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OIL PRICE SHOCKS AND PRIVATE INVESTMENT IN GHANA

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Abstract

This study examines the effect of oil prices on domestic investment in Ghana using quarterly time series data from 1984 to 2012. Dynamic Ordinary Least Squares (DOLS) technique was used to estimate the effect of oil price on domestic investment in Ghana. The analysis revealed that there is long run relationship between domestic private investment, oil price shocks, exchange rate, inflation, income and credit to private sector. The study found negative effect of oil price shocks on investment. This indicate that shock in oil prices leads to a reduction in investment. It is therefore recommended that mechanisms be put in place to check or cushion the economy against oil price shocks and variability. This could be done through providing domestic credit to the private sector to boast investment.

Key word: Investment, Oil price shocks, Oil price

JEL Code: E22, E29, G00, G11

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Introduction

Capital accumulation is necessary for economic development of every nation. This is evident from all the theoretical theories on growth and productivity. Capital accumulation comes in the form of addition to existing capital stock or adding entirely new capital stock. This act is referred to as investment. Thus, the role of investment is very crucial to economic growth and development, as economic growth and development depends on level of investment in the economy. According to Ogundipe and Ogundipe (2008), the level of investment is positively related to income. This implies that increases in investment should result in growth in income. The increase in investment leads to increase in income while increase in income results in increased investment. This creates some sort of "vicious circle of investment". In most developing country, this chain reaction is conspicuously missing.

In explaining the importance of investment, Michealides, Roboli, Economakis and Milios (2005) argue that investment increases a country's capacity to produce output, increase the level of employment and improves personal income. This leads to increase in the demand for capital goods (Du Toit & Moolman, 2004). On the contrary, investment expenditure could result in volatility causing economic fluctuations in economic activity. Also, increased investment makes economies competitive in the long-run (Romer, 1996; Dornbusch & Fischer, 1990).

Similarly, the private sector contributes more meaningfully to economic growth than the public sector. This is due to the fact that corruption as observed by Seruvatu and Jayaraman (2001) seems to be less pervasive in the private sector investment compared to the public sector investment (Gyimah-Brempong & Traynor, 1999; Asante, 2000; Ndikumana, 2000). This explains government's earnest efforts to affect the investment climate so as to attract investment of which private investment is key. Accordingly, Bayai and Nyangara (2013) attribute increase efficiency in factors of production to improved environment to private sector investment and participation.

Various governments in Sub-Saharan Africa, being aware of the potentials of private investment in sparing growth and economic development, have made policy to attract private investment. This is done through the promotion of private sector-led investment and Economic Recovery and Structural Adjustment Programmes (ERP/SAP) (Frimpong & Marbuah, 2010). Ghana for example pursued the "golden age of business" at the start of the past decade in an attempt to attract private investors. In an attempt to boast infrastructural development in Ghana, the government is encouraging Public-Private Partnership (PPP). According to the World Bank

(1991), the level of investment is inadequate (Frimpong & Marbuah, 2010). This poses a challenge to government in meeting the Millennium Development Goals (MDGs). And also missing the benefits associated with private sector led growth (Coutinho & Gallo, 1991; Serven & Solimano, 1990).

In the quest to explain the investment behaviour, plethora of factors has been identified. These factors include economic growth (khatib, Altaleb & Alokor, nd), exchange rate (Asante, 2000), inflation, export, interest rate and other macroeconomic conditions (Bayai & Nyangara, 2013; Sioum, 2002; Eshun, Adu & Boabeng, 2014; Akpalu, 2002; Ayeni, 2014). Other studies that have looked at uncertainty and investment have mainly focused on demand (Fuss & Vermeulen, 2008) or how uncertainty in general affect the dynamics of investment, uncertainty and irreversibility (Antoshin, 2006; Abel & Eberly, 1994; Bloom & Bond, 2007).

One consensus in the literature on determinant of investment is the impact of risk and uncertainty on investment. Risk and uncertainty affect the investment climate and ultimately slow down investment. Source of uncertainty may include macroeconomic behaviour and international trade. One of such source is the oil price shock. According to Guo and Kliesen (2005), oil price shocks raises uncertainty about future oil prices and thus delays business investment. In Elder et al (2009), uncertainty about energy prices will induce optimizing firms to postpone irreversible investment decisions as long as the expected value of additional information surpasses the expected short-run return to current investment (Henry, 1974; Bernanke, 1983). Also, Bernanke (1983) cited in Elder et al (2009) suggests that a sharp decrease in oil prices, may not necessarily be expansionary for oil-importing countries in the short-run, given that oil price changes creates uncertainty about prices. Therefore, oil price shocks, both positive and negative shocks, increase uncertainty in the economy, thereby causing stagnation in investment. Therefore, the overall effect of oil price shocks is a decrease in aggregate investment caused by risen uncertainty levels in the economy.

The theories that focus on real options such as firm-level investment decisions developed by Henry (1974), Bernanke (1983), Brennan and Schwartz (1985), Majd and Pindyck (1987), Brennan (1990), Gibson and Schwartz (1990), Triantis and Hodder (1990) and Aguerrevere (forthcoming) suggest similar incidence of the effect of oil prices. Bernanke (1983) argues, in addition, that uncertainty about the return to investment (which may come as a result of variability in oil prices) at the firm level may create cyclical fluctuations in aggregate

investment. This makes the need for a study on Oil price variability crucial to the economy of Ghana.

Though there exist very view literature on the effect oil prices on macroeconomic variables in Ghana, these studies focuses on inflation (Wiafe & Ahiakpor, 2014) or economic growth (Cantah, 2013). There is no attempt to explore the role of oil price shocks on investment in Ghana. Motivated by theory and literature gap in empirical research for Ghana, we reinvestigate the empirical relationship between uncertainty about oil prices and investment.

The subsequent sections of the study would be divided as follow; section two provides empirical review on the effect of oil price and inflation. Section three gives theoretical framework and model. While the fourth section presents empirical results of the study, the last section presents the conclusion and policy recommendation.

Theoretical Framework

Investment decision theories are central to economic analysis. This is emphasized in the Rostows growth theory, Ricardo's steady state and Harrod and Dormar growth models in the form of capital accumulation. This is because capital accumulation sets the economy on the path of increasing productivity. Therefore, the need to explain investment behaviour was inevitable. One of the theories that seeks to explain investment behaviour is the cost of capital. This theory argued that firms attempt to maximize their value by adjusting capital stock in such a way that marginal value product of capital matches the market interest rate (Sioum, 2002). This theory is based on the law of diminishing marginal product of capital in a convex production function. Hence it is expected that demand for investment goods will decline with an increase in interest rate (the user cost of capital).

Extensions to the user cost were easily made by incorporating fiscal incentives like taxes on profits and investment tax credits to make it more realistic. Despite its elegance, user cost theory nevertheless, says little or nothing about what determines the marginal value product of capital. Therefore, uncertainty in investment is driven by volatility or uncertainty of expected profit from such investment. How expectations are formed is however a contentious issue in economics.

On a more formal basis, shifts in investor expectations are supposed to be founded on economic fundamentals including observed shifts in technology, consumer demand, opinion surveys and the like. They could also occur for inexplicable attitudes of pessimism or optimism affecting economic agents throughout the economy. Keynes (1936) was the most prominent of

those who subscribed to the latter notion and he attributed fluctuations in investment to "animal spirits" of investors than to a meticulous calculation of future streams of profit weighted by their respective probability of occurrence.

The remaining theories were developed based on empirical formulation of theoretical models. The accelerator model is the simplest of them in which the firm is assumed to keep a stable relationship between the capital stock it desires to maintain and the level of output. The model mainly suggest that investment (changes in capital stock) is driven by changes in aggregate demand. Notwithstanding the obvious critique on its neglect of the cost of capital and issues of profitability, the accelerator model often better explains investment patterns than sophisticated models.

The neoclassical flexible accelerator model suggested by Jorgenson (1967) combines the user cost of capital (interest rate, depreciation and price of capital goods) and the accelerator effect to explain investment behaviour. Subject to lags and costs involved in adjusting the capital stock, a competitive firm in the neoclassical model is supposed to realize only a portion of the desired capital stock in the current period. It is also important to note that the firm in the neoclassical model is assumed to operate under perfectly competitive product and factor markets which implies inter alia absence of liquidity constraints (to adjust capital stock) and a general equilibrium situation with full employment. Another popular and yet equivalent investment model is Tobin's *q* theory, (Tobin, 1969) which relates the market value of the firm with its replacement cost as a guide for investment decision. In its simplest form, this theory postulates that investment will be worthwhile as long as the value of the firm in the stock market is higher than the cost of acquiring the firm (its machinery and equipment) in the product market.

These theories were formulated base on the characteristics of advanced industrial economies. The application of these theories to a developing economy like Ghana is difficult. This is mainly due to the fact that, the financial markets constraints in developing countries and market inefficient making investment in such economies unattractive (Asante, 2000). The assumptions of the models to understand investment decisions were not tenable in most developing countries. For example, no or little government intervention, no liquidity constraints is hard to come by and most, if not all, of the markets in developing economies are not operating under perfect competitions. One of the most important issues relating to the above

is the differences in institutional and organisational arrangements in developed and developing economies.

One of the studies that investigated developing economies private investment deviated from the traditional theories of investment and emphasized the role of the financial sector development. Mckinnon (1973) and Shaw (1973) suggested that private investment is caused by a repressed financial sector through the real interest rate on deposits. Thus a well-developed financial market results in increased saving and subsequently investment.

Overtime, studies have come out with different possible explanations for the fluctuations in private investment. Agenor and Montel (1996) explain how exchange rate affects investment under capital mobility. The role of public investment on private investment is explained by the crowding out and crowding in of government expenditure on investment. Since public investment in developing countries assumes a relatively larger role than in industrial counties, it becomes important to take account of its complementarity and substitutability with private investment.

In theory, crowding in and crowding out effects of public investment could take place at the same time and, a priori, the net effect on private investment is indeterminate. The crowding out effect of public investment in developing countries however may not be felt through higher taxes and/or increased interest rates as in industrial countries; rather it is likely to take one or all of the following three forms. First, limited market size in many developing counties implies public investment in productive sectors may displace private ventures, causing what we call a *real crowding out*. Second, financial crowding out may take place as both agents run for the same and often limited credit pool. And finally financing public investment through domestic and/or foreign borrowing could crowd out private investment through its effect on inflation and debt accumulation which render the business environment uncertain. Crowding in effects of public investment in developing countries may also not appear through the accelerator channel as in developed countries but rather through the long run efficiency (profitability) effects of its infrastructural component on private investment. (Fitzgerald et al., 1992).

A rapidly expanding recent literature on investment decision has focussed attention on the irreversible nature of part or all of fixed investment (Dixit & Pindyck, 1994). When investment is hard to reverse, instability and uncertainty create a value to waiting for more information so as to avoid getting stuck with unprofitable and irreversible project(s). The basis for this theory lies in the asymmetry of the adjustment cost of capital stock, i.e. most investment projects are

easily done than undone making downside risks costlier than positive shocks. Under such condition, the optimal investment policy seeks balance between the value of waiting (which is the present value of future streams of returns in case they fall short of the user cost of capital) and the cost of waiting (which is the net present value of returns forgone by waiting for a project which would turn out successful anyway). The literature points out that the value of waiting could be considerably large particularly when uncertainty is high, suggesting that uncertainty can become a major obstacle for investment. The important policy implication that comes out of the new investment theory and the empirical studies is that the stability and predictability of the incentive framework is at least as important for private investment as the level of the incentives themselves. It should be noted however that the new theory is mute regarding the long-term impact of uncertainty on private investment.

Model

In contrast to some previous studies which anchored their framework on any one of the investment theories reviewed, this study follows that of Asante (2000) and Frimpong and Marbuah (2010) by adopting an eclectic model in which we specify the determinants of private investment as consisting of Keynesian, neoclassical, neo-liberal and uncertainty variables. This is due to inherent drawbacks confronting those models used in previous studies.

$$LInv = \alpha_0 + \alpha_1 Os_t + \alpha_2 LGPPC_t + \alpha_3 LCPI_t + \alpha_4 R_t + \alpha_5 LRER_t + \alpha_6 CRSP_t + \alpha_7 GOv_t + \varepsilon_t \quad (1)$$

The variables presented in the model are oil price shocks (OS) captured as the volatility in oil price. The effect of volatility is negative on investment from the theoretical position (Elder, 2009). Log of real per capital GDP (LGDPPC) is used to proxy demand for the economy. This is done due to the fact that increase in income is expected to result in increase in aggregate demand for the economy. Percentage change in domestic prices is interpreted as inflation. The interest rate used for this studies is the deposit interest rate (R). It is expected that the deposit rate have a negative effect on private investment. To measure liquidity constraint in the domestic economy, the study uses domestic credit to private sector as a proxy (Frinmpong & Marbuah, 2010). The ease in liquidity constraint measured by an increase in the domestic credit to private sector improves the private investment figure. Real effective exchange rate is measured as the weighted average of exchange rate adjusted for inflation. Due to the effect of government expenditure in developing countries, the study introduces the effect of government investment proxied by government expenditure to examine whether government is a

complement or otherwise to private investment. The effect of government expenditure could either be negative (crowding out effect) or positive (crowding in effect)

Data

The data on oil price was obtained from US crude oil price to capture the world crude oil price. The data was obtained from the Federal Reserve website. The remaining data with the exception of the Prime rate were obtained from the World Development Indicator (WDI) from the World Bank Website. The Prime rate was obtained from the Bank of Ghana website. Due to the limited availability of data, the result from the External Debt data obtained from the WDI, the study period was limited to 1984 to 2010. The 1984 was also the period that most of the structural reforms of the Ghanaian economy started. However due to many policy reforms which may have influence the international level of liquidity constraints, the study suggest a possible structural break in the data which could emanate from the adoption of HIPC initiative. The policy turn the economies debt situation from worse to better. This affected other indicators like investment, interest rates and inflation in the economy.

Empirical results

The results presentation starts with the regular unit root test for the variables used for the data analysis. The unit root employed in this study is the ADF and the PP unit root test. The PP unit root test uses non-parametric estimation approach to evaluate the series. The test result presented are for the cases of intercept. However, the test result for cases of trend and intercept and trend only presented similar results. The result is presented in Table 1.

Table 1: Unit root test using ADF and PP

Variable	ADF		PP		Order
	Level	1st diff	Level	1st diff	
LINV	-0.7201	-5.1622***	-0.9722	-2.681*	*I(1)*
LGOV	-1.010	-3.522***	-1.9615	2.850*	*I(1)*
LGPPC	0.7851	-4.351***	0.6426	-3.219**	*I(1)*
CRPS	-1.558	-4.732***	-1.902	-3.093**	*I(1)*
LREER	-2.551	-4.799***	-1.688	-3.946***	*I(1)*
LCPI	-2.94260	-5.0189***	-2.408	-5.969***	*I(1)*

Note: "*", "**" and "***" represents 10%, 5% and 1% significant levels respectively

Cointegration relations and Long run Results

This study employs the single equation approach to cointegration to test the existence of long run relationship among the variables employed for the study. The concept of cointegration suggest that, non-stationary level variables when combine should yield a stationary series at level (Hamilton, 1999; Enders, 2005 cited in Wiafe, 2013). The single equation cointegration test was formulated based on Dynamic Ordinary Least Squares approach. Owing to the possibility of structural breaks, this study adopts Hansen Instability test to cointegration to test for any existence of cointegration. The result from the test indicates that, the null hypothesis of cointegrating relationship existing among the variables was not rejected.

Similarly, the Engel-Granger test to cointegration also suggested the relationship between the variables used in the study as integrated in the long-run. Phillips-Ouliaris also showed that the variables are cointegrated in the long run. Thus all the three cointegration test used showed some form of long run relationship between the variables used for this study as shown in Table 1.

Table 1: Stock and Watson DOLS Results Estimate

Variable	Coeff	Std. Error	t-Statistic	Prob.
LOS	-1.5300	0.280120	-5.461993	0.0000
LGDPPC	0.052	0.01182	4.391397	0.0001
R	-0.2008	0.078602	-2.554035	0.0153
INF	-0.3306	0.045259	-7.303493	0.0000
LRER	-0.0086	2.062411	-0.004179	0.9967
CRPS	0.4558	0.073420	6.208167	0.0000
GOV	1.7093	0.174406	9.800860	0.0000
C	-4.8752	12.47525	-0.390796	0.6984
		Diagnostics		
R-squared	0.9973	Mean dependent var		9.6613
Adj. R-squared	0.9918	S.D. dependent var		4.4571
S.E. of regression	0.4030	Sum squared resid		5.5235
Durbin-Watson stat	1.8668	Long-run variance		0.0551
		Cointegration test result		
		Critical value		Prob.
Engle-Grnager tau statistics		-5.674		0.0293
Engel-Granger Z Statistics		-85.755		0.000
Phillips- Ouliaris tau-statistic		-5.990307		0.0781
Phillips- Ouliaris Z-statistic		-44.57415		0.0993
Hansen Instability test		0.1944		0.200

Source: Author's estimate (2014)

The study aimed at examining the effect of oil price volatility on investment in Ghana. The shocks in oil price is found to be negative related to private investment in Ghana. The shocks in oil prices was found to be -1.5 and statistically significant at 1%. This shows that 1% increase in volatility would result in 1.5 percentage points decrease in investment. The effect confirms the theoretical expectation of relationship between investment and oil price fluctuation or shocks. The shock results in an increase in risk to investors which in turn leads to reduction in profit and increased cost. Once the expected returns decline, investment would also decline. An oil price increase will typically lead to a transfer of income from the oil importing countries to the oil exporting countries. This reduction in income would cause rational consumers in oil importing countries to cut back on their consumption spending and investment (Ogundipe & Ogundipe, 2008). Therefore, oil price shocks, both positive and negative shocks, increases uncertainty in the economy, thereby causing delayed investment. Hence, oil price shocks, lowers aggregate investment by raising uncertainty levels in the economy (Elder, 2009).

Economic instability capture by inflation rate had a negative effect on investment. The impact though small was significant at 1%. This indicated that an increase in the inflation rate by 1% would result in reduction of private investment by 0.33 percentage points. This is in line with the findings of Asante (2000), Ogundipe and Ogundipe, (2008) and Frinmpong and Marbuah (2010). High economic instability affect the expected returns on investment and increases cost of private investment hence reducing private investment.

The log of real effective exchange rate was found not to be significant. However, exchange rate was found to have a negative coefficient indicating that, depreciation of the currency have a negative effect on the investment in the country. The insignificance of exchange effect on investment could be explained by the fact that, as Rodrick puts it, "Uncertainty matters a lot. Indeed it may matter so much as to render insignificant some of the traditional determinants of investment (Asante, 2000).

Income measured as per capita income had positive and statistically significant relationship with private domestic investment in Ghana. This means that income is important in explaining private investment in Ghana as a country. GDP growth rate, households' income (Valadkhan, 2004; Rinluhart & Khan, 1990). This emphasized that income is an important for investment to grow. The improvement in income per capita would result in, if not equivalent,

improvement in aggregate demand. The increase in aggregate demand signals investor of the profitability of investing in an economy and hence leads to increase in investment.

The possible crowding-in effect of the government spending over the private investment result in its positive impact on domestic private investment for Ghana. It is a fact that in developing economies, government expenditure are target at infrastructure development. These kind of infrastructure are linked theoretically to increases in capital's productivity for future investments, and saves the private investors from additional investment expenditure cost (Ferreira, 2005; Melo & Rodrigues Junior, 1998; Rocha & Teixeira, 1996; Studart, 1992). For example, in Ghana, government spends much in road infrastructure which open various regions of the economy up for market and to business centres. This reduces cost and improves business transaction and returns from investment. Thus encouraging private investment in the economy.

Domestic credit to private sector was found to be a significant factor in influencing private investment in Ghana. It had positive effect on investment in Ghana. This means that if the domestic credit constraints of citizens of a country is reduced through the financial sector providing a lot of credit to the private sector for investment purposes, the overall investment would increase for that country. The alternative argument is presented by the proxy for interest rate. It was realised that the higher the interest rate on deposits, the lesser there would be a growth of private investment. Thus, potential investors compare the marginal returns on their capital as against what they would get on their investment, would lead to investment decision.

Conclusion and recommendations

The study sought to examine the effect of oil price volatility on domestic private investment in Ghana. The study using volatility predicted from GARCH (1, 1) model revealed that oil price volatility is a significant factor that affect private investment in Ghana. This implies that, oil price shocks is detrimental to private investment in Ghana and ultimately affect economic growth by affecting aggregate demand. Thus, the risk inherent in oil price shocks affect the cost of investment and reduces the expected returns from investment. Other factor that were identified to affect investment include inflation, domestic credit to private sector of the economy. It is therefore recommended that mechanisms should be put in place to curtail the effect of oil price shock on the Ghanaian economy through domestic private investment. This could be done by reducing the overreliance on crude oil in productive sectors of the

economy by ensuring efficient power supply in the economy. Economic stability should also be enhance and credit be provided to the private sector to foster investment.

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