The economic evidence in the relationship between corporate tax and private investment in Ghana

Tweneboah Senzu, Emmanuel and Ndebugri, Haruna

African School of Economics- Republic of Benin, Cape Coast Technical University Ghana

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THE ECONOMIC EVIDENCE IN THE RELATIONSHIP BETWEEN CORPORATE TAX AND PRIVATE INVESTMENT IN GHANA

Prof. Emmanuel Tweneboah Senzu
Tsenzu@fbiresearchedu.org / Tsenzu@cctu.edu.gh
Director of Frederic Bastiat Institute, Cape Coast Technical University

Rev. Haruna Ndebugri
Haruna.ndebugri@cctu.edu.gh
Director of Academic Planning & Quality Assurance, Cape Coast Technical University

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A. ABSTRACT

Understanding and appreciating the crucial role privates' investment plays in developing economies towards it sustainable growth, it became an imperative assignment to investigate the effect of corporate taxes and it impacts on privates' Investment in developing countries, but focused the study on Ghana for the hypothetical test. For this very reason, the study sort to derive a cogent argument between corporate tax and it impacts on private investment including controllable variables like real GDP, Inflation estimated under consumer price index, exchange rate measured nominally, government expenditure and finally domestic credits as a vector indicators using Johansen approach to co-integration.

B. INTRODUCTION & BACKGROUND

For the past decade, governments around the globe had tried to create an economic environments suitable for technologically intensive economic activities. In countries where the wage costs are relatively high, the economy need to focus on activities that add higher value to products or customers. As part of this development, various countries are resorting to the use of various tax incentives including that of corporate tax to support and to Stimulate higher investments by the private sector in order to expand output growth hence leading to the development of the country. Governments all over the world including the government of Ghana are challenged with poverty alleviation, security, education, health and the general welfare of the citizenry. These call for the provision of social infrastructure and implementation of development projects among other things to improve the standard of living of the people. In

view of these social commitments, governments need to generate enough revenue to meet their expenditures (Ahiawodzi & Tsorhe, 2013). Even though, it is observed that governments raise revenues from several other sources such as licenses, fees, and fines, corporate tax remains one of the largest contributors of government revenue even when the other sources are put together. This supports the assertion made by Otieku (1992) and cited by Azah (2005) that, "corporate tax has become one of the key sources of domestic revenue for the government. It is the major fiscal tool not only in mobilizing the much needed government revenue but also for directing investment flow and other desirable socio-economic behaviours". Addo (2008) revealed that, corporate tax revenue in Ghana increased consistently between 2003 and 2006 from 58% to 60%. Governments depend on corporate tax as one of its revenue to fund their economies. Nearly all Sub-Saharan African countries rely on income tax on wages, corporate profit, international trade and excise taxes for a substantial share of their revenues (Terkper, 1996) cited in (Norgah, 1998). For any government to raise the expected revenue to meet its expenditure, depends on a large extent to its tax policies (Addo, 2008). In addition to providing social amenities, governments also have to provide enough jobs to cater for the employment needs of its citizens. But government alone cannot meet the employment demands of the people. Therefore the heavy reliance on the private investors to create jobs to help government absorb the unemployed. It is often said that the private sector is the engine of growth of the economy. However, governments must create the right economic environment for the private sector to thrive. This is done through the use of fiscal or economic policies of which taxation policy is one (Ahiawodzi & Tsorhe, 2013).

It is observed that, corporate taxes reduce the amounts of incomes available to the private firms for re-investment to expand the economy. Higher corporate taxes are noticed to be a disincentive to privates' investment since they erode whatever profits that are made by the firm and hence scare away the private investor. Norgah, (1998), opined that an economy of deficits is not attractive to foreign investors and taxation is one of the means of ensuring the avoidance of deficits. However, higher taxes tend to drive out or scare off investors. This is the problem for any nation that wishes to attract foreign investors. Much as the nation wants to raise the maximum tax revenue from corporate tax, it is faced with the problem of ensuring that tax levels do not serve as a disincentive to private investment. The question to ask therefore is, what is the right level of corporate tax rate that will generate the optimum level of tax revenue and at the same time does not erode the investor's profits to the extent that they are thrown out of business? After all, profit is one of the major aim of every private investor. The extent to which privates' investment responds to the levels and changes in tax rates (elasticity of private investment to tax rates) is therefore the issue under consideration (Ahiawodzi & Tsorhe, 2013). In an attempt to balance the effects of tax on the investor, the tax system provides a lot of tax incentives including tax holidays, investment tax credits, capital allowances, lower taxes and tax rebates. These incentives go a long way to lessen the tax burden when taken advantage of by the investor. It is important to mention that, countries must be concerned about the trade-offs between the higher tax revenue from corporate taxes and the tax incentives (Ahiawodzi & Tsorhe, 2013). Apart from the usual factors of government attitude to private Investments, the caliber of public administration, political climate, foreign exchange convertibility and open trade policy, all have a critical effects on private investment. However it is further believed that a

favourable tax system acts as an incentive to private investment. It has therefore been an area of concern to any governments, with Ghana not exception. Investment is a necessary condition for the development of every nation. Hormats (2010) in alluding to how necessary investment is, indicated that "Investment also drives development". He further expounded on the Monterrey Consensus in March 2002, which outlined sound policies to attract international investment flows and adequate levels of productive investment as a key factors in sustainable development. Investment apart from assisting in producing needs for man's survival can also be used as a tool for transmitting technical change and product innovations. It is equally important for policy makers in developing countries to be able to assess how investment responds to changes in government policy, not only in designing long-term strategies but also in implementing short-term stabilization programmes (Hormats, 2010). The level of investment in Ghana is generally low, with the total investment in the 1970s standing at 12% of GDP on the average; in the 80s, it was 6% of GDP on the average. In the 1990s, however, the figure rose again to 12% of GDP on the average. There is therefore the need to investigate the factors that inhibit rapid investments growth in Ghana. Political upheavals in the 70s and early 80s reduced the level of confidence in the economy (Asante, 2000). Though private domestic and foreign direct investment has shown a considerable improvement, peaking at 16.7 percent and 3.3 percent of GDP in 2001 and 2000 respectively, there is still much to be done to increase it volume (Aryeetey & Baah-Boateng, 2007). According to the World Bank (1991), the level of domestic savings and investments are inadequate to fuel the growth needed to raise living standards and generate sufficient productive employments. The role of taxation cannot be overemphasized as a way of stimulating investments in Ghana. Private investments in Ghana have been affected mainly by

macroeconomic factors like inflation, interest rate and exchange rate volatilities (Asante, 2000). Although these situations have considerably been stabilized, there is still a problem to the privates' investment in Ghana. Ghana undoubtedly needs to raise her level of privates' investment to create more employments opportunities but ironically, corporate taxes seem high. In the 60s, corporate tax was around 65%. This figure reduced to 60% in the 70s and later 55%, and 35% in the 80s and 90s respectively. This figure was further reduced to 28% and 25% in 2005 and 2006 respectively (Budget, 2007). The 2012 Budget Statement saw an increase in corporate tax in the mining sector from 25% to 35%.The latter is still astronomical to investors but a revenue opportunity for government of Ghana. Such call for a special need to look at key issues retarding privates' investment in Ghana, which the compass to this problem signal corporate taxes as an indicative variable to consider, hence the need to investigate variables that impede investments in Ghana. This study therefore intend to empirically examine the economic impacts of corporate taxes on private investments in Ghana, taken into consideration the effect of other variables noted to equally have significant impact on private investments in Ghana . As a result, a lot of effort was displayed to extract quarterly data series from Bank of Ghana and the World Development Indicator from 1986 to 2011 as a bases to subject it into scientific analysis and arrive to a sound deduction, which will define the roots cause of poor privates' investment performance in Ghana

I. The Objective & Importance of Studies

The targeted objective of the studies was to examine both long and short- term economic impact of corporate taxes on private investments, to further establish the causal relation, if any,

with these chosen variables analyzed in the context of Ghana and offer policy recommendations. The vital reason behind this work, is to delve deeper into the economic effect of corporate taxes on privates' investment in Ghana. Which we believe is very crucial in understanding of how privates' investment is driven in Ghana, giving empirical guide for policy formulation. This is to provide a guide for further studies on performance assessment of the privates' sector investments growth of the economy. It augments the relatively scarce empirical literature on the short run and long run economic effect of corporate taxes on privates' investment in Ghana.

C. LITERATURE REVIEW AND THEORITICALS

The theories of investment date back to Keynes (1936), who first called attention to the existence of an independent investment functions in the economy. A central feature of the Keynesian analysis was of the observation that, although savings and investments must be identical ex-post, savings and investments decisions are, in general, taken by different decision makers and there is no reason why ex-ante savings should equal ex-ante investments. The next phase in the evolution of investment theory gave rise to the accelerator theory, which makes investment a linear proportion of changes in output. In the accelerator model, expectations, profitability and capital costs play no role. Keynesians have traditionally favored the accelerator theory of investment while disregarding the role of factor costs. A more general form of the accelerator model is the flexible accelerator model. The basic notion behind this model was that, the larger the gap between the existing capital stock and the desired capital stock, the higher a firm's rate of investment. The hypothesis is that, firms plan to close a fraction of the gap

between the desired capital stock, K*, and the actual capital stock, K, in each period. This gives rise to a net investment equation of the form

$$I = \delta\,[\,K^{*} - K_{-1}\,]\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where I = net investment, K* = desired capital stock, K_{-1}= last period's capital stock and δ= partial adjustment coefficient. In the framework of the flexible accelerator model; output, internal funds, cost of external financing and other variables are classified as determinants of K*. The flexible accelerator mechanism may be transformed into a theory of investment behaviour by adding a specification of K* and a theory of replacement investment. Alternative econometric models of investment behavior, differ in the determinants of K*, the characterization of the time structure of the investment process and the treatment of replacement investment. In the flexible accelerator model, K* is proportional to output, but in alternative models, K* depends on capacity utilization, internal funds, the cost of external finance and other variables. Another most influential structural analysis of investment for the last two decades has been the Jorgenson model (Jorgenson, 1971), pioneered by Dale Jorgenson and his followers. The framework of the Jorgenson investment model is as follows;

$$I_{t=}\ \alpha\beta_{j}\Delta\left(Y_{t-j}\,C_{t-j}^{-\sigma}\right) + \mu\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2,\ \text{j=0}$$

Where "I" is real investment, "Y" is output, "C" is the user cost of capital, to be defined in details later, "σ" is a constant elasticity of substitution between capital and other inputs in production function, "μ" is a random error, "α" and "β_j" are the parameters, and "Δ" is a lag operator. Behind this framework is the neoclassical theory, which deduce that competitive firms would maximize their discounted flow of profit by achieving instantaneously and an optimal (desired) capital stock "K" for the given output "Y", that is,

$$K_t^* = \alpha Y_t C_t^{-\sigma} \text{.....3}$$

Where “C” is the user cost of capital, defined exactly as;

$$C_t = P_t^1 \frac{(r_t + \delta)(1 - m_t - z_t)}{(1 - t_t)} \text{.....4}$$

Where "P_t" is relative price of capital goods (relative to price of output), "r_t" is the Real financial cost of capital, “δ” is the capital depreciation rate, which is assumed to be geometric, "m_t" is the rate of the investment tax credit, "z_t" is the tax depreciation allowance rate, "t_t" is the corporate income tax rate. Although firms are assumed to be able to obtain any optimal capital stock "K_t^*" instantaneously, “α”, distributed lag on new investment orders is also assumed so, that the net investment equals the change in the desired optimal capital stock as given below:

$$I_t = \sum \beta_j \Delta K_{t-1}^* \text{ .....5, } j=0$$

Combining equation 5 with equation 3 will yield the Jorgenson investment function as observed in equation 1. The Jorgenson investment model is considered to be the first systematical framework to define investment as a structural function of both the quantity and the relative price variables, although the framework defined in equation “1” can be treated as a more general form of some earlier investment models prior to Jorgenson. For example, if j is assumed to be zero, that is, if the impact of price variables (relative price of capital goods, interest rate, etc.) on investment is ignored, then equation “1” will become the Flexible Accelerator Investment model originated by H.B. Chenery as cited in (Chinery & Strout, 1966). Furthermore, if the distributed lags are also omitted, then it will become the simple Accelerator investment model also proposed by J. M. Clark (Clark, 1917). The policy implications for investment are

defined in the Jorgenson model through variables in the user cost of capital. Thus monetary policies would directly affect variable "r". Then the fiscal policies, especially tax policies, would affect variables "m", "z" and "t" directly. The Jorgenson framework has been adopted for specification of investment functions in many macro-econometric models for forecasting and policy analysis. However, it has also received many criticisms (Chirinko, 1993). First of all, the theoretical framework is inconsistent in terms of the profit maximizing behaviour of firms: Firms are assumed to maximize the profit flow by choosing the desired capital stock (K_t^*), nevertheless, the distributed lags of delivery are imposed outside of the maximization decision process so that the investment path generated by the Jorgenson framework may not be optimal except for the case of static expectation. Secondly, the treatment of expectation in this investment framework is essentially static or extrapolative, which is regarded by some economists as to be fundamentally inconsistent with the forward looking nature of investment. Thirdly, the general neoclassical assumptions behind the Jorgenson investment framework are not accepted by all economists. For example, if the assumption of decreasing rate of return to scale is not held for the production function, the optimal capital stock, K, will not be well defined. Also, if markets (markets of goods and service, of labour and of finance) in a real economy are not as frictionless as assumed by the neoclassical theory, the framework will not be applicable (more on this criticism in the latter discussion of investment models for developing economies). There are more criticisms, such as the absence of consideration of vintage effect of capital-the new capital and the existing capital are assumed to be homogenous in this investment framework, but in reality they may not be the same and cannot be combined together at any desired proportions

(Chirinko, 1993). Structural investment functions, especially the Jorgenson type investment functions, have been widely used in many macro econometric models for forecasting and policy analysis. However, since the late 1970s, these models have been challenged by the Rational Expectation Theory. Known as the Lucas Critique (Lucas, 1976), the Rational Expectation school claims that these models have fundamental flaws and are of no value in evaluating policies, because the expectations of individual agents are either ignored, or miss-specified in these models. The key point of the Rational Expectation Theory is not the importance of expectation in economic decision making, which has been recognized by many economists as early as Keynes (1936), instead, it is the hypothesis that individuals are "rational" so that they should not make systematic errors in forming their expectations. By further assuming that all individual agents would share the same macro-econometric model, the theory claims the expectations of all individual agents should converge to the expectation specified in the macro-econometric model and should be equal to the exact true mathematical conditional expectations implied by the model itself. Therefore, whenever government changes a policy (the Rational Expectation theory considers policy rules, not discretionary policies), the expectation would change, that is, the parameters representing expectations in the model should vary for an alternative policy, rather than remain invariant as in most mainstream macro-econometric models (Lucas, 1976).

The Rational Expectation Theory has not been agreed by all economists. Some economists pointed out that the hypothesis was unrealistic at the micro level and superficial when it is applied to macro analysis (Miller, 1994). While there is no doubt that the Rational Expectation Revolution did create a large impact on academic research-at least for a decade, the hypothesis has been used as a fashion in most economic research to generate views totally different from

mainstream economics. However it has, had a little impact on the policy-making community who had continued to rely on the traditional models. The reason is, in addition to the theoretical debate, the theory is either irrelevant or inapplicable to empirical model based on policy analysis (Chirinko, 1993). Another approach dubbed “neoliberal” (Galbis, 1979) emphasizes the importance of financial deepening and high interest rates in stimulating growth. The proponents of this approach are McKinnon and Shaw (1973). The core of their argument rests on the claim that, developing countries suffer from financial repression (which is generally equated with controls on interest rates in a downward direction) and that if these countries were liberated from their repressive conditions, this would induce savings, investments and growth. Not only will liberalization increase savings and loanable funds, it will result in a more efficient allocation of these funds, both contributing to a higher economic growth. In the neoliberal view, investment is positively related to the real rate of interest in contrast with the neoclassical theory. The reason for this, is that, a rise in interest rates increases the volume of financial savings through financial intermediaries and thereby raises investible funds, a phenomenon that McKinnon and Shaw (1973) calls the “conduit effect”. Thus, while it may be true that, demand for investments, declines with the rise in the real rate of interest, it is realized, investments actually increases because of the greater availability of funds. This conclusion applies only when the capital market is in disequilibrium with the demand for funds exceeding supply. Boadway (1978) investigated the most efficient scheme of investment tax incentives in the neoclassical theory of investment and concluded that investment allowances and tax credits on gross investment over and above regular depreciation are efficient investment incentives. Sandmo (1974) and Averbach (1987) independently analyzed the effects of corporate income taxes on

investments incentives. Sandmo (1974) used the neoclassical framework of investment and capital, which he found that, corporate income tax changes relative prices in favour of either short term or long-term capital goods depending on relative magnitudes of parameters involved. Averbach (1987), introduced personal income taxation and inflation in the model and found out that taxation had implications for risk taking and hence the type of investment undertaken. Corporate taxes reduce the return of equity holders and therefore tends to reduce risk taking. Earlier, Sandmo (1974) had concluded also that investment allowances and gross investment tax credit without basis in adjustment, favours short-term investment. However, Shah and Baffes (1991) concluded that investment incentives have not been effective in stimulating investments. The empirical findings though mixed, they are particularly relevant since they provide an explicit treatment of effect of taxation. Se-hark (1985) who had made studies on developing countries on investments planning reveals that investment and inflation are linked, as well as the size of government deficit. The linkage stems from the fact that government deficits were mainly contributed by the Implementation of ambitious Investment programs and predominantly financed by unrestrained credit expansion from the banking system, which is not able to take independent decisions on monetary policy due to weak capital markets. Attitudes and policies toward foreign direct Investments is very important, if more Investments is to be encouraged in a country. A research carried out in Central American business community towards direct foreign Investments in 1969 under the auspices of the organization of American states show that 77% of businessmen interviewed expressed that direct foreign Investment was desirable in general, but 80% of those interviewed favoured some type of government control or regulation of direct Investment flows. Representation from the privates' sector recognize the possible

benefits of private Investment, but nonetheless favours regulation because of the possibility that they themselves will be unable to compete with foreign owned enterprises. A Research carried out by Schneider (1985) found that there was direct empirical link between government policy variable and private capital formation. The result further proves that privates' Investment in developing countries is constrained by the availability of deficit financing and that of monetary policy, by varying the flow of credit from the Public Sector to the private Sector, this can change Investment decisions in the private sector. The tightening of monetary policy which is an element of stabilization Policy would be expected to have adverse effect on the level of private Investment and would lead to a reduction in economic growth. Furthermore the flow of foreign capital may be affected by inappropriate exchange and interest rate polices and this may impact negatively on private investment. There is empirical findings which suggest that debt overhang and amortization can affect Investment, which is confirmed by Faimi and Melo (1990) paper; assessing that, debt burden has adverse effects on investmens. Also Fitzgerald, Vos and Jansen (1994) looked at 22 developing countries from 1970 – 90 and found out that, the ratio of external debt to GDP have negative impact on private Investment. Server (1997) also confirmed this by saying uncertainty and instability are Investments deterrent after his research. He further found out that, terms of trade and real exchange volatility are adversely related and had effect on privates' Investment. Patillo (1997) worked at various regimes and some kind of uncertainty it had on irreversible Investment decisions using Ghana as an example, which has had several political regimes, some socialist, and some capitalist. She found out that, firms that expects unfavourable political regimes is more hesitant to invest and would have only a small level of investment as response to favourable current response trends, this is driven on the reason of

being too cautious about the future. Mint (1994) found out that when capital is imported, and the government of the foreign investor taxes the profit of that particular investor and also taxed by the country where it plans to invest, resulting in double taxation, and the Investor knows he can only have marginal profit, this many serve as a disincentive. They also looked at the rate of accelerated depreciation, which is, if an asset is capital in nature and long-lived with depreciation allowances for tax purposes, is accelerated; and yet an attempt is made by a country to prevent depreciation deduction during periods of peak profits, will prevent a firm from Investing in such a country, even during such tax holiday. He further said, if effective rates and user cost of capital under tax holiday system allows depreciation allowances to be deferred until after the holiday, would be very beneficial to the firm and can act as a good incentive for Investments. According to Lent (1991) re-investment allowance can serve as an incentive for expanding businesses. It is exempt from all income tax or part or corporate earnings that are retained and invested in approved projects. This is similar to a grant, and lowers the risk element in business and allows a business to recoup its capital quickly and can serve as a good incentive in attracting potential investors into a country. In a related study, Asante (2000) employed the Ordinary Least Squares approach to model private investment behaviour in Ghana using time series data over the period 1970 to 1992. Asante finds a positive public-private Investment relationship which was significant at the 1% level suggesting a “crowding-in” effect of public investment on private investment thus confirming the theoretical hypothesis between the two variables. The growth rate of real credit to the private sector also has a significant positive sign in all the trials. Furthermore, the measure of macroeconomic instability has a negative sign in the trials and significant at the 1% level particularly inflation rate. Asante also established the detrimental

effect of over-valued exchange rates, corruption and erratic import licensing, foreign exchange quotas for various sectors and rent-seeking activities on private investment over the study period. The political dummy representing political instability was highly significant and negative in all the trials. Lagged private investment /GDP ratio was also found to be positive and significant, indicating a good investment climate, which act as a good indicator for current investment decisions. GDP growth rate had negative significant sign contrary to expectation but marginally significant in a few trials thus rejecting the accelerator theory of investment in Ghana. Badawi (2004) investigated the impact of macroeconomic policies on private investment in Sudan employing annual data over the period of 1969-1998. The focus was on public investment, credit, devaluation, and interest rate policies while blending co-integration, vector autoregressive (VAR) and error correction techniques to estimate the long and short run coefficients. The results suggested significant crowding-out effect of public investment over private investment in Sudan. Devaluation policies also contributed to discouraging private sector capital expansion. Monetary policy in the form of restricting domestic credit appeared to have had a significant impact on private investment. This was indicated by the positive impact of banking sector credit on private investment. Increasing real interest rates has been impacting negatively on privates' investment in Sudan. Blejer and Khan (1984) incorporated features of the neoclassical model into investment models for developing countries. Their approaches took into account the relevant data problems and structural features that caused a gap between the modem theory of investment and the models that were specified for developing countries. They focused on the role of government policy and derived an explicit functional relationship between the principal policy instrument and private capital formation. Using the model, they were able to

assess the extent of any “crowding out”. The second extension that Blejer & Khan (1984) did was to make a distinction between government investment that is related to the development of infrastructure and government investment of other kinds. They found a positive relationship between the share of private investment in total investment and the ratio of total investment to income. They also found that the larger the share of private investment, the higher the average growth rate of the economy. These patterns indicate the relevance of private investment behaviour in developing countries and call for the testing of formal models of private capital formation in individual countries. Two principal conclusions emerged from Blejer & Khan’s (1984) tests of formal model for 24 developing countries. The first was the possibility of identifying well established empirical function for private investment in developing countries. This challenged the traditional view that standard investment theory is not relevant for developing countries and conclude their theory by establishing a direct empirical links between governments. Shrestha and Chowdhury (2006) used the Autoregressive Distributive Lag (ARDL) modeling approach for 34-year period data from 1973 to 2003 to test the financial liberalization hypothesis, which specifically relates to effect of interest rate on savings and investments. Their findings strongly supported the crux of the McKinnon-Shaw financial liberalization hypotheses that, interest rate has a significant positive relationship with savings and savings was found to be positively related to investment, hence a positive relationship between interest rate and investment. Reinhart and Tokatlidis (2001), in a study of 50 countries (14 developed and 36 developing) report that financial liberalization appears to deliver: higher real interest rate (reflecting the allocation of capital toward more productive, higher return projects.); lower investment, but not lower growth (possibly owing to a shift to more productive uses of financial

resources); a higher level of foreign direct investment; and high gross capital flows. Liberalization appears to deliver financial deepening, as measured by the credit and monetary aggregates-but, again, low income countries do not appear to show clear signs of such a benefit. As regards savings, the picture is very mixed. In some regions, saving increased following financial sector reforms; but in the majority of cases saving declined following the reforms. Indeed, it would appear that what financial liberalization delivers is greater access to international capital markets, although this appears to be uneven across regions and income groups. Bandiera, Caprio, Honohan and Schiantarelli (2000) constructed an index of financial liberalization on eight sovereign nations based on these three indicators prudential regulation; securities markets deregulation; and capital account liberalization. Their data spans from 1970-94 for Chile, Ghana, Indonesia, Korea, Malaysia, Mexico, Turkey and Zimbabwe. Among the key findings of the estimation of their benchmark model is that, there is no evidence of any positive effect of the real interest rate on saving. Indeed in most cases the relationship is negative, and significantly so in the cases of Ghana and Indonesia. Furthermore, the effects of the financial liberalization index on saving are mixed: negative and significant in Korea and Mexico, positive and significant in Turkey and Ghana. The long run effect of financial liberalization is sizeable. Corresponding to the realized change in the index, the estimated model indicates a permanent decline in the saving rate of 12% and 6% in Korea and Mexico, and a rise of 13% and 6% in Turkey and Ghana respectively. Naa-Idar, Ayentimi and Frimpong (2012) employed the techniques of co-integration and error correction modeling to identify the determinants and their respective nature of relationship with private investment in Ghana over the period of 1960-2010 both in the short run and long run perspectives. Their study employed mechanisms to deal with the problems of

unit root faced in time series data and they found that inflation, exchange rate, public investment, GDP, trade openness, aid and external debt both in a short run and long run significantly affect the level of privates' investment. They again applied the general to specific approach to error correction model and statistical results, suggested the existence of stable long run co-integrating relationship between macroeconomic and other variables on private investment. Eregha (2010), with time series data for the period of 1970- 2002, employed dynamic model of two equations using instrumental variable technique estimation to examined the variations in interest rate and its impact on investment in Nigeria. His results revealed that investment decision played a negative and significant role in interest rate behaviour in the short run and long run, while aggregate savings, government spending and money stock played a positive significant role in interest rate changes. He then identified that interest rate plays a highly significant positive role in investment decisions in Nigeria. Ronge and Kimuyu (1997) examined the determinants of private sector investment for Kenya, using data over the period 1964-1996. A double logarithmic form of the investment equation was estimated using OLS. The results indicated that both the availability of credit and foreign exchange exerts significantly positive effects on private investment confirming the results in most empirical studies. Private investment however, was adversely affected by the stock of debt. Specifically, a 1% increase in the lagged debt to GDP ratio reduced private investment by 0.3%.The study also established a negative effects of exchange rate depreciation on investment while public investment crowded in private investment, contrasting the results of Were (2001) for Kenya where crowding-out was found. Interest rate was also found to be less important in determining the level of private investment in Kenya. Akpalu (2002) used annual time series data from 1970 – 1994, on Private

Investment, Public Investment, Real GDP, Consumer Price Index (CPI), Lending Rate, Credit to the private sector and GDP per capital, to model the determinants of private investment. He employed the Engle-Granger Two Step procedure and the Johansen multivariate test. The study reveals that, in relative terms, the private investment in the short-run responds more, to real per capital income growth, credit availability and public investment. Public investment was found to crowd-out private investment. There was also a significant negative relationship between cost of capital and private investment in both the short and long run. Further, a significant positive relationship between real GDP and private investment was found in both the short and long run models but was not significant in the short- run. This result indicates a confirmation of the accelerator theory of investment in Ghana. The Consumer Price Index however was found not to be significant in both situations. Islam and Wetzel (1991), in a World Bank Study empirically examined the link between real private investment on one hand and real public investment/GDP, corporate tax revenues/GDP, credit to the private sector /GDP, real rate of interest and a dummy for 1976. The dummy for 1976 was included because of the large and unexplained drop in private investment in that year. Employing Ordinary Least Squares (OLS), they found a negative public-private relationship and a positive relationship between corporate tax revenue and flow of credit to the private sector in the case of Ghana thus confirming the findings of Akpalu (2002) but contrast that of Asante (2000) where public investment was found to crowd-in private investment in Ghana. The study also established a positive relationship between corporate tax revenue and flow of credit to the private sector with all the variables having significant coefficients. However, real interest rate was found not to have a substantial effect on private investment even though it has the expected negative sign. Thomas (1997) in his study of 86

developing countries examined data on terms of trade, real exchange rates, property rights and civil liberties and concluded that while factors including credit availability and the quality of physical and human infrastructure are important influences, uncertainty in the investment environment was negatively related to private investment in sub Saharan countries. Employing the variability in real exchange rates as an explanatory variable in regression analysis, in his cross-country study on the macroeconomic environments and privates' investment in six Pacific Island countries, observed a statistically significant negative relationship between the variability in the real exchange rate and private investment. Vergara (2004) empirically modeled the link between corporate tax reform and private investment performance of Chile in 1975-2003. The result affirmed the theoretical underpinning, that privates' investment is negatively affected by higher corporate tax rates. Furthermore, crowding-in effect of public investment was established while the investment climate, proxied by the lagged private investment was found to boost private sector investment in Chile. Attar and Temel (2002) in their paper "Modeling Private Manufacturing Investment in Turkey", modeled private investment in the manufacturing sector in Turkey. The empirical results showed that in the long run, private manufacturing investment responds positively to an increase in the manufacturing sector's real income and negatively to an increase in public investment or cost of capital. Mbanga (2002) investigated the impact of external debt on private investment in Cameroon from 1970-1999. Using time series data over the period under the study, he finds the investment accelerator effect in existence since a significant positive real GDP-private investment relationship was found. The "debt overhang" hypothesis was also confirmed in the case of Cameroon as well as the "crowding-out" effect of debt service ratio. Public investment however crowded-in private investment. While the

investment climate captured by the lagged value of private investment, stimulates current levels of investment. There was also a confirmed positive and significant relationship between credit expansions and private investment whereas deteriorating terms of trade and depreciating real exchange rate had negative effects on private investment. Mehrara and Musai (2011) investigated the nonlinear relationship (inverted U) between real interest rate and private investment in developing countries during 1970-2007 based on threshold dynamic panel approach. Results indicate that real interest rate have positive effect on the private investment below threshold level, but beyond the estimated threshold, real interest rates have negative effect on private investment. The results indicate that the threshold of real interest rate above which interest rate significantly slows growth is around 5-6 percent for these economies. So if real interest rates increase beyond the threshold, its effect on investment is negative. Marbuah and Frimpong (2010) did an empirical work on factors determining foreign direct investment in Ghana using the error correction technique within an ARDL framework. The findings show that in the short run, private investment is determined by public investment, inflation, real interest rate, openness, real exchange rate and a regime of constitutional rule in the short-run. Again, real output, inflation, external debt, real interest rate, openness and real exchange rate significantly influenced private investment response in the long-run. Kotlikoff (2011) in a study on the topic: is the corporate income tax regressive? Revealed that, the U.S. corporate tax income is relatively high compared to many other countries. Again, statutory tax rate is 35%, but their effective rate is lower, at 28% due to subsidies and tax credits and other tax breaks that corporations receive on their investments. It came out that, some countries like Portugal lower the effective rate to 19%. High corporate tax encourages U.S. corporations to invest overseas, and discourage

foreigners from investing in the United States. This reduces demand for U.S. workers, compared to what it would be if U.S. tax rates were lower. As a result, American workers' wages are lower than they otherwise would be. Conversely, increased overseas investment raises the wages of workers abroad. The study concluded that US tax system is regressive and that if the United States cut its corporate income tax rate dramatically, the country would likely experience a huge rise in net domestic investment, which is now running at a post-war low of 4 percent. This would, potentially, raise U.S. workers' wages dramatically by as much as 10 percent. As part of the conclusions, the study recommended elimination of corporate income tax in the US. Ahiawodzi and Tsorhe (2013) also investigated the effect of corporate income tax rate reforms on private investment in Ghana where a model was specified with private investment as a dependent variable and six independent variables including corporate income tax rate by employing the Ordinary Least Square (OLS) multiple regression technique for the estimation. The empirical results revealed that the level of corporate income tax rate in Ghana, adversely affected the level of private investment during both pre-tax reform and post-tax reform period. In the same study interest rate also had a negative effect on private investment during the period of the study.

D. METHODOLOGY & EMPIRICISM

The scope of the study, was to critically examine the effects of corporate taxes on the level of privates' investment in Ghana by including other controllable variables for comparative studies. The analysis for deduction was built on the quarterly data series from 1986 to 2011 from World Development Indicator of the World Bank and Bank of Ghana as 25years data study period.

Which was proxied by gross fixed capital formation under privates sector Investment category.

Variables considered for studies were as follows

i. Corporate Taxes

ii. Inflation measured under consumer price index

iii. Exchange rate measured under nominal rate

iv. Public Investment

v. Government Expenditure

vi. Real GDP

vii. Domestic Credit

This study employed the Johansen approach to co-integration, however, one major limitation with the Johansen approach to co-integration is that, it is based on VAR methodology that is inherently over parameterized, which is sensitive to both model specification and lag length selection. The selected lag length has implications for the outcome of the co-integration and causality test. Nevertheless, the co-integration and causality test of our work, produced consistent results. Another observed challenges, which has confronted previous researchers, was unavailability of quarterly data, particularly in developing countries, as requisite variables suggested by the theoretical models in the determination of privates' investment analysis. This means that some of the variables either have to be excluded in the empirical model, albeit with the risk of an Omitted variables bias, or proxies have to be found for those variables for a complete model analysis. The risk involved in finding proxies, is the situation of not correctly representing the impact of the actual variables of the material market, resulting in inconsistent results. Striking this balance, poses a serious challenge to empirical studies on the determinants

of private Investment analysis. However, these problems seem not to have significantly affected the constructs of this study, since they are consistent with both the theoretical and empirical literature

I. Hypothetical Constructs towards the experimental tests

Hypo-Test 1:

H_0 *; There is no long run economic impacts of corporate taxes on privates' investment in Ghana*
H_1 *; There is a long run economic impacts of corporate taxes on privates' Investment in Ghana*

Hypo- Test 2:

H_2*; There is no short run economic impacts of corporate taxes on privates' investment in Ghana*
H_3*; There is a short run economic impacts of corporate taxes on privates' investment in Ghana*

Hypo-Test 3:

H_4*; There is no causal relationship between corporate taxes and privates' Investment in Ghana*
H_5 *; There is a causal relationship between corporate taxes and private' Investment in Ghana*

This study adopted the quantitative research design. With respect to the objectives of this study, systematical approach was adopted to collect and present data in a method of examining the effect of corporate taxes on private investments in Ghana by including other control variables. The significant efforts of this research design, was to maximize objectivity, replication and generalization of findings. This research design ensures that researchers set aside their personal prejudices and biases to ensure objectivity in the conduct of the study, for quality conclusions to be drawn. This ensure an accurate and valid representation of the variables that are relevant to the objectives of the study. Analyzing the purpose and the objective of the study

in selecting the best model of analysis applicable and realistic, flexible accelerator was adopted and expressed as

$$\iota^{g} = \left(\frac{\alpha}{c}\right) \Delta Y + \delta K \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

Where $\iota^{g} = Investment;\ \delta K = Replacement\ investment; \frac{\alpha}{c} = user\ cost\ of\ capital;\ \Delta Y = Change\ in\ output$

To capture all relevant variables from both Keynesian and Neoclassical traditions, the study adopted a general model whose functional form is expressed as in equation 7: The variables in the study were chosen based on theories of investment and empirical literature. Thus the study follows Cebula and Koch (1989) and Asante (2000) by adopting their model specification for private investment with some modifications. The private investment equation is then specified as in equation one (1)

$$PRIV_t = \eta\ (CTAX_t\ , INT_t, PUB_t, RGDP_t, EXR_t, CPI_t, M2_t) \ldots\ldots\ldots\ldots\ldots\ldots 7$$

Where $PRIV_t$ is private investment, $CTAX_t$ is corporate tax, INT_t is interest rate, EXR_treal exchange rate, CPI_t is consumer price index a proxy for inflation, $RGDP_t$ is real GDP, PUB_t is public investment, $M2_t$ is money supply. Consistent with the objectives of the study and in accordance with the literature, the study applied natural logarithm to equations (7), with the Exception of the interest rate and corporate tax; resulting in the estimation of a log-linear model forming equation (8)

$$Log\ PRIV_t = Log\ \eta + \alpha_1 INT_t + \alpha_2 LogPUB_t + \alpha_3 LogRGDP_t + \alpha_4 LogEXR_t + \alpha_5 LogCPI_t + \alpha_6 LogM2_t + \alpha_7 CTAX_t + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 8$$

Given that $\log \eta = \alpha_0$, then the long run model for private investment will be deduced as;

$$Log\ PRIV_t = \alpha_0 + \alpha_1 INT_t + \alpha_2 LogPUB_t + \alpha_3 LogRGDP_t + \alpha_4 LogEXR_t + \alpha_5 LogCPI_t + \alpha_6 LogM2_t + \alpha_7 CTAX_t + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 9$$

However in the short run, private investment may depend on its own lagged values, lagged values of interest rate, consumer price index, public investment, real GDP, exchange rate, money supply and corporate tax. As a result, the expected relationship among these variables are deduced below as the equation 10:

$$\Delta Log\ PRIV_t = \alpha_0 + \sum_{i-1}^{j} \delta\ \Delta LogPRIV_{t-i} + \sum_{i-1}^{k} \alpha_2\, \Delta\, LogPUB_{t-i} + \sum_{i-1}^{q} \alpha_3\, \Delta LogRGDP_{t-i} + \sum_{i-1}^{w} \alpha_4\, \Delta\, LogEXR_{t-i} + \sum_{i-1}^{n} \alpha_5\, \Delta\, \mathrm{Log}CPI_{t-i} + \sum_{i-1}^{h} \alpha_6\ \Delta \mathrm{Log}M2_{t-i} + \sum_{i-1}^{m} \alpha_7\, \Delta CTAX_{t-i} + \varphi ECT_{t-1} + v_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 10$$

The expected signs of parameters according to equation 10 is as follows;

$$\alpha_1 \prec 0,\ \alpha_2\ \succ or \prec 0, \alpha_3 \succ 0, \alpha_4 \prec 0, \alpha_5 \prec 0, \alpha_6 \succ 0, \alpha_7 \prec 0$$

While PRIV, INT, PUB, RGDP, EXR, CPI, M2 and CTAX are already defined above, “μ” and “v” is the error terms for both the long-run and short-run model respectively, “t” as time subscript and Log is the logarithm of the respective variables. Note that α_1 to α_7 are the elasticity’s of the respective variables with "φ" showing the speed of adjustment to the long-run when there is a short run disturbance in the system, “Δ” is a difference operator and $ECT_{t-1}$is error correction term, lagged one period and "α_0" is the drift component. We applied the natural logarithm in order to effectively linearize exponential trend (if any) in the time series data, since the log function is the inverse of an exponential function (Asteriou & Price, 2007).

II. Definition of Investment according to this study

In the theoretical concept of investment, the change in capital stock during a period is the study focus. The investment flow in a period can be calculated as the difference between the capital stock at the end of the period and the capital stock at the beginning of the period. Thus, the investment flow at a time period t, could be defined as: $\boldsymbol{I_t = [\,K_t - (K_{t-1})]}$ Where, ‘K_t’ is the stock of capital at the end of period‘t’ and ‘K_{t-1}’ is the stock of capital at the end of period‘t-1’ (and thus at the beginning of period). For the purpose of this study, investment is any expenditure that is aimed at increasing the value of a business. Thus private investment is aimed at increasing value of a private business, which is not made by the government.

III. Definition of Corporate tax according to this study

Corporate tax refers to a tax imposed on entities, taxed at the entity level in a particular jurisdiction. It could also be interpreted as a levy placed on the profits of firms with different

rates based on different levels of profits. Thus corporate taxes are taxes against profits earned by businesses during a fiscal year. Corporate tax reduces the amounts of incomes available to the private firms for re-investment to expand the economy. Higher corporate taxes is a disincentive to privates' investment, since they erode whatever profits made by the firms and hence scare away the private investors. According to Norgah (1998) an economy of deficits is not attractive to foreign investors and taxation is one of the means of ensuring the avoidance of deficits. However, higher taxes tend to drive out or scare off investors. Given that all other factors remain constant and following Norgah (1998), corporate taxes is expected to be negatively related to private investment $\alpha_7 \prec 0$

IV. Interest Rate definition according to this study

Interest rate is the amount of money paid in addition to the principal capital by the borrower, who has been extended a credit facility. The effect of interest rate on private investment in developing countries is potentially ambiguous. Under the neoclassical investment model, interest rate is treated as a key component of the user cost of capital and therefore affect private investment negatively. However, there is also an argument that, a higher interest rate increases the flow of bank credits, which complements the private sector savings and furthermore facilitates private capital formation and hence private investment. Thus, a negative coefficient of real interest rate will imply user cost of capital effects, whereas a positive real interest rate would support the complementarity hypothesis. In other words, the sign of interest rate is an empirical issue and depends on whether the data support the McKinnon-Shaw hypothesis or the neoclassical model. But for the purpose of this study and following the

neoclassical arguments, interest rate is expected to have negative effect on privates' investment as defined by the parameter $\alpha_1 \prec 0,$ when all other factors are held in constant.

v. Exchange rate definition according to this study

Exchange rate is the rate in which the Central bank of a nation is prepared to purchase a foreign currency. There is no theoretical debates on the effect of exchange rate in developed countries but developing countries are so vulnerable to imports particularly the intermediate and capital goods. Therefore, changes in exchange rate are crucial for output. Thus an increase in exchange rate or depreciation of the importing country's currency (Ghana Cedi), production cost increases and investment returns decreases thereby discouraging investment. (Serven & Solimano, 1992). Exchange rate acts as an adverse supply shock in the production of investment goods as argued by Chibber and Mansoor (1990). Given that all other factors remain constant and following Serven and Solimano (1992) and Chibber and Mansoor (1990), then exchange rate is expected to be negatively related to private investment $\alpha_4 \prec 0$.

vi. Inflation definition according to this study

Inflation is an explanatory variable in the model and is used as a proxy for macroeconomic instability because it measures the persistent increase in the general price levels. In Tobin-Model, a high rate of inflation lowers the interest rate thereby moving portfolio adjustments away from real money and balances it towards real capital assets (Tobin, 1969). Thus a high rate of inflation is expected to decrease interest rate, thereby decreasing investment, according to this model. But in developing countries, inflation act as a proxy for macroeconomic instability

and may increase uncertainty and affect private investment adversely. Again, high and unexpected rate of inflation is expected to lead to a contraction of private investments. This is because it causes distortions of relative prices, increases the risk of long term investments and reduces the average maturity of commercial lending as confirmed by Akporkodje (1998). Given that all other factors remain constant and following Tobin (1969) and Akporkodje (1998) inflation proxied by consumer price index is expected to be negatively related to private investment $\alpha_{5<}0$

vii. Definition of Public Investment according to this study

Public investment encompasses investment in physical infrastructure made by government and public corporations. The impact of public investment on private investment is another important issue in many studies of investment in developing economies, since the ratios of public investment to GDP are comparatively high in many developing economies. Theoretically, no general conclusion could be made on the effect of public investment on private investment. It can be positive or negative, depending on the specific case. When public investment involve infrastructure, such as transportation and communication system, schools, utility system, it will have positive effect on private investment because the investment in these systems will facilitate the implementation and realization of private business activities. Increased public goods and services from these systems will generate large spillover benefit and tend to increase the total factors of productivity and labor efficiency. Meanwhile, increasing public investment will increase aggregate demand and thus will directly raise the expected rate of return on private investment. However, on the negative side, when public investment involve large state owned enterprises producing competitive goods and services, competing with the private sectors, it will

have substitute, or crowd-out effects on private investment. Moreover, when large spending for public capital leads to large internal and external indebtedness, or heavier tax burden, higher interest rates, or credit rationing, it will crowd out private investment. So, the overall effect of public investment on private investment is uncertain and complex. Hence given that all the other factors remain constant, public investment is expected to have a positive or negative effects on private investment α_2><0.

viii. The Definition of Money Supply according to this study

Money supply (M2) from the World Development Indicators (WDI) is defined as money and quasi money plus foreign currency deposits to the banks excluding those of government. With the quantitative theory of money, money stock can be represented by any monetary aggregate. However the choice of M2 is based on the fact that, it is broad and covers most financial transactions in Ghana. Given that all things remain constant and following Keynesian position, we expect money supply to be positively related to private investment hence α_6>0.

ix. Techniques adopted to estimate relationship among variables

To examine the long run and short run relationship among the main variables of studies, we employed the Granger causality test within the framework of co-integration and error-correction models. The Augmented Dickey-Fuller (ADF) and the Phillips-Perron test statistics were equally employed to analyze the time series properties of the data set. This was done by carrying out the following steps carefully, as stated below;

1. Unit roots test was applied to determine whether our variables are stationary.
2. We tested for the co-integration using Johansen's multivariate approach.
3. Finally, granger-causality was employed to test for causality.

The causality test preceded co-integration testing because the presence of Co-integrated relationships; has implications for the way in which causality testing is carried out.

1.1. Unit root tests

The results related to long-run as well as short-run relationship often rests on the observation period and the economic techniques used. In this regard, when time series data are used for analysis in econometrics, several statistical techniques and steps must be undertaken. First of all, unit root tests was applied to each series, individually in order to provide information about the stationarity of the data. To test for the presence of unit roots and to determine the order of integration in other to obtain statistically stationary series of variables, Augmented Dickey Fuller Test and Philips-Perron was equally applied. The ADF test is based upon estimating the following equation sectioned as 11

$$\Delta X_t = \alpha + \delta t + \rho X_{t-1} + \sum_{i-1}^{p} \lambda_i \Delta X_{t-1} + \varepsilon_{1i} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 11$$

The use of ADF, is to test the null hypothesis, that a series of data contains unit roots against the alternative hypothesis with an evidence of no unit root. That is;

$$H_0 : \rho = 0 \mid H_1 : \rho \neq 0$$

Where "X_t" represents the series at time "t", "Δ" is the first difference operator, $\alpha, \delta, \rho, \lambda$ are the parameters to be estimated and "ε" is the stochastic random disturbance term. It is widely

known that the ADF tests do not consider cases of heteroscedasticity and non-normality that are regularly disclosed in raw data of economic time series variables, and are also unable to discriminate between stationary and non-stationary series that has a high degree of autocorrelation. The Philips-Perron (PP) test for unit roots is also used in the empirical analysis in order to resolve this problem. It is also observed that, the PP test is superior to the ADF test in situations where the time series variables under consideration have serial correlations and a structural breaks. This is based on the assumptions inherent in both tests. The ADF test assumes the error terms are independent with a constant variance, whereas the PP test assumes, the error terms are weakly dependent and heterogeneously distributed and thus provides robust estimates over the ADF and is specified as follows:

$$\Delta X_t = \alpha + \lambda_2 X_{t-1} + \theta\left(t - \frac{T}{2}\right) + \sum_{i-1}^{m} \theta_i \Delta_{t-1} + \varepsilon_{2i} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 12$$

In both equations that is equation 11 & 12, $\boldsymbol{\varepsilon_{1i}}$, $\boldsymbol{\varepsilon_{2i}}$ are the covariance stationary random error terms. The following hypotheses are therefore tested in both situations:

H_0: Series contains unit root

H_1: Series is stationary

The null hypothesis depicts that: The series contains unit roots, implying non stationary against the alternative hypothesis, which depicts that, it does not contain unit roots, implying stationary. The rule is that, if the ADF and PP statistics are higher (in absolute terms) than the critical values, then we will not accept the null hypothesis and conclude that, there is no unit root, implying

stationary. Also, if the ADF and PP statistics are less negative than the critical values, then we will accept the null hypothesis and conclude that, there is unit root, implying non-stationary.

1.2. Co-Integration Tests

Two or more variables are said to be co-integrated if there is a long-run equilibrium relationship or they share common trend. Co-integration exist when a linear combination of two or more non-stationary variables are stationary. Non-stationary series with a unit root, after first differencing; appears to provide appropriate solution to the problems associated with non-stationary series, however, first differencing tends to eliminate all the long-run information, which economists are normally interested in. Granger (1986) later identified a link between non-stationary processes, and preserved the concept of a long-run equilibrium. Johansen and Juselius approached co-integration as follows; once pre-testing has demonstrated that the variables are integrated at the same order, OLS is used to estimate the parameters of a co-integrating relationship. It is observed that, the application of OLS to an I (1) series yields super consistent estimates, which such estimates converge onto their true values at a faster rate than the case, if I (0) or stationary variables are used in estimation. Then, these parameter values are used to compute the residuals. Co-integration test are the tests for stationarity of the residuals by using DF and ADF tests. If the residuals are stationary, there exist one co-integrating relationship among variables and it will rule out the possibility of the estimated relationship being “spurious”. Since the residuals are estimated by OLS, by construction, the residual variance is made as small as possible, hence the test is prejudiced towards finding a stationary error process. The test is also sensitive to how the equation is presented (i.e. whether x is regressed

on y or vice versa). Finally, if there are more than two variables, the Engel-Granger (EG) procedure will not allow discrimination between different co-integrating vectors. Given these limitations of the Engel-Granger (EG) procedure, several methods have been developed for testing co-integration among variables. One of the most popular is the Johansen and Juselius (JJ) procedure. They include the Fully Modified Ordinary Least Squares (FMOLS) procedures of Phillips and Hansen (1990), the Johansen (1988) or the Johansen and Juselius (1990) and the Autoregressive Distributed Lag (ARDL) approach popularized by Pesaran and Shin (1999) to determine the long-run nexus in bivariate and multivariate frameworks. Johansen (1988) and Johansen and Juselius (1990) particularly developed multivariate method that explicitly used the vector autoregressive (VAR) and the vector error correction (VECM) framework for the testing of the presence of co-integration and estimation of long-run and short-run relationships among non-stationary macroeconomic time series. The VAR and VECM provide a useful framework to study the impact of unanticipated shocks (individual and system) on the endogenous variables (impulse response functions). Additionally, we can identify the relative importance of each variable in explaining the variations of endogenous variables (variance decomposition analysis). Moreover, both long-run (co-integration) relationships and short-run dynamics of the variables in the system can be established. The relationship between VAR and VECM is expressed as follows;

$$X_t = \alpha + \phi_1 X_{t-1} + \ldots + \phi_k X_{t-k} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 13$$

Where $\boldsymbol{X_t, X_{t-1}} \ldots \boldsymbol{X_{t-k}}$ contains integrated series of order one I (1) and k denote the lag length of the series. While $\phi_1 \ldots \phi_4$ are a vector of coefficients to be estimated, "α" is a vector

intercepts, "ε_t" is a vector of error terms. However, since they are the only lagged values of endogenous, appearing on the right-hand side of the equations simultaneity, it is not an issue because the OLS will yields consistent estimates. Estimation of equation (13) requires that $\boldsymbol{\varepsilon_t \, \Delta \, N \, (0, \Omega)}$ where "Ω" is non-diagonal covariance matrix that remains constant overtime. Following Johansen (1988), which provided that the variables that are integrated of order one are Co-integrated, further assuming "Δ" represent the first differences, equation (13) is transformed into an equilibrium error correction model of the form shown below:

$$\Delta X_t = \alpha + \Pi X_t + \psi_1 \Delta X_{t-1} \dots \psi_{k-1} \Delta X_{t-k+1} + \varepsilon_t \, , t = 1, 2, \dots n - - - - - - - - 14$$

While $\psi_i = -(\phi_{i+1} + \cdots + \phi_k), i = 1, \dots, k-1, and \; \Pi = -(I - \phi_1 - \cdots - \phi_k)$

This ψ_1 represent the matrix coefficient of the first difference variables that capture the short-run dynamics. The coefficient of the lagged dependent variable, indicate inertia as well as the formation of expectations. The coefficient of the other lagged endogenous variables provide estimates for pass-through effect or impact assessments. The coefficient matrix "Π" contains information about the long-run relationships among the variables. Which is involved in the model. Since "ε_t" is stationary, the rank of matrix "Π", denoted by "r", determines how many linear combinations of "X_t" are stationary, i.e., the number of co-integrating vectors. The null hypothesis that submit that, there are at most r (0<r<m) co-integrating vectors in the system is defined as a reduced rank below;

$$H_0(r) \colon \Pi = \alpha\beta \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots . . 15$$

While $\alpha \; and \; \beta$ are m,x,r matrices. The "r" columns of "β" are the co-integrating vectors providing the "r" long-run relationship ($\beta' X_t$) among the series. These co-integrating relation are such that $\beta' X_t$ is stationary, although X_t is not stationary. The loading matrix α contains the adjustment parameters. These adjustment parameters indicate the speed of adjustment of the various markets. That is, the null hypothesis H_0 is tested against alternative hypothesis H_1 (m) specifying that "Π" is of full rank. That is the rank of $\Pi = r = m.$ If the alternative hypothesis is accepted, this means that, X_t is stationary and hence the VAR model as in equation 7 is to be used. If the rank of $\Pi = r = 0, thus \; \Pi = 0$, then no stationary long-run relationship exist among the variables and hence the VAR model in first differences is to be used. It is only when the null hypothesis is accepted that the error correction model is to be used. The error correction representation of equation 14 is expressed under the null hypothesis to establish equation 16 as

$$\Delta X_t \; = \; \alpha + \; \psi_1 \Delta X_{t-1} + \cdots + \; \psi_{t-k+1} + \; \theta(\beta' X_{t-p}) + \; \varepsilon_t \; \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..16$$

Where the columns of "β" are interpreted as distinct co-integration vectors providing the long-run relationships ($\beta' X_t$) among the variables, and $\theta' s$ are the adjustment or the error correction coefficients indicating the adjustment to the long-run equilibrium. "β" Contains the coefficients of the "r" distinct co-integrating vectors giving that $\beta' X_t$ is stationary, meanwhile (X_t may not necessarily be Stationary). One major problem in the estimation of VAR and VEC models is the selection of an appropriate lag length. Thus strictly speaking, in an m-variable of VAR model, all the "m" variables should be stationary. The lag length plays a crucial role in diagnostic tests as well as in the estimation of VECM and VAR models (Bhasin, 2004). As a result, appropriate lag length (p) will be chosen using standard model selection criteria (AIC and SBC) that ensure normally distributed white noise errors with no serial correlation. Johansen (1988), Co-

integration techniques allow us to test and determine the number of co-integrating relationship between the non-stationary variables in the system using a maximum likelihood procedure. There are two tests to determine the number of co-integrating vectors namely, the trace test and the maximum eigenvalue test. They are defined as follows:

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} In(1-\lambda_i) \dots\dots\dots\dots\dots\dots\dots\dots 17$$

$$\lambda_{max}(r, r+1) = -T\, In(1-\lambda_{r+1}) \dots\dots\dots\dots\dots\dots\dots\dots 18$$

Where "λ_i" represent the estimated value of the characteristic roots, "T" is the number of usable observations, and "r" is the number of distinct co-integrating vectors. In the trace test, the null hypothesis (H_0) is that, there is at most "r" co-integrating vectors (r =0, 1, 2...) which is tested against an alternative hypothesis. Alternatively, in the maximum eigenvalue test, the null hypothesis ($H_0: r = 0$) is tested against the alternative ($H_1: r = 1$), this is followed by ($H_0: r = 1$) against ($H_0: r = 2$) and so forth. The trace and maximum Eigen value statistics are compared with the critical values tabulated in Osterwald-Lenum (1992). The distribution of the statistics depends on the number of non-stationary components under the null hypothesis and whether or not a constant is included in the co-integrating vector.

1.3.Granger Causality Test

The study of causal relationships among economic variables has been one of the main objectives of empirical econometrics. Also according to Engle and Granger (1987), co-integrated variables must have an error correction representation. One of the implications of Granger representation

theorem is that, if non-stationary series are co-integrated, then one of the series must granger cause the other (Gujarati, 2004). Thus, Granger (1986) observed that, it is difficult to determine the direction of causality between two related variables. Therefore to examine the direction of causality in the presence of co-integrating vectors, Granger causality is conducted based on the following:

$$\Delta X_t = \alpha_0 + \sum_{i-1}^{p} \beta_{1i} \Delta X_{t-1} + \sum_{i-0}^{p} \psi_{1i} \Delta Y_{t-i} + \varphi_{1i} ECT_{t-1} + v_t \dots\dots\dots\dots\dots\dots 19$$

$$\Delta Y_t = \alpha_0 + \sum_{i-1}^{p} \beta_{2i} \Delta Y_{t-1} + \sum_{i-0}^{p} \psi_{2i} \Delta X_{t-i} + \varphi_{2i} ECT_{t-1} + \mu_t \dots\dots\dots\dots\dots\dots 20$$

Where $\Delta X_t \; and \; \Delta Y_t$ are non-stationary dependent and independent variables, ECT is the error correction term, where $\varphi_{1i} \; and \; \varphi_{2i}$ are the speed of adjustments, "p" is the optimal lag order whiles the subscripts "t" and "t-I" denote the current and lagged values. If the series are not co-integrated, the error correction terms will not appear in equation 19 and 20. To find out whether the independent variable (X) granger-causes the dependent variable (Y) in equation 19, we examined the joint significance of the lagged dynamic terms by testing the null hypothesis:

$H_0: \psi_{1i} = 0,$ Which Implies, the independent variable (X) does not granger-cause the dependent variable (Y), against the alterative hypothesis.

$H_1: \psi_{1i} \neq 0$ Which Implies, the independent variable (X) granger-cause the dependent variable (Y). Also to find out whether the independent variable (Y) granger-cause the dependent variable (X) in equation 15, we examine the significance of the lagged dynamic term by testing the null hypothesis:

$H_0 : \psi_{2i} = 0$, This implies that, the independent variable (Y) does not granger-cause the dependent variable (X), against the alternative hypothesis.

$H_0 : \psi_{2i} \neq 0$, This implies that the independent variable (Y) granger-cause the dependent variable (X).

Using the standard F-test or Wald statistic, four possibilities exist:

The first (1st) possibility is the rejection of the null hypothesis in equation 19 but failing to reject the null hypothesis in equation 20 at the same time implies uni-directional causality running from X to Y. 2nd possibility is a rejection of the null hypothesis in equation 20 but at the same time failing to reject the null hypothesis in equation 19 implies uni-directional causality running from Y to X. 3rd possibility is the simultaneous rejection of the two null hypotheses, indicates bi-directional causality. 4th possibility is the simultaneous failure to reject the two null hypotheses, which indicates independence or no causality relationship between the variables of interest. The study employed both descriptive and quantitative analysis. Charts such as tables and graphs were employed to aid in the descriptive analysis. Unit root tests were carried out on all variables to ascertain their order of integration. Furthermore, the study adopted the Johansen's maximum likelihood econometric methodology for co-integration, introduced and popularized by Johansen (1988), Johansen and Juselius (1990) to obtain both the short and long-run estimates of the variables involved and also to verify the direction of causality among the variables. All estimations were carried out using Econometric views (Eviews) 6.0 package. The robustness of the coefficient was used to determine the nature of the relationship and also whether it is statistically significant. The study followed the standard literature of Cebula and Koch (1989) and Asante (2000) to specify the econometric model for private investment. Quarterly time-series

data on interest rate, exchange rate, CPI a proxy for inflation, real GDP, public investment, money supply and corporate tax from 1985:Q1-2011:Q4 were used for the study signifying 25years historic data captured. Moreover, the Johansen approach to co-integration and vector error correction model (VECM) were employed to examine the economic implication of corporate tax on private investment in Ghana by including other control variables.

X. Results & Discussion

2.1. Data Summary and Statistics

Table 4.0

Statistical Measurement	LPRIV	CTAX	INT	LPUB	LRER	LRGDP	LCPI	LM2
Mean	14.34193	9.442130	25.26620	15.10158	3.443263	21.90125	1.663073	18.02356
Median	14.34742	8.750000	26.00000	15.08051	3.36582	21.87690	1.955570	18.25994
Maximum	16.06386	13.97603	45.00000	16.67931	4.813920	22.87475	4.153610	22.16461
Minimum	11.77483	5.943627	2.076525	13.54950	2.734651	21.29174	1.360421	13.40058
Standard Deviation	1.144592	2.778873	10.32321	0.822531	0.356719	0.377170	1.656197	2.510471
Skewness	-0.255516	0.300440	0.323195	-0.002995	1.430317	0.353267	-0.293412	-0.130476
Kurtosis	2.217780	1.618955	2.768674	2.294404	5.923781	2.405543	1.766579	1.817483
Jarque-Bera	3.928599	10.20753	2.120989	2.240558	75.29275	3.836564	8.395599	6.598991
Probability	0.140254	0.051680	0.346284	0.326189	0.155200	0.146859	0.215029	0.136902
Sum	1548.928	1019.750	2728.750	1630.970	371.8724	2365.335	179.6119	1946.544
Sum of Square Deviation	140.1797	826.2686	11402.86	72.39169	13.61557	15.22155	293.4999	674.3635
Observations	108	108	108	108	108	108	108	108

Source: Tweneboah Senzu (2018), Computed from BoG (2011) and WDI (2011) data using Eviews 6.0 package

The study outline, the descriptive statistics of the variables involved, which Table 4.0 illustrates these statistics. It could be observed from the table that, all the variables had positive average values (means). There is a minimal deviation of the variables from their means with the exception of the interest rate comparatively as shown by the standard deviations attests to the

fact that, taking logs of variables minimizes their variances. The standard deviation of interest rate is relatively big because it was not logged. The data from the Table 4.0 further indicates that almost all the variables show signs of negative skeweness with the exception of interest rate, real exchange rate, corporate tax and real GDP. The Jarque-Bera statistic test generated from the series, which are drawn randomly from normally distributed populations depicts that the null hypothesis cannot be rejected for most of the variables as shown above.

2.2. Unit root test results

In order to examine the relationship between corporate tax and private investment by including other control variables, it is imperative to carry out unit root test to confirm whether the variables are not integrated of an order higher than one. This will guarantee the avoidance in the possibility of spurious regression results. As a result, all the variables were examined by first checking their trends graphically. From the graphs as presented in the Appendix column and captured as Exhibit A and B of this publication, it can be seen that, all the variables appear to exhibit behaviours of non-stationary series at levels. However, the plots of all the variables in their first differences exhibit some stationary behaviour. This means that all the variables are stationary after first difference. The order of integration of the variables were also tested via the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. The Schwarz-Bayesian Criterion (SBC) and the Akaike Information Criterion (AIC) were automatically used to determine the optimal number of lags included in the test. The table below report the results of the unit root tests with intercept and trend.

Table 4.1: Unit Root Test- ADF Test for the Order of Integration

Levels	(Trend and Intercepts)			1st Difference (Trends and Intercepts)		
Variables	ADF Statistics	Lag	Variable	ADF Statistics	Lag	I0
LPRIV	-1.051063(0.7325)	4	DLPRIV	-6.727078(0.0000)***	3	I(1)
LCPI	-0.820835(0.9597)	4	DLCPI	-4.513012(0.0023)***	3	I(1)
LM2	-1.160034(0.9129)	0	DLM2	-3.189122(0.0000)***	0	I(1)
CTAX	-2.892319(0.1692)	1	DCTAX	-6.871056(0.0000)***	3	I(1)
LPUB	-1.303570(0.6259)	1	DLPUB	-6.565445(0.000)***	0	I(1)
INT	-1.458086(0.8375)	4	DINT	-7.128360(0.0000)***	3	I(1)
LRER	-2.248119(0.1909)	5	DLRER	-4.267753(0.0008)***	4	I(1)
LRGDP	0.337012(0.9986)	12	DLRGDP	-6.585966 (0.0000)***	10	I(1)

*Source: Tweneboah Senzu (2018), Computed from WDI(2011) and BoG-data using Eviews 6.0 package. 'D' denote first difference. *** Represent significance at 1% level. Number in Brackets are P-Values. IO represent the order of Integration*

Table 4.2: Unit Root Test- PP Test for the Order of Integration

Levels	(Trend and Intercept)			1st Difference (Trends and Intercepts)		
Variables	PP Statistics	Bwd	Variable	PP Statistics	Bwd	IO
LPRIV	-0.609124(0.8630)	10	DLPRIV	-5.229474(0.0000)***	28	I(1)
LCPI	0.674051(0.9996)	4	DLCPI	-11.69310(0.0000)***	3	I(1)
LM2	-0.792651(0.9625)	1	DLM2	-8.394284 (0.0000)***	7	I(1)
CTAX	-1.822802(0.6869)	2	DCTAX	-4.180424(0.0067)***	23	I(1)
LPUB	-2.771965(0.2109)	2	DLPUB	-6.603554(0.0000)***	4	I(1)
INT	-1.386962(0.8595)	9	DINT	-7.189918(0.0000)***	19	I(1)
LRER	-4.449362(0.1909)	5	DLRER	-9.579200(0.0000)***	5	I(1)
LRGDP	-1.676327(0.4403)	0	DLRGDP	-16.12654(0.0000)***	11	I(1)

*Source: Tweneboah Senzu (2018), Computed from WDI (2011) and BoG-data, Used Eview 6.0pac. "D" denotes first difference. *** Represent significance at 1% level. The Numbers in brackets are P-Values. OI represents the order of Integration. Bwd represents bandwidth.*

From the tables above, the following were observed; both the ADF and PP statistics for all the logged variables were all stationary after first difference. According to the test results from the table above, taken into consideration the intercepts and trends, the null hypothesis has to be rejected at the existence of unit root in all the variables after first difference.

2.3. VAR Lag Length Selection

One of the problems in the estimation of VAR models, is the selection of an appropriate lag length. The lag length plays a vital role in diagnostic tests as well as in the estimation of VAR models for co-integration, impulse response and variance decomposition (Bhasin, 2004). Appropriate lag length (p) is chosen using standard model selection criteria (AIC and SBC) that ensure normally distributed white noise errors, with no serial correlation. The results of the VAR lag selection criteria for the models are presented in the table 4.3 below:

Table 4.3: VAR Lag Order Selection Criteria for Private Investment Model

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-2931.185	NA	4.13e+08	39.70520	39.84696	39.76279
1	-1163.243	3344.755	0.033771	16.47625	17.61033	16.93703
2	-977.3815	334.0479	0.005335	14.62678	16.75318*	15.49073*
3	-928.1374	83.84815	0.005374	14.62348	17.74220	15.89061
4	-861.3424	107.4136	0.004313	14.38301	18.49405	16.05331
5	-798.4678	95.16153*	0.003698*	14.19551*	19.29887	16.26900
6	-772.0633	37.46588	0.005281	14.50086	20.59654	16.97752
7	-751.4638	27.28044	0.008336	14.88465	21.97265	17.76448
8	-715.2639	44.51609	0.010951	15.05762	23.13794	18.34064

*Source: Tweneboah Senzu (2018), Computed from WDI(2011) and BoG-data using Eviews Pac. Lag order selected by the criterion is denoted with *, LR: Sequential modified LR Test statistic(each test at 5% level), FPE: Final predictor error, AIC: Akaike information criterion, SC: Schwarz information criterion and HQ: Hannan-Quinn information criterion.*

According to the table 4.3 above, it is observed from the VAR lag selection criteria that there are asterisks attached to some statistics of the five lag selection criteria (AIC, LR, SC, FPE and HQ). Tracing these statistics against the first column labelled 'lag' shows that, they coincide with lag 5, which imply that, the appropriate lag length to be chosen is 5 for the model.

2.4. Co-integration Test

Contributing to the significance and rational for co-integration analysis, Johansen (1988) argued that co-integration can be used to establish, whether there exists a linear long-term economic relationship among variables of interest. Pesaran and Shin (1999) added that co-integration enable researchers to determine whether there exists disequilibrium in various markets. In this regard, Johansen (1988) asserts that co-integration allows for the specification of a process of dynamic adjustment among the co-integrated variables and disequilibrium markets. Given that the series are I (1), the co-integration of the series is a necessary condition for the existence of a long run relationship. Under the assumption of linear trend in the data, and an intercept and trend in the co-integration equation, the results of the Johansen co-integration test of private investment market in Ghana is presented in the table 4.4 below:

Table 4.4: Johansen's Co-Integration Test (Trace) Results

Hypothesized		Trace	0.05	
No. of CE(S)	Eigenvalue	Statistic	Critical Value	Probability**
None **	0.561734	311.7785	187.4701	0.0000
At most 1**	0.442677	227.6356	150.5585	0.0000
At most 2 **	0.359400	168.0053	117.7082	0.0000
At most 3 **	0.320069	122.5796	88.80380	0.0000
At most 4 **	0.291670	83.23159	63.87610	0.0005
At most 5**	0.222408	48.05734	42.91525	0.0141
At most 6	0.144871	22.39886	25.87211	0.1275
At most 7	0.061144	6.43550	12.51798	0.4071

Source: Tweneboah Senzu(2018), computed from WDI (2011) and BoG-data. The trace test indicates 6 co-integrating equation(s) at both 5% and 1% levels. (**) denotes rejection of the hypothesis at the 5% (1%) level.

Table 4.5: Johansen's Co-Integration Text (Maximum Eigen Value) Results

Hypothesized No. of CE(s)	Eigen Value	Max-Eigen Statistic	0.05 Critical Value	Probability **
None **	0.561734	84.14284	56.70519	0.0000
At most 1 **	0.442677	59.63031	50.59985	0.0046
At most 2 **	0.359400	45.42574	44.49720	0.0395
At most 3 **	0.320069	39.34797	38.33101	0.0381
At most 4 **	0.291670	35.17425	32.11832	0.0205
At most 5	0.222408	25.65848	25.82321	0.0525
At most 6	0.144871	15.96331	19.38704	0.1468
At most 7	0.061144	6.435550	12.51798	0.4071

Source: Tweneboah Senzu(2018), Computed from WDI (2011) and BoG using Eviews 6.0 pac. (**) denote rejection of the hypothesis at the 5 %(1%) level. Max-Eigen value test indicate 5 con-integrating equation(s) at both 5% and 1%

It could be observed from table 4.4 that, the trace statistic indicates the presence of co-integration among the variables. Specifically, the null hypothesis of no co-integrating relationship or vector (r = 0) is rejected since the computed values of the trace statistic of 48.05734 is greater than its critical value of 42.91525 at 1%. That is, applying the Johansen test to the quarterly series spanning from 1985:Q1 to 2011:Q4, enable us to conclude that, there exits at most six co-integrating relationships. This confirms the existence of a stable long-run relationship among private investment, interest rate, public investment, corporate tax, and money supply, consumer price index a proxy for inflation, real exchange rate and real GDP. But for the purpose of this study, the first co-integration relation will be estimated based on the fact that, there are co-integrating vectors among the variables. The estimated long-run equilibrium relationship for private investment was derived from the un-normalized vectors as presented in Table 4.5 above.

2.5. Long Run Estimates for Private Investment in Ghana

Table 4.6: Un-normalized Co-integrating Coefficients for Private Investment

LPRIV	LPUB	LRER	LM2	LCPI	INT	CTAX	LRGDP	TREND
-1.341825	8.951494	17.67215	-15.40738	22.11174	-0.104694	2.970141	-17.63311	0.494097
0.622851	16.19451	6.282613	11.47178	7.031968	-0.278559	-0.336561	-17.76179	-1.778432
6.389726	-8.732799	4.600058	-5.476981	5.909384	0.347587	2.681907	-11.73939	-2.032172
2.044615	-15.70261	-9.829984	4.078433	0.782911	0.154694	-1.081012	71.59397	-1.045045
-2.293398	3.909151	10.05644	24.11714	-13.38772	-0.023819	0.395705	-41.86851	-0.625163
-3.098465	7.800673	3.121160	-1.663036	-2.081841	0.061766	1.141235	-45.27798	0.781685
2.935470	-9.331748	-5.572641	-4.206790	-11.40759	0.085396	-2.258237	27.92697	0.154315
0.223957	-4.526130	-3.688197	0.507141	1.333826	-0.120889	-0.142051	62.21606	-0.165988

Source: Tweneboah Senzu (2018), Computed from WDI(2011) and BoG-data, using Eviews 6.0 package

From the un-normalized co-integrating coefficients in the Table 4.6 above, the third vector appears to be the one in which we can normalize private investment. The choice of this vector is based on sign expectations about the long- run relationship as indicated in equation (8). The derivation of the long run relationship was done by normalizing the LPRIV and dividing each of the co-integrating coefficients by the coefficient of LPRIV. The long run private investment equation is therefore specified below as:

$$LPRIV = 0.318037T - 0.419722CTAX - 0.054398\ INT + 1.366694\ LPUB + 0.857154\ LM2 - 0.924826\ LCPI - 0.719915\ LRER + 1.837229\ LRGDP \quad (21)$$

The error correction representation of equation 21 is specified as follow

$$ECM = LPRIV - 0.318037\ T + 0.419722CTAX + 0.054398\ INT - 1.366694LPUB - 0.857154LM2 + 0.924826LCPI + 0.719915LRER - 1.837229LRGDP \quad (22)$$

From equation 21, holding all other factors constant, as time passes by, private investment in Ghana, will increase by approximately 0.318% each quarter. This means that, time has a positive impact on private investment. This is justified by the fact that, as time passes by, technology,

institutions and human behaviour changes and such changes will naturally grow the activities in the private sector, promoting economic growth as a whole. From equation 21, with regard to the significance of the corporate tax, which is the main variable of study focus, the results of the long run estimate on investment in Ghana, the equation above deduce that, corporate tax has the expected sign, that is corporate tax has a negative and significant impacts on privates' investment in Ghana. This equally justify that, the corporate tax in Ghana negatively affect private investments in Ghana. Thus for every 1% increase in corporate tax, private investments on the other hand will decrease by approximately 0.420% holding all other factors in constant. This is consistent with mainstream economic theory, because higher corporate taxes serve as a disincentive to private investor's efforts, since much of the profits are wiped off by taxes. It is also consistent with the findings of Vegara (2004), Tatom (2007), Romer and Romer (2007), Djankov et al. (2010) and Ahiawodzi and Tsorhe (2013) who found a negative relationship between corporate tax and private investment but contradicts the findings of Attar and Temel (2002) who on the other found a positive relationship between corporate tax and private investment. Interest rate from the equation above also had the expected sign. Which project that interest rate has an inverse relationship with private investment in Ghana. Thus for every 1% increase in interest rate, private investment under the constant of the other factors will decrease by approximately 0.054% in the long run. This is consistent with the theoretical expectation of the Keynesians and neoclassical view on the effect of interest rate on private investment. Thus according to the Neoclassical, an increase in the rate of interest, crowds out private investment through high cost of borrowing, making private capital formation difficult. The findings of this study is consistent with the findings of Lewis (1992), Bascom (1994),

Bandiera et al. (2000), Reinhart and Tokatlidis (2001), Badawi (2004) and Ahiawodzi and Tsorhe (2013), who also found an inverse relationship between interest rate and private investment, which contradicts the findings of Shrestha and Chowdhury (2006) and Eregha(2010), who found a positive relationship between interest rate and private investment in their study. Also, real exchange rate which serves as an exogenous variable for the study was observed to have a negative and decreasing effect on privates' investment in the long run. Thus for every 1% increase in real exchange rate, private investments will decrease by approximately 0.720% in the long run, when holding all other factors constant. This is because an increase in the real exchange rate will increase the cost of importing certain inputs and raw material needed for production, thereby increasing the cost of production. This increase in the cost of production makes the prices of final output relatively high and un-competitive as compared to the same goods produced in other countries. This in the long run reduces private investments in the country. The finding however is in consonance with the findings of Ronge and Kimuyu (1997), Asante (2000), Naa-Idar et al. (2012) and Ahiawodzi and Tsorhe (2013) but contradicts the findings of Were (2001) who found a positive relationship between exchange rate and private investment. In the instance of real GDP as a factor of study, which serves as an exogenous variable in this study, exhibited a positive sign, which indicate that, the real GDP of Ghana has a positive and increasing effect on private investments in the long run. Thus for every 1% increase in real GDP of Ghana, private investment in Ghana will increase by approximately 1.837% in the long run, when all other factors are hold in constant. This is consistent with the theoretical expectation of Keynesian views of the role of real GDP on private investment. Thus an increase in real GDP is an indication of expansion of the economy, which has the tendency of increasing the

aggregate demand in the long run. This increase in aggregate demand serve as an incentive to the private investors to increase their production output since there is a potential demand for their supply. This in the long run will increase privates' investment in the country. This further confirms the accelerator theory of investment in Ghana. The findings of this study is in accord with that of Akpalu (2002), Mbanga (2002) and Naa-Idar et al. (2012), who found a positive relationship between real GDP and private investment but contradicts the findings of Asante (2000), who found a negative relationship between real GDP and private investment. Furthermore, money supply which served as an exogenous variable of this study, was observed to have a positive and increasing effect on private investment in the long run. Thus for every 1% increase in money supply to the economy, private investments will increase by approximately 0.857% in the long run, when all other factors are hold in constant. The availability of funds to the private sector has the tendency of boosting private investment in the country in the sense that, as the central bank increases money supply, interest rate on the other hand has the tendency of reducing and hence making the cost of borrowing relatively cheaper. This has the potential of boosting privates' investment in the long run, since private investors can now expand their production output base at a relatively lower cost. This findings is in total agreement with the studies of Asante (2000) and Akpalu (2002). Probing further into the equation above, consumer price index a proxy for inflation which also serves as an exogenous variable was observed to operate in an inverse relationship with private investment. Thus for every 1% increase in price level under the constant of all the other factors, private investment decrease approximately 0.925% in the long run within the economy of Ghana. This is consistent with the theoretical expectation of the monetarists view of the effect which price level (inflation) has on

private investment. Thus according to the monetarists, an increase in price level (inflation) makes prices of goods and services of private investors relatively high and un-competitive thereby reducing aggregate demand hence causing a reduction in private investment in Ghana in the long run. This revealing concur with the findings of Asante (2000), Naa-Idar et al. (2012) and Ahiawodzi and Tsorhe (2013). Finally in respect of equation 21, public investment which also served as an exogenous variable in the study, indicate clearly that, public investment has a positive and significant impacts on private investment in Ghana in a long run, suggesting a "crowding-in" effect of public investment on private investment and thus confirming the theoretical hypothesis between the two variables. Thus for every 1% increase in public investment, private investment will increase by approximately 1.367% in Ghana's economy in the long run, when all the other factors are hold in constant. Thus an increase in public investment is an indication of expansion of the economy which has the tendency of increasing aggregate demand in the long run. This increase in aggregate demand serve as an incentive to the private investors to increase their output since there is a potential demand for their supply in order to compliment public investment, such efforts has a positive impact in the increase of private investment in Ghana. This finding is also consistent with the findings of Asante (2000), Vergara (2004), Naa-Idar et al. (2012) and Ahiawodzi and Tsorhe (2013) who found a positive relationship between public investments and private investments but contradicts the findings of Islam and Wetzel (1991), Akpalu (2002) who found a negative relationship between public investment and private investment.

2.6. Short-run dynamics of Private Investment in Ghana

Engle and Granger (1987) argued that when variables are co-integrated, their dynamic relationship can be specified by an error correction representation, in which an error correction term (ECT) computed from the long-run equation must be incorporated in order to capture both the short-run and long-run relationships. The error correction term indicates the speed of adjustment to long-run equilibrium in the dynamic model. In other words, its magnitude shows how quickly variables converge to equilibrium when there is a shock in the system. It is expected to be statistically significant with a negative sign. The negative sign implies that any shock that occurs in the short-run will be corrected in the long-run. The larger the error correction term in absolute value, the faster the convergence to equilibrium. Given that our variables are non-stationary but co-integrated, estimation of the ECM, which included a first differenced VAR with one period lagged error correction term, yielding an over-parameterized model. The parsimonious ECM for private investment model is presented below in Table 4.8. However, the approach from general to specific model was employed to arrive at a more parsimonious model where insignificant variables were deleted using the p-values. Rutayisire (2010) argued that this process of moving from general to specific brings about a simplification of the model that makes the estimation more reliable and increases the power of the test. The general to specific model for the private investment model is discussed below in Table 4.7

Table 4:7 Error Correction Model for Private Investment

Variable	Coefficient	Std. Error	T-Statistic	Probability
ECT(-1)	-0.221588	0.056365	-3.931284	0.0002
D(LPRIV(-1))	1.305262	0.288552	4.523495	0.0000
D(CTAX (-1))	-0.371933	0.134667	-2.761862	0.0076
D(LRER(-3))	-0.714008	0.351088	-2.033700	0.0463
D(LM2(-3))	0.534741	0.293661	1.820948	0.0735

D(LCPI(-4))	-0.518263	0.298797	-1.734499	0.0879
D(INT(-3))	-0.022937	0.009669	-2.372081	0.0209
D(INT(-4))	-0.034029	0.009632	-3.533012	0.0008
D(LPUB(-1))	0.939587	0.341297	2.752990	0.0078
D(LRGDP(-2))	1.493232	0.834321	1.789757	0.0785
C	-0.224519	0.075805	-2.961817	0.0042

DW=2.109903; R-Square=0.722002; F-Statistics = 3.960659; Prob= 0.000001

Source: Tweneboah Senzu(2018), Computed from WDI (2011) and BoG-data using Eview 6.0 pac.

Table 4.8: General Vector Error Correction model for Private Investment

Variable	Coefficient	Std. Error	T-Statistics	Probability
ECT(-1)	-0.219352	0.060196	-3.643983	0.0005
D(LPRIV(-1))	1.304988	0.291033	4.483987	0.0000
D(LPRIV(-2))	-0.199436	0.132571	-1.504370	0.1377
D(LPRIV(-3))	0.045915	0.127125	0.361180	0.7192
D(LPRIV(-4))	0.022886	0.127499	0.179499	0.8582
D(LPRIV(-5))	-0.142570	0.117567	-1.212669	0.2300
D(CTAX(-1))	-0.371939	0.135784	-2.739207	0.0081
D(CTAX(-2))	0.081946	0.110995	0.738285	0.4632
D(CTAX(-3))	-0.024647	0. 103704	-0.237665	0.8130
D(CTAX(-4))	0.052820	0.106232	0.497214	0.6209
D(CTAX(-5))	0.174361	0.129597	1.345409	0.1836
D(LRER(-1))	0.362488	0.606229	0.597939	0.5521
D(LRER(-2))	-0.404784	0.574399	-0.704708	0.4837
D(LRER(-3))	-0.714097	0.354005	-2.017194	0.0482
D(LRER(-4))	0.013493	0.355855	0.037918	0.9699
D(LRER(-5))	-0.109310	0.395883	-0.276118	0.7834
D(LM2(-1))	-0.405393	0.398040	-1.018473	0.3125
D(LM2(-2))	0.310839	0.313108	0.992752	0.3248
D(LM2(-3))	0.535893	0.297650	1.800416	0.0768
D(LM2(-4))	0.220088	0.139559	1.577019	0.1200
D(LM2(-5))	0.092307	0.374308	0.246607	0.8061
D(LCPI(-1))	-0.414429	0.510078	- 0.812481	0.4197
D(LCPI(-2))	-0.071063	0.467401	- 0.152039	0.8797
D(LCPI(-3))	0.352255	0.477364	0.737916	0.4634
D(LCPI(-4))	-0.515273	0.311423	-1.654576	0.1032
D(LCPI(-5))	0.819134	0. 557829	1.468431	0.1472
D(INT(-1))	-0.005005	0. 010840	-0.461763	0.6459
D(INT(-2))	0.015858	0.009884	1.604454	0.1139
D(INT(-3))	-0.022934	0.009750	-2.352222	0.0220
D(INT(-4))	-0.034009	0.009725	-3.497002	0.0009
D(INT(-5))	-0.016818	0.011429	-1.471539	0.1464
D(LPUB(-1))	0.940102	0.344393	2.729737	0.0083
D(LPUB(-2))	0.429894	0.323053	1.330722	0.1883

D(LPUB(-3))	0.198058	0.313948	0.630860	0.5305
D(LPUB(-4))	0.322756	0.488460	0.660762	0.5113
D(LPUB(-5))	-0.064452	0.372351	-0.173096	0.8632
D(LRGDP(-1))	0.814732	0.981357	0.830209	0.4097
D(LRGDP(-2))	1.492362	0.841548	1.773354	0.0812
D(LRGDP(-3))	0.375066	0.878906	0.426742	0.6711
D(LRGDP(-4))	0.927946	1.220489	0.760306	0.4500
D(LRGDP(-5))	0.688466	1.650343	0.417165	0.6780
C	-0.222298	0.085545	-2.598612	0.0116

Source: Tweneboah Senzu(2018) WDI (2011) and BoG-data Using Eviews 6.0pac

From the Table 4.6 above there is no evidence of spurious regression as the Durbin-Watson (DW) is greater than the R-squared. The F-statistic is significant, implying that the explanatory variables in the model are good predictors of private investment. The results from the error correction model as displayed in the table 4.7 above, suggest that the ultimate effect of previous periods' values of private investment on current values of private investment in the short-run is positive and significant at lag one (1). The implication is that current values of private investment are affected by previous quarters' values of private investment. From the table4.7 above, the results of the short run dynamic coefficient of corporate tax has the expected sign as obtained in the long run. That is, corporate tax has a negative and significant effect on private investment in Ghana on a short-run. This means that corporate tax in Ghana negatively affect privates' investment. Thus for every 1% increase in corporate taxes, privates' investment on the other hand will decrease by approximately 0.372% holding all other factors in constant. This is consistent with mainstream economic theory, because higher corporate taxes serves as a disincentive to private investor's efforts, since much of the profits are wiped off by taxes. It is also consistent with the findings of Vegara (2004), Tatom (2007), Romer and Romer (2007), Djankov et al. (2010) and Ahiawodzi and Tsorhe (2013) who found a negative relationship between corporate taxes and privates' investment but contradicts the findings of Attar and

Temel (2002) who found a positive relationship between corporate tax and private investment in a short run. Furthermore, with regard to the significance of interest rate on private investment in Ghana, interest rate has the indicative sign as obtained in the long run estimate. Thus interest rate in the short run has an inverse relationship with privates' investment. This means that, for every 1% increase in interest rate, privates' investment in the short run will fall by approximately 0.034% when all the other factors are hold in constant. This however is consistent with the findings of Lewis (1992), Bascom (1994), Bandiera et al. (2000), Badawi (2004) and Ahiawodzi and Tsorhe (2013). Also, real exchange rate which in the studies was serving as an exogenous variable, was observed to have had an indicative sign as obtained in the long run estimate. It was observed that, real exchange rate has a negative and significant effect on privates' investment in Ghana at the short run as well, thus for every 1% increase in real exchange rate, privates' investment decrease by approximately 0.714% in the short run, when all the other variables are hold in constant. This is because an increase in the real exchange rate will increase the cost of importing certain inputs and raw material needed for production, thereby bidding up the cost of production. The increase in the cost of production makes the prices of final output relatively high and un-competitive as compared to the same goods produced in other countries, thereby reducing private investment activities in the country. Which the findings in short run dymanics of real exchange rate is observed to be in consonance with the report of Asante (2000), Naa-Idar et al. (2012) and Ahiawodzi and Tsorhe (2013). Also, the short run dynamic coefficient of real GDP which served as an exogenous variable in this studies, was observed to have a positive and increasing effect on privates' investment as obtained in the long run. Thus for every 1% increase in real GDP, privates' investment increases by approximately 1.493% in the short run, holding all

other factors in constant. This is consistent with the theoretical expectation of Keynesian views of the role of real GDP on privates' investment. This also deepen and confirms the accelerator theory of investment in Ghana and it consistency with the findings of Akpalu (2002), Mbanga (2002), Naa-Idar et al. (2012) and Ahiawodzi and Tsorhe (2013) who found a positive relationship between real GDP and private investment but contradicts the findings of Asante (2000) who on the other hand found a negative relationship between real GDP and private investment. From the table 4.7 above, consumer price index a proxy for inflation, which also served in this studies as an exogenous variable, had an inverse relationship with private investment as obtained in the long run. Thus for every 1% increase in price level under the constant of all the other variables, private investment decreases by approximately 0.518% in the short run. This is consistent with the mainstream theoretical expectation of the monetarists view of the effect price level (inflation) has on private investment and further agree with the findings of Asante (2000), Naa-Idar, et al. (2012) and Ahiawodzi and Tsorhe (2013) who found a negative relationship between price level (inflation) and private investment. The study further deduce that, public investment in the short run analysis, indicate a positive and significant effect on privates' investment as obtained in the long run, suggesting a "crowding-in" effect of public investment on private investment and thus confirming the theoretical hypothesis between this two variables. Thus for every 1% increase in public investment, private investment will increases by approximately 0.940% in the short run, when all the other factors are hold in constant. This in the long run will increase private investment. This finding was consistent with the studies of Asante (2000), Vergara (2004) and Naa-Idar et al. (2012) who found a positive relationship between public investment and privates' Investment but contradicts the findings of Islam and Wetzel (1991) and

Akpalu (2002). Finally, the money supply as a variable, which served as an exogenous indicator under this study, was noted to have a similar character as noted in the long run effect. Money supply has a positive and increasing effect on privates' investment in the short run. Thus for every 1% increase in money supply, privates' investment will increase by approximately 0.535% in the short run, holding all other factors in constant. The availability of funds to the private sector has the tendency of boosting private investment in the country in the sense that, as the central bank increases money supply, interest rate on the other hand has the tendency of reducing and hence making the cost of borrowing relatively cheaper. This has the potential of boosting private investment in the country since private investors can now expand their output base at a relatively lower cost. This also confirms the findings of Asante (2000) and Akpalu (2002) who found a positive relationship between money supply and private investment. Most importantly the coefficient of the lagged error-correction term was negative and statistically significant as expected at 1% significance level suggesting that, it would take a short time for the system to return to its equilibrium position once it is out of equilibrium. Thus Bannerjee, Dolado and Mestre (1998) asserted that a highly significant error correction term further confirms the existence of a stable long-run relationship between variables. From the results in the table 4.7, the estimated coefficient of the error correction term is -0.221588; which implies that the speed of adjustment is approximately 22.16% per quarter or 88.64% per year. This negative and significant coefficient is an indication that co-integrating relationship exist among private investment and its explanatory variables in the study. The size of the coefficient of the lagged error correction term (ECT-1) denotes that about 22.16% of the disequilibrium in the private investments market caused by previous quarters' shocks, converges back to the long-run

equilibrium in a new quarter. Thus, the study discerns that the variables in the model show evidence of moderate response to equilibrium when shocked in the short-run. The rule of thumb however is that, the larger the error correction coefficient (in absolute term), the faster the variables equilibrate in the long-run when shocked (Acheampong, 2007). However, the magnitude of the coefficient in this study suggests that the speed of adjustment to the long-run changes is relatively high.

Table 4.9: Evaluation of the Model

Diagnostic	Statistics	Conclusion
Ramsey RESET Test	F-Statistic=0.013643 (0.9074) Log likelihood ratio=0.023190 (0.8790)	Equation is stable
Heteroskedasticity ARCH Test:	F-Statistic= 1.700071(0.1425)	No Heteroskedasticity
Breusch-Godfrey Serial Correlation LM Test:	F-Statistic=1.390843(0.2417)	No Serial Correlation
Multivariate Normality	Jarque-Bera Test= 1.390843 (0.2417)	Residuals are normal

Source: Tweneboah Senzu (2018), Computed from WDI (2011) and BoG-data using Eviews 6.0 pac

The results from the table 4.9, indicate that, by moving from the general to specific model for the private investment model, passes all the diagnostic test of Ramsey's RESET test of functional form, Heteroscedasticity ARCH test, Breusch-Godfrey serial correlation LM test, as well as the multivariate normality test. Also, the plots of CUSUM and the CUSUMSQ stability tests in the appendix, marked Exhibit A cartegory, also indicates that all the coefficients of the estimated model was stable over the study period since it was within the five percent critical bounds.

2.7. Granger Causality Test

After establishing co-integration among the main variables subjected to studies, Granger causality test was applied to verify the direction of causality between corporate tax and privates' investment. The table 4.10 below reports the results of the pair wise Granger causality tests carried out.

Table 4.10; Granger Causality Test between Corporate Tax and Private Investment

Null Hypothesis	F-Statistics	Probability
CTAX does not Granger Cause LPRIV	4.04919	0.0023***
LPRIV does not Granger Cause CTAX	2.54237	0.0335**

Source: Tweneboah Senzu(2018), Computed from WDI(2011) and BoG-data using Eview 6.0 pac

** and *** denote a rejection of null hypothesis at 5% and 1% level of significance

The Granger causality test from the table 4.10 define under the null hypothesis that, corporate tax does not Granger cause private investment, is rejected at the 1% significance level; implying that corporate tax does Granger cause private investment. It also further reject the null hypothesis that, private investment does not granger cause interest rate at the 5% significance level. This means that corporate tax predicts private investment and private investment as well, also predicts corporate tax in Ghana as shown in the table 4.10. From the results, it is clear that there is a bi-directional causality running from corporate tax to private investment and from private investment to corporate tax in Ghana, however it is evidence that, the causality from corporate tax to private investment in Ghana is greater than the causality from private investment to corporate tax, as given by their significance level.

E. CONCLUSION, RECOMMMENDATIONS AND RESEARCH DIRECTION

3.1. Conclusion

The economic effect of corporate tax on privates' investment is a central question in both public finance and development. This effect matters not for the evaluation and design of corporate tax policy only, but also for thinking about economic growth (Barro, 1991; DeLong & Summers, 1991 and Baumol, Litan, & Schramm, 2007). Thus the economic effect of corporate tax on privates' investment has been hotly debated both in academic and political circles. This very study in line with the empirical literature, confirmed both the long run and short run relationship between privates' investment and its determinants. Which deeply outline that, real GDP, public investment, money supply, all have positive effects on private investments, with the greatest impacts observed from real GDP both in long run and short run. Corporate tax, interest rate, real exchange rate and price level on the other hand, had a negative effect on private investment with the greatest effect coming from price level and real exchange rate both in the long and short run respectively. Although interest rate had a decreasing effect on private investment, its effect was noted to be very minimal. The error correction term of the private investment model indicated that, we can count on corporate tax, interest rate, real GDP, money supply, public investment, inflation as well as real exchange rate as policy variables to bring back privates' investment market to equilibrium in the face of short run disturbance once the coefficient of the error correction term was significant and did carry the negative sign. Consistent with the empirical literature, the study found evidence of bi-directional causality between private investment and corporate tax in Ghana. This indicates that, in Ghana private investment and

corporate tax predicts each other, which according to the findings, they Granger cause each other.

3.2. Recommendations

Based on the findings from the study, the following recommendations are proposed for policy consideration.

1. Since it was observed that corporate tax has negative impact on privates' investment over the study period both in the long and short run, it is recommended that the government keep the corporate tax as low as possible, so as to reduce the rate at which corporate tax reduces corporate profit in order to encourage private investors to expand their output base and by so doing increase the level of private investments in the country.
2. From the findings, real exchange rate and price level had negative and significant impact on private investment both in the long and short run. It is recommended that the Bank of Ghana adopt foreign exchange interventions that do not affect the domestic monetary base, which is a unit component of the overall money supply. Thus by arresting the rate of depreciation of the local currency, as the key effort of the Central Bank of Ghana to restore investor confidence in the local currency. Similarly, interest rate had a negative impact on privates' investment over the study period both in the long and short run. It is therefore recommended that the Bank of Ghana keep the prime rate as low as possible, so as to reduce the high cost of borrowing from the financial institutions in order to encourage private investors to expand their output base and by so doing increase the level of private investment in the country.

3. It was again observed that, real GDP which served as exogenous variables had much positive effect on private investment in Ghana both in the long run and short run. It is therefore strongly recommended that government expenditure should be geared towards productive investment and infrastructural development to help boost economic activity which will promote output growth and by so doing increase privates' investment in the country.
4. It is also observed from the findings of the study that money supply has an appreciating effect on private investment. It is therefore recommended that monetary authorities keep money supply at a moderate level so as to influence the interest rate downward. This will in the long run boost and create an enabling environment for privates' investment in the country. Also, the more stable the economy, the better it prospects of huge private investments and hence increase in output growth and price stability. It is thus recommended that, price fluctuations should be kept at a moderate level by the monetary authorities since high level of price changes indicate, high levels of economic distortion which discourages private investment in the country.
5. Finally, once public investment had a positive impact on private investment over the study period both in the long and short run, the government should design policies to promote enabling environment to increase public investment which has a crowding-in-effect on private investment. This in the long run will promote the level of private investment in the country.

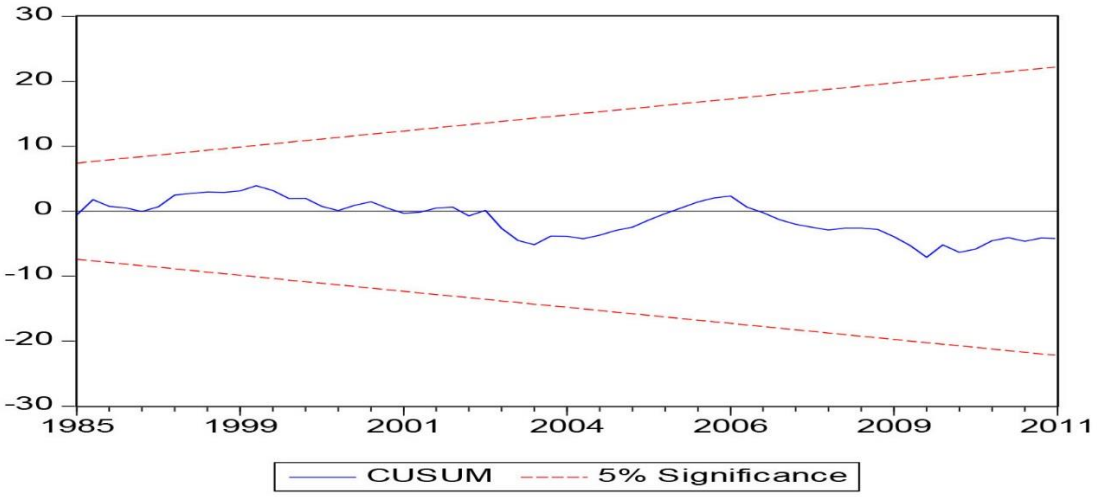
3.3. Guide to Future Research

The study only examined the relationship between privates' investment and corporate taxes by including other controlled variables, in which the long-run and short-run relationship were established as well as the direction of causality. The study however did not determine the level of these variables that would either promote or distort stability of privates' investment. Hence, future direction of research on this topic should consider the possibility of exploring the desired levels or degree at which these variables would either propel or harm private investment in the country. The study employed the Johansen approach to co-integration, to establish the long and short run relationship between privates' investment and corporate taxes by including other control variables. Future direction of research on this topic could consider the possibility of exploring other estimation techniques to further confirm the relationship between privates' investment and corporate taxes.

F. APPENDIX

Exhibit A Category

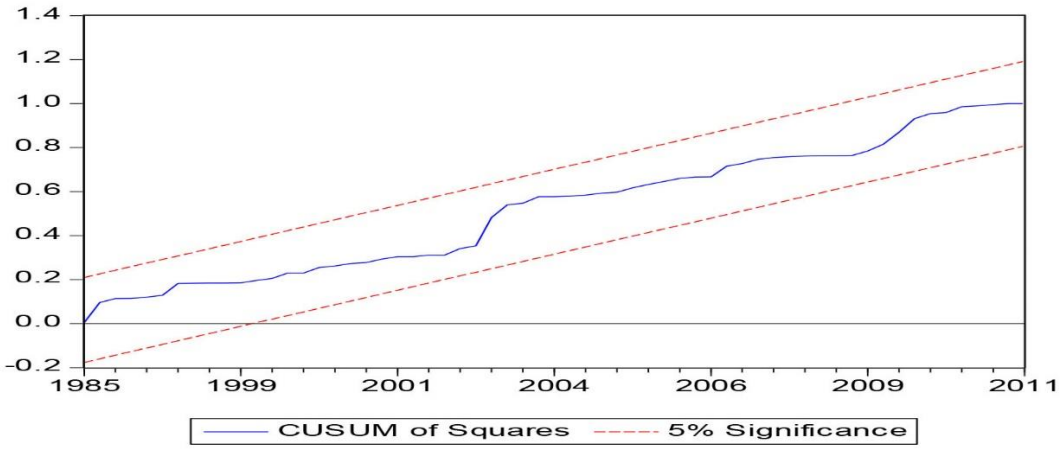
Figure A1.
Plotting graph of Cumulative Sum of recursive residual of private Investment



Source: Tweneboah Senzu(2018), Estimation results using Eview 6.0 pac

The Straight line represent critical bounds at 5% significance level

Figure A2.
A plotting graph of cumulative sum of square of recursive residuals of private investment



Source: Tweneboah Senzu(2018), Estimation results using Eview 6.0 pac

The straight line represent critical bounds at 5% significance level

Exhibit B Category:

Figure BX.
Plots of Variables in Levels

1.

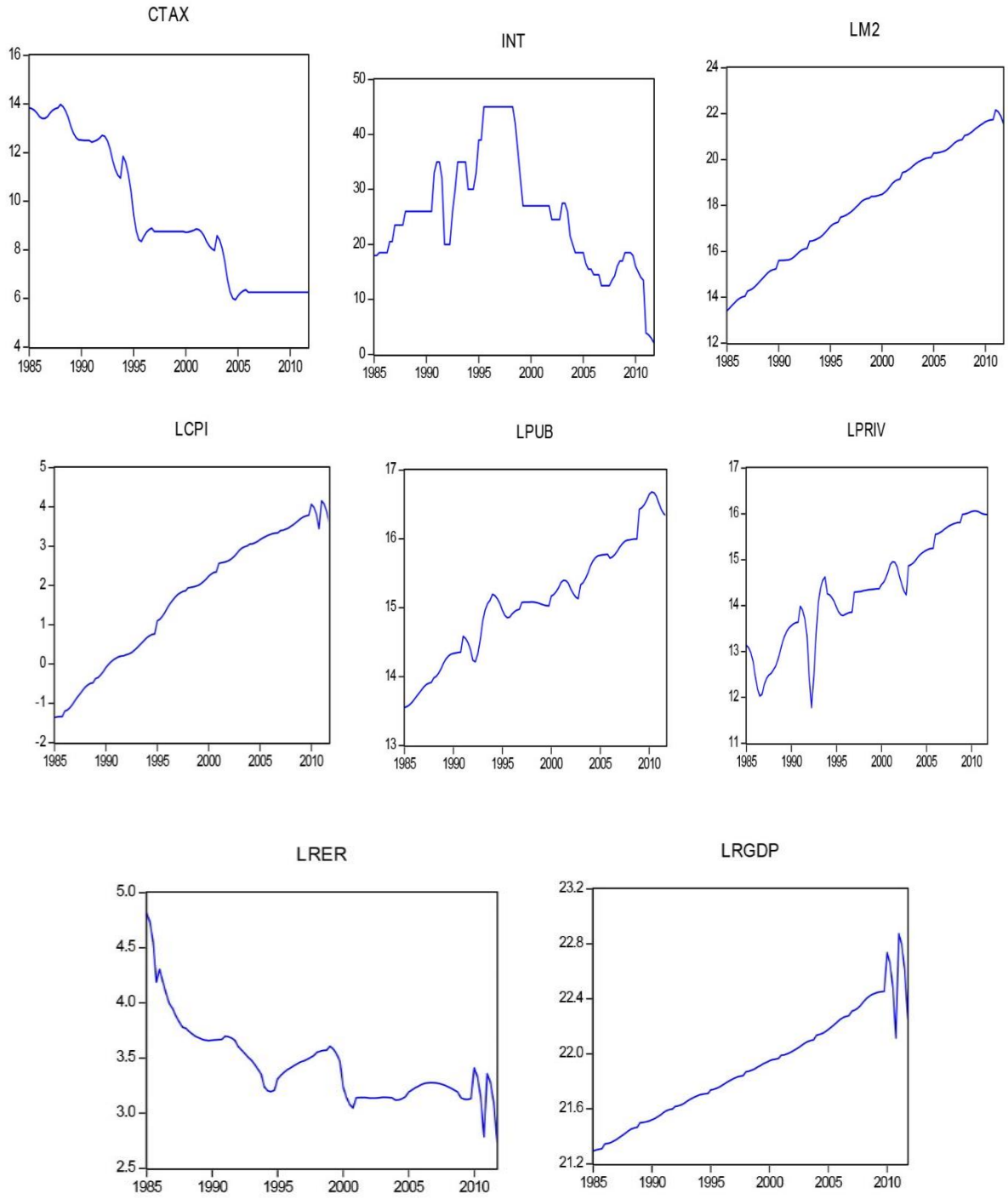
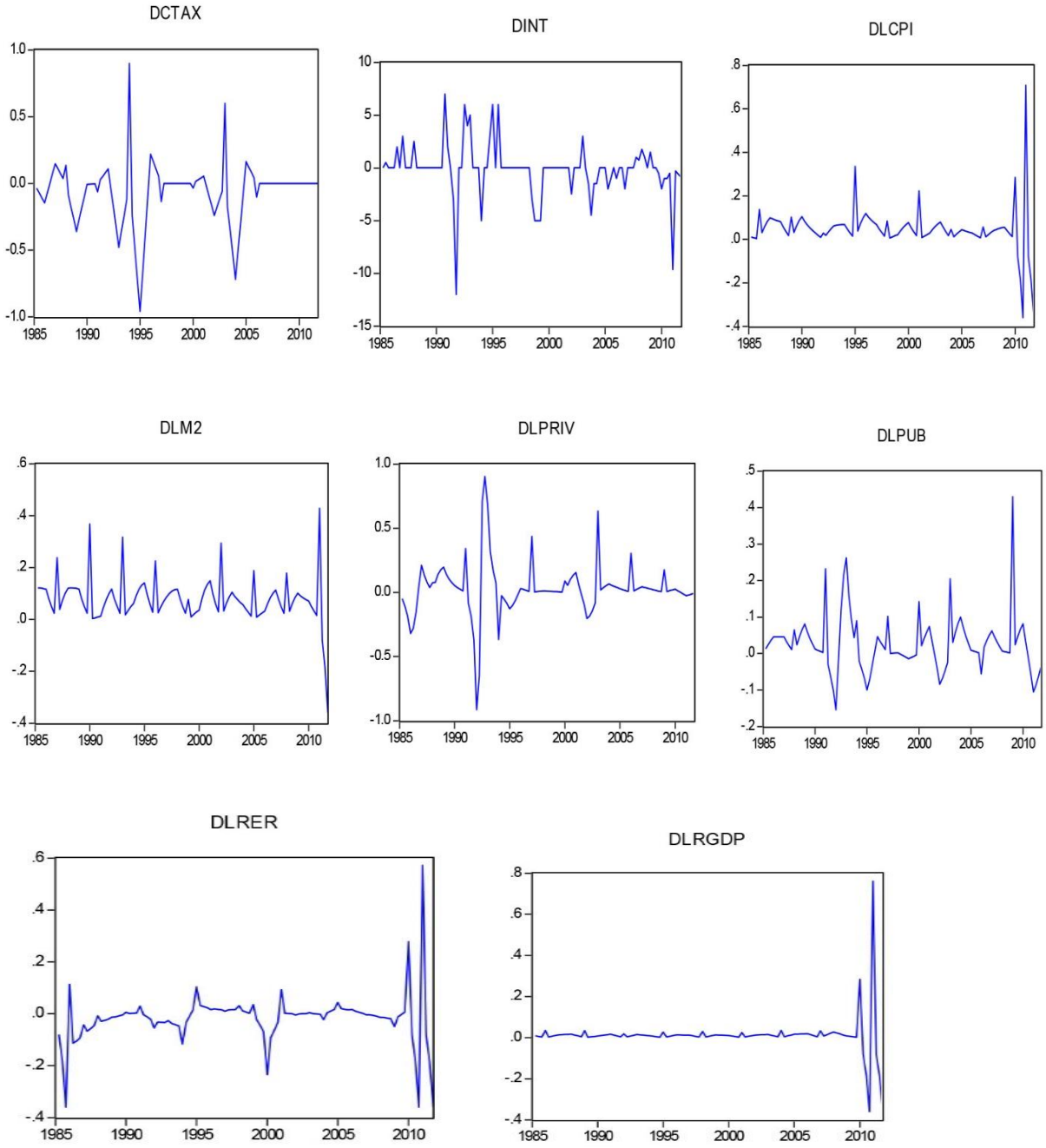


Exhibit C. Category

Figure CX.

Plots of Variables in First Difference



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