FINANCIAL MARKET EFFICIENCY UNDER THE INTEREST RATE REFORM POLICY IN GHANA: Theory, Model and Empirical Analysis

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Abstract

This paper sets out to evaluate the level of financial market efficiency under the interest rate reform policy (interest rate liberalization policy) in Ghana from 1988 to 2004. In line with this objective, a model has been specified and estimated. The results of the study revealed that the interest rate liberalisation policy has not yet succeeded in correcting the financial market inefficiency or distortion in the country between 1988 and 2004, even though there has been a fair improvement as compared to the pre-reform period. There is therefore the need to intensify efforts to significantly reduce the inflation rate for a corresponding reduction in the interest rate, in order to minimize or eliminate the level of financial market inefficiency, which is necessary for efficient mobilization and allocation of financial resources in the country.

Introduction

The Ghanaian financial sector like the real sector of the economy suffered from the distorted macroeconomic policies that prevailed in the 1970s and early 1980s, and deteriorated immensely. Cheap credit was directed to the favoured borrowers, mostly the public sector itself at the expense of economic efficiency and productive investment. As a result, financial intermediation (the main function of the financial system) in the economy declined as people abandoned banking system deposits that yielded negative real rates of return.

Money supply increased very fast during the period 1970 to early 1980s. For example, in 1972 broad money rose by over 41 percent (from 473.9 million Cedis in 1971 to 666.2 million Cedis in 1972, and between 1972 and 1978, the average rise was about 41 percent with a peak of 68 percent in 1975 and 50 percent in 1981 (ISSER 1993: 27). Since money supply was increasing and quite out of hand, monetary/financial policy at the time was geared towards achieving economic stability, achievement of financial mobilisation and allocation. Credit and interest rate policies were used to achieve these objectives. The prevailing interest rates were administered. The Central Bank (Bank of Ghana) set both the lending and deposit rates based on the Bank of Ghana discount rate. These rates were rarely adjusted and kept down low (interest rate repression) apparently to stimulate investment in accordance with Keynesian and Neoclassical theories of investment, and also possibly to reduce the cost of interest rate payment to the financial institutions and the private sector by the government. Deposit rates varied between 3.5 to 17.58 percent and, lending rates from 10 to 25.5 percent from 1970 to 1987 (see Table 1a).

Another factor that adversely affected the efficiency of the prevailing interest rates was rising inflation rates. As the adjustments of the nominal interest rates lagged behind changes in the expected inflation rate, the real interest rates remained persistently negative. For example in 1971, real deposit rate was 0.5, -109 in 1977 and 113 in 1983, whiles the corresponding real lending rates for these years were 6.5, -104.0 and 103.8 respectively

Consequently, financial resources flowed into inflation hedges and holding of foreign currency and assets. Thus, financial deepening of the economy which was as high as 29.8 percent in 1976 declined remarkably to 13.2 percent in 1983, and shot up a little to 17.8 percent in 1987.

In order to address the distressed or distorted financial market that prevailed in the 1970s through early 1980's, the interest rate liberalisation (deregulation) policy was launched in September, 1987 as one of the major components of the Economic Recovery Programme (ERP) started in 1983 (Aryeetey et al. 2000). The interest rate reform policy was meant to permit interest rates to move closer to the market-clearing rates, in order to eliminate the level of financial market distortion (inefficiency).

Ever since the launching of the interest rate liberalisation policy, both nominal and real interest rates for both deposit and lending rates have been fluctuating widely and causes concern.

The main objective of the research therefore, is to evaluate the efficiency of the financial market under the interest rate liberalisation policy in Ghana from 1988 to 2004. The specific objectives are to:

- Determine the level of financial market efficiency during the pre-interest rate liberalization period (1970 1987);
- Determine the level of financial market efficiency during the interest rate liberalization period;
- Compare the pre- and post interest rate reform levels of financial market efficiency and
- Analyse the policy implications.

The paper is divided into six sections. After the introduction, we examine briefly the elements of the interest rate policy reform in Ghana in section two. Section three addresses both theoretical and empirical literature on the topic. The methodology for the study is taken up in section four. It includes portions on model specification, econometric techniques and sources of data. Section five presents the empirical results and their interpretation, whiles section six deals with conclusions and policy implications of the study.

Table 1a. Selected Financial Market Indicators in Ghana, 1970 to 1987

YEAR	NDR	NLR	FR	RDR	RLR	DLRS %*	FD
1970	3.5	10.0	3.0	0.5	7.0	187.7	18.8
1971	7.5	14.5	8.0	-0.5	6.5	93.33	18.9
1972	7.5	14.5	10.8	-3.3	3.7	93.33	23.6
1973	5.0	10.0	17.1	-12.1	-7.1	100.0	22.7
1974	5.0	10.0	18.8	-13.8	-8.8	100.0	21.8
1975	7.5	12.5	29.8	-22.3	-17.3	66.7	26.8
1976	7.5	12.5	55.4	-47.9	-42.9	66.7	29.8
1977	7.5	12.5	116.5	-109.0	-104.0	66.7	27.2
1978	11.5	19.0	73.1	-61.6	-54.1	65.22	24.3
1979	11.5	19.0	54.5	-43.0	-35.5	65.22	20.9

YEAR	NDR	NLR	FR	RDR	RLR	DLRS %*	FD
1980	11.5	19.0	50.1	-38.6	-31.1	65.22	20.4
1981	11.5	19.0	116.5	-105.0	-97.5	65.22	18.8
1982	11.5	19.0	22.3	-10.8	-3.33	65.22	19.8
1983	11.5	19.0	122.	-11	-10	65.2	13.
			8	1.3	3.8	2	2
1984	15.5	21.17	39.0	-23.5	-17.83	36.58	12.5
1985	15.75	21.17	10.4	5.35	10.77	34.41	16.0
1986	17.0	20.0	24.6	-7.6	-4.6	17.65	16.5
1987	17.58	25.5	39.8	-22.22	-14.3	45.05	17.8

Sources: International Financial Statistics (various issues); The State of the Ghanaian Economy (various issues);

Author's Calculations

- $DLRS\% = \left(\frac{NLR - NDR}{NDR}\right)100$

NDR = **Nominal deposit rate**
NLR = **Nominal lending rate**
RDR = **Real deposit rate**
FR = Inflation rate
RLR = Real lending rate
DLRS = Deposit-lending rate spread
FD = Financial deepening (see Appendix 1 for definition of the variables)

INTEREST RATE LIBERALISATION POLICY

The Ghanaian financial system like that of most developing countries is fragmented. There exist both formal (organised) and informal (unregulated) markets giving rise to what is called "credit dualism". The informal sector comprises susu groups, money lenders and petty traders, providing financial or credit services to the people.

In the formal sector, we have the Central Bank (Bank of Ghana) as the apex bank overseeing monetary and financial transactions of the units in the sector. The sector includes; Commercial banks, Development banks, Merchant banks and rural/community banks. Also found in the formal financial sector is the non-bank financial institutions (NBFIs) which include the Stock Exchange, Leasing Companies, Credit Unions, Building Societies among others.

Even though the need to introduce some flexibility into the determination of the prevailing interest rates in Ghana was realised in 1983, the actual reform policy started in 1988. The interest rate liberalisation policy involved the deregulation of interest rates (both deposit and lending rates) in order to reduce the high level of the financial market distortion, and to encourage competition among the banks. Consequently, financial intermediation would improve, leading to increased mobilisation and allocation of resources in the financial sector in particular and in the economy as a whole. Thus, the prescription of Commercial banks' borrowing and lending rate ceased, except for savings deposit rate which was temporarily maintained at 21.5 percent. By March 1989, the commercial banks were given the full authority to determine their own rates and display them in their banking halls. Furthermore, in November 1990 the 20 percent mandatory lending to agriculture was abolished, and by the beginning of 1991, the Ghanaian financial sector was highly liberalised.

As a result, the nominal deposit rate increased

from 16.5 percent in 1988 to 33.50 percent in 1997, and there after has continued to decrease reaching 10.35 percent in 2004. The nominal lending rate also shot up from 25.58 percent in 1988 to 47.0 percent in 1997, and fell to 28.75 percent in 2004. The corresponding real deposit rates were 14.9 percent in 1988, 5.7 percent in 1997 and 2.25 percent in 2004. Whiles the real lending rates were 5.82 percent in 1988, and 16.15 percent in 2004 (see Table 1b).

Financial deepening unlike the pre-FINSAP period, has fairly assumed an increasing trend during the FINSAP period (1988 2004), despite the fluctuating rates as we see in Table 1b.

Table 1b. Selected Financial Market Indicators in Ghana, 1988 to 2004

YEAR	NDR	NLR	FR	RDR	RLR	DLRS %*	FD
1988	16.5	25.58	31.4	-14.9	-5.82	55.03	14.7
1989	16.0	30.25	25.2	-9.2	5.05	89.06	16.9
1990	19.0	30.3	37.1	-18.1	-6.8	59.47	13.4
1991	21.32	31.5	18.0	3.32	13.5	47.75	13.4
1992	16.32	29.0	10.1	6.22	18.9	77.70	19.2
1993	23.63	34.5	25.0	-1.37	9.5	46.00	16.9
1994	23.15	35.0	24.9	-1.75	10.1	51.19	18.6
1995	28.73	36.0	59.5	-30.77	-23.5	25.30	17.6
1996	32.28	41.5	46.6	-14.32	-5.10	28.00	19.4
1997	33.50	43.0	27.8	5.70	15.20	28.00	18.0
1998	23.30	38.50	14.6	8.70	23.90	65.00	22.7
1999	17.11	36.50	12.43	4.68	24.07	113.00	22.0
2000	27.61	47.00	25.6	2.01	21.40	70.00	23.3
2001	18.22	43.75	32.9	-14.68	10.85	140.00	20.7
2002	13.38	36.36	14.8	-1.42	21.56	171.00	24.7
2003	12.45	32.75	26.7	-14.25	6.05	163.00	25.1
2004	10.35	28.75	12.6	-2.25	16.15	177.00	26.3

Sources: International Financial Statistics (various issues); The State of the Ghanaian Economy (various issues);

Author's Calculations

$$** DLRS\% = \left(\frac{NLR - NDR}{NDR}\right)100$$

NDR = **Nominal deposit rate**
NLR = **Nominal lending rate**
RDR = **Real deposit rate**
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LITERATURE REVIEW

Theoretical Literature

The Neoclassical and Keynesian Theories

Until 1970s, the mainstream theoretical literature on interest rates, savings and investment was underpinned by Neoclassical and Keynesian schools. The Neoclassical school was founded in the 1870s, by Leon Walras, Kenneth Arrow and Daivid Strarret , and the Keynesian school was powered by John Maynard Keynes in 1939. These two schools advanced the argument that interest rate and investment vary indirectly, based on the implicit assumption that the cost of capital and not the availability of loanable fund is the binding constraint for capital accumulation. In line with this, the policy of low interest rates was implemented by most developing countries in order to accumulate sufficient capital, via productive investment for rapid economic growth. It is in this respect that Raj (1948) reiterated that, since investment is a desideratum in the LDCs it needs be promoted by reducing interest rates.

The Repressionist School

McKinnon (1973) and Shaw (1973) provided theoretical models to criticise the supposed wisdom of keeping interest rates very low in countries, especially LDCs and hence the repressionist school. The McKinnon and Shaw (1973) hypothesis suggests that the level of financial intermediation should be closely related to the prevailing level of real interest rates, because the level of real interest rate, when held below their normal competitive levels, indicates the level of interest rate or financial repression (Gregorio and Guidoli 1995). Financial repression especially under inflationary conditions stimulates demand for physical wealth as well as capital flight. According to this repressionist view a positive real interest rate stimulates financial savings and financial intermediation, thereby increasing the supply of credit to the private sector. This in turn stimulates investment and economic growth. Thus, positive real interest rates that are consistent with the equilibrium interest rates make the allocation of investible funds more efficient, thereby providing positive effect on economic growth. This school therefore favours interest rate liberalisation within an economy, and so largely underlies the interest rate reform policy in Ghana. Among the supporters of the 'Repressionist' school in slightly modified forms (see Fry 1988) include; Kapur (1976a), Galbis (1977), Fry (1980a, 1980b), Mathieson (1980b), Romer (1986, 1990), Lucas (1988), De Gregorio (1993), and Levine (1993).

The Neostructuralist School

The Neostructuralist school was formulated in the early 1980s. Prominent economists in this school include Wijnbergen (1982, 1983a, 1983b), Tayor (1983), Kohsaka (1984), and Buffie (1984), who launched attack on the Mckinnon-Shaw (1973) school of thought for failing to recognise the negative impact of the high real interest rates on costs. They maintain that increasing interest rates would lead to a cost-push inflation, and become counter productive. According to them, the nominal interest rate which is determined in the curb or informal market, adjusts to equate demand for and supply of money and credit. Income then adjusts to equilibrate the demand for and supply in the goods market.

They maintain further that funds flow freely between the banking system and the curb market; savers and investors can use either market at least to some extent. Thus, the relevant interest rate in the Structuralist models is the curb market rate (Fry 1995). Hence their models provide an intellectual justification for financial repression.

Market Failure or Imperfect Information School

This is a slightly different kind of school from

the neostructuralist theory, which runs counter to the McKinnon-Shaw (1973) model. The Market Failure or Imperfect Information School spear-headed by Stiglitz in the early 1980s, emphasises market failures as a principal cause of poor financial markets (Stiglitz and Weiss, 1981; Stiglitz, 1989; Stiglitz, 1994). It goes to emphasise that high transactions costs due to imperfect information and difficult contract enforcement lie at the root of these market failures, inhibiting the ability of interest rates to achieve market equilibrium. There is therefore the need for governmental intervention for a smooth running of the financial market.
Thus, Stiglitz (1994) suggests that "there exist forms of government intervention that will not only make the markets function better but will also improve the performance of the economy".

Empirical Literature
The main stream empirical literature attests to the fact that the level of financial market inefficiency reduces as the persistently negative real interest rate turns positive during the process of interest rate deregulation. Generally, the empirical works on the effectiveness of interest rate liberalisation policy in a nation are methodologically based on negative and positive real interest rates. All these works maintain that the level of financial market inefficiency reduces as the persistently negative real interest rates turn positive during the liberalisation period. Consequently, an interest rate reform process may stimulate savings, investment and economic growth. We note some of these studies as follows:

Vogel and Buser (1976) tested the repressionist hypothesis for 16 Latin American countries using pooled time-series data for the period 1950 to 1971. As proxies for financial deepening, they used three indicators, namely, currency in circulation, demand deposits and time deposits, each expressed as a ratio of GDP. They developed two regression equations. In one, the independent variables were the current and one-period lagged values of the actual rate of inflation and real GDP. In other, a simple average of the two period values of the independent variables were used. Their findings were that, inflation had a consistently significant and negative effect on financial deepening and moreover, the low elasticities for currency in circulation and demand deposits strongly supported the McKinnon and Shaw (1973) view that financial repression may proceed to the point where the willingness to hold those assets that are used for transaction are no longer very responsive to inflation because of the high cost of reversion to barter.

Lanyi and Saracoglu (1983) in a sample of 21 developing countries between 1970 and 1980, using regression analysis have shown that liberalised financial (specifically interest rate) policies have led to positive real interest rates. As a result, financial savings have significantly improved.

World Bank (1983) employed the methodology of negative and real interest rates to classify a sample of 31 countries according to their degree of distortions in the financial markets. The degree of distortions is defined as being high when the real interest rates during the 1970s were less than minus 5 percent, low when real interest rates were positive and medium when they were in the zero to minus 5 percent range.

De Melo and Tybout (1986) analysed the effects of financial liberalisation on savings and investment for Uruguay during the period 1974 to 1983. They specified separate single equation models for savings and investment variables with the interest rate as a proxy for financial liberalisation. The estimation technique was the ordinary least squares method. They observed that even though the real interest rates improved positively, there was no significant improvement in the savings and investment levels of Uruguay during the period.

Cole and Slade (1988) reviewed the Indonesian experience of financial liberalisation for the period mid-1960s and late 1980s using simple statistical techniques of observing the trends

ratios of the variables concerned. The financial reform programme involved the removal of interest rate controls and credit ceilings, which was preceded by a major devaluation and fiscal retrenchment. Consequently, the prevailing real interest rates improved and led to a rapid growth of the banking system. However, it exposed the economy to sudden shocks emanating from large falls in foreign exchange reserves.

Oshikoya (1992) undertook a study on the effect of financial liberalisation (interest rate liberalisation) on savings and economic growth among others for Kenya between 1980 and 1999. The methodology involved computation of ratios and averages of some key financial indicators. He noted that as might be expected, the real rate of interest on the average became positive in the liberalisation regime. However, he observed that the computed statistics did not support the view that domestic savings rate rose in response to interest liberalisation. According to him, gross domestic savings rate remained virtually stagnant at 20.1 percent during the reform period, and even the gross domestic product growth declined remarkably from 7.3 percent to 4.2 percent.

Khan and Hassan (1998) have examined the effect of financial liberalisation on saving and economic growth in Pakistan using a simultaneous equation model, in an error correction fashion. The period of study was 1960 to 1995. The results suggest that financial liberalisation policies pursued in Pakistan were likely to result in financial deepening. An increase in the real interest rate (by increasing the nominal interest rate or by reducing the inflation rate) would lead to the accumulation of money balances (financial assets) which would enhance the availability of loanable funds for investment activities and hence economic growth.

This study, unlike the earlier ones employs a different methodology based on the observed nominal and estimated equilibrium interest rates to evaluate the effectiveness of the interest rate liberalisation policy in Ghana and the related policy implications. An important and useful advantage of this new approach is its ability to track quantitatively the magnitude of a financial market efficiency or otherwise during a period of time.

METHODOLOGY

Deviations Model

In order to effectively address the stated objectives of this research, we use a model called the "Deviations Model". This model seeks to make a comparison between the observed nominal interest rates and those that would prevail in a perfectly functioning financial market. This implies that the various equilibrium nominal interest rates from 1988 to 2004 would be estimated. The deviations of the actual or observed nominal interest rates from the equilibrium ones would then be compared and hence, the name "Deviations Model".

The deviations may assume any of the following forms:

(i) all deviations being positive,
(ii) all deviations being negative, and deviations made up of both positive
(iii) and negative values

It is the sum of all deviations that would be meaningful for the analysis. The sum of deviations of the observed nominal interest rates from the equilibrium nominal interest rates can either be positive, negative or zero. Symbolically, we state the Deviations model as follows:

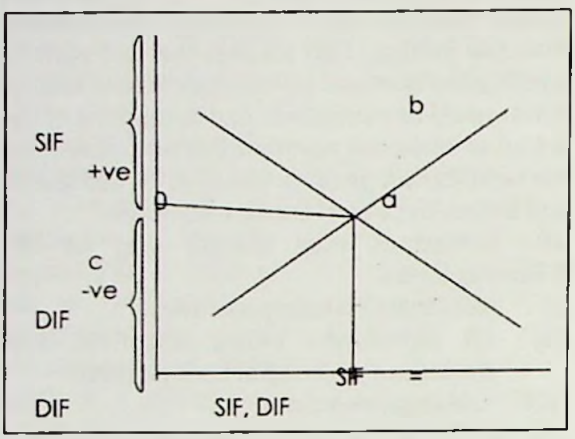
$$\sum_{t=1}^{n}(NIR_t - ENIR_t) \quad \leq / > 0 \qquad (1)$$

Where:
NIR = Nominal interest rate (actual)
ENIR = Equilibrium nominal interest rate
$t = 1,2,3...n$ (i.e; 1988 to 2004)
n = number of observations.

There is an upward distortion of the financial market if the sum of the deviations is positive, meaning that the prevailing interest rates are above the market equilibrium rates in aggregate. The model points to a downward distortion of the financial market if the sum of

the deviations is negative, meaning the prevailing interest rates have fallen below the market equilibrium rates on the average. A situation, in which the sum of the deviations is zero on the average, indicates an absence of distortion in the financial market, meaning an optimally functioning of the financial market Figure 1 is a diagramatic illustration of the Deviations model.

Figure 1. Graphical Illustration of the Deviations Model



SIF = Supply of investible funds
DIF = Demand for investible funds
a = Equilibrium point
o = Zero deviation (no distortion)
b = Positive deviations (upward distortion)
c = Negative deviations (downward distortion)

In order to have a firm basis for conclusion, the Deviations model has to be subjected to a statistical test of significance of which the Chi-square goodness of fit test is the most appropriate here.

Estimation of the Equilibrium Nominal Interest Rate

An important requirement of the Deviations model is estimation of the equilibrium nominal interest rate. In this research we base our estimation on the Fisherian (1907) theoretical formulation of the interest rate and the work of Khan and Edwards (1985) as follows:

Specification (2) states that the nominalinterest rate at any time is the sum of the real interest rate plus the expected inflation rate. The real interest rate (RIR) is also specified as follows:

$$NIR_t = RIR_t + RF_t^e \quad (2)$$

Where:

NIR = Nominal interest rate

RIR = Real interest rate or short-run real interest rate (SRRIR)

RF^e = Expected inflation rate

$$RIR_t = LRRIR - h(SRMB_t - DRMB_t) + e_{1t} \quad (3)$$

In the long-run, when the money market is in equilibrium, and demand and supply of real money balances are equal, the excess supply of real money balances *(SRM, DRMB,)* is zero, and equation (4) collapses to:

Where:

LRRIR = Long-run real interest rate

SRMB = Supply of real money balances

DRMB = Demand for real money balances

h = Speed of adjustment between zero and one

According to equation (3), the real interest rate (RIR) which is the same as short-run real interest rate (SRIR) deviates from its long-run value (LRRIR) if there is a monetary disequilibrium in the economy. An excess demand for real money balances such that $(SRMB_t\text{-}DRMB_t) < 0$, will yield a temporarily higher real interest rate; and an excess supply of real supply of real money balances such that $(SRMB_t\text{-}DRMB_t) > 0$, will yield a temporarily lower real interest rate.

Combining specification (2) and (3), we have:

$$NIR_t = LRRIR - h(SRMB_t - DRMB_t) + RF_t^e + e_{1t} \quad (4)$$

In the long-run, when the money market is in equilibrium, and demand and supply of real money balances are equal, the excess supply of real money balances *(SRM, DRMB,)* is zero, and

equation (4) collapses to:

$$NIR_t = LRRIR + RF_t^e + e_{1t} \quad (5)$$

Specification (5) states that in the long-run when the financial market is in equilibrium, the nominal interest rate is the sum of the long-run real interest rate (LRRIR) and the expected rate of inflation. In this specification (5), the expected inflation rate term (RF_t^e) is a variable, whose coefficient is unity.

The argument is that in the long-run a proportionate change in the expected inflation rate leads to an equal proportionate change in the nominal interest rate, since the long-run real interest rate (LRRIR) is a constant (Khan and Edwards 1985; Dornbusch and Fischer 1994). (The reason why we have such a strong inflation-nominal interest rate link is that in the long-run, the real interest rate is not affected by monetary disturbances which do affect the inflation rate). This therefore implies that, in a perfectly functioning financial market, the coefficient of the expected inflation rate is equal to unity. Thus specification (5) is an equilibrium function with two variables nominal interest rate (NIR) and expected inflation rate (RF_t^e) The long-run real interest rate (LRRIR) is a constant term.

In order to estimate the constant long-run real interest rate (LRRIR) we linearize equilibrium specification (5) by introducing a parameter B_1 as a coefficient of the expected rate of inflation as follows:

$$NIR_t = LRRIR + \beta_1 RF_t^e + e_{1t} \quad (6)$$

Where:
β_1 is a parameter.

By regressing the nominal interest rate on the expected inflation rate, as in equation (6), we get a constant which is equivalent to our desired long-run constant real interest rate and a value for , the coefficient of the expected inflation rate. A value of , which is not equal to unity implies an ill-functioning of the financial in the computation. The equilibrium nominal interest rate is then the estimated regression constant (long-run real interest rate) plus the value of , equals unity, times the expected inflation rate. This amounts to *adding the full value of the expected inflation rate to the long-run interest rate to obtain the equilibrium nominal interest rate*, that is:

$$ENIR_t = LRRIR + \beta_1 RF_t^e \quad (7)$$

Where:
ENIR = Equilibrium nominal interest rate
LRRIR = Long-run real interest rate
$\beta_1 = 1$
This implies:

$$ENIR_t = LRRIR + RF_t^e \quad (8)$$

A comparison would then be made between the actual (observed) nominal interest rates and equilibrium interest rates for the relevant decision to taken. The Chi-square goodness of fit test will be employed to determine the significance or otherwise of the deviations of the estimated equilibrium nominal interest rates from the observed ones.

Econometric Techniques

First and foremost, time series properties (such as stationarity and cointegration tests etc;) of the variables were explored to avoid the spurious regression problem. The Ordinary least squares technique was used in estimating the specified model. The necessary statistical techniques such as the R- bar squared, t-test, F-test were used in determining the plausibility of the estimates. The Chi-square goodness of test was also conducted.

4.3 Sources of Data

The time series data for the study were obtained from the following sources:

(i) Bank of Ghana Bulletins (various issues)
(ii) The State of the Ghanaian Economy, published by ISSER (Various issues)
(iii) Quarterly Digest of Statistics, published by the Statistical Service
(iv) International Financial Statistics, published by the IMF

5. EMPIRICAL ANALYSIS

The empirical results are given in Tables 2 to 4:

Table 2a. Stationarity Test (Augmented Dickey-Fuller, 1981 Test) Results: 1970 to 1987

Variable	Lag length	LM statistic	Test statistic	Critical Value	Intergration
NIR	1	0.3373(.561)	- 3.7534	-3.08.9	I(1)
FR	2	0.3762 (.540)	-4.0145	-3.7612	I(1)

Table 2b. Stationarity Test (Augmented Dickey-Fuller 1981 Test) Results: 1988 to 2000

Variable	Lag length	LM statistic	Test statistic	Critical value	Order of Intergration
NIR	1	0.0824(.774)	-4.2681	-3.7921	I(1)
FR	1	0.1031(.748)	-4.0990	-3.1004	I(1)

From Tables 2a and 2b we see that all the variables are non-stationary (dependent on time). All of them are I(1) and have to be differenced once to achieve stationarity. The variables are however cointegrated, implying that there is a stable long-run equilibrium relationship between them.

Table 3a. Ordinary Least Squares Regression Results of the Nominal Interest Rate Function, 1970 to 1987

Dependent variable is NIR

Regressor	Coefficient	Standard Error	T-Ratio (Probabilty)
CONSATANT	12.5559	1.6275	7.7144(.000)
FR	0.019805	0.027695	0.71509(.485)

R-Squared 0.030970
R-Bar- Squared-0.029594
F-Statistic (1,16) 0.511361 (.485)
DW-Statistic 0.36600
Cointegration Statistic -4.2550140(-3.7612)*
* 5 percent critical value in brackets

Table 3b. Ordinary Least Squares Regression Results of the Nominal Interest Rate Function, 1988 to 2000.

Dependent variable is NIR

Regressor	Coefficient	Standard Error	T- Ratio Probability)
CONSATANT	22.9993	3.02220	7.61061(.000)
FR	0.19224	0.10402	1.8482(.084)

R-Squared 0.18548
R-Bar- Squared 0.13118
F-Statistic (1,15) 3.4157(.084)
DW-Statistic 0.75882
Cointegration Statistic -5.8445(-4.1109)*
* 5 percent critical value in brackets

The regression results of Table 3a and 3b indicate that our estimated long-run real interest rates for the pre and interest reform periods are 12.56 and 23.00 respectively. (It must be pointed out that in this study, our concern in estimating the interest rate function is to get an estimate for the regression constant which is our long-run real interest rate. We are not using the model for prediction (forecasting) or any other analysis. Even though the R-Squared and F-statistic values are very low, they do not affect the precision and reliability of our constant parameter estimates. The Durbin-Watson statistics are also very low, indicating the presence of of positive autocorrelation. However, in the presence of positive autocorrelation, the Ordinary Least Squares (OLS) estimators are still linear, unbiased and consistent (see Gujarati, 1988 p. 363). Furthermore, the variables are cointegrated as indicated by the significant cointegration statistics.)

The next step is to compute the various equilibrium nominal interest rates in order to get the corresponding deviations from the actual rates for both periods. Columns 5, 6 and 7 of Tables 4a and 4b show the computed

equilibrium nominal interest rate (ENIR), the magnitude of the deviations (NIR-ENIR) and the associated Chi-square statistic respectively.

Table 4a. Computation of Equilibrium Interest Rates and Level of Financial Market Efficiency 1970 to 1987

YEAR	NIR	LRRIR	FR	ENIR	NIR-ENIR	$\frac{(NIR-ENIR)^2}{ENIR}$
1970	6.5	12.56 6	3.0	15.56	-8.81	4.99
1971	11.0	12.5 6	8.0	20.56	-9.56	4.45
1972	11.0	12.56	10.8	23.36	-12.36	6.54
197	7.5	12.56	17.1	29.66	-22.16	16.56
1974	7.5	12.56	18.8	31.36	-23.86	18.15
1975	10.0	12.56	29.8	42.36	-32.36	24.72
1976	10.0	12.56	55.4	67.96	-57.96	49.43
1977	10.0	12.56	116.5	129.06	-106.5	87.88
1978	15.25	12.56	73.1	85.66	-70.41	57.87
1979	15.25	12.56	54.5	67.06	-51.81	40.03
1980	15.25	12.56	50.1	62.66	-47.41	35.87
1981	15.25	12.56	116.5	129.06	- 113.81	100.36
1982	15.25	12.56	22.5	34.86	-19.61	11.03
1983	15.25	12.56	122.8	135.36	- 120.11	106.56
1984	18.34	12.56	39.0	51.56	-33.22	21.40
1985	18.46	12.56	10.4	22.96	-4.5	.88
1986	18.5	12.56	24.6	37.16	-18.66	9.37
1987	21.54	12.56	39.8	52.36	-30.82	18.14

Degrees of freedom (n-1) = 17
The critical values at 0.05 and 0.01 levels of significance are 27.59 and 33.42 respectively.

It is quite evident from Table 4a that the financial market was grossly inefficient (distorted downwards) with a magnitude of negative 783.93 and a Chi-square value of 614.25 in the pre-reform period (1970-1987).

During the interest rate liberalisation period (1988-2004), we still see a low level of financial market efficiency (downward distortion); with a magnitude of negative 439.62 and a Chi-square value of 245.1 (see Table 4b). However, there has been a fair improvement in the level of financial market efficiency by 43.98 percent. This is because the magnitude the pre-reform level of financial market inefficiency or distortion which stood at negative 783.93 has fallen to negative 439.62 (a decrease of negative 344.73; that is 43.98 percent.

Table 4b. Computation of Equilibrium Interest Rates and Level of Financial Market Efficiency 1988 to 2004

YEAR	NIR	LRRIR	FR	ENIR	NIR-ENIR	$\frac{(NIR-ENIR)^2}{ENIR}$
1988	21.04	23.00	31.4	54.4	-33.36	20.46
1989	23.13	23.00	25.2	48.2	-25.07	13.04
1990	24.65	23.00	37.1	60.1	-35.45	20.91
1991	26.41	23.00	18.0	41.0	-14.59	5.19
1992	22.66	23.00	10.1	33.1	-10.44	3.29
1993	29.07	23.00	25.0	48.0	-18.93	7.47
1994	29.08	23.00	24.9	47.9	-18.82	7.39
1995	32.37	23.00	59.5	82.5	-50.13	30.46
1996	32.28	23.00	46.6	69.6	-37.32	20.01
1997	33.50	23.00	27.8	50.8	-17.30	5.89
1998	23.30	23.00	14.6	37.6	-14.30	5.44
1999	17.11	23.00	12.43	35.43	-18.32	9.47
2000	27.61	23.00	25.6	48.6	-20.99	9.07
2001	18.22	23.00	32.9	55.9	-37.68	25.40
2002	13.38	23.00	14.8	37.8	-24.42	15.78
2003	12.45	23.00	26.7	49.7	-37.25	27.92
2004	10.35	23.00	12.6	35.6	-25.25	17.91

-439.62 245.1
Degrees of freedom (n-1) = 16;
The critical values at 0.05 and 0.01 levels of significance are 26.30 and 32.00 respectively.

6.0 CONCLUSIONS AND POLICY IMPLICATIONS

The results of the study have revealed that the interest liberalisation policy has not yet succeeded in correcting the financial market inefficiency or distortion in the country, even though the level of the inefficiency in the country has fairly improved by 43.98 percent as compared to the pre-reform period (1970-1987).

The policy implications are that there is the need to intensify efforts to significantly reduce the inflation rate for a corresponding reduction in the nominal interest rate, in order to minimise or eliminate the level of financial market inefficiency in the country. Reduction of high risks associated with lending and borrowing, high bank transaction and other related costs would also help in reducing the high level of the prevailing interest rates (the inflation rate and the interest rates are crucial variables in this regard).

Future Research Direction

A further research may be necessary to examine the extent to which the interest rate reform policy has promoted external integration of the Ghanaian financial market as this may help in formulating policies to prevent any implied capital flight from the country.

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Appendix

Variables and Their Definitions

NIR = Nominal interest rate (it is the average of nominal deposit rate and nominal lending rate).

FR = Inflation Rate. Calculated as the percentage change in the annual consumer price index (CPI), with 1995 as the base year.

FD = Financial deepening (M2/GDP)

RIR = Real interest rate. Computed as the difference between nominal interest rate and the inflation rate.

SRRIR = Short-run real interest rate. This is equivalent to real interest rate (RIR).

LRRIR = Long-run real interest rate

ENIR = Equilibrium nominal interest rate

NDR = Nominal deposit rate. This is the average of annual savings and time deposit rates

RDR = Real deposit rate. Computed as the difference between nominal deposit rate and the inflation rate.

NLR = Nominal lending rate. Calculated as the average of annual lending rates to various sectors

RLR = Real Lending rate. Computed as the difference between nominal lending rate and the inflation rate.

DLRS = Deposit-Lending rate spread. Calculated as the difference between nominal lending rate and the deposit rate.

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