Interest Rate Deregulation and Private Investment: Revisiting the McKinnon-Shaw Hypothesis in Ghana

Eric Osei-Assibey* and William Baah-Boateng**

The study re-examines the McKinnon-Shaw financial liberalization hypothesis, which posits simply that high real deposit interest rates increase financial savings, which in turn lead to increase in the quantity and quality of domestic investment. More specifically, the study investigates the impact of interest rate deregulation on investment in Ghana and the transmission mechanism through which this could happen. Utilizing cointegration and error correction model techniques with data for the period 1970-2005, the study’s findings are as follows. While the study finds a statistically significant and positive relationship between real deposit interest rate and financial savings as well as between bank credit and financial savings, the net effect of a real deposit rate on investment is found to be negative. In other words, holding all other variables constant, a higher real deposit rate which leads to a higher increase in financial savings and then bank credit, is offset by a higher cost of lending, thus making the net effect on investment negative. In this regard, the findings do not seem to provide support for the McKinnon-Shaw financial liberalization hypothesis. Other variables found to be important in explaining investment in Ghana are the financial deepening, macroeconomic volatility that is proxied by inflation differential and the lagged change in GDP, affirming the accelerator model principle. The findings therefore have important policy implications for the on-going financial sector reforms.

Introduction

There has been a paradigm shift in the choice of factors influencing a country’s investment and economic growth. While the emphasis during the 1950s and 1960s was on the nexus between capital accumulation and economic growth to the extent of almost neglecting the financial factors, it is now well acknowledged that an efficient and relatively stable financial system is vital for investment and growth. Prior to the early 1970s, the policy stance of many countries was overwhelmingly in favor of low interest rates because it was believed to

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facilitate capital accumulation or promote investment spending. Subsequently, many governments in the developing countries generally adopted low interest rate policies, whether for doctrinal or other reasons (Hussain et al., 2002).

McKinnon (1973) and Shaw (1973), however, disputed this idea by arguing that financial repression associated with negative real interest rates often leads to the withdrawal of funds from the banking sector as well as is a saving disincentive. In effect, it reduces the availability of bank credit which lowers investment and growth. The policy recommendation was therefore to liberalize the financial sector. Such liberalization, as suggested by McKinnon and Shaw, includes eliminating undue reserve requirements, interest rate ceilings and mandated credit allocations, while at the same time using appropriate macroeconomic measures to stabilize price levels. The expected outcome is increased savings and investment and a reduction in dispersion in the profitability of investing in different sectors of the economy. According to the McKinnon-Shaw hypothesis (hereinafter referred to as M-S hypothesis), deregulating the financial system raises interest rates, which then encourages more people to demand financial savings. These in turn lead to increase in the quantity and the quality of domestic investments. However, this hypothesis is radically different from the neoclassical and Keynesian positions. Neo-Keynesians argue that financial liberalization is deleterious to investment and growth. They stress the fundamental Keynesian message that it is investment that determines saving, not the other way round; and that high interest rate, by stifling investment, may reduce saving. Furthermore, high interest rates may lead to cost-push inflation via the financing of working capital with borrowed funds. To them what is important is the prospect of profit and an ample and elastic supply of credit to the private sector but not prior saving (Warman and Thirlwall, 1994).

Following the experiences of Taiwan, Korea and other Asia-Pacific countries, which incorporated high real interest rates as part of their successful development strategies, many developing countries began to experiment with higher interest rate policies as part of their IMF-sponsored financial liberalization programs. However, there is a growing controversy as to the relative advantages or disadvantages of financial liberalization, particularly interest rate deregulation in the economies of developing countries. This is because evidence across most developing countries has been rather mixed. Interest rate deregulation appears to have improved economic performance of a few countries, but has resulted in financial distress and economic retardation in the others (Cho and Khatkhate, 1990). Even though Ghana has undergone more than two decades of interest rate deregulation under a comprehensive financial sector reform program, the response of domestic investment has been far from impressive. This study therefore seeks to revisit the M-S hypothesis by using cointegration and Error Correction Model (ECM) techniques which have been ignored in most of the previous studies. Besides testing whether the high levels of interest rates prevailing in the country after the reforms have boosted or stifled domestic investments, the study further investigates the transmission mechanism or the structural relationships that link a real deposit rate to investment demands. The remainder of the study is structured as follows: it briefly takes a look at the financial conditions and the policy framework in both pre- and post-financial reform era,
followed by a review of the theoretical underpinning and existing empirical literature. Subsequently, it presents the empirical framework and discusses the estimation results, and finally, offers the conclusion with policy implications of the findings as well as scope for future research.

**Overview of the Financial System in Ghana**

Financial sector reform in Ghana was part of a comprehensive Economic Recovery Program (ERP) and Structural Adjustment Program (SAP), which began in 1983. Prior to that, the country’s financial sector was characterized by financial repression policies which, coupled with balance of payments deficit, overvalued exchange rates, and high inflationary pressures culminated in almost the collapse of the country’s financial system. This necessitated the introduction of the financial sector reforms between 1988 and 1989, which became known as the Financial Institutions Structural Adjustment Program (FINSAP). Among some of the broad objectives of the program were to restructure banks that were distressed, to improve saving mobilization, to enhance efficiency in credit allocations, to reform banking laws, etc. Consequently, by the mid-1990s, the financial sector had been progressively liberalized. This had involved interest rates deregulation (i.e., withdrawal of ceilings on deposit and lending rates), removal of credit guidelines, and the introduction of market-based instruments of monetary control. The reform results have, however, been mixed.

One of the initial effects of the reform was that the real interest rates, which had remained largely negative during the regime of the financial repression, turned positive in 1991 and 1992, following the decline in the rate of inflation. Since then, the banking industry has consistently witnessed phenomenal growths, and it is currently one of the fastest growing sectors in the country. The widely deregulated environment and the introduction of the universal banking concept in the early 2000s as well as the relatively stable macroeconomic environment have resulted in the influx of both foreign and domestic banks. The number of banks has consequently increased from nine at the beginning of the reform to 26 currently. This has also resulted in a massive expansion of banks’ branch network and a keen competition within the sector.

However, the responsiveness of financial savings and investments to the interest rate deregulation and the apparent improvements in the institutional framework has been worryingly slow. In part, various economists and policy makers have attributed this to the wide interest rate spreads after the reform. While for the most part of the 1990s, the average nominal interest rate hovered around 40%, the average bank deposit rate was below 10%, with its real value remaining negative throughout the period. This obviously not only slowed effective financial savings mobilization, but also crowded out private sector investments as the cost of borrowing was too expensive to bear. The banks however were not much bothered as they could still make huge profits from the soaring government Treasury bill rates at that time. This situation of a wide interest spread remains, despite the keen competition within
the financial sector and the relative stability in the macroeconomic environment. For example, despite the fact that all the major macroeconomic indicators such as the inflation rates, Treasury bill rates and the BOG prime rates show downward trends in recent times, the lending base rates by the banks are much more higher and have failed to fall in tandem with the others (see Figure 1). The country reached a single-digit inflation (9.46%) in the third quarter of 2010 for the first time in many years, while the policy rate (also known as the prime rate represents an indicative rate around which all the other rates revolve) had also fallen from a high of 18% in 2009 to 13.5% by mid-2010. Yet, the base rates (i.e., the minimum lending rate quoted by banks) have failed to fall as expected. The base rates are still around 25-28%, albeit the actual rates charged are between 30-34%.

![Figure 1: Financial Indicators](image)

Meanwhile, the deposit rates have been kept so low at about 5%, raising questions about the intermediation efficiency of the banking industry and the ability of the deregulated banking sector to stimulate domestic private investments to bring about the much-needed growth and poverty reduction in the country.

**Theoretical Literature**

**McKinnon-Shaw Financial Liberalization Hypothesis**

The first theoretical pillar to the independent works of McKinnon (1973) and Shaw (1973) is on the premise that interest rates have a positive relationship with economic growth via...
investment and that financial repression, far from being regarded as growth promoting, is deleterious to investment and economic growth. However, the transmission mechanism or the ‘channel of influence’ of how interest rates affect investment differs according to the viewpoints of these two economists. McKinnon (1973) posits that potential investors must accumulate money balances prior to investment. He argues that money holding and capital accumulation are complementary in the developing process, which is in contrast to the neoclassical monetary growth theory. He contends that because of the lumpiness of investment expenditure and the reliance on self-finance, agents need to accumulate money balances before investment takes place. Positive (and high) real interest rates are necessary to encourage agents to accumulate money balances, and complementarities with capital accumulation will exist as long as the real interest rate does not exceed the real rate of return on investment. A higher real deposit rate of interest provides an impetus for firms purporting to finance investment projects.

Shaw (1973), on the other hand, emphasizes the importance of financial liberalization for financial deepening, and the effect of high interest rates on the incentive to save and disincentive to invest in low-yielding projects. The increased liabilities of the banking system, resulting from higher real interest rates, enable the banking system to lend more resources for productive investment in a more efficient way. According to him, measures to raise real rates of return on financial assets, to reduce the variance of returns, and to improve financial technology, along with measures in non-financial areas, extend savers’ horizons over both space and time. Shaw, therefore, included debt intermediation in his model of financial repression, reflecting what investors could borrow. He also included opportunity costs (in real terms) of holding money, such as non-monetary financial assets and inflation hedges. However, the point of convergence with McKinnon is that he also places premium on the role of deposits as a source of funds for financial intermediaries. As he explains, the expanded financial intermediation between savers and investors as a result of higher real interest rates increase incentives to save by means of deposits. This then stimulates investment due to an increased supply of credit, and raises the average efficiency of investment. In sum, the important policy conclusion emanating from the M-S hypothesis is that financial liberalization policies that lead to a deregulated interest rate result in an increase in the nominal deposit rate which undoubtedly stimulates savings and investments.

However, several other theoretical studies have criticized this hypothesis, particularly those of the neo-Keynesian economists and structuralists. Contrasting the M-S hypothesis and the transmission mechanism, Bhatia and Khatkhate (1975) contend that savings and investment differ behaviorally since transfer of savings to investment depends on a host of other factors other than the real interest rate. Such factors include availability of investment opportunities at rates exceeding the cost of funds, institutional constraints and cost of administering funds. Another attack on the transmission mechanism by a neo-Keynesian is Rittenberg (1991) and to some extent, Warman and Thirlwall (1994). They actually reverse the direction of causation by emphasizing the fundamental Keynesian message that “prior
savings has no more tendencies to release funds available for investment than prior spending”. They argue that it is investment that determines saving and not the other way round, and that high interest rates may stifle investment and growth. According to them, what is important is not prior saving, but the prospect of profit and an ample and elastic supply of credit to the private sector.

**Empirical Evidence**

Even though there is a wealth of empirical literature on M-S hypothesis, evidence in support of the perceived benefits from interest rate deregulation on investment is, at best, weak or inconclusive. Various empirical studies have either supported or dismissed the positive impact of interest rate deregulation on investment. A study by two World Bank economists, Cho and Khatkhate (1990), in connection with the financial liberalization experiences of five Asian countries, rejects the M-S hypothesis. The study reports that a financial reform, whether comprehensive and sweeping or measured and gradual, does not seem to have made any significant difference to the saving and investment activities in the liberalized countries. They observed that decisions to invest are determined by several factors and the relationship between investment and real interest rate is at best ambiguous. This conclusion appears to be corroborated by Hussain et al. (2002), who studied the impact of financial liberalization on financial savings and investment between 1970 and 1992 in some selected countries in Africa. The study finds that real interest rate has no effect on investment through the supply of credit, but it appears to affect investment directly, probably, through its bearing on the cost of investment. However, it concludes that it is not difficult to argue that a manipulation of the real interest rate is not a reliable policy instrument for resource mobilization in the context of African countries because both total and financial savings are not responsive to movements in the real interest rate and that its effect on investment is uncertain. Furthermore, in a related study on the effect of financial liberalization on gross investment allocation in India, Guha-Khasnobis and Bhaduri (2000) examine the allocation of credit across industrial sectors by using a simple measure of efficiency over the liberalization period 1991-1998. Their conclusion refutes the argument that financial liberalization is supposed to enhance economic growth mainly by directing investment towards industries and better firms. The study concludes that “Although equity capital increased sharply as a source of funds, there was no corresponding rise in investment in productive assets in our sample”.

However, a more recent study by Odhiambo (2010), although the study does not directly assess the impact of an interest rate deregulation on investment, finds a strong support for the positive impact of interest rate reforms on financial development in South Africa. By creating a simple trivariate causality model and using cointegration and ECMs, the study, contrary to the results from some previous studies, finds that financial development, which results from interest rate reforms, does not Granger cause investment and economic growth. Similarly, a study (Akpan, 2004) on Nigeria, utilizing a similar methodology as above, reaches somewhat similar conclusions. The study assesses the impact of financial liberalization in the form of an increase in real interest rates and financial deepening (broad money (M2) relative to GDP) on the rate of economic growth in Nigeria and finds a positive relationship.
between broad money (M2), investment and real deposit rate and economic growth. However, it concludes that the low coefficient of the real deposit rate implies that interest rate liberalization alone is unlikely to expedite economic growth.

In Ghana, although there is no known study that has rigorously tested the M-S hypothesis, a few exploratory studies available show very little support for the hypothesis. For instance, Brownbridge et al. (2000), who explored the impact of financial sector on the saving and investment in Ghana, came to the conclusion that even though the institutional structures of the banking system had improved considerably since the reforms, investment remained depressed. The present study therefore departs from the previous ones by not only rigorously investigating both the short- and long-run effects of interest rate deregulation on private investment in Ghana, but also assesses the structural relations (or the transmission mechanism) relating real deposit rate to investment.

Theoretical Framework and Empirical Model Specification

Economic theory suggests that the rate of interest may affect investment in two opposite directions. On the one hand, interest rates may affect investment positively through the effect on financial savings and on the credit to the private sector (Galbis, 1979). On the other hand, according to Warman and Thirlwall (1994), a high interest rate can affect investment negatively, particularly if it is considered as a proxy for the price of credit or as a cost of borrowing. To further explain these relationships under both liberalization and repression regimes, we make use of a simple conceptual diagrammatical framework (see Figure 2) (Rittenberg, 1991; Killick and Martin, 1993; and Hussain et al., 2002). The upward sloping curve, $S_1$, represents a saving supply schedule, in line with the classical assumption that the more the present consumption is postponed the higher the interest reward, $r$ (i.e., a real deposit interest rate). The downward-sloping curve, $I$, represents an investment demand schedule (or a saving demand curve). The negative slope is on the assumption that the returns on investment decrease as the quantity of investment increases.

In a free market economy, the interplay of the demand and supply of funds fixes the nominal rate at $r^*$ (i.e., the equilibrium level of interest rate where savings equals investment) and the volume of savings and investment at $I^*$. Now, assume that a government in a financially repressed regime imposes a ceiling on interest rates below the equilibrium rate so that the real rate is $r_0$. At this rate, the level of investment demand is $I^*$, but the quantity of savings is reduced to $I_0$. As McKinnon (1973) points out that investment is constrained by the shortage of savings, only $I_0$ amount of investment actually occurs, so the effect of an interest control that was intended to boost investment actually reduces it. Moreover, according to previous studies by Galbis (1979), Levine (1997) and Hussain et al. (2002), lowering the cap on interest rates reduces average investment efficiency since investments with lower returns then become profitable. Thus, the impact on investment does not only have a quantity effect but also a quality effect, or a productivity effect.

From Figure 2, if the quantity of savings and investment is pegged at $I_0$, we can infer that the market clearing interest rate would be $r_1$, and only projects offering investors a
better real return than $r^1$ would be undertaken. The ceiling on interest rate at $r^0$ has therefore generated an excess investment demand of $(I^0 - I^1)$. In such a situation, credit allocations are not based on expected productivity of investment projects but on transactions cost and default risk considerations such as the quality of collateral, political clouts, and covert benefits to loan officers (Killick and Martin, 1993). When there is an excess demand for investment, as seen above, M-S hypothesis postulates that if the government decides to scrap the interest ceiling, $r^0$, and allows interest rates to rise to market clearing levels, the real rate moves upward towards the equilibrium interest rate, $r^2$. This rate, apart from encouraging more people to save, also deters entrepreneurs from undertaking all those low-yielding investments below the equilibrium since they are no longer profitable, thereby ensuring that only highly efficient investments are carried out. Saving increases because it becomes more attractive and hence investment increases from $I^0$ to $I^2$. The average return to or efficiency of aggregate investment increases, inducing an increase in the rate of economic growth. This will, in turn, encourage additional saving, shifting the saving supply curve to the right (from $S^1$ to $S^2$).

However, if the market interest rate rises beyond the equilibrium interest rate ($r^*$), then investment is expected to fall, as the economy moves along the negatively sloped investment demand curve. This seems to be in conformity with the Keynesian framework, which says that saving is positively related to income, while investment is negatively related to the price of credit, for which the interest rate stands as a proxy, suggesting a highly positive correlation between deposit rate and lending rate. On the contrary, as observed by Rittenberg (1991) and Stiglitz and Weiss (1981), financial market imperfections in developing countries may
mean that these two rates will never converge, but the spread between the deposit and lending rates will rather grow wider. Deducing from this view, if financial markets were perfect, then the equilibrium would be established at \( r^* \) and \( I^* \). However, in the case of financial market imperfection, as in many developing countries like Ghana, significant transactions cost and high default risks shift the investment-optimizing point to \( r_1 \) and \( I_0 \) and establish a wide discrepancy between deposit and lending rates.

In line with the foregoing, and following Rittenberg (1991), Warman and Thirlwall (1994), and Hussain et al. (2002), we specify a simple linear investment function as follows:

\[
I = \beta_0 + \beta_1 r + \Sigma \beta_i x_i + u
\]  

...(1)

The coefficient of the explanatory variable, \( r \) (representing a real deposit interest rate) in Equation (1), is indeterminate at this stage due to the two conflicting theories described above. This is explored in a more detailed way in the following section. The other explanatory variable, \( x_i \), included in the investment function, is chosen based on previous studies such as Rittenberg (1991), Warman and Thirlwall (1994) and Hussain (1997). A detailed explanation of these variables and their hypothesized signs are provided in Table 1.

The final equation to be estimated is therefore specified as follows:

\[
I = \beta_0 + \beta_1 r + \beta_2 B_c + \beta_3 (\pi - \pi_{USA}) + \beta_4 \Delta GDP_{-1} + \beta_5 FIR + \beta_6 D(1988) + u
\]  

...(2)

All variables are time series variables, except for the dummy. However, the time subscripts are removed for ease of exposition.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Hypothesized Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>( r )</td>
<td>Real deposit rate, measured as the difference between nominal deposit rate and rate of inflation.</td>
<td>+/-</td>
</tr>
<tr>
<td>( B_c )</td>
<td>The supply of bank credit (the supply-side determinant).</td>
<td>+</td>
</tr>
<tr>
<td>( FIR )</td>
<td>The ratio of M2 to GDP as a proxy for financial intermediation ratio or a measure of financial deepening.</td>
<td>+</td>
</tr>
<tr>
<td>( \Delta GDP_{-1} )</td>
<td>The lagged change in real GDP as a measure of the income accelerator effect on investment (demand-side determinant).</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 1: Description of Other Explanatory Variables

Table 1 (Cont.)

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Hypothesized Sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>((\pi - \pi_{USA}))</td>
<td>Inflation differential as a measure of macroeconomic uncertainty, where (\pi) is the domestic inflationary rate in Ghana and (\pi_{USA}) is the inflationary rate in USA. This also has an implication for exchange rate and interest rate differentials.</td>
<td>+/-</td>
</tr>
<tr>
<td>(FD)</td>
<td>Debt overhang effect, measured as the ratio of external debt to GDP.</td>
<td>-</td>
</tr>
<tr>
<td>(D(1988))</td>
<td>A dummy variable for the pre- and post-reform period to capture structural reforms.</td>
<td>+/-</td>
</tr>
</tbody>
</table>

The Transmission Mechanism

Previous studies (Warman and Thirlwall, 1994; and Hussain, 1997) have shown that real deposit interest rates affect both financial savings and costs of credit in different directions, thus having varying effects on supply of credits, and for that matter on investment. Here, we briefly focus on the net effect or on how a real deposit interest rate affects the eventual investment demand. In other words, we examine the transmission mechanism (or the structural relationship) linking a real deposit rate \((r)\), financial savings \((FS)\), supply of bank credit \((B)\) to investment. In the ‘neo-liberal’ view, investment is positively related to the real deposit rate. The reason being that a rise in interest rate increases the volume of financial savings through the financial intermediaries, thereby raising the investable funds (i.e., the supply of bank credit)—a phenomenon McKinnon (1973) referred to as the ‘conduit effect’. Thus, financial liberalization increases financial savings, which in turn increases bank credit, and thus investment. However, it should also be noted that a higher deposit interest rate would mean a higher cost of borrowing which can be a disincentive to investments (Rittenberg, 1991). In this regard, and simplifying Hussain et al.’s (2002) model of transmission mechanism, we specify a simple one-to-one chain-effect model to determine the net effect of a real deposit rate on investment.

\[
B_c = \alpha + \gamma(FS), \quad \text{where } \gamma > 0 \quad \ldots(3)
\]

\[
FS = \lambda + \delta(r), \quad \text{where } \delta > 0 \quad \ldots(4)
\]

The variable, \(FS\), represents financial savings, which indicates the amount of savings that is channeled via financial assets. Since saving is a flow concept, it is measured by the change in the stock of monetary assets.\(^1\) The variable, \(B_c\), is previously explained in Table 1.

\(^1\) The monetary assets are defined broadly to include short-term and long-term banking instruments, and non-bank financial instruments such as treasury bills and other government bonds. But we exclude notes, coins and demand deposit from our measure of financial savings, since we do not expect the demand for non-interest bearing assets to be sensitive to the rate of interest.
Plugging Equation (4) into Equation (3) and substituting the result into Equation (2), we obtain a reduced-form equation as:

\[ I = (1 + \gamma \alpha \beta_0 + \cdots + \beta_3 r + \alpha x_i) r + \cdots + \sum x_i + u \]  

...(5)

where \( \rho = (\beta_0 + \beta_3 \alpha + \beta_3 \gamma \lambda) \), and further differentiating w.r.t. \( r \) gives:

\[ \frac{dl}{dr} = \gamma_1 + \cdots \times \times \]

This implies that the change in investment per a unit change in real deposit rate will be determined by the relative magnitude of \( \gamma_1 + \cdots \times \times \). The product \( \gamma_1 \times \times \) represents the chain effect that goes from the real deposit rate to investment, through the supply of bank credit (Hussain et al., 2002). An increase in interest rate is expected to stimulate financial saving (measured by \( \delta \)). This then is expected to increase the supply of bank credit (by the parameter, \( \gamma \)), which in turn is expected to increase investment (by the parameter, \( \beta_3 \)). However, the issue of whether the final effect of interest rate on investment is negative or positive depends on the relative magnitude and sign of the parameter, \( \gamma_1 \) (which measures the remote relationship between a bank deposit rate and investment demand).

**Data Sources**


**Estimation Procedure**

**Stationarity Tests**

Nelson and Plosser (1982) have shown that most econometric time series data are usually non-stationary. It is therefore imperative that we take steps to make all the time series data stationary. Time series data is stationary if the mean and variance remain constant over time, while the value of the covariance between two specified periods depends only on the gap between the periods, and not on the actual time at which this covariance is considered. A violation of any one of the conditions leads to non-stationarity of the process. If a series is non-stationary, one is likely to end up with a model showing promising diagnostic test statistics even when the regression analysis is spurious (Charemza and Deadman, 1992). To begin with, we conduct Augmented Dickey-Fuller (ADF) unit root test (i.e., test of stationarity). The ADF test is identical to the standard Dickey-Fuller (DF) test, but is constructed within a regression model of the form:

\[ \Delta x_i = \beta_0 + \beta_1 x_{i-1} + \cdots + \beta_l \Delta x_{i-l} + u_i \]  

\( \cdots (6) \)

where \( x_i \) represents a vector of all the time series variables in our model.
The ADF model is obtained by the inclusion of the term $\sum \beta_j \Delta x_{t-j}$ into the DF test model in order to avoid the problem of autocorrelation in $\Delta x$ and to ensure that the error term, $u_t$, is distributed as a white noise. Further, the ADF test helps in determining the order of integration. If, for example, a variable is integrated or differenced of order zero, then the time series data is said to be stationary. On the other hand, if it is integrated of a higher order, say one or two, then it is a non-stationary time series data. The ADF test results indicate that almost all the variables exhibit unit roots (i.e., non-stationarity with the exception of real GDP growth rate, which is integrated of order zero (stationary at 1% level)). All other variables are integrated of order one according to the ADF test. The test employs the $t$-statistic on the coefficient of the lagged independent variables ($x_t$) and the null hypothesis of no unit root is rejected if the value of $t$-statistic is significantly different from the critical value at 1% or 5% level of significance (Table 2).

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF: Levels</th>
<th>ADF: 1st Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I$</td>
<td>-1.4301</td>
<td>-4.9140***</td>
</tr>
<tr>
<td>$r$</td>
<td>-2.7328</td>
<td>-5.1024***</td>
</tr>
<tr>
<td>$B_c$</td>
<td>-1.3690</td>
<td>-3.6687**</td>
</tr>
<tr>
<td>$FD$</td>
<td>-1.0531</td>
<td>-4.7276***</td>
</tr>
<tr>
<td>$GDP_{-1}$</td>
<td>-4.7072***</td>
<td></td>
</tr>
<tr>
<td>$FS$</td>
<td>-2.1544</td>
<td>-4.1051**</td>
</tr>
<tr>
<td>$(\pi - \pi_{USA})$</td>
<td>-2.7273</td>
<td>-5.1744***</td>
</tr>
<tr>
<td>$DT$</td>
<td>-2.5582</td>
<td>-4.0677**</td>
</tr>
<tr>
<td>$E_{r,t}$</td>
<td>-3.6391**</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** McKinnon critical values for rejection of hypothesis of unit root: *** 1% value (–4.3082); ** 5% value (–3.5731); and * 10% value (–3.2203).

### Test for Cointegration

Having established that the variables are integrated of the same order, I(1), we proceed by testing the possibility of cointegration among the variables. It is believed that failing to test for cointegration when the time series variables are integrated at least of order one, can result in a spurious correlation. To test for cointegration, therefore, Equation (2) was estimated with variables at their level to generate residuals by an application of OLS method. The ADF test was then applied to the residuals for which the $t$-value obtained (at lag 1) is –3.6392. The ADF critical values (using E-views statistical package) are –4.3226 and –3.5796 at 1% and 5% respectively. Since the calculated ADF test statistic is greater (in absolute value) than the critical value at 5%, we reject the null hypothesis that the residuals have a unit root and conclude that they are integrated to the order zero, which implies that the variables in Equation (2) are cointegrated.
**Error Correction Model**

One of the problems of performing regression using differenced variables is that the estimation captures only the short-run relationships. To capture the long-run responses, Engle and Granger (1987) suggested that if variables are cointegrated, then we can incorporate an error correction term that ties the short-run behavior of the dependent variable to its long-run value. The Engle and Granger's representation theorem states that if two series are cointegrated, then they can be most efficiently represented by an error correction specification. Therefore, in line with the ECM, an error correction factor $E_{t-1}$ (i.e., the lagged of the residual generated) that measures the extent of adjustment in a given period to deviations from the long-run equilibrium is introduced in the first difference of Equation (2) as specified in Equation (7) below. The $E_{t-1}$ also constitutes one case of a systematic disequilibrium adjustment process through which the cointegrated variables are prevented from drifting too far apart.

$$\Delta I_t = \beta_0 + \sum \beta_i \Delta x_{t-i} + \varphi E_{t-1} + u_t \quad \text{...(7)}$$

where $\Delta$ is the first-order difference of gross fixed investment, $\Delta x_t$ is a vector of all the explanatory variables in differenced form, and $E_{t-1}$ is the lagged residual generated. The coefficient of $E_{t-1}$ is expected to be negative and less than unity in absolute value.

**Regression Results and Discussion of ECM**

The model is estimated by first taking logarithms of some variables, since test statistics suggest this to be a superior specification. In order to avoid autocorrelation, a first-order autoregressive technique, AR(1), was applied to all the equations. The Durbin-Watson statistic (DW-stat.) then improved considerably afterwards (i.e., getting closer to 2) in all the estimations, suggesting the absence of autocorrelation among the variables. Further diagnostic tests also indicate that the equations passed all the specification tests. This is indicated by the F-statistic for the Regression Specification Test (RESET). Specifically, the Ramsey RESET F-statistic of 0.07996 [0.78025] and the Jarque-Bera (JB) test results of 0.22626 [0.89303] are both less than their critical values. Thus, we fail to reject the value at 5% level of significance. Granger causality test was also carried out between the dependent variable, investment, and the real interest rate. The results indicate that there is a one-way causality between the dependent variable, investment ($I$) and the variable of interest, the real deposit rate ($r$). This enabled us to specify a single linear equation for our estimation. However, the results of these specification tests are not reported here for the sake of brevity. Table 3 reports a number of estimation results of an Engle-Granger’s ECM that relates private investment to real deposit interest rate. The constant term was dropped because the Wald test for the constant term shows a statistically insignificant F-statistic of 0.196593 [0.662493], thus accepting the null hypothesis of no constant term. Excluding the constant term robustly improved the subsequent estimation results.

The regression results show a statistically significant and negative relationship between a real deposit rate and investment demand in four out of five estimations performed. This may
suggest that by working through the cost of credit, investment is not positively related to $r$ as the M-S hypothesis predicts. However, we cannot be emphatic at this stage since the coefficient on the bank credit turned out positive and significant. The net effect will therefore be examined in the subsequent section. Regarding other explanatory variables, the real stock of bank credit to the private sector has the expected positive sign in all the estimations, indicating a 1% level of significance. This result is consistent with a number of recent evidences that support the ‘credit availability’ effect. For example, studies by Warman and Thirlwall (1994), Hussain (1997) and Asante (2000) somewhat conclude that credit availability has a strong and significant effect on investment and that lack of bank credit is a major constraint to private investment. The coefficient on the inflation differential variable, a proxy for a macroeconomic instability, is negative and significant at 10% level. Model 3 shows that 1% increase in the rate of inflation in relation with the US inflation leads investment spending to fall by 0.54%. Similar to Hussain (1997), this result suggests that a macroeconomic uncertainty emanating from high inflation or a rise in the exchange rate has an adverse effect on investment decisions.

Further, the results show that investment responds positively and significantly to the lagged change in GDP ($\Delta GDP_{-1}$), albeit weakly. This is in line with the principle of accelerator model, which makes investment a linear proportion of changes in output. It states that investment is related to output and that each level of output requires a particular amount of capital stock to produce it. In regard to the financial deepening variable, $FIR$, it has the expected positive sign and is significant at 10% level. Model 3 shows that a 1% increase in the $FIR$ causes investment to increase by 0.31%. This result is somewhat consistent with the study by King and Levine (1993) who found that average financial depth is significantly and robustly correlated to both investments over GDP ratio and a measure of the efficiency of investment. In Ghana’s context, this result is not surprising in that the ever increasing financial deepening since the start of financial sector reform had rekindled the confidence of both domestic and foreign investors to invest in the economy. Anecdotal evidence suggests that the reform had improved the efficiency of the financial system which had in turn stimulated individuals and enterprises to hold more financial assets. Even though the reform dummy $D(1988)$ is not significant, albeit negative, the above results on $FIR$ motivated us to do a further test to check for a structural break in order to determine whether policy changes in the deregulated and regulated regimes, besides those related to interest rates, have had any impact on investment. Therefore, a stability test such as Chow-breakpoint test, with settings as 1970-1988, 1989-2005 and 1970-2005, was conducted. We found that the computed $F$-statistic of 3.12878 was greater than the tabulated $F$-ratio of 2.57 at 5% significant level. We thus reject the null hypothesis that there had been no structural change in investment function since post-reform period of 1988. This implies that the financial sector reforms in general have had some effect on the rate of investment.

The external debt overhang variable, $FD$, which is proxied by the ratio of external debt to GDP, carries a positive sign, but statistically insignificant in all the estimations. The positive effect may however be due to the conjecture that a large chunk of inflows into Ghana went
<table>
<thead>
<tr>
<th>Variable</th>
<th>Model Numbers</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>CONST</strong></td>
<td>0.0225</td>
</tr>
<tr>
<td></td>
<td>(0.3336)</td>
</tr>
<tr>
<td><strong>r</strong></td>
<td>–0.1707</td>
</tr>
<tr>
<td></td>
<td>(–1.0211)</td>
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<tr>
<td><strong>Bc</strong></td>
<td>0.8820***</td>
</tr>
<tr>
<td></td>
<td>(5.8128)</td>
</tr>
<tr>
<td>(r – r*) D**</td>
<td>–3.0733</td>
</tr>
<tr>
<td></td>
<td>(–0.8226)</td>
</tr>
<tr>
<td>ΔGDP –1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>(π – πUSA)</td>
<td>–0.6170**</td>
</tr>
<tr>
<td></td>
<td>(2.2274)</td>
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<tr>
<td>FIR_{y-1}</td>
<td>0.5524*</td>
</tr>
<tr>
<td></td>
<td>(1.9668)</td>
</tr>
<tr>
<td>E_{t-1}</td>
<td>–0.4825</td>
</tr>
<tr>
<td></td>
<td>(–1.4129)</td>
</tr>
<tr>
<td><strong>FD</strong></td>
<td>0.0690</td>
</tr>
<tr>
<td></td>
<td>(0.7606)</td>
</tr>
<tr>
<td><strong>D(1988)</strong></td>
<td>–0.0074</td>
</tr>
<tr>
<td></td>
<td>(–0.1101)</td>
</tr>
<tr>
<td>Adj. R²</td>
<td>0.6470</td>
</tr>
<tr>
<td>DW-Stat.</td>
<td>1.9844</td>
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<tr>
<td>AR(1)</td>
<td>(0.3866)</td>
</tr>
</tbody>
</table>

**Note:** *** 1% significance level; ** 5% significance level; * 10% significance level; r-ratios are given in parentheses; It was a switching point dummy variable which takes a value of 0 when interest rate is below the equilibrium (r < r*) and the value of 1 when it is above equilibrium and captures interest rate differentials. However, it was dropped in the subsequent estimations because it correlated with the real deposit rate (r) variable, and worsened the efficiency of the parameters.
into the development of infrastructure, which is complementary to private investment. The results also show that the ECM factor, \( E_{t-1} \) (i.e., the lagged value of the residual), has the expected sign and is significant at 5% level. This suggests that when investment deviates from its long-run level, there is an in-built mechanism to correct the distortion. The coefficient of about 0.8 (see Table 3) indicates that about 80% of the deviation from equilibrium is corrected each year.

The Net Effect of Interest Rates on Investment

The estimation results of Equations (3) and (4) of the ‘channel of influence’ or the transmission mechanism assessing the net effect of real deposit rates on investment are shown in Equations (8) and (9). The estimations done using OLS technique have passed all the diagnostic tests discussed above. The results appear to indicate a significant chain effect of a change in real deposit rates on investment, but the direction of influence seems to be determined by the negative effect of a high cost of borrowing on investment. The relationship between bank credits and financial savings is shown as follows:

\[
B_c = 8.4735 + 0.321640(FS) \\
(4.620594) \quad (2.211979)
\]

\[
\text{Adj. } R^2 = 0.61 \quad \text{DW} = 1.69
\]

This result suggests that the coefficient (\( \gamma = 0.321640 \)) of \( FS \) variable has a positive and significant effect on \( B_c \) (bank credit). The impact coefficient of a change in the real interest rate, \( r \), on financial savings, \( FS \), (i.e., Equation 4) is also estimated as follows:

\[
FS = 0.023482 + 2.50860( r) \\
(0.10150) \quad (1.891)
\]

\[
\text{Adj. } R^2 = 0.44 \quad \text{DW} = 2.12
\]

Here again the coefficient (\( \delta = 2.50860 \)) of the real interest rate variable, \( r \), has a positive relationship with financial savings. These positive relationships are in conformity with the M-S hypothesis that real interest rates will encourage financial savings, and the increased liabilities of the banking system will force financial institutions to advance more credit for investment. Having estimated these parameters, we now adopt the simple technique described previously to test whether the final effect of the real interest rate on investment is negative or positive. Substituting these parameter estimates into the reduced form of Equation (5), we have:

\[
I = ( 1 + 3 \times r) + ...
\]

where \( i \) is the effect of the real deposit rate on investment in Equation (2) via the cost of credit, \( \gamma \) is the positive effect of the supply of bank credit, \( B_c \), on investment in Equation (2), \( \gamma \) is the effect of financial savings on the real stock of bank credit obtained from Equation (8), and \( \delta \) is the effect of real interest rate on investment obtained from Equation (9). Substituting in Equation (6) we have:
The negative outcome indicates that while there is a positive effect from the supply side of the real interest rate on investment via bank credit, this is offset by the negative effect that the rate of interest has on investment via the relative cost of credit, holding the supply of bank credit constant. This results in a negative net effect of real deposit rates on investment. The result suggests that a 1% increase in a real deposit rate results in a 0.97% fall in investment, holding all other variables which can influence the level of investment constant. Thus, we hesitate to accept the null hypothesis that a real deposit interest rate has a positive impact on investment. In this regard, the evidence for Ghana does not seem to support the M-S hypothesis of a positive relationship between the real rate of interest and investment.

The plausible reason for this may be that, as mentioned earlier, since the financial sector reforms, there has been an ever-widening gap between the lending rates and deposit rates. While the lending rates or the costs of credit have been high and constantly being kept over and above inflation rates, the saving rates remain way below the inflation rates. This ‘financial distortion’ and high inflation trends not only make costs of borrowing unaffordable for the indigenous enterprises, but also real deposit rates are continually rendered negative, making saving rates unattractive and acting as a disincentive for saving mobilization. It is therefore not surprising that Ghana has one of the lowest saving rates in the sub-region (Brownbridge et al., 2000). We therefore conclude that the findings are somewhat more consistent with the Keynesian theories of interest rates and investment than the M-S hypothesis. The former models stress the adverse consequences of high real interest rates on investment by reducing the cost of capital, which in turn impacts negatively the investment.

Conclusion

The study attempted to empirically re-examine the McKinnon-Shaw financial liberalization hypothesis, which stipulates simply that high real deposit interest rates increase financial savings, which in turn lead to increase in the quantity and quality of domestic investments. More specifically, the study investigated the impact of interest rate deregulation on investment in Ghana and the transmission mechanism through which this could happen. Utilizing cointegration and ECM techniques with data for the period 1970-2005, the main findings of the study are as follows: While the study finds a statistically significant and positive relationship between real deposit interest rate and financial savings as well as between bank credit and financial savings, the net effect of a real deposit rate on investment was found to be negative. In other words, holding all other variables constant, a higher real deposit rate which leads to a higher increase in financial savings, and then bank credit, is offset by a higher cost of lending, thus making the net effect on investment negative. In this regard, our finding does not seem to provide support for the McKinnon and Shaw financial liberalization hypothesis. Other variables found to be important in explaining investment in Ghana were the financial deepening, the macroeconomic volatility that is proxied by inflation differential, and the lagged change in GDP, affirming the accelerator model principle.
The study therefore concludes that although the policy options regarding interest rates deregulation available to a developing country like Ghana are limited, and a high deposit rate, as stipulated by the M-S hypothesis, is a necessary policy device for mobilizing financial savings for investments. However, if it is implemented during periods of high inflation, it can be counterproductive since the resultant high real lending rate discourages investment spending. However, it is noteworthy that the present study has focused on only one aspect of the M-S hypothesis, that is, the quantity effect of high interest rate without a qualitative effect on investment. In this regard, future research should consider the effect of interest rate deregulation on the efficiency and quality of investment.

References


*Reference # 05J-2012-04-02-01*