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Working Paper

Bank Interest Rate Channel of Monetary Policy Transmission in Ghana

Kwasi Acheampong
(Research Dept)

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BANK OF GHANA

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Abstract

The paper investigates the interest rate channel of monetary policy transmission by analyzing both the impact and long run adjustments of lending rate and deposit rate to changes in the money market rate. It estimates both symmetric and asymmetric adjustments using error correction model. A dummy variable was introduced to capture the effect of the policy shift from bank rate to prime rate. It concludes that interest rates in Ghana respond sluggishly to changes in the money market rates. However, the policy shift has some impact on the lending rate decisions of the banks but no significant effect on the borrowing rate.

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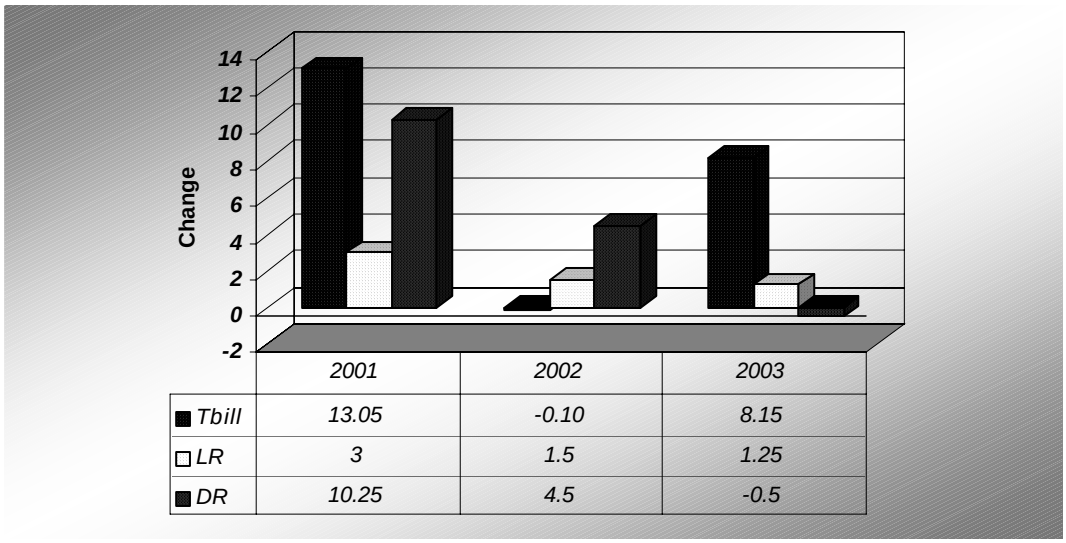
Author's E-mail Address: kachie78@hotmail.com

1. Introduction

The objective of the paper is to investigate how changes in the Central Bank's monetary policy stance are transmitted to the commercial banks' deposit and lending rates. Bank interest rates play an important role in the monetary policy transmission especially the speed and the extent to which banks adjust their lending rates to interest rates movement in the money market. This is a matter of concern for policy makers especially in the light of the lags for the commercial banks' lending rate to come down despite the general decline in the prime rate and other market rates.

In 2003 for instance, the 91-day treasury bill rate(interest equivalent) fell by 815 basis points(26.81% to 18.66%) compared with a decline of 125 basis points (34% to 32.75%) for lending rates proxied by lending rate to the manufacturing sector(figure 1). By contrast, the deposit rate (3months time deposit rate) increased by 50 basis points(13.75% to 14.25%). Bank interest rate spread continues to trend upwards over the years with an average of around 20 percent since January 2003 (figure 2). Figure 3 also shows that the gap between lending rate and deposit rate has remained virtually the same despite the falling prime rate, again indicating the insensitivity of the bank interest rates to policy rates.

Figure 1: Changes in Tbill, LR and DR



	2001	2002	2003
Tbill	13.05	-0.10	8.15
LR	3	1.5	1.25
DR	10.25	4.5	-0.5

Figure 2: Bank interest spread

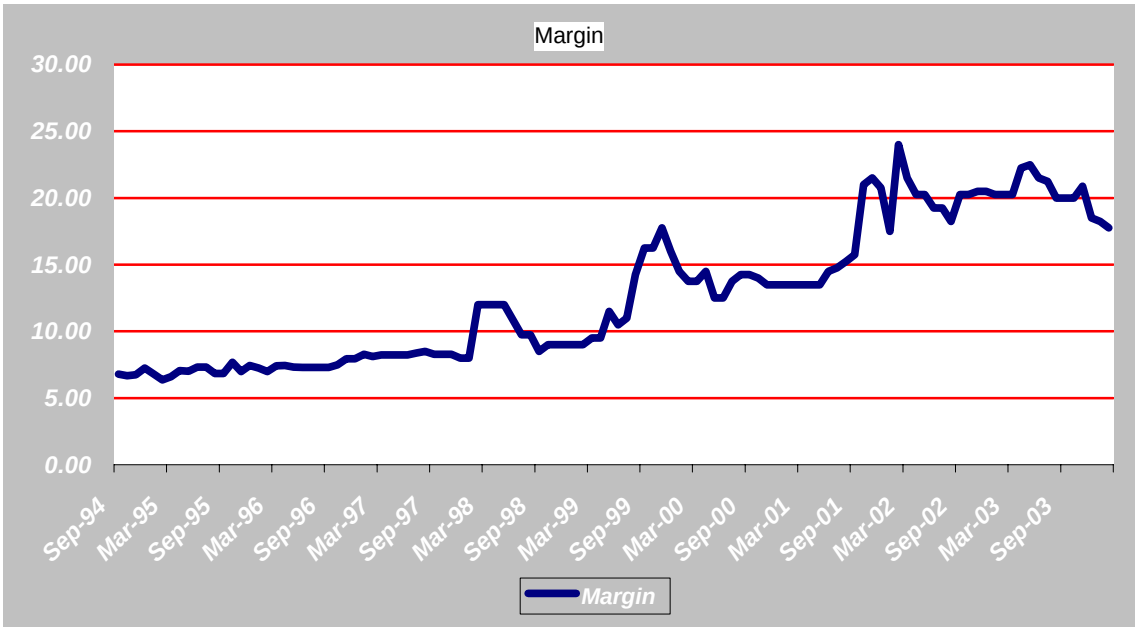
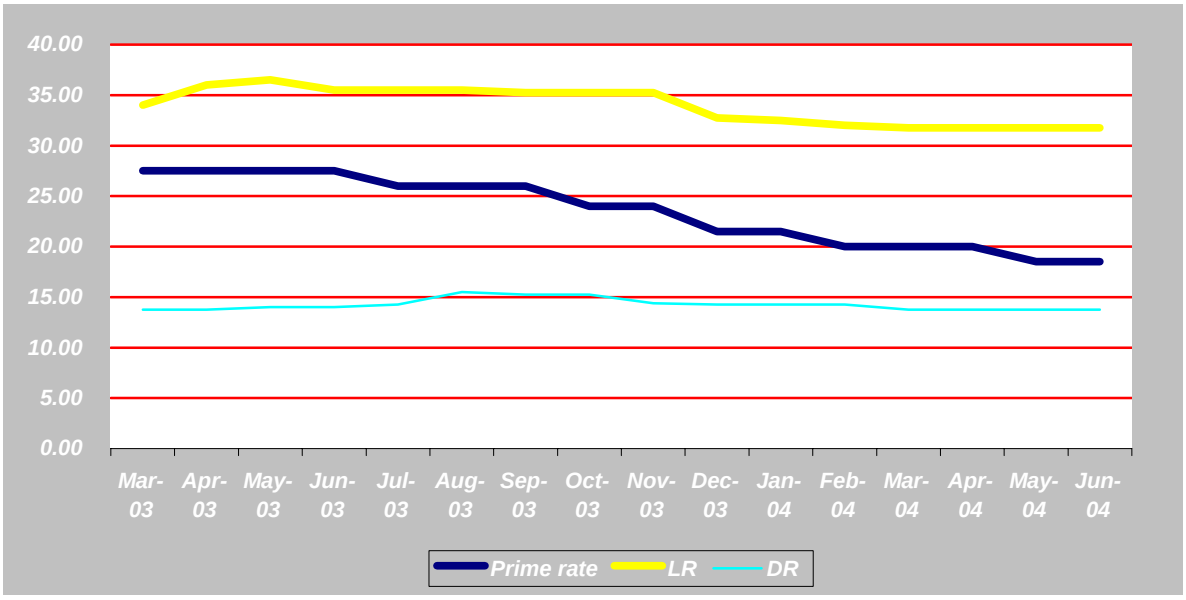


Fig 3: Trends in Prime rate, Lending rate and Deposit



There is extensive literature on interest rate rigidity mainly in the context of developed countries with limited attention to developing countries. Interest on banks' interest rates stickiness has heightened in recent years in developing countries mainly on account of inflexibility in commercial banks' interest rates and higher margins despite financial reforms and liberalization. The paper uses co-integration and error correction modeling to examine the dynamic adjustment of deposit and lending rates to a given change in the money market rates.

2. Financial Sector Policies

The financial sector in Ghana is highly dominated by the banking sector. The Ghanaian financial sector was subjected to financial represssionist policies till latter part of 1980. Before 1983, the banking system was characterized by directed credit, controls on interest rates, fixed exchange rates and exchange controls, weak management and inefficient prudential regulations. By 1982, Ghana provided a classic case of financial repression as M/GDP ratio declined from 19% in 1970 to 13% in 1983.

Poor macroeconomic management contributed to the financial crisis as real per capita income growth in the period 1970-1983 was negative 3%, inflation reached 123% in 1983, real interest was negative with low levels of savings and investment. It was against this background that financial sector reforms were initiated in 1987 to among other things to enhance competition and diversify the banking system. A central tenet of the financial reforms was the adoption of market-based instrument of monetary control through the auctioning of treasury bills, which took off in 1992. However, quantitative controls in the form of reserve requirements to date continued to be imposed.

3. Theoretical considerations

3.0 Tacit Collusion

Fear of entry into the banking industry will make the incumbent banks price makers in the retail loan and deposit products due to tacit collusion(Heffernan 1997). As a result of second-guessing others in the setting of rates, a change in the base rate makes the process of reaching the new equilibrium slow.

3.1 Consumer Inertia

Consumer inertia due to lack of up-to date information also contributes to the slow adjustment of bank deposit and lending rates.

3.2 Menu Cost

High cost of adjusting the interest rates has the potential of encouraging sticking with the earlier rates especially when it is perceived that the change in the policy rate is temporal and marginal. Also the more uncertain banks are about the future development of general market rates, the longer they are likely to leave their lending rates unchanged

3.3 Stiglitz-Weiss Phenomenon of endogenous loan default

If increasing loan rate could lead to loan default and hence reduce profit, banks would take time to change their rates in response to changes in the policy rates.

3.4 Interest elasticity

In most cases the spread between deposit rates and lending rates depends on the size of interest elasticity of demand for loans and the interest elasticity of supply of deposits. If demand for loans is interest inelastic, banks will not hesitate to raise lending rate if policy rate changes and will also reduce it appropriately if necessary. By contrast, if demand for loans is interest elastic and the current rate does not

diverge from the profit-maximizing rate, banks may delay increasing lending rate in response to a rise in other market rates.

In the same vein, if supply of deposit is interest inelastic, which could be due to underdeveloped financial market, deposit rate is adjusted downwards quickly to a change in money market rates but tends to be rigid upwards. But if it is interest elastic, which may be due to the availability of alternative sources of portfolio investment, banks will delay in reducing deposit rate (sticky downwards) even if other money market rates fall, but will raise it if doing so will attract more deposits. Greater degree of interdependence and cohesiveness are some of the factors that could cause asymmetric adjustment in the deposit and lending rates.

Hannan and Berger(1991) and Cotarelli and Kourelis (1994) have shown that the incentive for a monopolistic bank to adjust either its deposit or lending rate in response to a given change in the money market rate would be when $0.25b(\Delta i)^2 > C$, where b is the elasticity of demand for loans with respect to the lending rate or the elasticity of deposit supply with respect to the deposit rate, i is the money market rate and C is the cost of either deposit or lending rate changes.

3.5 Core deposit and relationship lending

Maintaining a stable lending rate is one way of showing commitment to a long-term relationship. The cost of attracting new customers and maintaining them could be high and this has the tendency to delay increases in lending rates even if necessary. Flannery (1982) has shown that banks face significant adjustment cost in the retail deposit market as they seek to attract and maintain core deposits. This could delay a decline in deposit rate if other rates fall but adjusted upwards quickly in response to changes in money market rates.

This situation could lead to interest rates smoothening where the risk is shared between the bank and its customers. In good and difficult times, the customer has the advantage of being able to rely on business relations that have been built up over time. Borrowing from another source on the same terms could be difficult and the borrower pays for this advantage to a certain extent by a higher interest rates mark-up in period of falling interest rates. Deposit rates in Ghana are affected comparatively little by market rate movements making deposits a cheap source of funds for refinancing purposes.

3.6 Dependence on bank loans and refinancing cost

In a situation where many firms depend on bank loans for their activities perhaps owing to underdeveloped money and capital market, banks feel less pressurized to reduce lending rates to the corresponding market conditions but could increase it at the least opportunity. Where banks fund their loans largely from deposits, they feel less pressurized to change lending rates compared with the situation where they have to compete with other financial institutions or with the securities market to source funds whose interest rates vary, for financing.

3.7 Bank size

Larger banks normally lend to big firms that have alternative means of raising finance in the market. This is likely to be reflected in larger banks setting rates in line with market conditions. Small banks' clientele base are normally small and medium size enterprises, which are more dependent on banks loans. Small banks are therefore not under any pressure to reduce lending rates following a reduction in other market rates.

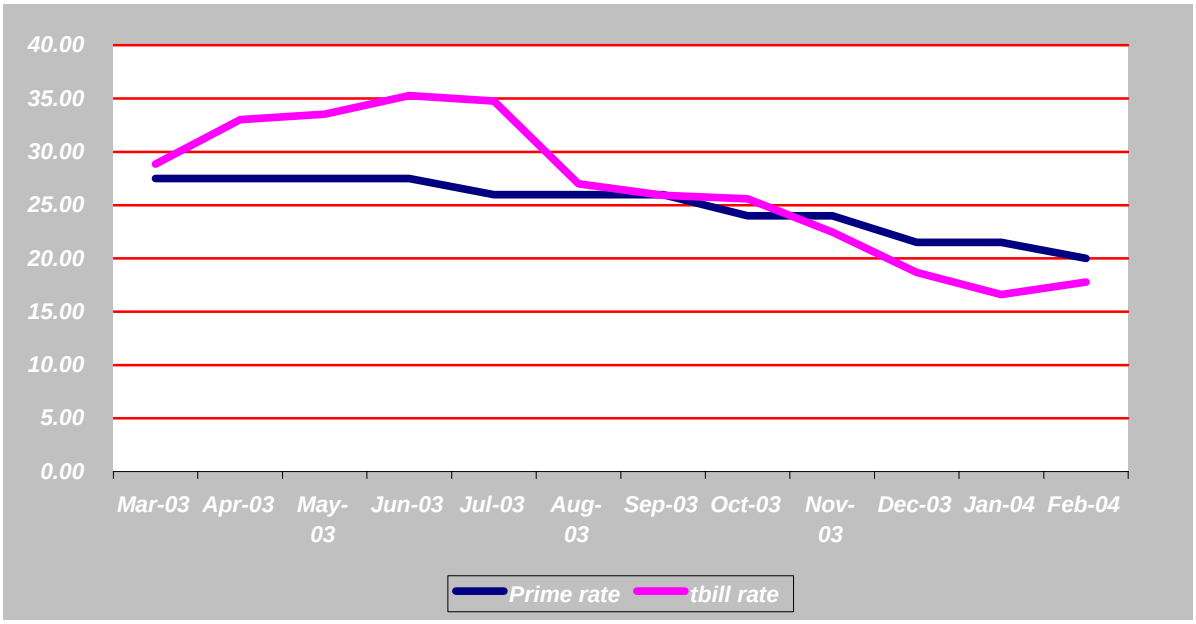
4. Variable selection and sources

4.1 Money market rate

The current regime of monetary management in Ghana rests upon the premise that inflation is caused by excessive expansion in money supply. In this regard, the main operating regime is reserve money targeting whereby the reserve money is controlled so as to achieve a certain growth rate of the money supply. At the same time the central bank seems to be targeting interest rates whereby liquidity is managed such that the short term interest rates are in line with the policy rate. The thrust of monetary policy instruments therefore proceeds towards the policy objectives by a transmission process which successively incorporates a number of financial instruments as the effects span out from the central bank to the money market, the banking system and other financial intermediaries and etc. In this study, we are interested in the transmission from the money market rate to the bank deposit rate and lending rate as the transmission process span from the policy rate to the money market rates.

The money market rate selected for this study is the interest equivalent of 91-day treasury bill rate obtained from Bank of Ghana statistical bulletins and other reports. Figure 3 shows the close relationship between the prime rate and the treasury bill rate indicating how the money market rates react to policy rate. This justifies our use of the treasury bill rate as a policy rate for the study. Another reason for using the treasury bill rate is data availability.

Fig 4: Prime Rate vs Tbill Rate



4.2 Lending rates and Deposit rates

Average lending rate on loans to the manufacturing sector and three months time deposit rate are selected for bank interest rate. Lending rate to the manufacturing sector was selected because of its(Manufacturing sector) dominance in the loan

market and also because of the fact the lending rates to the various sectors bear some kind of equilibrium relationship. In the deposit market, the three months time deposit appears to be the most preferred instrument for investment, hence the choice of this instrument. These variables are also obtained from Bank of Ghana statistical bulletin and other reports.

4.3 Dummy variable

To capture the effect of the shift from bank rate to prime rate introduced in March 2002, a dummy variable (D) is introduced taking the value of zero from September 1994 to February 2002, and a value of one from March 2002 to February 2003 Monthly data is used for the study spanning September 1994 to February 2004 giving a sample size of 114 observations. This period falls within the time Ghana's monetary management was transformed into a market-based instrument of monetary control.

5. The Framework

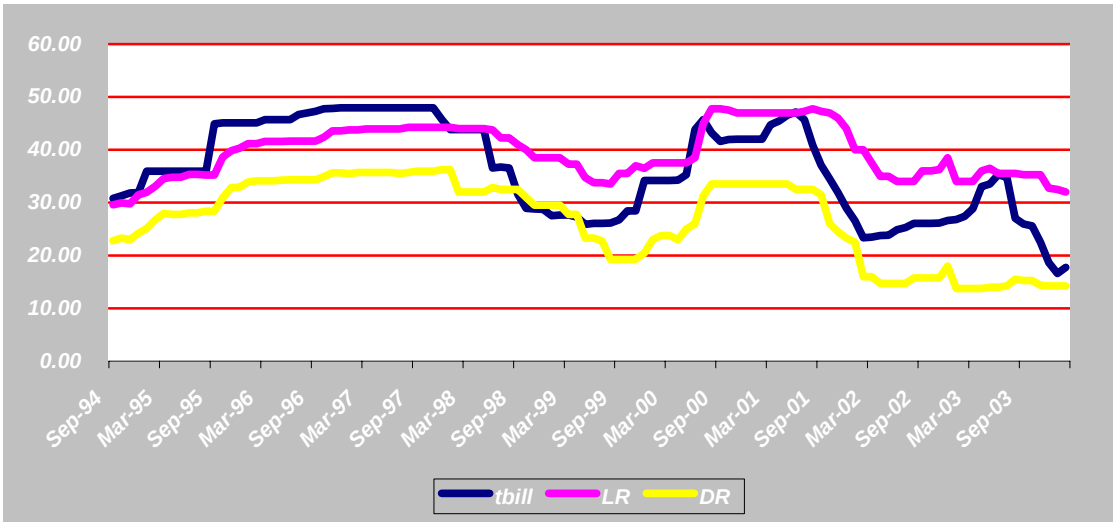
The framework used to investigate the dynamic adjustment of deposit and lending rates in response to money market rate changes is that proposed by Hannan and Berger(1991) and Neumark and Sharpe(1992) which was later developed by Scholnic (1996). As quoted in J. J. Kheswar " Adjustment in Commercial Banks' Interest Rates" The case of Mauritius, they distinguish between symmetrical and asymmetrical rigidities in deposit and lending rates. By symmetrical rigidity, they refer to equal adjustments in the deposit and lending rates when the money market rate change(ie increase or decrease). In the case of asymmetrical rigidities, they contend that deposit rates are sticky upwards and lending rates are more rigid downwards due to collusive pricing behavior of banks. At the same time, they argue that deposit rates are more rigid downwards and lending rates rigid upwards due to customer reaction hypothesis.

6. Methodology

6.1 Symmetric ECM

The standard procedure for studying dynamic interest rate adjustment is to use error correction model (ECM). In addition, visual examination of the plot of the variables used in the study reveals some kind of equilibrium relationship among them necessitating the use of ECM. In this model, short run dynamics are linked to long run equilibrium.

Fig 5: Trends in Interest Tbill, Lending Rate and Deposit Rate



We therefore specify the following error correction model of the form

$$\Delta r_t = \sum_{i=1}^{I} \beta_i \Delta r_{t-i} + \sum_{j=0}^{J} \psi_j \Delta tbill_{t-j} + \lambda ecm_{t-1} + \phi D + \varepsilon_t \quad (1)$$

where r_t is deposit rate(DR) or lending rate (LR), tbill is the 91-day treasury bill rate(interest equivalent), and ecm is the error correction term estimated from the respective co-integration regressions and ε_t is the error term assumed to be normally distributed and not serially correlated. The term ecm_{t-1} is one period lagged deviation from the long run equilibrium. Its coefficient λ is an estimate of the fraction of maladjustment in the previous period that is corrected in the current period.

6.2 Asymmetric ECM

We will also estimate asymmetric ECM to find out if interest rates adjust differently to an increase or a decrease in money market rate. We specify an asymmetric short run dynamic equation as:

$$\Delta r_t = \sum_{i=1}^{I} \beta_i \Delta r_{t-i} + \sum_{j=0}^{J} \psi_j \Delta tbill_{t-j} + \alpha_1 ecm_{t-1}^{+} + \alpha_2 ecm_{t-1}^{-} + \phi D + \varepsilon_t \quad (2)$$

This specification assumes that the lending rate or deposit rate, in addition to its past values, is determined solely by an exogenous money market rate. The application of the above relationship presumes the existence of a stationary long run relationship between the bank interest rates and the money market rate. Stationarity means that the relationship has no trend and is thus constant over time. The application of the above model requires investigating the time series properties of the variables used in the

study since its applicability requires that they be nonstationary and cointegrated. The positive errors (ecm^{+}_{t-1}) in equation 2 implies that if the deposit or lending rate is above its equilibrium value following a decline in the money market rate, then it will start falling in the next period. Similarly, the negative errors (ecm^{-}_{t-1}) means that if deposit or lending rate is below their equilibrium value following an increase in the money market rate, they will start increasing in the subsequent period.

For the deposit and lending rate, $\alpha_1, and\ \alpha_2$ represent their speed of adjustments coefficient in response to the previous period disequilibrium relationship between deposit or lending rates and money market rates as a result of a decrease or increase in the treasury bill rate. For an uncompetitive banking sector, $\alpha_1 > \alpha_2$ for deposit, i.e. banks are quicker in adjusting deposit rates downwards than they are to adjust them upwards, and $\alpha_2 > \alpha_1$ in the loan market implying that banks adjust lending rates upwards faster than they are to adjust them downward.

7. Unit root and Co-integration

To test for a possible co-integration between the money market rate and lending rate on one hand, and the money market rate and deposit rate on the other hand, the order of integration of the variables used in the study should be tested. The unit root test, based on Augmented Dickey-Fuller test (ADF) is given in table 1. From the results for the ADF regression, we find that the null of a unit root is not rejected for all the variables in levels (lending rate, deposit rate, and treasury bill rate). By contrast, the null hypothesis that the first difference of these variables has a unit root is strongly rejected. The variables are therefore difference stationary variables, i.e. they are I(1) variables.

Table 1: Augmented Dickey Fuller Unit Root Test

Variable	Levels		First difference	
	Lag order	Test statistics	Lag order	Test statistics
DR	1	-0.58687	1	-5.3608
LR	1	-1.5654	1	-5.4266
TBILL	1	-1.1185	1	-6.0140
5% critical value = -2.8884				

Lag order selection was based on Schwarz Bayesian Criteria(SBC)
And Akaike Information Criteria(AIC)

We can then move on to test whether there is a long run relationship between the variables. The ADF test on the residuals based on the regression of money market rate and lending rate, and the money market rate and deposit rate, show that the residuals are indeed I(0), enabling us to conclude that both the deposit and lending rates are co-integrated with the treasury bill rate.

Using Johansen's maximum likelihood procedure, the hypothesis of no co-integration between lending rate and treasury bill rate, and deposit rate and treasury bill rate were rejected by both the maximum and trace eigenvalue statistics, but do not reject the hypothesis that there is one co-integrating relation between these variables

(i.e. r=1)(table 2 and 3). Both the Akaike Information criteria(AIC) and Schwarz Bayesian Criteria(SBC) select the order of VAR to be two for the lending rate-treasury relation and one (1) for the deposit rate-treasury bill relation. The finding of a co-integrating relation between the variables implies that in the long run, the bank interest rates mirror developments in the treasury bill rates.

Table 2: Lending-Treasury bill Rate Equation

Maximal eigenvalue (Order of VAR=2)				
Null	Alternative	Statistic	95% c.v.	90% c.v.
r=0	r=1	29.349	18.330	16.280
r<=1	r=2	4.713	11.540	9.750
Trace statistic				
Null	Alternative	Statistic	95% c.v.	90% c.v.
R=0	r>=1	34.060	23.8300	21.230
R<=1	R=2	4.711	11.540	9.750

Normalized Cointegrating Vector: $LR - 0.549TBILL$ (3)
(10.138)

Table 3.Deposit Rate-Treasury bill Rate Equation

Maximal eigenvalue (Order of VAR=1)				
Null	Alternative	Statistic	95% c.v.	90% c.v.
r=0	r=1	30.5637	18.3300	16.2800
r<=1	r=2	4.5209	11.5400	9.7500
Trace statistic				
Null	Alternative	Statistic	95% c.v.	90% c.v.
r=0	r>=1	35.0846	23.8300	21.2300
r<=1	R=2	4.5207	11.5400	9.7500

Normalized Cointegrating Vector: $DR - 0.6913TBILL$ (4)
(-7.57)

8. Long Run Coefficients

Equation three and four give estimates of the normalized co-integrating vector (long run) for lending rate-money market rate relation and deposit rate-money market rate relation. The long run adjustment of lending rate and deposit rate to a 1 percent change in treasury bill rate is 0.55 and 0.69 respectively. It indicates that in the long run banks adjust lending rate by about half relative to treasury bill rate while only a weak long-term pass through (0.69) occurs for deposit rate. Low competition, together with other factors as mentioned in section three, could account for the high degree of stickiness.

9. Short Run Estimates

Table 4 gives the results of the dynamic short run adjustments estimated for symmetric ECM model and asymmetric ECM model. In both the lending rate-money market rate relationship and the deposit rate-money market rate relationship, the coefficient on the error correction terms are significantly negative as required. The symmetric short run adjustment of the lending rate following a deviation from long

run equilibrium in the previous period is 0.26 for lending rate and 0.22 for the deposit rate. These indicate slow speed of adjustment making bank interest rates very inflexible to changes in the money market rates. The slow response implies that interest rate channel of monetary policy transmission is weak. Current changes in the treasury bill rate has no effect on the current lending and deposit rates, but there is evidence of Granger causality from treasury bill rate lagged one period to lending rate by 0.2.

The introduction of the prime rate, for the period under study, did affect the asset pricing behavior of the banks but has no influence on the cost of funds of banks as the dummy variable turned out to be insignificant. As stated earlier, the response of bank interest rates to an increase or a decrease in the money market rates may differ especially in an uncompetitive banking market sector as opposed to the same response to an increase or decrease in the money market rate. All the estimates of the asymmetric coefficients are rightly signed, though insignificant. According to the estimated model, the lending rate adjusts downwards by 0.29 following a previous period's decline in the treasury bill rate, compared with an upward adjustment of 0.11 in response to a disequilibrium in the money market brought about by an increase in the treasury bill rate in the previous period. This difference in response thus, supports the customers' negative reaction hypothesis of Scholnick (1996). The deposit rate, on the other hand, adjusts downward faster (0.08) than it does upwards (0.03) following a decrease or an increase in the treasury bill rate. The Berger and Hannan hypothesis of collusive pricing behavior of banks seems to be supported in this case.

An important step in the analysis of asymmetric adjustment is to test whether the estimated asymmetric coefficients are equal. In other words, we specify the null hypothesis that $\alpha_1 = \alpha_2$, and its rejection indicates there is asymmetric adjustment in bank interest rates to changes in the Treasury bill rate. We use Wald test, distributed as chi-square with degrees of freedom equals to the number of restrictions. From the bottom part of table 4, the null hypothesis of equal adjustments cannot be rejected as the Wald statistics are significantly less than the critical value ($\chi^2(1) = 2.71$) at 5% level of significant. Therefore, lending and deposit rates adjust equally to a change in money market rate. This could be expected in view of the fact that the interest rates, for a greater part of the sample period, have been unidirectional.

Table 4: Results of the Error Correction Model (ECM)

	LR		DR	
	Symmetric	Asymmetric	Symmetric	Asymmetric
Intercept	3.998 (5.693)	0.178 (1.305)	1.209 (4.332)	-0.11429 (-0.252)
ΔLR_{t-1}	0.070 (0.997)			
$\Delta TBILL_{t-1}$	0.1454 (2.875)	0.336 (7.523)		0.329 (5.729)
ECM_{t-1}	-0.264 (-5.635)		-0.221 (-5.803)	
ECM_{t-1}^{+}		-.291 (-1.455)		-0.077 (-0.362)
ECM_{t-1}^{-}		-0.112 (-0.602)		-0.029 (-0.216)
Dummy variable	-1.485 (-3.967)	0.283 (-1.148)	-0.623 (-1.299)	0.114 (0.378)
Wald statistic HO: no asymmetry (C.V. =2.71)		0.285		0.027
R	0.516	0.376	0.286	0.238
DW-Statistic	2.059	1.56	1.713	1.96

t-statistics in brackets

10. International Comparison

Table 5: International Comparison of bank lending rate rigidities

	Short-term	Long-term
Ghana	0.26	0.55
Chile	0.86	0.97
Mauritius	0.27	0.71
Germany	0.38	1.04
United Kingdom	0.82	1.04
Colombia	0.42	1.03
Mexico	0.83	1.29
Venezuala	0.38	1.48
Canada	0.76	1.06
United States	0.32	0.97
Italy	0.11	1.22
Spain	0.35	1.12

Source: Solange and Fuentes(May 2003) picked from Cottareli and Kourelis(1994) and authors own estimates for Ghana

Table 5 shows that bank interest rates in Ghana exhibits high inflexibility. Among the countries compared, it is easy to see that interest rate pass through in Ghana is the lowest both in the short run and in the long run. All the countries fully adjust the lending rate to a change in the money market rate. Having made such comparison, it is important to take into account the fact that the time periods and data frequency are different for the countries.

11. Conclusion

The results of the econometric analysis shows that the interest rate channel of monetary policy transmission is weak in view of the slow response of bank interest rates to changes in the money market rate both in the short run and in the long run. The long run pass-through from money market rate to bank lending rate is significantly weak while the deposit rate shows some flexibility. The evidence does not support the hypothesis of asymmetric adjustment in bank interest rates to an increase or a decrease in money market rate but rather supports equal adjustment of bank interest rate to changes in the money market rate. The introduction of the prime rate in March 2002 has some influence on the asset pricing of banks but not on the cost of funds of banks (deposits rates).

The conclusions should however be taken with caution as the treasury bill rate in Ghana reflects more of a fiscal than monetary development. As data becomes available, the prime rate may be used as a policy rate (independent variable) to see the extent to which the results will vary. Bank characteristics that might affect the degree of stickiness were not analyzed. An empirical study of this, in addition to the current study, could help complete the picture of interest rate channel of monetary policy transmission.

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