Summary

R	R Square	Adjusted Square	RStd. Error of the Estimate
.651	.424	.418	.091

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	.547	1	.547	66.371	.000
Residual	.741	90	.008		
Total	1.288	91			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
Case Sequence	-.003	.000	-.651	-8.147	.000
(Constant)	1.383	.019		72.482	.000

The results showed R-Square of 0.424 this implies that 42.4% of variation in tax revenue collection is determined by interest rate. The ANOVA test is used to determine whether the model is important in predicting the Tax revenue collection. In table 4.4, at 0.05 level of significance the ANOVA test indicated that in this model the independent variable namely Interest Rate is important in predicting Tax revenue collection as indicated by significance value=0.000 which is less than 0.05 level of significance (P-value=0.000<0.05). It is also observed that taking all factors constant; the tax revenue collection was 1.383. A unit increase of Interest Rate would lead to a -0.003 decrease in tax revenue. This results seems to contrast with that one of Spengel and Heckemeyer (2016) who found that average tax burdens are higher in times of low interest rates.

Table 4.5 Effect of Exchange Rate on Tax Revenue Collection

Model Summary

R	R Square	Adjusted Square	RStd. Error of the Estimate
.856	.733	.730	.041

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Regression	.412	1	.412	247.636	.000
Residual	.150	90	.002		
Total	.562	91			

Coefficients

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
Case Sequence	.003	.000	.856	15.736	.000
(Constant)	1.764	.009		205.722	.000

The results showed R-Square of 0.733 this implies that 73.3% of variation in tax revenue collection is determined by exchange rate. The ANOVA test is used to determine whether the model is important in predicting the Tax revenue collection. In table 4.5, at 0.05 level of significance the ANOVA test indicated that in this model the independent variable namely Exchange Rate is important in predicting Tax revenue collection as indicated by significance value=0.000 which is less than 0.05 level of significance (P-value=0.000<0.05). It is also observed that taking all factors constant; the tax revenue collection was 1.764. A unit increase of Interest Rate would lead to a0.003 increase in tax revenue.

4.4 The Mediation Effect

Mediation tries to explain a situation where the effect of the independent variable on the dependent variable can best be explained using a third mediator variable. The variable, which is caused by the independent variable, is itself a cause for the dependent variable. In this study instead of interest rates, inflation rates and exchange rates causing an effect on tax revenue directly, the independent variables are causing the mediator, which is economic growth which is in turn causing an effect on tax revenues. The causal relationship between

the independent variables and dependent variables is indirect. The mediation effect was tested using Sobel Test. The mediation effect was conducted and results were summarized in the following output.

Table 4.6: Mediation effect on inflation rate

Input	Test Statistic	Std. Error	p-value
-1429628.603	1.2722495	13982800696.1	0.20328965
-1429628.603	-036420059	12903288163.1	0.71570823
-1429628.603	-3.08070235	1139854855.4	0.00206513

The test statistic for the Sobel test is 1.27 with an associated p-value of 0.20, hence the association between tax revenue collection and inflation rate in the model is not reduced significantly by the inclusion of the mediator. The test statistic for the Sobel test is -0.36 with an associated p-value of 0.72. Hence, the association between tax revenue collection and interest rate in the model is not reduced significantly by the inclusion of the mediator. The test statistic for the Sobel test is -3.08 with an associated p-value of 0.002. Hence the association between tax revenue collection and exchange rate in the model is reduced significantly by the inclusion of the mediator.

5.0 Summary

5.1 Effect of interest rate on tax revenue in Kenya

The study revealed that there is a weak negative relationship between interest rate and tax revenue collection. Interest rate significantly affects tax collected since 42.4% of variation is determined by interest rate in the economy. Interest rate is important in predicting tax collection but a unit increase in interest rate tends to reduce tax collected.

5.2 Effect of inflation rate changes on tax revenue in Kenya

The study shows that there is weak positive relationship between inflation rate and tax revenue collection. Inflation rate does not significantly affect the tax collected by the KRA in Kenya. Since only 0.9% variation is explained by inflation rate. Nevertheless a unit increase in inflation rate increases tax collected marginally.

5.3 Effect of exchange rate on tax revenue in Kenya

The study has shown that there is a strong positive relationship between exchange rate and tax revenue collection. The study finds that exchange rate is important in predicting tax collections in the country and a unit increase in the exchange rate will result to increase in tax collections.

5.4 The moderating effect of Economic Growth on effect between exchange rates and tax revenue

The study shows that the long run coefficient of economic growth is significant at 5% indicating that economic growth affects the amount of tax revenues in Kenya. The findings show that tax revenue in Kenya is mediated by the level of economic growth of the country. There is causal relationship between interest rates, inflation rates and exchange rates and tax revenue in Kenya. However, the association between tax revenue collection is not significantly reduced for inflation and interest rates but it is reduced for exchange rate.

5.5 Conclusions

The study has shown that tax revenue is important to a country for self-determination. Despite the efforts by the government to increase tax revenue it has never exceeded its projections per year. This as the study has shown is caused by various factors among them; interest rate, inflation rate, exchange rate, and economic growth of the county.

There is a relationship between these factors and tax revenue in Kenya. The government needs to put in place policy mechanisms to check on inflation that negatively affects tax revenue as the study has shown. The study also has shown that no one factor can be dealt in isolation, all these variables are inter-linked and instead of interest rates, inflation rates and exchange rates causing an effect on tax revenue directly, the independent variables are causing the mediator which is economic growth which is in turn causing an effect on tax revenues.

5.6 Recommendations

Based on the conclusions, the study recommends that the government through the CBK which regulates the economy through monetary policy, the Treasury which regulates the economy through the fiscal policy should work hand in hand to maximize tax revenue in Kenya. These agencies must work on the rates of inflation since it reduces the tax revenues for the government. In addition, it should check on exchange rates that affect trade levels in the country and hence affect tax revenue collected. Finally, the economic growth of the country is interlinked with independent variables, which in turn affect the amount of tax revenue collected in the country.

5.7 Areas for further research

Further work on this can be done by testing each variable independently, applying a different model and methodology, and expanding the scope to other developing countries.

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