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THE ROLE OF EXPECTATIONS IN INTEREST-RATE DETERMINATION

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The purpose of this paper is to understand the role of expectations in the determination of interest rates in the Philippines. The study focused on the interest rates of Philippine Treasury Bills from 1970 to 1980. The results show that the market makes forecast of the future levels of interest rates and that the market participants revise these expectations in a manner consistent with the error-learning behavior. The changes in expectations as measured by the forward rates are a positive function of the forecasting errors. However, the forward rates are biased estimates of future rates, due to the presence of a liquidity premium on longer-term maturities. This makes the Treasury bills of varying maturities non-substitutable with each other.

The factors that determine interest rates are the demand and supply of loanable funds, and inflation. The variables that measure these factors found with significant contribution in explaining the behavior of Treasury Bill Rates are; outstanding securities of the national government, outstanding securities of monetary authorities (Central Bank Certificate of Indebtedness), balance of payments, stock price index, U.S. discount rate, demand deposits and their turnover rates, and Consumer Price Index.

The equations developed explain the levels of Treasury Bill rates, with high degree of significance, but display also positive serial correlation. As a consequence, the predictive power suffers from this limitation. However, the close relationship between the estimates for 1980 and 1981 using the regression coefficients of the equations and the forward rates implied by the term structure cannot be ignored.

1. Introduction

This study seeks to understand the role of expectations in the determination of interest rates in the Philippines. An understanding of their determination in the financial market can give useful insights for policymakers in connection with the adoption of interest-rate policies which are consistent with the short- and long-term objectives of economic development. The public, likewise, can gain a sharper focus on how best to maximize its position as a saver/investor, or fund user/borrower. The continuing studies conducted in this area

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toward understanding the behavior of interest rates in the United States and other countries attest to the importance of such knowledge gained. While some research studies investigate issues related with interest rate determination, others address the effects of interest rate on the economy.

Several theories have been advanced in various term structure studies to explain interest-rate behavior over increasingly longer maturities. The most widely tested is the Expectations Hypothesis, in its pure and modified versions. Under this theory, long-term rates are the "average" of the current rate and a host of forward short-term rates, each renewing the instrument at the end of the term. The Philippine data on interest rate are analyzed to establish if, in fact, expectations play a role in interest-rate determination.

We have chosen to focus on short-term interest rates, with the specific objective of observing their behavior and the role of expectations in their determination.

In this connection, it is useful to remember that there is no single short-term interest rate. Rather, there is a host of interest rates depending upon the quality and maturity of the instruments, and nuances surrounding the issues. With every borrower goes a different perception of the exposure to the risk of non-payment. Likewise, different lenders have unique cost structures and varying objectives, hence some may agree to earn lower rates, while others demand higher. Other features of the instrument change the risk characteristic of the loan, thus affecting the interest rate. Even with this observation of the existence of a variety of interest rates in the short-term money market, there is a general tendency to think of interest rates chiefly in terms of the more widely quoted money market rates and rates on government issues such as Treasury Bills and Central Bank Certificates of Indebtedness.

For this reason, we chose to study the interest rates on Treasury Bills. Data on the issue rates of treasury bills are available on a comparative and sustained basis during the period covered by this study. These rates are those determined at auctions conducted every Monday at the Central Bank all year round. The rates on treasury bills are ideal for use in testing the expectations hypotheses. Basically a homogenous instrument, there is no risk of non-payment since these are issues of the National Government. A liquidity mechanism is provided by the government securities dealers in a fairly well-developed secondary market, and the eventual retirement is guaranteed by the Central Bank. Hence, any differences observed in the

interest rates for the varying maturities are attributed solely to the differences in maturity.

2. Short-term Interest Rates in the Philippines

Up until the partial decontrol in 1981, interest rates in the Philippines have always been controlled. Rates paid on deposits were set by the Central Bank of the Philippines,[1] and these differed from one type of financial intermediary to another, depending upon the perception of policymakers for the need to influence the flow of funds within the financial system. Hence, the savings deposit rate paid by thrift banks was set, at one time, at a level higher than that paid by commercial banks. Lending rates were likewise controlled with absolute ceilings set by law. The legal ceilings allowed 14% per annum on unsecured loans, 12% on loans secured by real estate, and a legal rate of 6% for contracts where no interest rate was set.[2] However, when the cost of money was higher, or when the lenders felt a general tightness of money, such ceilings were circumvented through a variety of practices.

The mid-1960s saw the emergence of the money market with the introduction of Treasury Bills. The truly short-term funds could now be borrowed or placed at market interest rates through the sale or purchase of high-grade commercial papers and government securities.

The money market had earlier existed in the loose arrangement among banks for meeting the reserve requirements imposed by the Central Bank, and the servicing of intercompany IOUs. Its development into a formal market was enhanced with the introduction in the mid-1960s of Treasury Bills with short maturities. The market soon developed for the sourcing of short-term funds by large corporations through the sale of commercial papers. Many investors moved in to take advantage of the rates which were higher than what the banks were legally allowed to pay on deposits. With the relative ease of raising funds through this market, more and more private corporate issues became available.

[1] The Central Bank of the Philippines was created in 1949, under Republic Act No. 265, "to administer the monetary, banking and credit system of the Republic."

[2] Provisions of Usury Law (Act No. 2655), as amended. The power to fix interest rates has been given to the Monetary Board of the Central Bank, subsequently.

Treasury bills with 91-day maturity were first issued in 1966. Since then, several other bills, with maturities ranging from 35 days to 364 days, have been introduced. These are instruments issued by the National Treasury of the Republic. They are auctioned off by the Central Bank, as fiscal agents, every Monday.

Government securities had increased tremendously in the 1970s. But only a little over 8% of all government securities outstanding is accounted for by Treasury Bills. Pertinent details are shown in Table 1.

Table 1 — Outstanding Government Securities (1970-1980, in Million Pesos)

National Government	1970	1975	1980
Treasury Notes	1,308	3,589	4,174
Treasury Bills	582	1,869	2,983
Treasury Bonds	—	3,183	8,639
Others	1,538	2,280	3,474
Sub-Total	3,428	10,921	19,270
Government Corporations			
DBP	1,206	792	2,101
Land Bank	6	192	879
Others	521	551	211
Sub-Total	1,733	1,535	3,291
Monetary Authorities			
CBCI	68	7,111	11,701
Total	5,233	19,567	34,262

Source: *Central Bank Statistical Bulletin*, A Statistical Appendix to the CB Annual Report, published by the Department of Economic Research, Central Bank of the Philippines, 1970-1980.

The average rates on all maturities of the Treasury Bills have shown a dependence on maturity. Bills with longer maturities were issued at higher rates. The yield curve covering the decade of the 1970s is upward-sloping but it increases at a decreasing rate. As

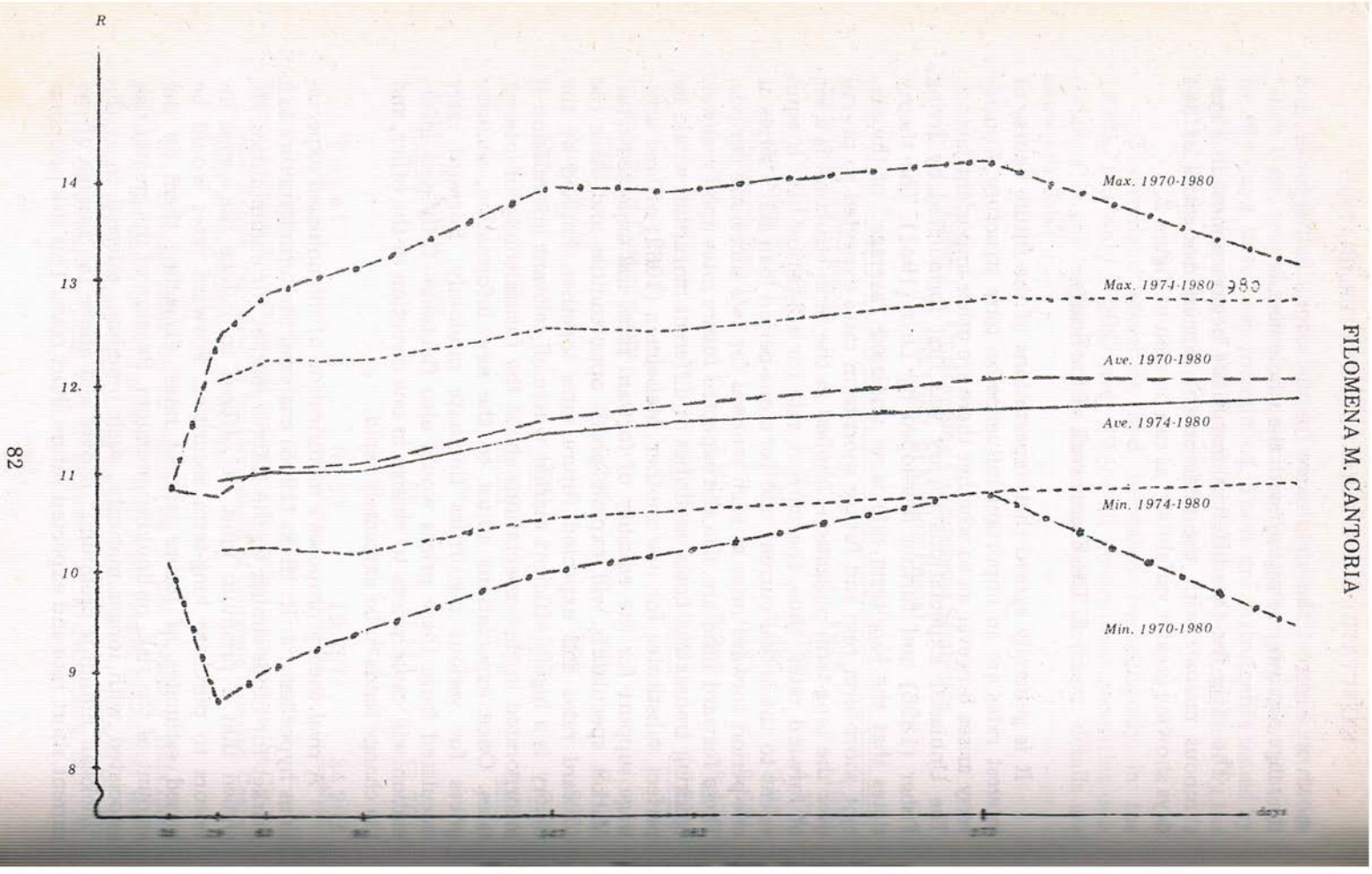
shown in Figure 1 the yield curve for the second half is lower, and the range narrower compared with the whole decade.

The rates for the different maturities behave almost in a synchronous manner with the rates on the longest maturities of 364 days showing greater variability, as can be seen in Figure 2.

3. The Framework of the Study

It is generally agreed that expectations of the future course of interest rates are an important influence on term structure. Controversy arises however as to whether there are other important factors. The Unbiased Expectations theory was first formulated by Irving Fisher (1896) and further developed by Lutz (1941). The theory states that the long-term rate is an unbiased "average" of the current short-term rate and future short-term rates expected to prevail over the long-term obligation. Implied in the term structure is a set of forward rates; thus, the current rate for a 3-period loan is equivalent to the actual current rate for a one-period loan and a series of one-period forward rates at each renewal for two successive periods. These forward rates are also the expected future rates upon renewal. Ignoring transaction costs, securities of different maturities would be perfect substitutes for one another. Meiselman (1962) offered arbitrage support for the equality of forward rates and expected rates. Market speculators will exploit profit opportunities and drive the forward rates and expected future rates together. Implied by the theory is a highly efficient market where all relevant information is incorporated in the expectations about the future course of interest rates. Once expectations adjust to the new information, security prices for various maturities fluctuate randomly. Forward rates calculated from these prices would also fluctuate. Only new information will cause prices to change in one direction or the other, and the change tends to be extremely rapid.

A rival theory proposes a modification of the unbiased expectations hypothesis. J. R. Hicks (1946) analyzed the term structure as a market for funds similar to the futures market for commodities. He argued that a premium must be offered to induce risk-averse investors to purchase long-term securities. Forward rates would be biased estimates of future interest rates, exceeding them by the amount of the risk, or liquidity premium. Because of the greater risk associated with longer maturity, such premium, referred to as the "Hicksian liquidity premium," is over and above the average of the current short rate and expected future short rates. This risk premium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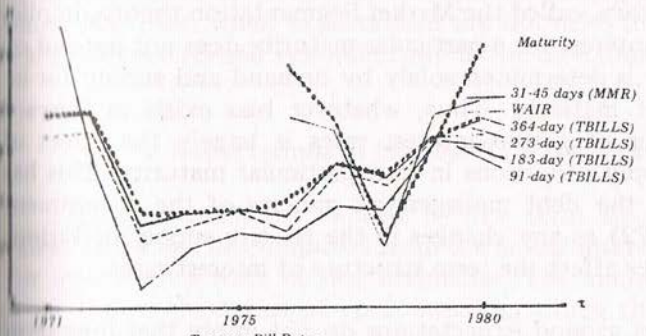
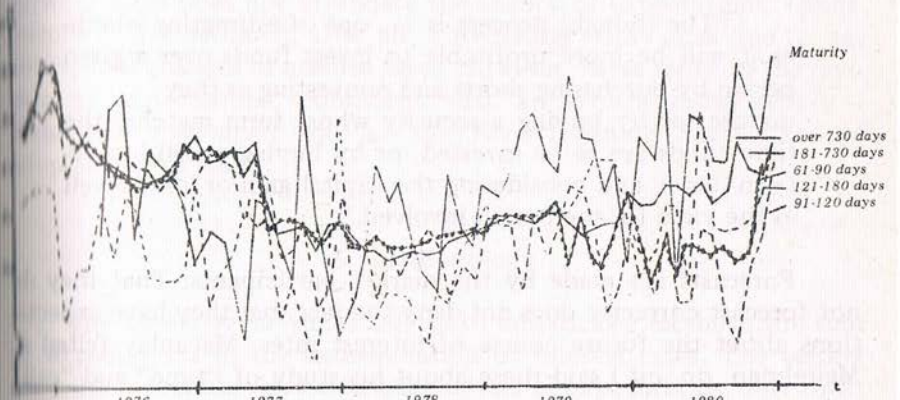


Treasury Bill Rates
Annual, 1971-1980



Money Market Rates
Monthly, 1975-1980

Figure 2 — Money Market Interest Rates Various Maturities Yearly, 1970-1980

was seen to increase with the length of maturity. Further, the risk related with changes in the rates over the long term, resulting in possible loss of principal, was seen to be inversely related to the rate levels.

Another theory, called the Market Segmentation theory, implies that the rate of interest for a particular maturity does not depend on expectations but is determined solely by demand and supply for investment of that maturity. Thus, whatever bias exists in forward rates as estimates of future interest rates is largely the effect of demand and supply conditions in that particular maturity. This has implications for the debt management policies of the government (Van Horne, 1972) as any changes in the relative supply of various maturity securities affect the term structure of interest rates.

The theories around expectations do not imply that long-term rates are caused by short rates. All rates depend upon the interaction of present and expected future supply and demand for the funds over the span of the loan (Conard, 1959). Market participants seek to maximize their returns based upon their expectations. As Conard *(op. cit.)* points out:

> "The thought process is . . . one of estimating whether it will be more profitable to invest funds over a given period by purchasing shorts and reinvesting as they mature, or by buying a security whose term matches the time funds are to be invested, or by buying a still longer-term issue and considering the capital gain or loss as well as the yield for the period involved."

Forecasts are made by the market participants. That they do not forecast correctly does not deny the fact that they have expectations about the future course of interest rates. Macaulay (cited in Meiselman, *op. cit.*) said these about his study of "time" and "call" rates:

> ". . . an examination of the course of 'time' and 'call' money rates offers almost conclusive evidence that forecasting is really attempted and that at least one reason it is so badly done is that it is so difficult.
>
> . . . Bankers and brokers acted as if they knew virtually nothing about future cyclical or other non-seasonal movements of call money rates . . . What they knew about they were able to forecast, at least approximately; what

they did not know about they were unable to forecast at all except by accident."

This study will test empirically the hypothesis that expectations of interest rates are made by the market participants in the Philippines. However, when expectations are not held, the subsequent forward rates are revised systematically in the direction of the error.

4. Expectations in Interest-Rate Determination

Forward rates are implied by the term structure of interest rates. These can be computed from the actual interest rates observed, for instruments with varying maturities. The methodology is drawn from the mathematics of compounding, where the long-term rate, R_{nt}, is an "average" of a short-term rate R_{jt}, (where j is a term shorter than n), and a series of future short-term forward rates at which subsequent renewals are made upon maturity. The equality between the computed forward or implied rates and expected rates is assumed here as did Meiselman (1962, *op. cit.*) in his very extensive work on term structure. That the actual rates differ from the forward rates does not invalidate the theory of expectations. Omniscience is not assumed, after all. Forecasting errors arise due to unanticipated changes in interest rates. However, these result in the revision of expectations, consistent with an error-learning behavior. Meiselman developed this as the Error-Learning Model, and is adopted in this study.

5. Methodology

The objective of this study is to empirically establish the role of expectations in the determination of interest rates. The testing procedures include an empirical analysis of expectations, developed in earlier studies, for the analysis of term structure determination.

5.1 *Testing for Expectations: The Calculation of Forward Rates*

The methodology developed for the analysis of expectations in structure determination rests on the fact that a set of forward rates is implied in the term structure at any moment, as described by the following equation:

$$(1+{}_tR_n)^n = (1+{}_tR_1)(1+{}_{t+1}r_{1t})(1+{}_{t+2}r_{1t})\ldots(1+{}_{t+n-1}r_{1t}) \quad (1)$$

Here, ${}_tR_n$ represents the actual interest at time t on an N-period loan which is equivalent to a one-period loan plus a series of forward contracts, each renewing the loan for a successive period. Forward rates implied in the term structure of Treasury Bills are calculated using the following:

$$(2) \qquad {}_{t+n}r_{1t} = \frac{(1+{}_tR_{n+1})^{n+1}}{(1+{}_tR_n)^n} - 1$$

where ${}_{t+1}r_{1t}, {}_{t+2}r_{1t}, \cdots {}_{t+n-1}r_{1t}$ are the one-period forward rates beginning at the time $t+1, t+2 \ldots t+n-1$ implied in the term structure at time t; ${}_tR_{n+1}$ represents the actual rate of interest at time t on an $n+1$ period loan; and ${}_tR_n$ is the actual rate at t on an n period loan. This formula is also used to calculate forward rates on any span of time, j, at t, thus:

$$(3) \qquad {}_{t+n}r_{jt} = \sqrt[j]{\frac{(1+{}_tR_{n+jt})^{n+j}}{(1+R_tR_{nt})^n}} - 1$$

Where ${}_{t+n}r_{jt}$ is the j-period forward rate at the beginning of $t+n$ implied in the term structure at time t.

Given the following yield-maturity combination, the forward rates implied are as shown on column 3 of the following table:

A Table of
Hypothetical Yields and Forward Rates

(1) Maturity	(2) Yield, R	(3) Implied One-Period Forward Rates
1 period	4%	
2 periods	5%	6.01
3 periods	6%	8.03

For a holding period of three (3) years, one can choose a 3-period instrument to earn 6%, or invest in a one-period security with reinvestment at each maturity and earn also 6%, as follows:

$$(4) \qquad 6\% = \sqrt[3]{(1.04)\ (1.0601)\ (1.0803)} - 1$$

5.2 *Calculations on the Philippine Treasury Bill Rates*

Having selected 91 days as the time span of one period, forward rates for Treasury Bills are calculated for various renewal dates, as follows:

No. of Periods	Forward rates to prevail at start
One-period rate	$t+1$
One-period rate	$t+2$
One-period rate	$t+3$

The above calculations are done using actual issue rates of Treasury bills for maturities ranging from 91 days to 364 days.

5.3 *Analysis of Forecasting Results*

The forward rate, ${}_{t}r_{1t-1}$, for each month is compared with the actual one-period rate ${}_{t}R_{1t}$ which the forward rate had attempted to forecast. The arithmetic difference is the forecasting error, E_t, in the equation:

$$E_t = {}_{t}R_{1t} - {}_{t}r_{1t-1} \tag{5}$$

Since the computed forward rates equal expected rates, any error in forecasting the short-term rate is attributed to unanticipated changes in the interest rate. This should now cause the revision of future expectations. Meiselman observed that such revisions are a positive and stable function of the forecasting error.

5.4 *Analysis of the Adjustment Behavior*

Tests are done if the forecasting error results in adjustments in the subsequent forecasts. The changes in subsequent forward rates are regressed with the error, E_t, as follows:

$$\Delta_{t+n}r_{1t} = f(E_t) \tag{6}$$

where $\Delta_{t+n}r_{1t} = {}_{t+n}r_{1t} - {}_{t+n}r_{1t-1}$

If the actual rate at time t exceeds the forecasted rate, the market is expected to automatically adjust upward its expectations of what the

short-term rate is likely to be in the future. A highly significant correlation coefficient will support the expectations hypothesis. Further, a constant term which is not significantly different from zero suggests the absence of a risk premium, and that forward rates are unbiased estimates of future rates.

The earlier described tests are indirect tests of the presence of expectations or forecasting. Risk premium may, however, create a bias in the forward rate and such is also observable in the presence of a constant term which is not significantly different from zero. More direct tests are not undertaken as to whether the participants in fact develop forecasts about the future, and on what these are based. The behavior of risk premium relative to lengths of maturities and with respect to levels is a special area of study by itself and is addressed by this study in a very general manner.

We have assumed that the forward rates implied by the term structure equal the expected rates. The equality is not the issue here. If the expected rates differ from actual rates, the necessary revisions are made in subsequent forecasts, as is expected in an error-learning behavior. Such error is attributed to the failure of the market to anticipate changes in interest rates.

6. Results of the Study

This study seeks to understand the role of expectations in the determination of interest rates. The empirical tests aim to establish the extent of forecasting done by the market. The analysis focused on short-term interest rates, using the Philippine Treasury Bill rates as the subject of the study.

6.1 *The Yield Curve of Treasury Bill Rates*

The yield curve of Philippine Treasury bills in Figure 1 constructed from data covering the period March 1970 to December 1980 is slightly upward sloping on the short end, but displays hardly any positive slope on the long end. Since the whole 10-year period consists of a downtrending behavior from 1970 to 1973, and a reversal from 1974, we constructed another yield curve for the second period covering 1974 to 1980. The range of the maximum and minimum rates of each year showed narrower gaps during the 1974-1980 period compared with the whole ten years.

We compared the means of spot rates of selected maturities of Treasury bills. Table 2 below shows that the mean rate of 91-day bills is significantly different from all the rates applicable to longer maturities.

Table 2 — Comparison of Means of Treasury Bill Rates of Varying Maturities, 1970-1980

Treasury Bills Maturities	Mean	Standard Deviation	t-values for the Comparison of Means
91-day	11.05	1.163	
182-day	11.54	1.100	
273-day	11.76	1.119	
364-day	11.86	1.057	
Maturities Covered in Comparison of Means			
91-day vs. 182-day			3.436 (significant)
91-day vs. 273-day			4.963 (significant)
91-day vs. 364-day			5.761 (significant)
182-day vs. 273-day			1.597
273-day vs. 364-day			.680

At the 5% significance level, the t value is 1.960. The difference was not significant between the mean rate for 182-day and 273-day maturities, and between 273-day and 364-day maturities. Calculations made for the period covering 1974 to 1980 showed similar results.

Forecasting the Interest Rates

A set of one-period forward rates was calculated for Treasury bills using the actual rates for maturities ranging from 91 to 364 days. With each period equivalent to 91 days, these forward rates are equal to the expected renewal rates at maturity, for a total of three renewals for the whole year.

We found that the forward rates did not forecast interest rates accurately. They were high estimates of the rates they attempted to forecast. (Please refer to Figure 3.) Forecasting errors were calculated as the difference between actual rates, R_{1t}, and the forward rates, $_{t+1}r_{1t}$. The predominance of negative errors suggests the presence of

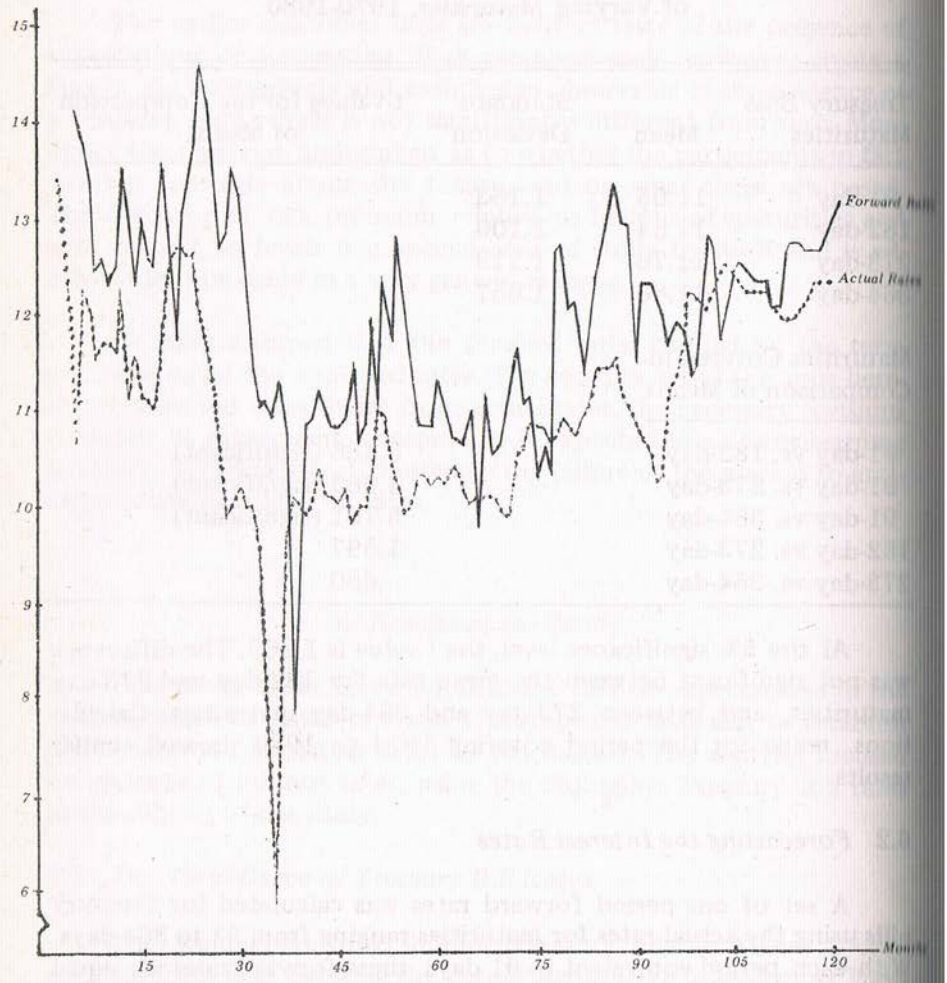


Figure 3 — Actual and Forward Rates of Treasury Bills, 91-day Maturity 1970-1980

Table 3 — Summary of Forecasting Errors (E_t) Treasury Bill Rates, 1970-1980, $E_t = {}_tR_{1t} - {}_tr_{1t-1}$

	One-Period Forward Rates to Apply at		
	t+1	*t+2*	*t+3*
Maximum Positive Error ($+E_t$)	2.188	1.558	1.523
Month/year	Jan. '74	May '74	Sept. '74
Maximum Negative Error ($-E_t$)	−4.960	−7.296	−7.921
Month/year	Oct. '73	Oct. '73	Oct. '73
No. of Positive Observations			
High	11	15	20
Low	42	39	33
No. of Negative Observations			
High	42	38	33
Low	26	26	29
Total Observations (Monthly)	121	118	115

factors that make the forward rates biased estimates. Table 3 however shows a preponderance of low (less than 1.0) values for the error term. The extreme positive errors were observed on the 1974 data while the extreme negative errors were on the 1973 data.

The Error-Learning Behavior

We have earlier asserted that forward rates equal expected rates, and that forward rates change if expectations about the future change. Meiselman's error-learning model showed that subsequent forward rates are adjusted as a result of errors in forecasting the short-term rate. If forecasts exceed the actual rates, a negative adjustment is seen in the forecast for the next period. Figure 4 shows the adjustment behavior of subsequent forward rates for 91-day bills in response to forecasting errors. Hence, a negative error observed in March 1975 is due to the fact that the actual rates in March for 91-day bills are lower than earlier expected. The error should cause a

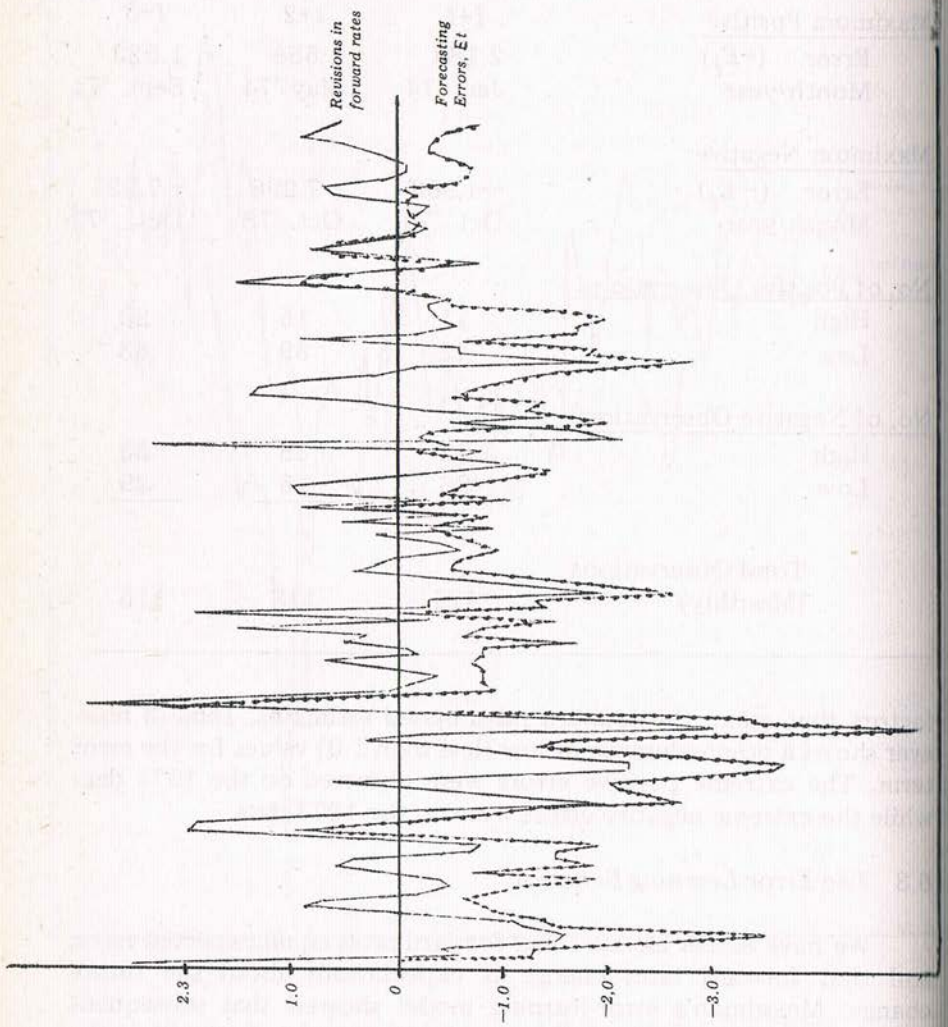


Figure 4 — Error-Learning Behavior of Treasury Bill Rates,1971-1980

reduction of the subsequent forward rate (that forecast in March to prevail in June, 1975, compared with the forward made earlier to prevail in March.) Table 4 shows that when errors are negative, the negative adjustments in forward rates predominate, and more so when the errors are on the high side. The adjustments, however, are not defined when negative errors are on the low side. Positive errors resulted in more positive adjustments in forward rates.

We find a strong support for the hypothesized role of expectations in the determination of interest rates. Forward rates are seen being revised when forecasting errors are observed. These errors earlier attributed to the unanticipated changes in spot rate cause the revision of expectations. As can be seen in Figure 3, forward rates lead the actuals in the major movements. This is not apparent, however, for minor movements.

6.4 *Test for Bias in Expectations*

The changes in the forward rates were regressed with the forecasting error using 121 monthly observations for the three forward rates computed from the data. For all, we found positive correlation, with correlation coefficients varying inversely with the proximity to t. All the regression coefficients were also positive and significant. However, only the correlation coefficient of $t+1$ was found significant. The data however are positively auto-correlated (please refer to Table 5).

Table 4 — Synchronization of 91-Day Forward Rate Adjustments and 91-Day Forecasting Errors Monthly Figures, 1970-1980

	When Error was Negative*					
Period to which forward rates apply	$t+1$(107)		$t+2$(104)		$t+3$(101)	
	Low	High	Low	High	Low	High
Adjustment in Forward Rates						
Negative Adjustment	23	42	21	37	26	31
No Change	0	0	0	0	0	0
Positive Adjustment	33	9	32	14	24	20

Table 4 (continued)

Period to which forward rates apply	When Error was Positive (14)*					
	t+1		*t+2*		*t+3*	
	Low	High	Low	High	Low	High
Adjustment in Forward Rates						
Positive Adjustment	9	2	7	1	9	0
No Change	0	0	0	0	0	0
Negative Adjustment	3	0	5	1	3	2

*Figures in the parenthesis show the number of monthly observations.

The constant terms were significantly different from zero. We interpret this to mean that the forward rates are biased estimates of future interest rates due to the presence of liquidity premium. Thus, forward rates equal the sum of expected rates and liquidity premium for longer maturities. Figure 4 is a plotting of the adjustment process showing the forecasting errors and the changes in the forward rates. The revisions in forward rates behave in a very synchronous manner with the forecasting error, confirming the statistical results of a high positive correlation between the two variables.

Table 5 — Relationship Between Forward Rate Adjustments and Forecasting Error Monthly Figures, 1970-1980

Period the beginning of which the Forward Rates Apply	Constant Term	Regression Coefficient (and F-value)	Coefficient of Determinant (R^2)	*D.W.**
t+1	.71511	.73824 (186.48)	.62268	1.0764
t+2	.32555	.37593 (10.293)	.08349	1.4465
t+3	.18091	.22861 (4.169)	.03558	1.3417

*Durbin-Watson statistic for absence of positive serial correlation at 1% is 1.56.

6.5 *The Behavior of Risk Premium: Some Extensions*

The findings support the hypothesis about the role of expectations in interest-rate determination. However, forecasts are biased estimates due to the apparent presence of a liquidity or risk premium. Therefore, instruments of varying maturities are not exact substitutes for each other.

Meiselman equated the forward rate implied by the term structure with expected rate, so that all observed differences between the two rates were attributed to forecasting error which is corrected in accordance with the error-learning model. Hicks, on the other hand, has the following formula:

Forward Rate = Expected Rate + Risk Premium

Kessel adopted the Hicksian premium as the cost of holding money substitutes, so changes in interest rates during the holding period directly affect the liquidity premium embodied in the forward rates.

Because of risks associated with the longer maturities, investors prefer to lend short unless offered a higher rate for longer maturities. Various studies on liquidity premium have tried to answer the following questions:

a) If there is liquidity premium on long terms, is it always positive?
b) How does it behave over varying lengths of maturity?
c) Is it a function of interest rate levels?

The biggest deterrent to empirical testing is the segregation of the risk premium component of the forward rate. Some studies have equated the difference between forward rate and spot rate (Meiselman's E_t) to risk premium, considering that forecasting errors cancel out in the long run. Variations of the perfect-foresight model were used in other studies. Spot long-term rates are compared with the "average" of short-term rates, since under the model, expectations on the average are realized. Other studies assumed that the market adapts to a "normal" range, and risk premium is the deviation of the long-term rate from either the mean of the normal range or from the range developed through a linear process. Findings of the numerous studies did not support each other due to differences in methodology, time frame, and instruments observed. This offers an area for further investigation of Philippine interest-rate behavior.

7. Conclusions and Limitations of the Study

The purpose of this study is to understand the role of expectations in interest-rate determination. Using the Treasury bills data for the period 1970 to 1980, the results of the study show that the market makes forecasts of the future levels of interest rates. It is also seen that the market participants make revisions in these expectations in a manner consistent with the error-learning behavior. The changes in expectations as measured by the forward rates are a positive function of the forecasting errors. It is seen, however, that the forward rates are biased estimates of future rates due to the presence of a liquidity premium on longer-term maturities. This makes the Treasury bills of varying maturities non-substitutable.

The use of the Treasury bills data for this study creates certain limitations with respect to generalizing the findings. Treasury bills are very different from the rest of the instruments available in the money market, not only because these are issues of the Philippine Treasury, with a Central Bank guarantee for its repayment, but also because there exists a group of security dealers to provide a secondary market.

The rates used are those observed at the time of issue, and the study assumed that the instrument is held for the full term. A study that uses current rates in the secondary market, for durations different from their original terms may result in different findings.

8. Recommendations

A fuller understanding of interest-rate behavior would require a study on the shapes of the demand for funds in the goods sector. The behavior of firms as they demand funds for investment in capital goods and working capital would transcend their planning for competition and growth, and the general resource allocation process. Financing these fund requirements is done in the financial markets. The behavior of savers who buy financial assets needs to be studied to understand the overall supply of loanable funds, and their demand for financial assets. Another area of research is the manner adjustments are made in the portfolio of assets as disequilibrating forces occur in the economy. How they form expectations about the future trends of profits and interest rates, and how they perceive risk likewise affect the overall direction of demand and supply for funds, hence of interest rates, and the allocation of resources of the whole economy.

Needless to say, monetary policy can benefit from the fuller understanding of interest rates, even if the control of it is not one of its policy instruments. Surely, this phenomenon that can seriously affect the behavior of the goods sector should be of prime consideration in the design of monetary policy.

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