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Bank of Canada Banque du Canada

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Abstract

One of the tools the Bank of Canada has as a means of conducting monetary policy is its influence on very short-term interest rates which, in turn, allows it to indirectly affect market and administered interest rates. This paper attempts to identify which interest rates - - market rates or the Bank Rate - - are the most important to the chartered banks in the setting of their prime rates. Results of equations estimated over the 1975-89 period indicate that the change in the Bank Rate is the most important variable in explaining short-run movements in the prime rate. Other variables influencing the prime rate include changes in the 90-day commercial paper rate and the spread between prime and the 90-day paper rate and between prime and the 30-day bankers' acceptance rate.

Résumé

L'un des outils dont dispose la Banque du Canada pour mettre en oeuvre sa politique monétaire est l'influence qu'elle exerce sur les taux d'intérêt à très court terme, influence qui lui permet, par ricochet, d'agir sur les taux du marché et les taux administrés. La présente étude cherche à établir quel taux - un taux du marché ou le taux officiel d'escompte - importe le plus aux banques à charte dans la détermination de leur taux préférentiel. Les résultats d'équations estimées pour la période 1975-1989 montrent que l'évolution du taux d'escompte est la variable qui explique le mieux les fluctuations du taux préférentiel en courte période. Les variations du taux du papier commercial à 90 jours, l'écart entre le taux préférentiel et le taux du papier à 90 jours, et l'écart entre le taux préférentiel et le taux des acceptations bancaires à 30 jours sont d'autres variables qui agissent sur l'évolution du taux préférentiel.

Determinants of the Prime Rate:

1975-1989

1. Introduction

One of the tools the Bank of Canada has as an aid in conducting monetary policy is its influence on very short-term, overnight interest rates which, in turn, allows it to indirectly affect the whole structure of market and administered rates. This paper attempts to identify which interest rates (market rates or the Bank Rate) are the most important to the chartered banks in setting their prime rates.

The analysis primarily uses Wednesday observations for the interest rates but also experiments with Thursday-to-Wednesday averages and Thursday observations. Post-1981 prime rate data are the typical weekly rates monitored by the Bank over this period. Pre-1981 prime rate data are the "low rates" recorded by the Bank. Equations were estimated for three sample periods: 1975W10 to 1980W11, 1980W12 to 1989W52, and 1984W1 to 1989W52. The sample was split after the eleventh week of 1980 because of the change in the policy regime from a fixed to a floating Bank Rate.

The estimation results indicate that the Bank Rate has the most power for explaining short-run movements in the prime rate. During the 1980s, however, CP90 (the 90-day commercial paper rate) and a 30-day rate were significant long-run determinants of the prime rate. CP90 seems to be the more powerful market rate, although there is some evidence that in more recent years the importance of 30-day rates may be increasing. Given its greater volatility, the call loan rate was generally not useful as an explanatory variable.

2. Descriptive statistics

This section describes some of the mean interest rate spreads and standard deviations that existed between the prime rate and various market rates on a daily basis from January 1982 to December 1989 (see Table 1). The average spread between prime and CP90 was 124 basis points over this period, but only 38 basis points the day before prime rate increases and 193 basis points the day before prime rate decreases. Chart 1 plots weekly observations for the prime rate and CP90, showing the high degree of correlation between these two rates. Chart 2 plots the differential between these two rates over the 1980-90 period.

With the exception of the call loan rate, the spreads between prime and the other rates showed consistently that prime tended to increase (decrease) when the spread had narrowed (widened) past some (unobserved) threshold level that was well below (above) the average. It is also apparent that the further the spread strays from its average, the larger the prime rate change is likely to be.

The presence of thresholds is suggested by the fact that the prime rate moves in multiples of 25 basis points and lags changes in the market rates. However, the large standard deviations of the spreads shown here for the day before a prime change, even for changes of the same size, is an indication of the subjective nature of these thresholds and the cause of difficulties with the estimation.

Table 1: Mean Interest Rate Spreads: 1982 to 1989
in basis points with standard deviation in parentheses

		On the day before: Prime increases of			
Spread*	All observations	+25bp	+50bp	>+50bp	All
CP90	124.0 (46.6)	27.5 (67.2)	45.0 (22.8)	19.0 (29.5)	38.4 (28.6)
CP30	133.7 (40.8)	80.0 (56.6)	73.6 (30.8)	42.0 (50.0)	67.8 (37.4)
3-month t-bill	145.5 (48.4)	40.5 (79.9)	69.2 (37.3)	55.0 (44.8)	64.0 (40.9)
1-month t-bill	164.0 (37.8)	111.0 (79.2)	114.3 (28.3)	97.2 (48.2)	110.6 (35.6)
BA30	137.3 (40.0)	75.0 (65.1)	75.8 (31.6)	38.8 (49.5)	68.3 (39.0)
Call	129.6 (82.9)	125.0 (70.7)	94.8 (98.1)	88.7 (73.9)	96.0 (89.5)
Bank Rate	121.5 (47.0)	20.0 (72.1)	55.9 (40.1)	37.0 (53.7)	49.3 (44.4)
Number of observations	2006	2	18	5	25

	On the day before: Prime decreases of				On the day of:	
Spread	25bp	50bp	>50bp	All	Increases	Decreases
CP90	140.0 (28.5)	197.1 (45.7)	247.5 (33.7)	192.7 (52.5)	85.0 (29.5)	149.7 (41.3)
CP30	134.4 (28.8)	178.6 (50.3)	222.5 (28.8)	176.0 (50.7)	113.2 (37.9)	129.9 (63.7)
3-month t-bill	160.1 (30.0)	229.2 (48.6)	293.0 (29.6)	224.4 (59.4)	111.6 (42.3)	175.7 (54.0)
1-month t-bill	156.0 (26.9)	210.3 (48.8)	279.2 (16.9)	209.7 (55.9)	158.0 (34.5)	163.9 (44.0)
BA30	138.5 (20.4)	184.7 (50.5)	232.5 (36.0)	182.3 (51.7)	116.4 (39.0)	133.8 (40.9)
Call	76.6 (89.5)	86.8 (101.9)	243.6 (354.7)	111.4 (173.2)	143.9 (86.2)	116.7 (96.9)
Bank Rate	132.5 (34.0)	200.0 (48.5)	267.2 (24.4)	196.1 (59.7)	98.4 (38.9)	148.9 (47.8)
Number of observations	8	21	6	35	25	35

* A spread is the prime rate less the rate indicated.

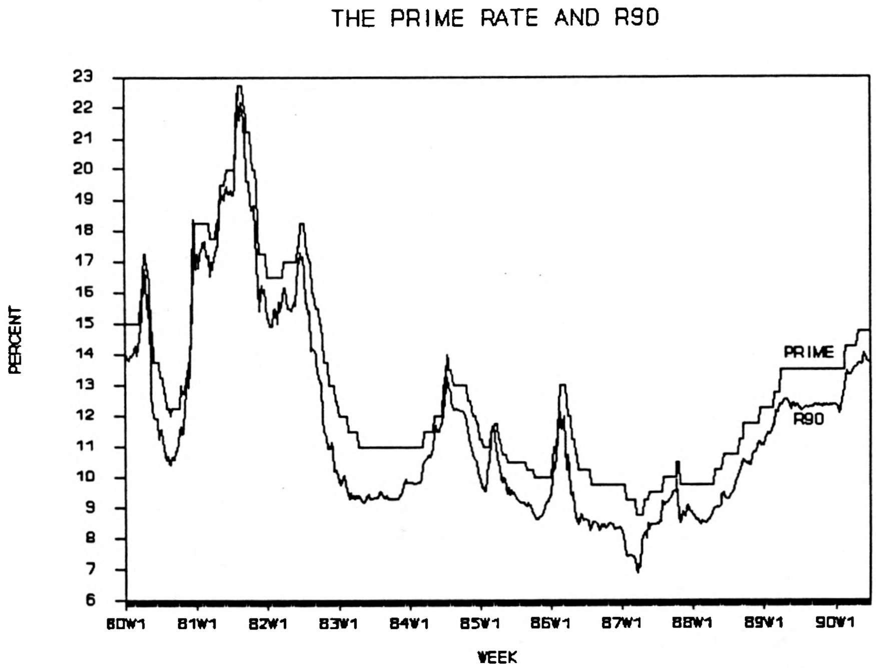

Chart 1

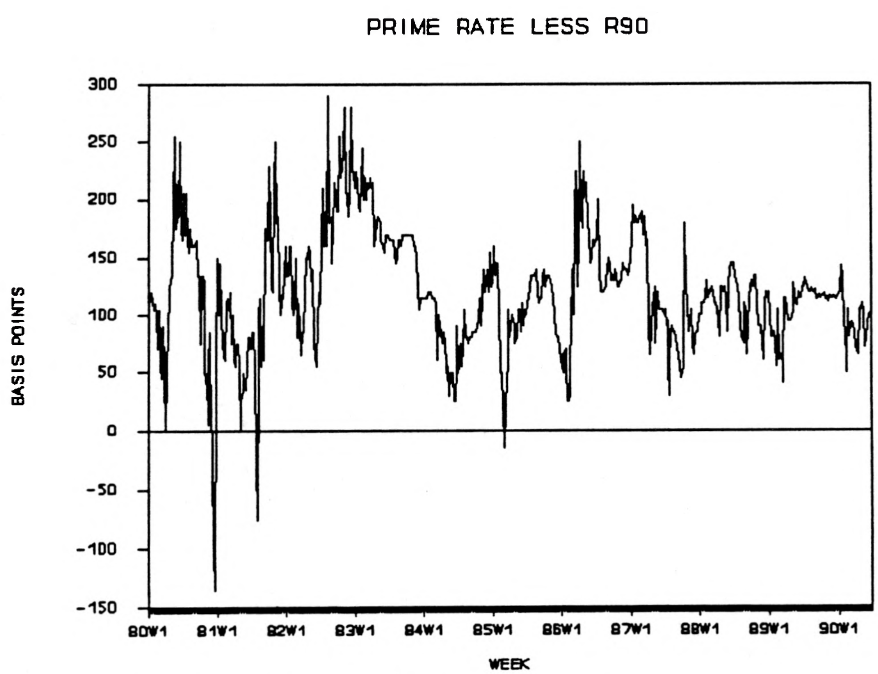

Chart 2

3. Basic equations for the prime rate

The model hypothesizes that changes in prime occur as a result of pressure generated by movements in market rates. The equations relate the first difference in the prime rate to current and lagged changes in market rates, the cumulative change in market rates since the last prime change, and the size of the spreads between prime and market rates (Table 2). The market rates tested were those on 90-day and 30-day commercial paper (CP90 and CP30, respectively), 30-day bankers' acceptances (BA30), 1-month treasury bills (TB30), the call loan rate (CALL), and the Bank Rate (RBank). It was expected that the changes in market rates would have positive coefficients, indicating that prime tends to move in the same direction as these rates. The spreads from prime, however, should have negative coefficients since low spreads indicate pressure for a prime rate increase, while high spreads indicate pressure for a cut. These equations can be interpreted as having short-run variables in first-difference form, and long-run steady - state components -- the spreads between prime and market rates.

This is basically an error-correction framework with the restriction that the weights on the explanatory variables (those market rates included in the spreads from prime) sum to one in a long-run steady state. There were no significant differences in the estimates of the coefficients or the equation statistics when unrestricted error-correction equations were estimated.

The first four equations in Table 2 show the results using weekly data as at the close of business on Wednesdays. Over this 1980-89 sample period, CP90 and the 30 - day rates had similar significance as long-run variables in equations with only one prime differential (see equations (2), (3) or (4)). Equation (1) included both the prime-CP90 and

Table 2: Regression Results: Dependent Variable - PRIME

	1980W12 to 1989W52						1975W10 to 1980W11
Variable	**Eq.(1) Wednesday**	**Eq.(2) Wednesday**	**Eq.(3) Wednesday**	**Eq.(4) Wednesday**	**Eq.(5) Thursday**	**Eq.(6) Thur-Wed**	**Eq. (7) Wednesday**
Constant	0.150	0.131	0.134	0.129	0.217	0.121	0.563
	(6.35)	(5.57)	(6.51)	(6.46)	(2.57)	(6.75)	(12.63)
Δ CP90	0.134	0.141	0.131	0.136	0.0684	0.0764	-
	(5.37)	(5.59)	(5.25)	(5.48)	(2.11)	(1.74)	-
$\Delta CP90_{-1}$	0.107	0.106	0.118	0.109	0.206	0.196	-
	(3.23)	(3.14)	(3.66)	(3.33)	(3.76)	(7.61)	-
Δ BA30	-	-	-	-	-	0.122	-
	-	-	-	-	-	(3.66)	-
Δ RBANK	0.226	0.239	0.221	0.227	-	0.269	0.713
	(4.08)	(4.25)	(4.00)	(4.10)	-	(5.85)	(12.38)
$\Delta RBANK_{-1}$	-	-	-	-	0.181	-	-
	-	-	-	-	(2.57)	-	-
CUMRBANK*	0.197	0.157	0.216	0.219	0.0916	0.0577	-
	(5.84)	(4.77)	(6.98)	(7.08)	(3.37)	(2.24)	-
$(PRIME - CP90)_{-1}$	-0.0362	-0.116	-	-	-0.0984	-0.0586	-
	(1.38)	(6.45)	-	-	(3.88)	(2.95)	-
$(PRIME - BA30)_{-1}$	-0.0901	-	-0.112	-	-	-	-
	(4.17)	-	(7.63)	-	-	-	-
$(PRIME - CP30)_{-1}$	-	-	-	-0.111	-	-0.0432	-
	-	-	-	(7.63)	-	(2.54)	-
$(PRIME - TB30)_{-1}$	-	-	-	-	-0.0630	-	-
	-	-	-	-	(2.55)	-	-
$(PRIME - RBANK)_{-1}$	-	-	-	-	-	-	-0.729
	-	-	-	-	-	-	(12.75)
$\bar{R}^2$	0.677	0.667	0.676	0.676	0.615	0.764	0.582
D.W.	2.22	2.28	2.20	2.21	2.37	2.09	2.06
S.E.E.	0.1588	0.1612	0.1588	0.1588	0.1743	0.1191	0.1375

* Cumulative change in the Bank Rate since the last prime rate change.

prime-BA30 spreads and, although the prime-CP90 differential was insignificant, this equation proved to be quite useful as a basis for further estimations later in the paper. It was found that there was little difference as to whether the equations used the spreads prime-BA30 (equation (3)), prime-CP30 (equation (4)), or prime-1-month treasury bills (not shown). The Bank Rate was the more important short-run trigger of prime-rate changes, but ΔCP90 was also a significant factor. The Bank Rate was included in the equations as the change during the current week and the cumulative change since the last movement in prime.[1] The cumulative change measured the longer-term buildup of pressure while the current change measured the effect of the final push on prime from the Bank Rate (which may or may not have been engineered by the Bank of Canada). The cumulative change in CP90 since the last prime rate change was not a significant variable, but the current and lagged first difference were significant.

Equation (5) used observations as at Thursdays (linking the equation more directly to the monetary policy signals provided by the treasury bill auctions). The overall fit was less satisfactory. In this regression, CP90 was still important in both the short and long run. Bank Rate also retained its explanatory power, but with a one-week lag, reflecting the fact that most prime rate changes occur on Thursdays and Fridays. The cumulative change in the Bank Rate was much less important when included with the one-week change. Finally, in equation (6) the regression was based on average of Thursday-to-Wednesday daily data, and used the changes in CP90, BA30 and Bank Rate as short-run determinants and the spreads between prime and CP90 and CP30 as longer-run

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[1] The cumulative change variable could also have been calculated as the change in the Bank Rate-prime differential from the last change in prime to the current week. This would not change the estimates of the coefficients but would change the ex post simulation properties discussed later. For example:

$$\begin{aligned} CUMRBANK &= RBK_t - RBK_0 && \text{where } t=0 \text{ was the date of the last prime rate change} \\ &= RBK_t - RBK_{t-1} + RBK_{t-1} - RBK_0 - PR_0 + PR_0 \\ &= (RBK_t - RBK_{t-1}) + \{(RBK_{t-1} - PR_0) - (RBK_0 - PR_0)\} \\ &= (RBK_t - RBK_{t-1}) + \{(RBK_{t-1} - PR_{t-1}) - (RBK_0 - PR_0)\} && PR_0 = PR_{t-1} \text{ since prime has not yet changed.} \end{aligned}$$

determinants. The fit in this case is the best of all, perhaps because the averaged data will have more non-zero observations for the dependent variable (a single change in prime will typically change the average prime for two weeks in a row). However, all three types of regression are of interest.

Only for the sample from 1975 to 1980, the fixed Bank Rate regime, was the prime-Bank Rate spread significant. The ΔBank Rate also had a coefficient that was much larger then than it was for the later samples. Since there was a fixed Bank Rate regime during this period, the Bank Rate's role as a signal of monetary policy would have been stronger and clearer, which would account for the larger coefficients. The switch to a floating Bank Rate in 1980 may have led the chartered banks to alter their prime-rate-setting behaviour and to consider other rates as well in order to determine monetary conditions. For the period before 1980, no other market rates added to the explanatory power of the Bank Rate. The equation was expected to have a much better fit over this sample since changes in the Bank Rate were virtually always matched with prime rate changes of the same size. However, the response by the chartered banks to a change in the Bank Rate was not always instantaneous and an equation estimated on a weekly basis was not able to capture the variable lag.

Over the shorter sample, from 1984 to 1989 (see Table 3), using Wednesday data, the first difference in the Bank Rate and its cumulative change since the last prime change were still quite significant. However, the change in CP90 lost much of its explanatory power (equation (8)) and the fit was improved when the first difference of the one-month treasury bill rate was used instead (see equation (11)). CP90 was still significant when included alone in an equation with the Bank Rate (see equation (9)) but lost all of its

Table 3: Regression Results: Dependent Variable - PRIME
Sample: 1984W1 to 1989W52

Variable	Equation (8)	Equation (9)	Equation (10)	Equation (11)
Constant	0.171	0.126	0.157	0.155
	(5.14)	(4.09)	(5.02)	(5.27)
Δ CP90	0.0731	0.0603	0.0757	-
	(1.64)	(1.34)	(1.70)	-
Δ $CP90_{-1}$	0.0817	0.0534	0.106	-
	(1.23)	(0.80)	(1.66)	-
Δ TB30	-	-	-	0.119
	-	-	-	(3.11)
Δ RBANK	0.165	0.201	0.148	0.234
	(2.15)	(2.60)	(1.95)	(4.43)
CUMRBANK	0.183	0.161	0.200	0.200
	(5.12)	(4.52)	(6.02)	(6.17)
$(PRIME - CP90)_{-1}$	-0.0434	-0.124	-	-
	(1.24)	(4.82)	-	-
$(PRIME - BA30)_{-1}$	-0.107	-	-0.134	-
	(3.29)	-	(5.77)	-
$(PRIME - CP30)_{-1}$	-	-	-	-0.137
	-	-	-	(6.11)
$\bar{R}^2$	0.540	0.526	0.540	0.549
D.W.	2.15	2.19	2.14	2.12
S.E.E.	0.1321	0.1342	0.1323	0.1310

significance if a 30-day rate was also added. Similarly, the prime-CP90 spread was omitted from the equation, leaving only the prime-CP30 spread. As with the longer sample, the prime-CP30 and prime-BA30 spreads seemed to be relatively interchangeable in terms of their explanatory power. The magnitude of the prime-CP30 coefficient was slightly larger than its value for the longer sample.

Replacing the Bank Rate with the three-month treasury bill rate yielded equations with similar significant variables but with a poorer fit. The significance of the three-month treasury bill rate is probably due more to the perfect correlation of the Thursday tender rate and the Bank Rate, at least since March 1981, than to any special importance in the setting of the prime rate. For the period from January 1975 to February 1980, the three-month treasury bill rate was the most significant market rate in the prime rate equations but lost all of its significance in any equation that also included the Bank Rate.

In summary, from the results discussed thus far, it is apparent that a large part, but not all, of the variation in the prime rate can be explained by movements in market rates. For the period since 1980, the most important long-run determinants of the prime rate seemed to be CP90 and some 30-day market rate (CP30, BA30, and TB30 had quite similar coefficients and t-statistics). However, over the more recent sample, it seems that CP90 has lost some of its importance. The 30-day rates have become more important in determining the equilibrium differential between prime and the market rates. The change in the Bank Rate was the strongest variable influencing the short-run dynamics of the prime rate, regardless of the sample chosen. ΔCP90 was also important over the longer sample since 1980, but it was replaced by ΔTB30 over the shorter sample since 1984.

4. Incorporating threshold effects into the equations

Since the prime rate has moved only in multiples of 25 basis points, there is a possibility that thresholds exist such that the prime rate will not increase (decrease) unless the spread between prime and some market rate falls below (rises above) a certain level. From Table 2 it would seem that, over the 1980 to 1989 period at least, any thresholds would be defined in terms of the spreads between prime and CP90 and between prime and some 30-day rate. To test for the existence of thresholds, the following equation was fit over the 1980-89 period:

Equation (12):

$$\begin{aligned}\Delta PRIME = {} & a_0 + a_1*DHCP90_{-1} + a_2*DLCP90_{-1} + a_3*DHCP30_{-1} + a_4*DLCP30_{-1} \\ & + a_5*\Delta CP90 + a_6*\Delta CP90_{-1} + a_7*\Delta RBANK + a_8*CUMRBANK \\ & + a_9*(\ (PRIME - CP90)_{-1}\ )*DHCP90_{-1} \\ & + a_{10}*(\ (PRIME - CP90)_{-1}\ )*DMCP90_{-1} \\ & + a_{11}*(\ (PRIME - CP90)_{-1}\ )*DLCP90_{-1} \\ & + a_{12}*(\ (PRIME - BA30)_{-1}\ )*DHBA30_{-1} \\ & + a_{13}*(\ (PRIME - BA30)_{-1}\ )*DMBA30_{-1} \\ & + a_{14}*(\ (PRIME - BA30)_{-1}\ )*DLBA30_{-1}\end{aligned}$$

DHCP90, DLCP90, and DMCP90 are dummy variables for the periods when the prime-CP90 spread is above, below, or in between the thresholds. DHBA30, DLBA30, and DMBA30 apply similarly for the prime-BA30 spread. A grid search, in five-basis-point increments, for the lowest standard error over the relevant range of possible thresholds determined the values of these dummy variables. It was expected that the thresholds would be approximately 50 basis points above and below the mean differential from prime since most prime rate changes are either increases or decreases of 50 basis points.

If thresholds do exist for the spreads between prime and the market rates, then one would expect that the speed of adjustment, the coefficient on the value of the spread, would be insignificantly different from zero for the middle range of the spread implying minimal pressure for a change in prime. The coefficients for the high and the low range of the spreads should both be negative, although the relative size is uncertain. Some observers have felt that the banks act more rapidly when there is reason to increase the prime rate than when there is reason to decrease it. This would be shown by a larger speed of adjustment on low spreads. The estimation results are shown in equation (12) in Table 4.

Equation (12) is an improvement on equation (1) although there is still a large unexplained component. In contrast to the results of equation (1), much of the explanatory power was found in CP90 and the Bank Rate with BA30 being insignificant. For the middle range of the prime-CP90 spread, between 99 and 214 basis points, the constant and the speed of adjustment were both insignificantly different from zero as was expected. The pressure for a prime rate increase begins only when the prime-CP90 spread narrows to less than 99 basis points, while pressure for a decline starts at spreads of greater than 214 basis points. The lower and upper thresholds were 84 and 194 basis points, respectively, for the prime-BA30 spread, but the speed of adjustment was insignificant for each range. Much of the change in prime was still explained by the first differences of CP90 and the Bank Rate.

The speed of adjustment for the prime-CP90 differential was greater for decreases, or high spreads, than for increases, or low spreads. However, the upper threshold was 90 basis points above the average prime-CP90 spread shown in Table 1, while the lower

Table 4: Estimation of Thresholds 1980W12 to 1989W52
Dependent variable: Change in prime

Variable	Equation (12) Coefficient	Equation (12) (t-stat)	Equation (13) Coefficient	Equation (13) (t-stat)	Equation (14) Coefficient	Equation (14) (t-stat)
Constant	-0.0626	1.29	-0.0453	0.099	-0.142	2.27
DHCP90$_{-1}$	1.121	3.37	1.097	4.69	-	-
DLCP90$_{-1}$	0.321	5.37	0.355	6.76	-	-
DHBA30$_{-1}$	-0.294	1.12	-	-	0.356	1.42
DLBA30$_{-1}$	0.0599	0.96	-	-	0.363	5.26
ΔCP90	0.148	6.13	0.156	6.49	0.121	4.95
ΔCP90$_{-1}$	0.0601	1.84	0.0548	1.69	0.0915	2.29
ΔRBANK	0.166	3.10	0.180	3.39	0.178	3.26
CUMRBANK	0.201	6.23	0.171	5.58	0.257	8.17
DHCP90$_{-1}$*(PRIME-CP90)$_{-1}$	-0.500	3.48	-0.540	5.17	-	-
DMCP90$_{-1}$*(PRIME-CP90)$_{-1}$	0.0622	1.61	0.0149	0.45	-	-
DLCP90$_{-1}$*(PRIME-CP90)$_{-1}$	-0.314	5.72	-0.406	9.73	-	-
DHBA30$_{-1}$*(PRIME-BA30)$_{-1}$	-0.0771	0.11	-	-	-0.151	1.38
DMBA30$_{-1}$*(PRIME-BA30)$_{-1}$	-0.0330	0.35	-	-	0.0699	1.69
DLBA30$_{-1}$*(PRIME-BA30)$_{-1}$	-0.0577	0.65	-	-	-0.222	6.53
$\bar{R}^2$	0.719		0.712		0.692	
D.W.	2.13		2.18		2.24	
S.E.E.	0.1480		0.1498		0.1549	

	Equation (12)	Equation (13)	Equation (14)
DHCP90=1 if PRIME-CP90 >=	214 bp	194 bp	-
DLCP90=1 if PRIME-CP90 <=	99 bp	94 bp	-
DMCP90=1 if PRIME-CP90	99 to 214 bp	94 to 194 bp	-
DHBA30=1 if PRIME-BA30 >=	194 bp	-	194 bp
DLBA30=1 if PRIME-BA30 <=	84 bp	-	114 bp
DMBA30=1 if PRIME-BA30	84 to 194 bp	-	114 to 194 bp

threshold was only 25 basis points below, so the equation indicates there may, effectively, be greater resistance to decreases than to increases. Nevertheless, given that the upper threshold is so much larger than the average spread just before prime rate declines, there may be a problem with estimates of the thresholds. The large variation in the point estimates of the spreads when prime changes (see Table 1) probably makes the estimation of the thresholds more difficult. It may also be that the values of the thresholds have changed over time.

Equations (2) and (3) were also re-estimated to test for thresholds, the results of which are shown as equations (13) and (14), respectively. Equation (13) also found significant thresholds for the prime-CP90 spread, but at slightly more reasonable levels, 94 basis points on the low side and 194 basis points on the high side. A good fit, although slightly inferior to equations (12) and (13), was also achieved in equation (14) using the prime-BA30 spread instead. A significant lower threshold was found at 114 basis points, but the speed of adjustment for the upper threshold was insignificant and the middle range was significantly positive. The results imply that thresholds seem to be better defined in terms of the prime-CP90 differential.

The equations estimated using this format had a good fit, but some diagnostic tests suggest that there may be a problem with heteroskedasticity. The coefficient estimates should not be biased by this but the standard errors (and t-statistics) may be.

Given that the estimation of the thresholds was not as expected, a number of other possible formulations were attempted. First, a version of equation (12) which was nonlinear in the parameters was estimated.

$$\Delta PRIME = a_1*\Delta CP90 + a_2*\Delta CP90_{-1} + a_3*\Delta RBANK + a_4*CUMRBANK$$
$$+ a_5*(\bar{a}_{CP90} - (PRIME - CP90)_{-1})*DHCP90_{-1}$$
$$+ a_6*(\bar{a}_{CP90} - (PRIME - CP90)_{-1})*DMCP90_{-1}$$
$$+ a_7*(\bar{a}_{CP90} - (PRIME - CP90)_{-1})*DLCP90_{-1}$$
$$+ a_8*(\bar{a}_{BA30} - (PRIME - BA30)_{-1})*DHBA30_{-1}$$
$$+ a_9*(\bar{a}_{BA30} - (PRIME - BA30)_{-1})*DMBA30_{-1}$$
$$+ a_{10}*(\bar{a}_{BA30} - (PRIME - BA30)_{-1})*DLBA30_{-1}$$

The speeds of adjustment, a_5 through a_{10}, represent the change in prime for each percentage point movement away from the equilibrium spread, ($\bar{a}_{CP90}$ or $\bar{a}_{BA30}$). These coefficients should be positive for high and low spreads and zero for the middle range of spreads. This equation should have permitted the direct estimation of the equilibrium spreads between prime and the two market rates (the equilibrium spreads should be close to the level of the average spreads and somewhere between the threshold values). However, the estimation results were very poor with one equilibrium actually being negative. Nonlinear versions of equations (13) and (14) were able to yield more reasonable, although not ideal, equilibrium values.

The results of these estimations are shown in Table 5. The equilibrium spreads and thresholds still do not meet with expectations. The equilibrium prime-CP90 spread was estimated to be only 80.4 basis points (the average spread was 124 basis points), while the lower and upper thresholds were 109 and 224 basis points, respectively. Similarly, the prime-BA30 equilibrium spread was estimated to be 99.4 basis points, while the lower and upper thresholds were 139 and 194 basis points, respectively. These equilibrium spreads are not as expected, but the standard errors are lower than for the simpler equations.

Table 5: Estimation of Thresholds 1980W12 to 1989W52
Dependent variable: Change in prime

	Equation (15)		Equation (16)		Equation (17)	
Variable	**Coefficient**	**(t-stat)**	**Coefficient**	**(t-stat)**	**Coefficient**	**(t-stat)**
$\Delta CP90$	0.153	6.36	0.122	4.99	0.143	5.96
$\Delta CP90_{-1}$	0.0616	1.91	0.0942	2.94	0.0821	2.51
$\Delta RBANK$	0.193	3.64	0.178	3.27	0.195	3.66
CUMRBANK	0.160	5.29	0.254	8.12	0.173	5.56
$\bar{a}_{CP90}$	0.804	24.28	-	-	1.213	-
$DHCP90_{-1}*(PRIME-CP90)_{-1}$	0.175	6.83	-	-	0.153	3.86
$DMCP90_{-1}*(PRIME-CP90)_{-1}$	0.0371	2.92	-	-	-0.0290	1.00
$DLCP90_{-1}*(PRIME-CP90)_{-1}$	0.370	10.02	-	-	0.161	4.76
$\bar{a}_{BA30}$	-	-	0.994	22.67	1.308	-
$DHBA30_{-1}*(PRIME-BA30)_{-1}$	-	-	0.0997	5.14	0.111	3.52
$DMBA30_{-1}*(PRIME-BA30)_{-1}$	-	-	0.0343	1.92	0.0417	1.37
$DLBA30_{-1}*(PRIME-BA30)_{-1}$	-	-	0.219	8.27	0.0853	3.01
$\bar{R}^2$	0.709		0.693		0.709	
D.W.	2.20		2.25		2.13	
S.E.E.	0.1505		0.1548		0.1507	

	Equation (15)	Equation (16)	Equation (17)
DHCP90=1 if PRIME-CP90 >=	224 bp	-	224 bp
DLCP90=1 if PRIME-CP90 <=	109 bp	-	59 bp
DMCP90=1 if PRIME-CP90	109 to 224 bp	-	59 to 224 bp
DHBA30=1 if PRIME-BA30 >=	-	194 bp	194 bp
DLBA30=1 if PRIME-BA30 <=	-	139 bp	64 bp
DMBA30=1 if PRIME-BA30	-	139 to 194 bp	64 to 194 bp

Equation (17) also shown in Table 5, estimates an equation with $\bar{a}_{CP90}$ and $\bar{a}_{BA30}$ fixed at the mean spreads[2] of the prime-CP90 and prime-BA30 differentials, respectively. The standard error was not quite as low as for equation (12), the unrestricted linear equation, but the thresholds were at more reasonable levels. While the upper prime-CP90 threshold was still uncharacteristically high at 224 basis points, the lower threshold was only 59 basis points, more in line with expectations. Similarly, the lower prime-BA30 threshold was 64 basis points, while the upper threshold was 194 basis points. The speeds of adjustment were of similar magnitude for increases and decreases.

Another estimation form was attempted, simply using dummy variables for the level of the prime-market rate spreads instead of the actual spreads themselves. For instance, low values of the prime-CP90 spread were represented by five dummy variables, each of which took on a value of one if the spread fell below successively lower thresholds. The threshold dropped 20 basis points with each dummy.[3] Similar dummies were used to represent high values of the prime-CP90 spread as well as the prime-BA30 spread. The full equation was estimated first, and then after insignificant dummies were eliminated, the results shown in Table 6 were obtained.

As expected, the dummies for low spreads generally had positive coefficients, while those for high spreads had negative coefficients. The equation shows that there is no effect from low prime-CP90 spreads until the differential falls below 64 basis points. If the spread is between 24 and 64 basis points, an additional 10.5 basis points are added

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[2] The mean spreads were 1.213 and 1.308 for prime-R90 and prime-BA30, respectively, for the sample period 1980W12 to 1989W52.

[3] Each spread was associated with ten dummy variables, five for above the average and five for below. Each successive dummy variable on each side of the mean started at a level 20 basis points further away. For example, below the prime-R90 mean of 124 basis points the first dummy had a value of one if the spread fell below 104 basis points while the second dummy was one for all those spreads below 84 basis points. The final dummy was one for spreads below 24 basis points. Therefore, the net effect of a low prime-R90 spread could be the sum of more than one dummy variable.

Table 6: Regression Results 1980W12 to 1989W52
Dependent variable: Change in prime

Variable	Equation (18) Coefficient	(t-stat)
Constant	-0.0394	4.19
ΔCP90	0.138	5.71
$\Delta CP90_{-1}$	0.0744	2.24
ΔRBANK	0.182	3.38
CUMRBANK	0.213	6.67
DLCP90A	0.105	3.98
DLCP90B	0.157	2.81
DHCP90A	0.0379	1.90
DHCP90B	-0.188	4.29
DLBA30A	0.0443	2.23
DLBA30B	0.126	3.26
DHBA30A	-0.0816	2.98
$\bar{R}^2$	0.708	
D.W.	2.16	
S.E.E.	0.1509	

DLCP90A=1 if PRIME-CP90 is less than or equal to 64 basis points.
DLCP90B=1 if PRIME-CP90 is less than or equal to 24 basis points.
DHCP90A=1 if PRIME-CP90 is greater than or equal to 164 basis points.
DHCP90B=1 if PRIME-CP90 is greater than or equal to 224 basis points.

DLBA30=1 if PRIME-BA30 is less than or equal to 97 basis points.
DLBA30=1 if PRIME-BA30 is less than or equal to 37 basis points.
DHBA30=1 if PRIME-BA30 is greater than or equal to 197 basis points.

to the estimated change in prime. Below 24 basis points, the effect of the prime-CP90 spread increases to 26.2 basis points. Similarly, when the prime-BA30 spread falls below 97 basis points, 4.4 basis points are added to the change in prime. After the spread dips below 37 basis points, the accumulated effect is an increase of 17 basis points.

The effect of the spreads on prime rate decreases was smaller than for increases. The equation actually predicted a small positive effect for prime-CP90 spreads of between 164 and 224 basis points. Above 224 basis points there was a -15 basis-point effect from the prime-CP90 spread on the change in prime. The prime-BA30 spread contributed -8.2 basis points to the estimated change in prime once the differential exceeded 197 basis points.

The final attempt at approximating nonlinear effects also began using equation (1) and, instead of using dummy variables, included the square, cube, and fourth power of the spreads in a new equation. The results, shown in Table 7, indicate that the fit could indeed be improved using this technique. The standard error was lower only for equation (12) in Table 4, which used dummy variables to estimate more precise thresholds. Higher powers were significant only for the prime-CP90 spread and not for the prime-BA30 differential.

To compare the equations of this section more easily, consider Charts 3 and 4. These charts illustrate the estimated change in prime for various levels of the prime-market rate spreads. The horizontal axis is the level of the prime-CP90 spread. The prime-BA30 spread was assumed to be 9.5 basis points larger than the prime-CP90 spread, as it was on average over the 1980W12 to 1989W52 sample. The vertical axis is the change in prime for each given prime-CP90 spread and corresponding prime-BA30 spread. The

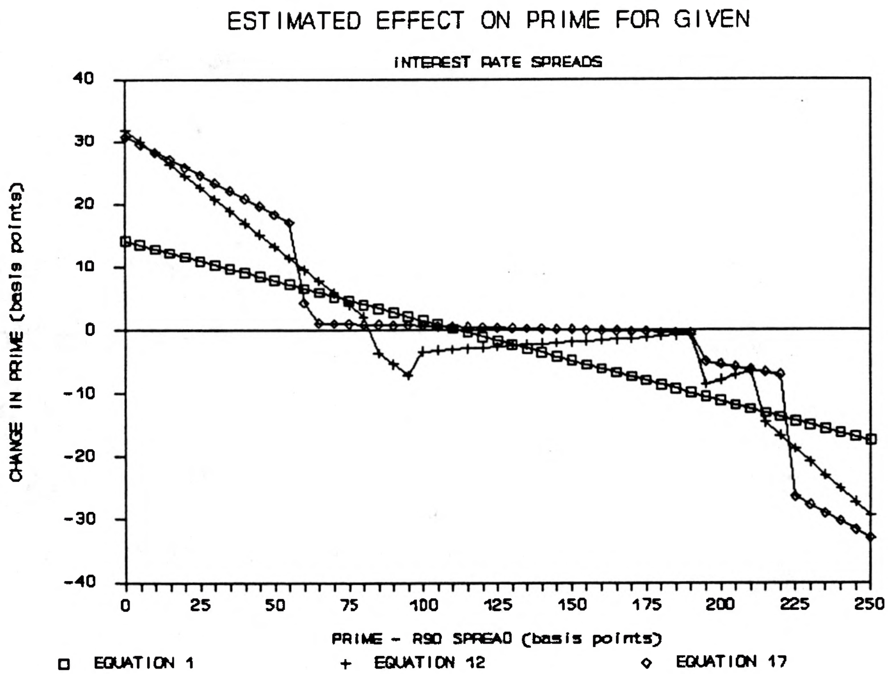

Chart 3

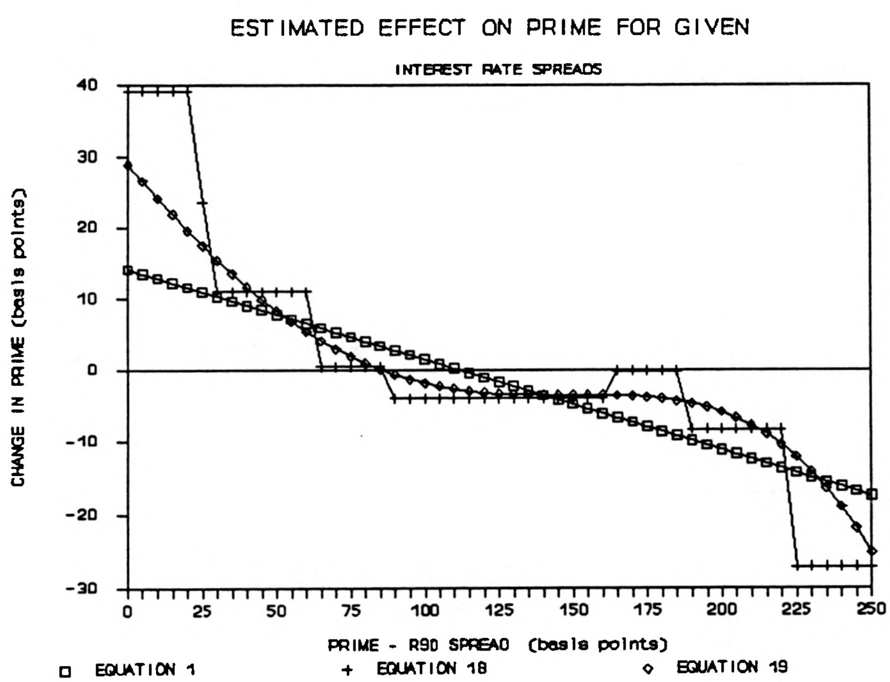

Chart 4

Table 7: Regression Results 1980W12 to 1989W52
Dependent variable: Change in prime

Variable	Equation (19) Coefficient	(t-stat)
Constant	0.297	8.34
ΔCP90	0.147	6.10
$\Delta CP90_{-1}$	0.0526	1.62
ΔRBANK	0.180	3.37
CUMRBANK	0.206	6.45
$(PRIME\text{-}CP90)_{-1}$	-0.428	7.30
$[(PRIME\text{-}CP90)_{-1}]^2$	0.124	3.73
$[(PRIME\text{-}CP90)_{-1}]^3$	0.113	3.45
$[(PRIME\text{-}CP90)_{-1}]^4$	-0.0469	5.24
$(PRIME\text{-}BA30)_{-1}$	-0.0702	3.40
$\bar{R}^2$	0.712	
D.W.	2.17	
S.E.E.	0.1498	

estimates also assume there is no change in market rates. As an example, a prime-CP90 spread of 50 basis points and a prime-BA30 spread of 59.5 basis points would tend to increase prime by about 10 basis points using equations (1), (18) or (19), but by closer to 15 basis points using equation (12), or by 20 basis points using equation (17).

Equation (1) represents the estimation without threshold effects, while the others represent the various alternatives. It is easy to identify the wide range over which the equations predict no change in prime. For equation (12), this range is from about 65 to 190 basis points, while equation (17) predicts no change in prime for spreads of between

80 and 190 basis points.[4] The simulations seem to show a slower response to pressure for prime rate decreases than for increases.

The results of this section give some strong evidence in favour of the existence of threshold effects for the prime-CP90 spread and possibly for the prime-BA30 spread as well. This allows the effects of the spread to become much stronger in its upper and lower regions, a phenomenon that has been observed in practice. However, further work is necessary to verify the estimates of the thresholds.

5. The in-sample and ex post fit of the equations

The in-sample fit of the equations was quite good, but there was some tendency for errors to build up over time so that there were periods of either consistent over- or underestimation. Table 8 shows some error statistics (mean absolute error (MAE) and root-mean-square error (RMSE)) for an in-sample and ex post dynamic forecast of some of the equations.

The best in-sample fit was achieved by the simple equations, notably equation (1) of Table 2. This equation did not estimate thresholds and was able to outperform those equations that did. However, for the ex post forecast over the 1990W1 to 1990W28 period, equation (17) yielded the best results with an MAE of only 10.7 basis points. This equation estimated thresholds based on both prime-CP90 and prime-BA30, under the restriction that the equilibrium spreads were equal to the average spreads.

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[4] These estimates assume that there is no change in market rates. They are estimated effects at a given point in time with given interest rate spreads.

Table 8: Error Statistics for Dynamic Forecast (Basis points)

Equation	In-sample MAE	In-sample RMSE	Ex post MAE	Ex post RMSE
Equation (1)	26.8	33.8	14.7	18.3
Equation (12)	29.9	36.9	15.9	18.1
Equation (14)	32.4	41.1	11.4	14.6
Equation (17)	28.5	37.0	10.7	12.6
Equation (18)	29.6	37.4	14.0	17.1
Equation (19)	28.3	35.0	11.5	13.8

The accuracy of the equations was also tested by looking at their errors just for those weeks in which there was a prime rate change. This abstracted from the equations' ability to predict the timing of prime rate changes and considered only the accuracy of their predictions of the magnitude of the changes. Some statistics for the in-sample errors are shown in Table 9, along with the results of the ex post forecast for 1990. In-sample MAEs and RMSEs were quite high for all of the estimated equations, while the ex post forecast errors were much more promising. No equation was closer than 20 basis points on average to predicting the magnitude of the prime rate changes.

Equation (1) was estimated over the 1980-89 period and had an ex post MAE of only 3.0 basis points for the two weeks when the prime rate changed this year. Equation (14) was the next most accurate, and missed the two prime rate changes by only 12 basis points on average. The other equations had poorer fits. The equations estimated over the 1984-89 sample (not shown in Tables 8 or 9) were not able to predict as accurately as equation (1), although they did outperform some of the other equations.

Table 9: Error Statistics[5] for Non-Zero Prime Rate Changes (Basis points)

Equation	In-sample MAE	In-sample RMSE	Ex post MAE	Ex post RMSE
Equation (1)	22.0	28.8	3.0	3.5
Equation (12)	24.8	32.3	24.3	24.3
Equation (14)	25.3	32.7	12.0	12.2
Equation (17)	27.2	34.6	19.3	19.4
Equation (18)	21.7	27.4	21.3	21.8
Equation (19)	21.9	28.8	20.0	20.0

Charts 5 and 6 illustrate the ex post forecasts of some of the equations. It is readily seen that equation (1) most accurately predicted the two prime rate changes in 1990 even though it has moved away from the actual at other times. Equation (1) was plotted on both charts to facilitate the comparison. The other equations tended to underpredict the prime rate level as errors built up over time.

Finally, a simulation exercise was performed using a number of equations and market rate scenarios. The equations were simulated from July 25, 1990 to the end of 1990 under three scenarios: i) no change in market rates from beginning-of-period values; ii) 50-basis-point fall in all market rates on Wednesday July 25; and iii) 10-basis-point declines in each of the five weeks beginning with July 25. For these simulations, the cumulative change in the Bank Rate variable actually became the one-week change in the Bank Rate, since it was a dynamic simulation, which assumed that prime actually did

[5] Equations estimated over the 1980W12 to 1989W52 period had 98 in-sample observations (prime rate changes) and 2 ex post observations.

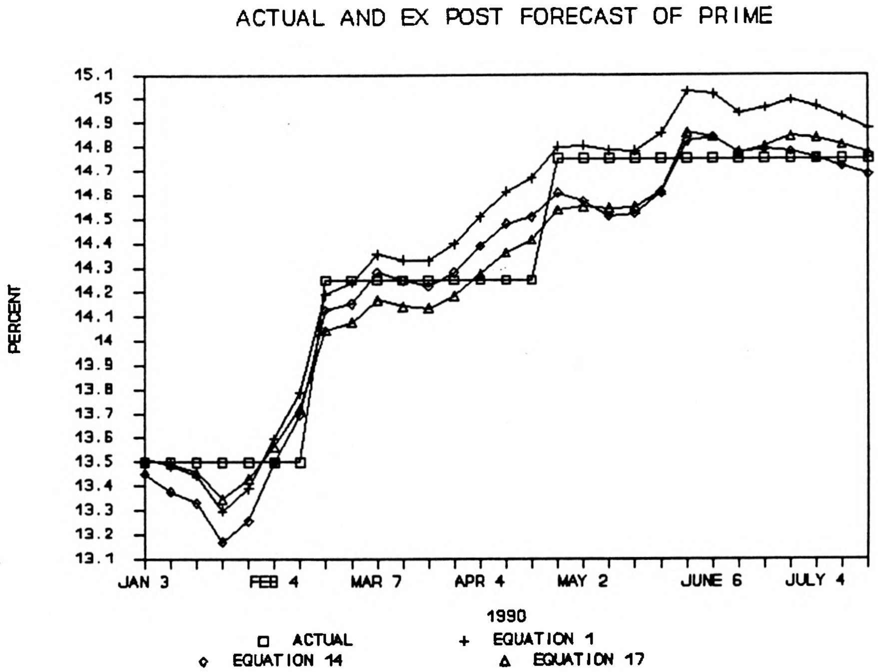

Chart 5

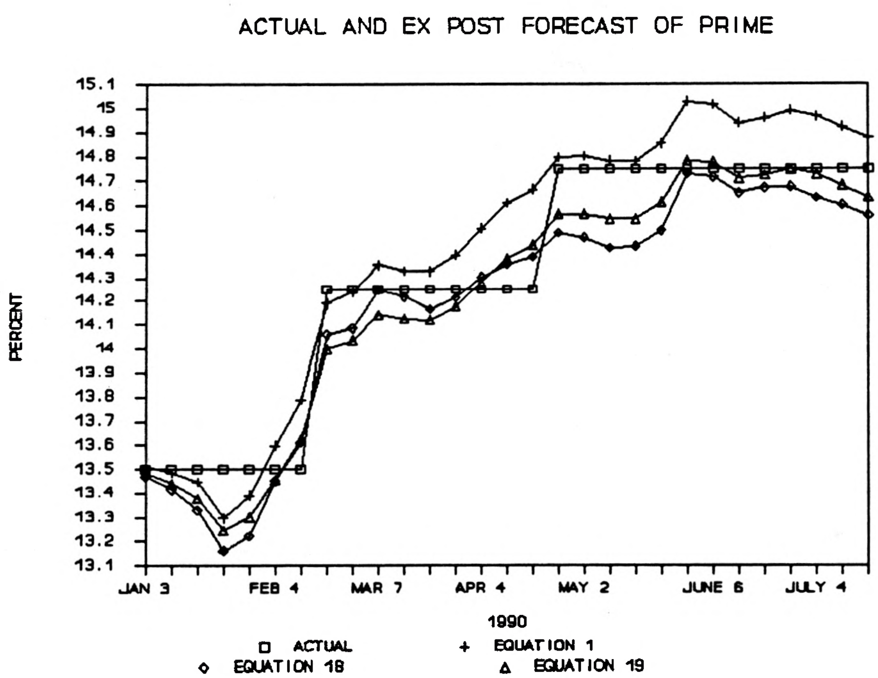

Chart 6

change by the amount predicted.[6] Charts 7, 8 and 9 show the estimated progression of the prime rate using equations (1), (17) and (14), respectively. These were the equations with the lowest ex post forecast errors shown in Tables 8 and 9. The equations, especially (1) and (14), estimate that the long-run prime rate would be slightly below its beginning-of-period level by about 10 basis points, given the state of beginning-of-period interest rates.

For the 50-basis-point drop in rates, most of the estimated decline in prime occurred in the second week after the initial fall in market rates, since the Bank Rate has the strongest effect in these equations and its change lags the other market rates since it is only set once each week. The long-run prime rate should fall about 50 basis points to 14.25 per cent for a decline in market rates of that much. The prime rate from equations (1) and (14) did tend towards this level, but in equation (17) it tended to rise over time to a steady state above 15 per cent. This tendency for prime to rise is the result of the estimated prime-R90 upper threshold being much larger than expected.

6. A cross-sectional event study

The preceding section used a time-series approach and all of the weekly observations to examine changes in the prime rate. To consider another viewpoint, this section takes a cross-sectional approach so that each observation is a change in prime. Using equation specifications similar to Table 2, it was found that the $\bar{R}^2$ statistics were considerably higher, although the standard errors also tended to be higher (see Table 10).

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[6] As discussed earlier, if the cumulative variable had instead been computed as the change in the bank rate-prime differential, then the estimated coefficients would be unchanged, but the simulation would be slightly different. In particular, for the simulation assuming no change in market rates, the estimated primes would have been, in the long run, 14.69, 14.64, and 14.65 for equations (1), (17) and (14), respectively. For a 50-basis-point decline in market rates, prime would have been estimated to fall to 14.19, 14.15 and 14.15 for equations (1), (17) and (14), respectively.

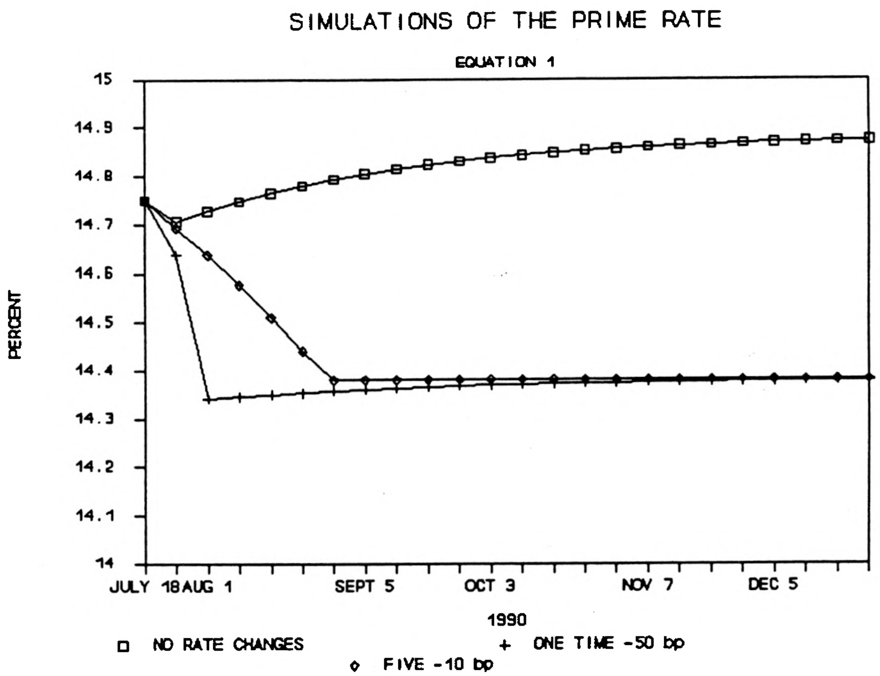

Chart 7

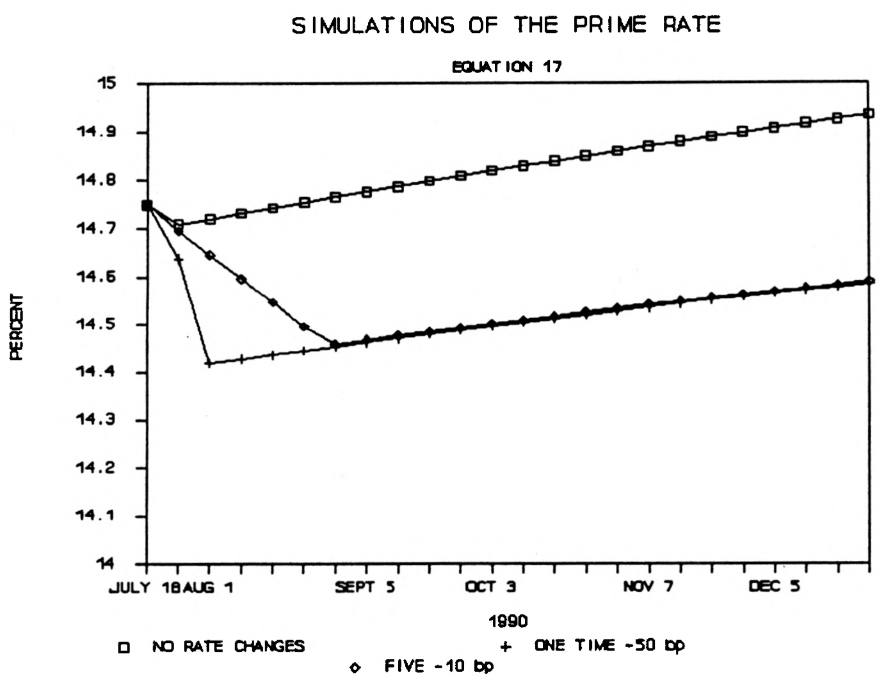

Chart 8

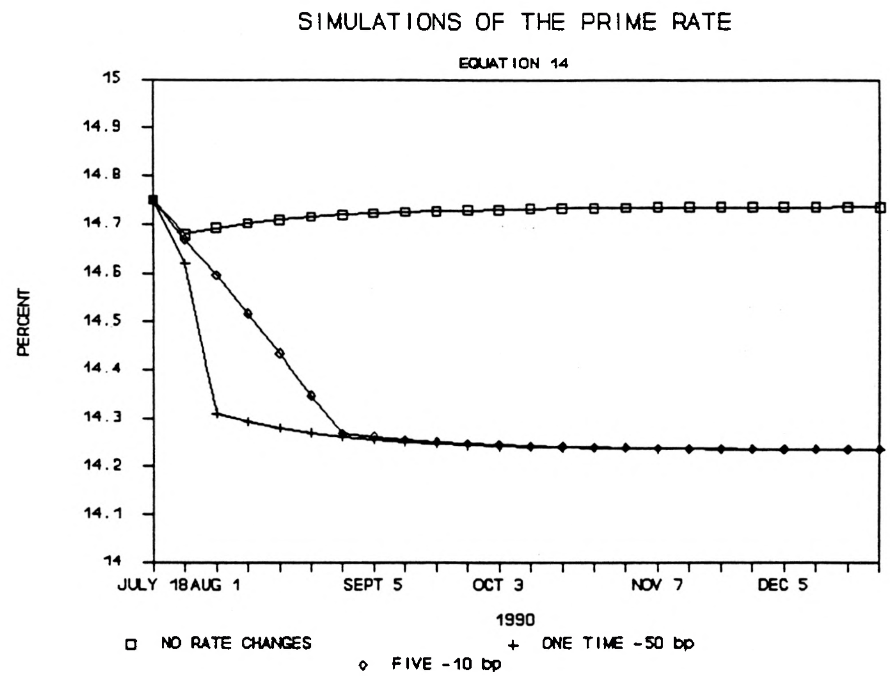

Chart 9

Owing to computing constraints, equation (20) could not be estimated over the full 1980-89 sample. However, the estimates achieved were quite similar to equation (1). Similarly, equation (21), estimated over 1984-1989, yielded similar results to those reported in equation (11) in Table 3. Over the longer period, CP90 is definitely the more important market rate, but for the shorter period it seems that the 30-day rates, particularly the 1-month treasury bill rate, have increased in importance.

7. Summary of equations explaining amount of change in prime rate

Much of the variation in the prime rate can be explained by changes in market rates. Many of the estimated equations had similar properties, but the best, in terms of

Table 10: Regression Results: Dependent Variable ΔPRIME

	Equation (20) 1982W25 to 1989W52 59 Observations		Equation (21) 1984W12 to 1989W52 45 Observations	
Variable	Coeff.	(t-stat)	Coeff.	(t-stat)
Constant	0.367	5.73	0.337	4.45
ΔCP90	0.141	1.76	-	-
ΔTB30	-	-	0.220	1.89
ΔCUMRBANK	0.445	6.99	0.489	8.62
$(PRIME - CP90)_{-1}$	-0.140	1.83	-	-
$(PRIME - CP30)_{-1}$	-0.166	2.24	-0.271	4.54
$\bar{R}^2$	0.899		0.880	
D.W.	2.05		2.83	
S.E.E.	0.170		0.1786	

reasonable coefficients and in-sample and ex post fit, were equations (1) and (14). From these equations, we would conclude that the prime rate fluctuates with changes in the 90-day commercial paper rate and the Bank Rate, and with the spreads between prime and CP90 and between prime and BA30. Over the more recent sample, there is evidence of a structural change so that ΔCP90 is no longer as significant a variable as before and that it has been replaced in importance by the change in a 30-day rate, particularly the one-month treasury bill rate. However, the better ex post fit of equations using CP90 as an explanatory variable illustrates its continued importance. The significance of the Bank Rate may have diminished somewhat in the movement to a flexible rate system in 1980, but it is still the most important interest rate in terms of explaining changes in prime.

Evidence of thresholds for the prime-market rate differentials was found, but the estimates were not as expected and further work is required to improve their specification. Over the ex post sample period, equations using thresholds did perform better than the others.

The next section of the paper estimates similar equations but uses probit as the primary estimation procedure to attempt to account for the discontinuity in the change in the prime rate variable.

8. Probit analysis

Probit analysis, like logit and tobit, is a method of analyzing a dependent variable that is not continuous. The dependent variable can be associated with two or more qualitative choices and the objective is to predict the likelihood or probability of a given outcome or choice. Probit transforms a linear regression model using the cumulative normal probability function such that the predictions are probabilities in the range (0,1).

Since the prime rate has typically only changed in multiples of 25 basis points, it is a non-continuous variable that can be analyzed with a probit procedure. The computer package available was not able to estimate multivariate probit equations, so it was necessary to estimate the probability of increases and decreases separately. The dependent variable for increases has a value of one for all increases and zero otherwise. Similarly, for decreases the dependent variable has a value of one for declines and zero otherwise. This could be extended further to estimate equations for each possible change in prime: +25 basis points, +50 basis points, +75 basis points etc., although there would probably be too few observations to be able to obtain reliable estimates.

Table 11 reports the results for increases, while Table 12 covers decreases. Two sample periods were again tested: 1980W12 to 1989W52 (floating Bank Rate period) and 1984W1 to 1989W52. For increases, the prime-R90 spread had one of the largest coefficients, in absolute value. The negative coefficient implies that the higher the spread, the less probability there is of a prime rate increase. Conversely, all of the change variables have positive coefficients, indicating that as market rates move up there is a greater probability that prime will increase as well. Over the full sample from 1980W12 to 1989W52, the contemporaneous change in 1-month treasury bills and the Bank Rate, and the cumulative change, since the last prime rate change, in R90 and the Bank Rate were all important explanatory variables.

The cumulative Bank Rate variable had only marginal significance but was able to improve the fit of the equation and raise the log of the likelihood function. Over the period from 1984 to 1989, the fit of the equations was improved by replacing the R90 and 1-month treasury bill rates with the cumulative change in R30. The cumulative change in the Bank Rate was, however, still an important determinant.

The estimates for prime rate declines in Table 12 show some differences, compared with the results for increases. The cumulative change in R90 was a significant variable for the longer sample but was replaced by 1-month treasury bill rates for the shorter sample. Also, the cumulative change in the Bank Rate was significant over both samples. Note that the coefficients for the change in market rates are now negative, indicating that as market rates rise there is less probability of a prime rate decline. The prime-market rate spreads also have switched signs and now show that as spreads widen, there is a greater probability of a prime rate decline.

Table 11: Probit Results: Increases in Prime

Variable	Equation (22) 1980W12 to 1989W52	Equation (23) 1984W1 to 1989W52
Constant	-0.707	-1.462
	(1.40)	(1.43)
CUMR90	1.672	-
	(3.00)	-
CUMR30	-	1.792
	-	(2.28)
CUMTB30	-	-
	-	-
ΔTB30	1.107	-
	(1.78)	-
ΔRBANK	1.473	-
	(1.87)	-
CUMRBANK	1.131	3.353
	(1.43)	(2.83)
$(PRIME - R90)_{-1}$	-2.458	-2.688
	(5.01)	(3.11)
LL[7]	-42.98	-26.58
AVG. LIKELIHOOD[8]	0.919	0.919
CASES CORRECT[9]	492/511	299/313

An interesting point to note is that prime rate increases are more highly correlated with the prime-R90 spread, while prime rate decreases are more highly correlated with the prime-BA30 or prime-R30 spreads. Equations (24) and (25), with the prime-30-day market rate spreads, were able to achieve a much higher log of the likelihood function than equation (26), which used the prime-R90 spread. A similar phenomenon occurred over the shorter sample with the prime-R90 spread consistently having smaller and less significant coefficients.

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[7] LL: log of the likelihood function.

[8] Average probability of predicting the actual observation (increases and all others as well).

[9] Number of cases for which the probability of occurrence was greater than 50 per cent compared to the number of observations in the sample.

Table 12: Probit Results: Decreases in Prime

Variable	1980W12 - 1989W52 Eqn. (24)	Eqn. (25)	Eqn. (26)	1984W1 - 1989W52 Eqn. (27)	Eqn. (28)	Eqn. (29)
Constant	-4.024	-3.887	-3.108	-4.266	-4.192	-3.389
	(7.71)	(7.83)	(7.39)	(4.39)	(4.50)	(4.86)
CUMR90	-1.248	-1.224	-1.145	-	-	-
	(3.51)	(3.48)	(3.56)	-	-	-
CUMTB30	-	-	-	-1.046	-1.086	-1.021
	-	-	-	(1.76)	(1.82)	(1.74)
ΔRBANK	-	-	-	-3.300	-3.314	-2.676
	-	-	-	(2.09)	(2.09)	(1.81)
CUMRBANK	-3.706	-3.742	-3.149	-3.489	-3.395	-3.226
	(6.87)	(6.98)	(6.28)	(3.13)	(3.08)	(2.98)
(PRIME - R90)$_{-1}$	-	-	0.706	-	-	0.716
	-	-	(2.82)	-	-	(1.59)
(PRIME - BA30)$_{-1}$	1.186	-	-	1.169	-	-
	(4.36)	-	-	(2.16)	-	-
(PRIME - R30)$_{-1}$	-	1.128	-	-	1.151	-
	-	(4.29)	-	-	(2.18)	-
LL	-64.10	-64.74	-71.97	-27.87	-27.78	-29.35
AVG. LIKELIHOOD	0.882	0.881	0.867	0.915	0.915	0.910
CASES CORRECT	486/511	487/511	484/511	302/313	303/313	302/313

9. Ex ante and ex post probit forecasts

The equations for increases were able to predict the prime rate change that occurred in February 1990[10] quite successfully (see Chart 10). Equations (22) and (23) predicted an increase in prime with 100 per cent probability. Both equations, however, performed rather poorly, reaching probabilities of only 10 per cent and 23 per cent during April when the prime rate next increased. If prime had not changed in April and rates had stayed at their April 25 level, then the probability would have increased to only 15 per cent and 24 per cent for equations (22) and (23), respectively. If prime had not changed, but the market rates had risen, as was the case during May, then the probability of an increase would have reached 92 per cent in the last week of May. When prime is allowed to change, as it did in April, then when interest rates started to edge up again towards the end of May, the equations predict only a slight probability (10 per cent) of an increase. If prime can change one week when there is a low probability and not later when the same probability exists, then there are obviously factors missing from the equations.

Chart 11 shows the ex post estimation for prime rate decreases. Through the first half of 1990 there was little probability of a prime rate decline, although the estimated likelihood did reach about 10 per cent during January when the Bank of Canada temporarily lowered interest rates. However, in August there was an increasing possibility of a prime rate decline as market rates slowly began to decline. By mid-August, equation (24) was predicting that there was a 30 per cent possibility of a prime rate decline, while equation (28) estimated only a 10 per cent probability. However, by the time prime declined by 50 basis points on August 17, equations (24) and (28) predicted probabilities of decline of 84 per cent and 74 per cent, respectively.

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[10] The prime rate increased 75 basis points the week of February 19 and another 50 basis points the week of April 25. Both of these changes are marked by a ** on Chart 10.

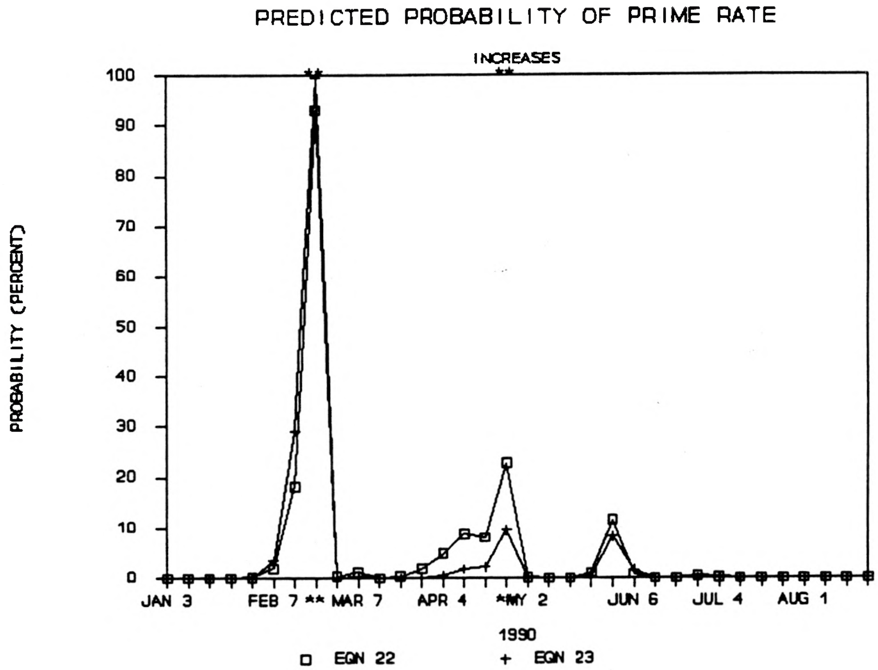


Chart 10

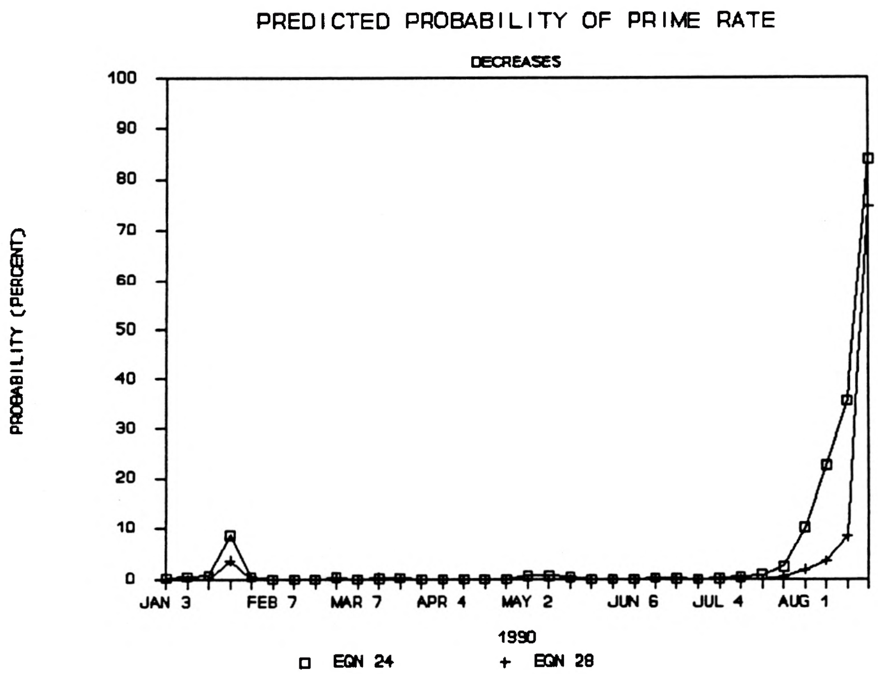


Chart 11

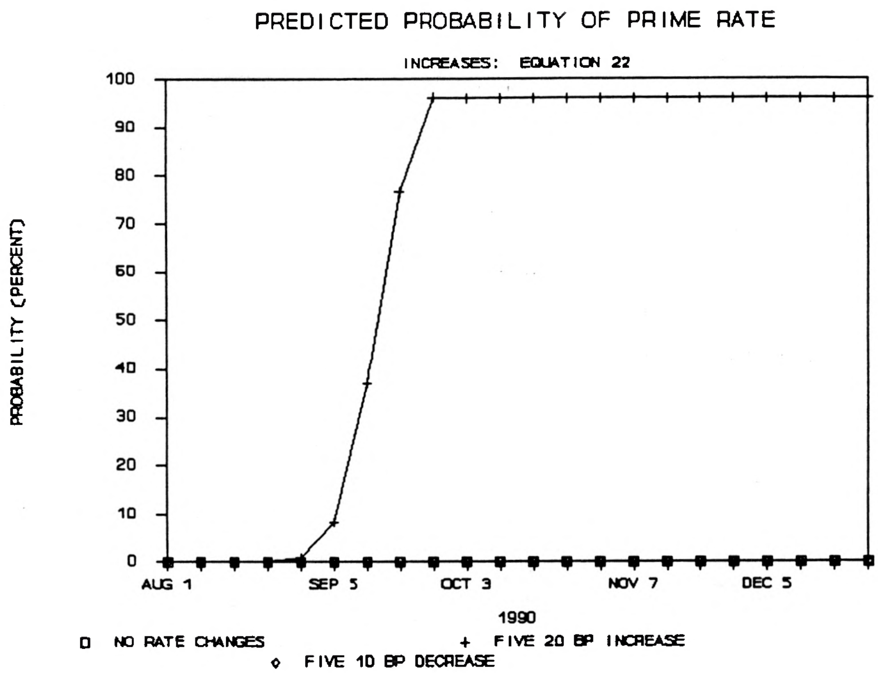


Chart 12

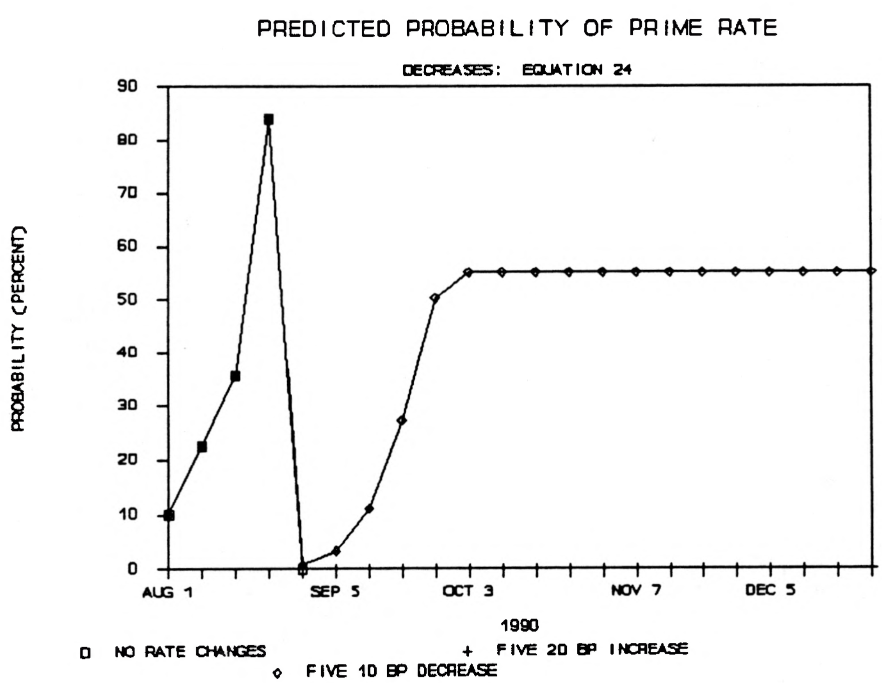


Chart 13

If market interest rates had remained in their positions as at August 22, just after the prime rate decline, then there would have been basically no probability of a prime rate increase and no further probability of a prime rate decline (see Charts 12 and 13 for simulations of equations (22) and (24), respectively). However, if interest rates had increased 100 basis points uniformly over the five weeks starting the week of August 29, then equation (22) would indicate that there would be a 96 per cent probability of a prime rate increase. Conversely, if rates had continued to decline by 10 basis points each week over the same five-week period, then, using equation (24), there would have been a 55 per cent probability of a prime rate decline after the market rates had declined the full 50 basis points.

Charts 14 to 19 plot the in-sample and ex post fit of equation (22) in two-year intervals (Chart 14 plots the 1989-90 period, while Chart 19 plots the data for 1980). Similarly, Charts 20 to 25 plot the fit of equation (24) over the same time periods. From these graphs we can see that most of the prime rate changes were predicted with high probabilities and that the probability did not tend to stay high without a change occurring. However, there were a number of cases of the prime rate changing when the estimated probability was quite low (20 per cent). At other times, the probability increased to the same 20 per cent level without a change in prime. There were no false negatives: every time that prime did change, there was some non-zero estimated probability associated with that change.

10. Overall conclusion

Probit analysis will be able to provide useful information in terms of better gauging the degree of pressure for a prime rate change. The method used in the earlier part of this paper is more useful for predicting the actual value of a change, while probit analysis is more suited to predicting when the change will occur. For example, if there is pressure for an increase, equation (1) can provide an estimate of how much prime may change in the long run, and equation (22) can estimate the probability of such a change occurring. Over the 1980s, R90 and the Bank Rate were the most significant determinants of prime rate changes, although there does seem to be some evidence that the 30-day rates have become increasingly important in more recent years. Although the differences may not be large, it is interesting to note that probit analysis shows that prime rate increases are more highly correlated with the prime-R90 spread, while prime rate declines are more strongly correlated with the prime-30-day spreads. There is no obvious reason why this may be the case.

Given the large unexplained variations in prime, there is work left to be done. More time should be spent analyzing the prime rate changes the equations could not predict (in April 1990 for example) to be better able to identify missing explanatory variables. Further research should also examine the surprising values of the threshold and equilibrium spread estimates, as well as the demand and supply of funds factors ignored by this paper. It is unlikely that the variation in prime is purely the result of changes in other market rates. Other factors, such as the demand for loans and the supply of funds, may explain why prime will change at one point in time but will not at another with the same configuration of interest rates. This point has been reinforced by the very different pattern of prime rate changes that has been observed in the period since August 1990.

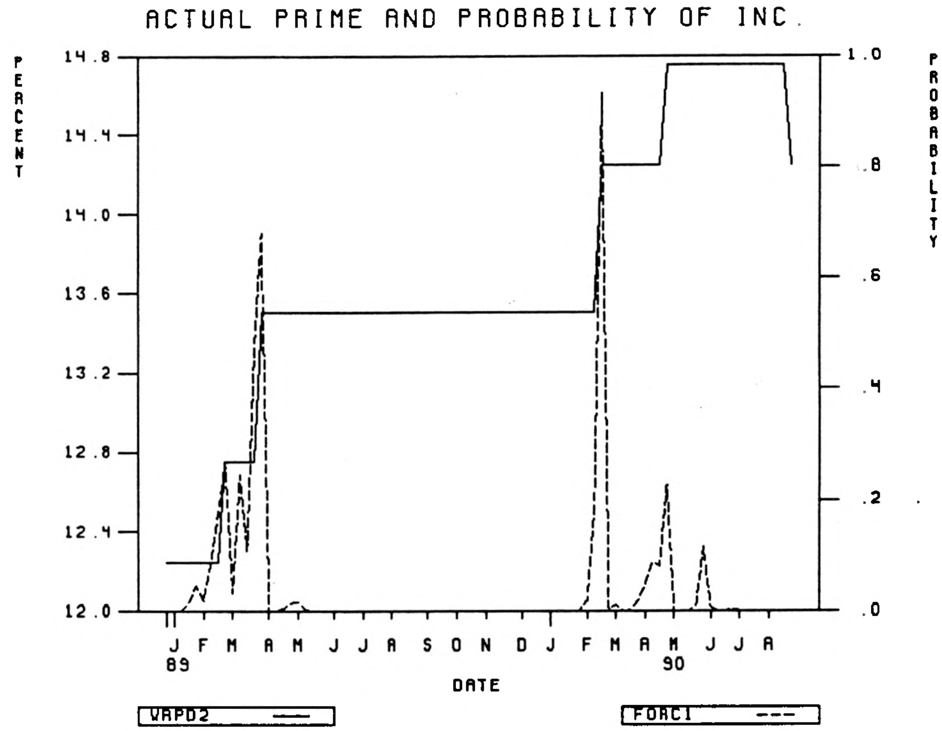
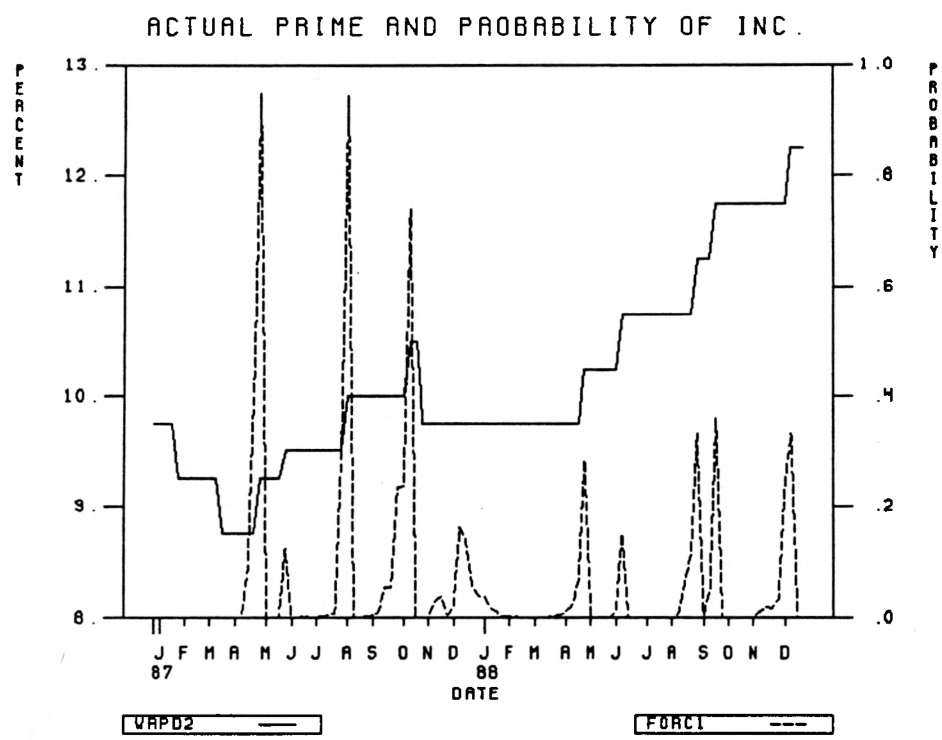


Chart 14



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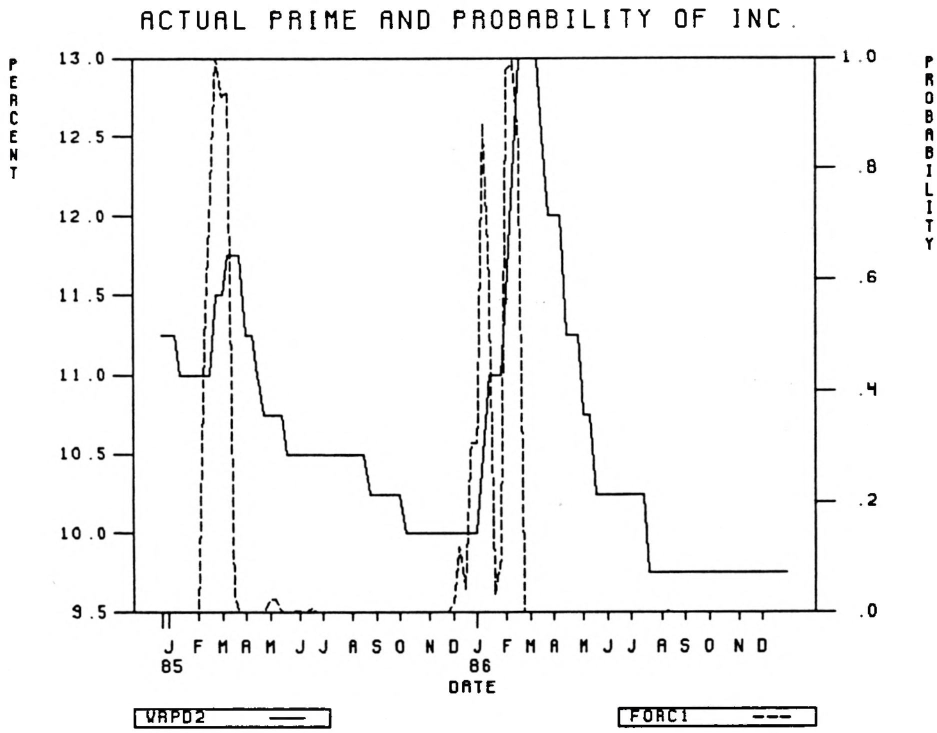

Chart 16

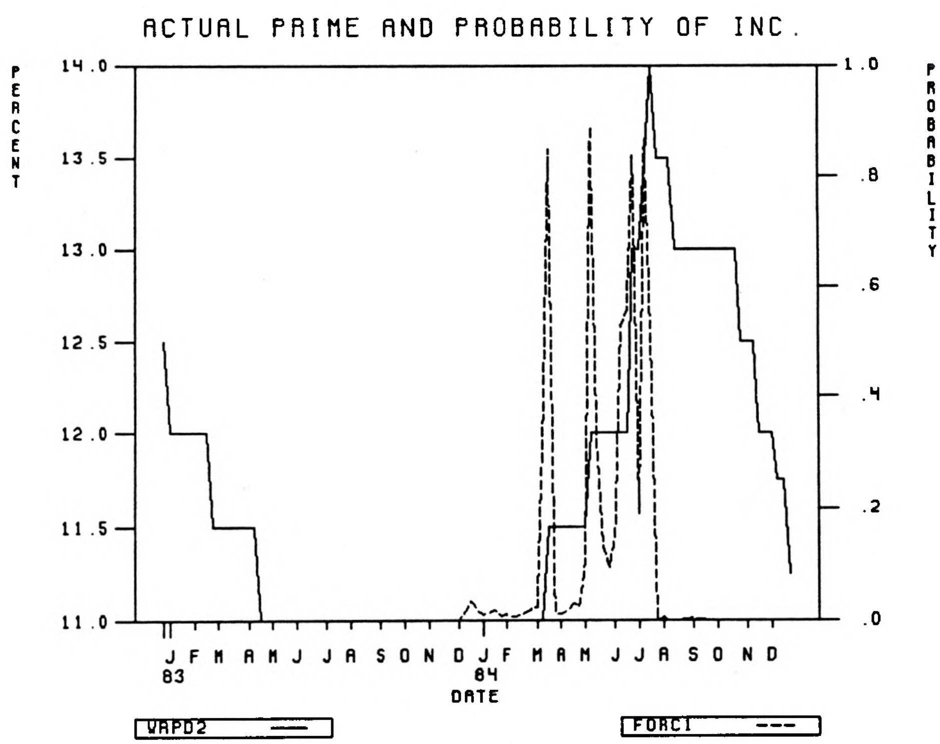

Chart 17

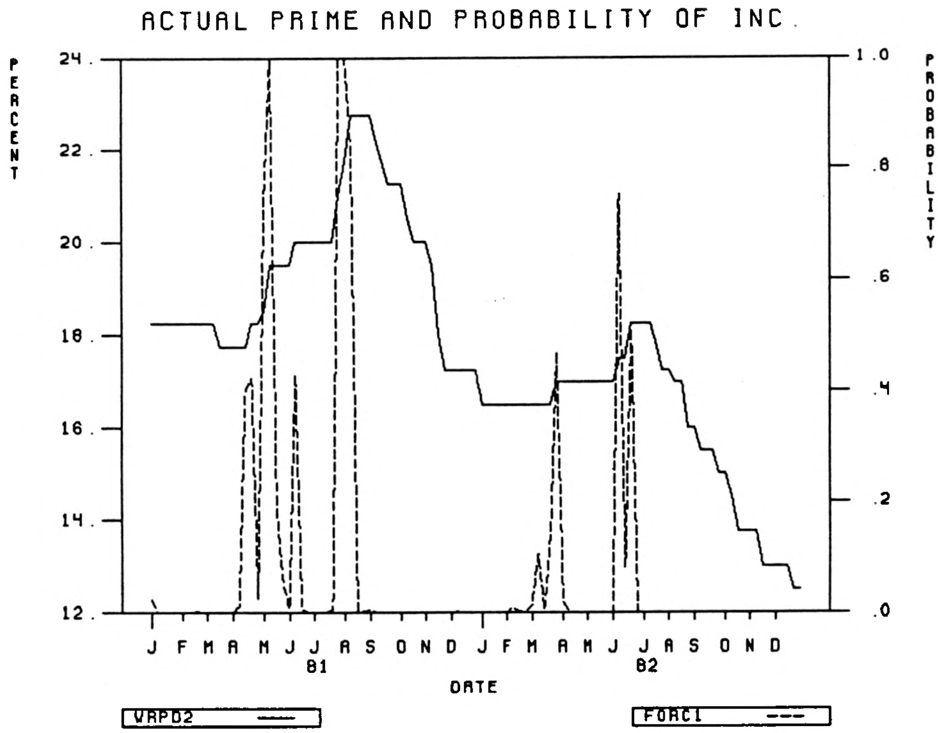

Chart 18

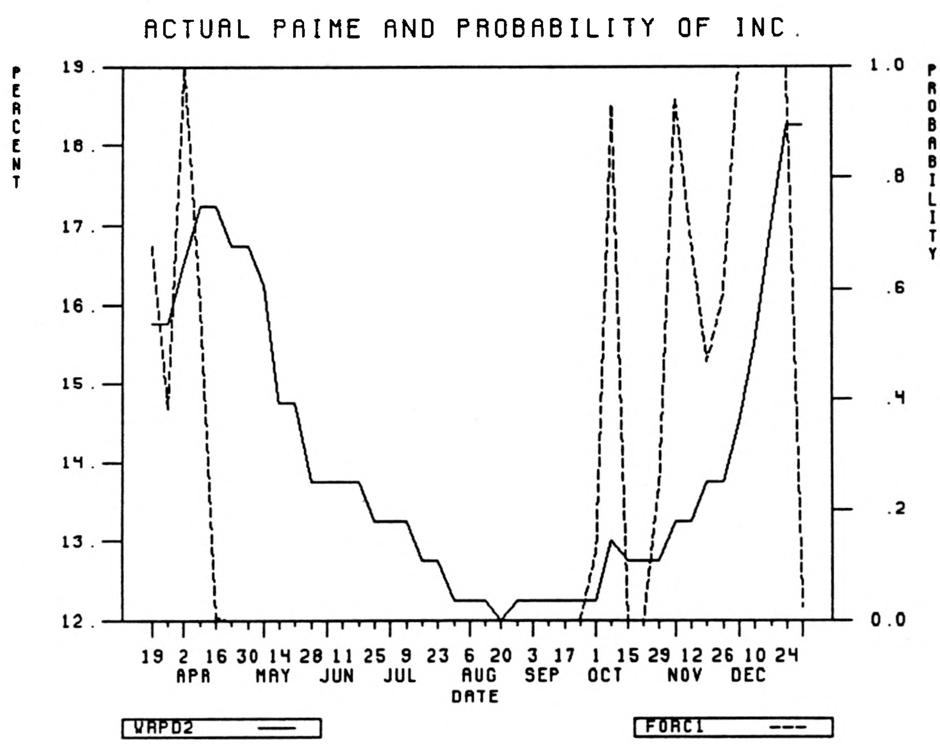

Chart 19

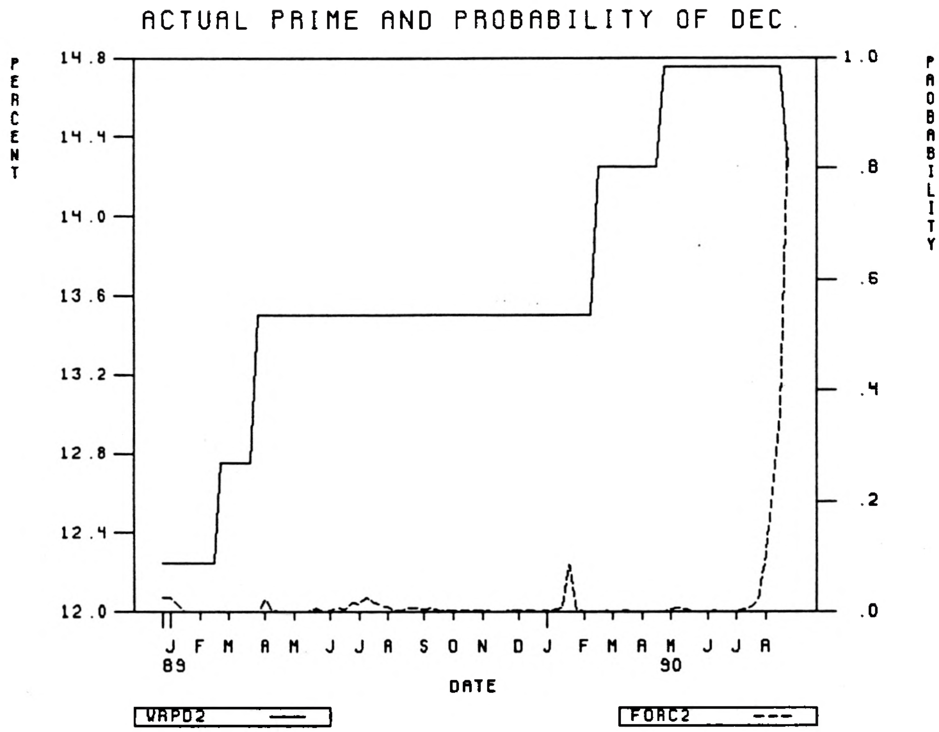

Chart 20

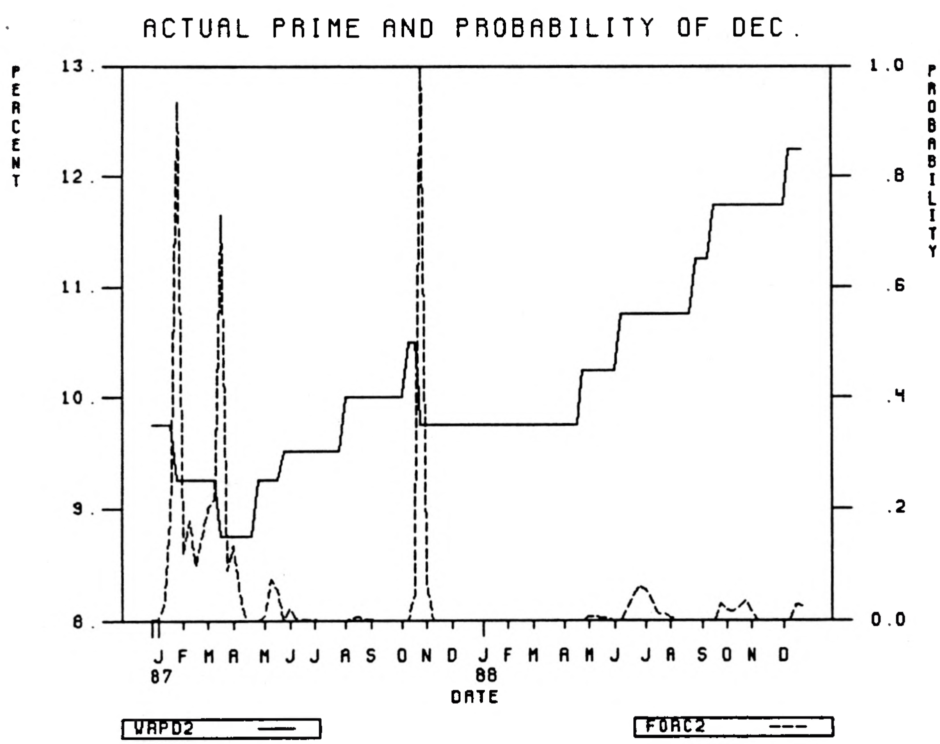

Chart 21

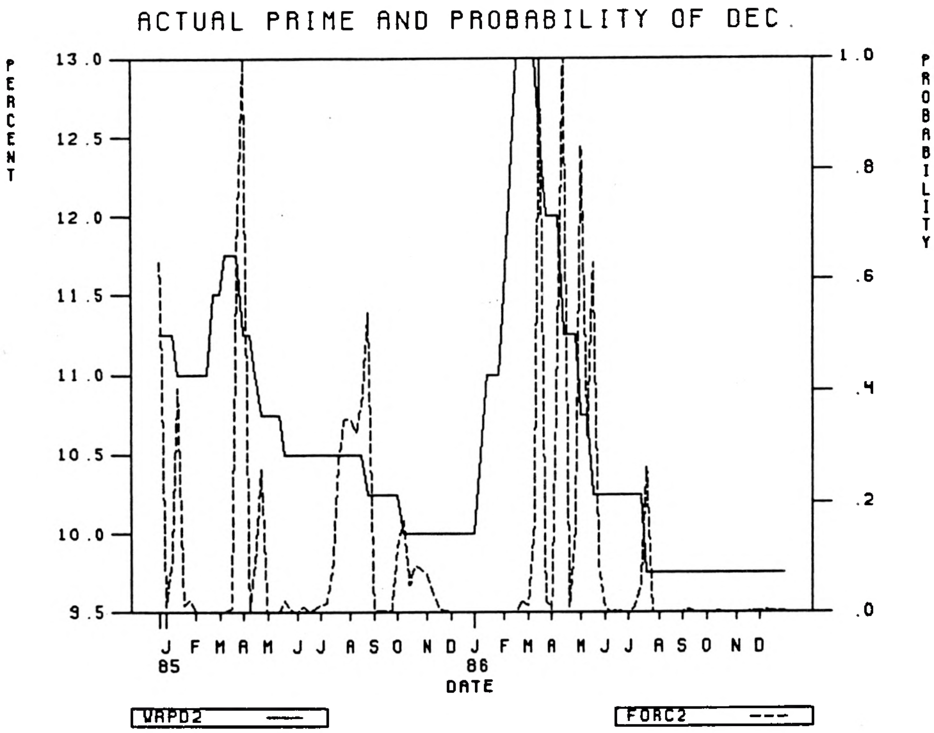

Chart 22

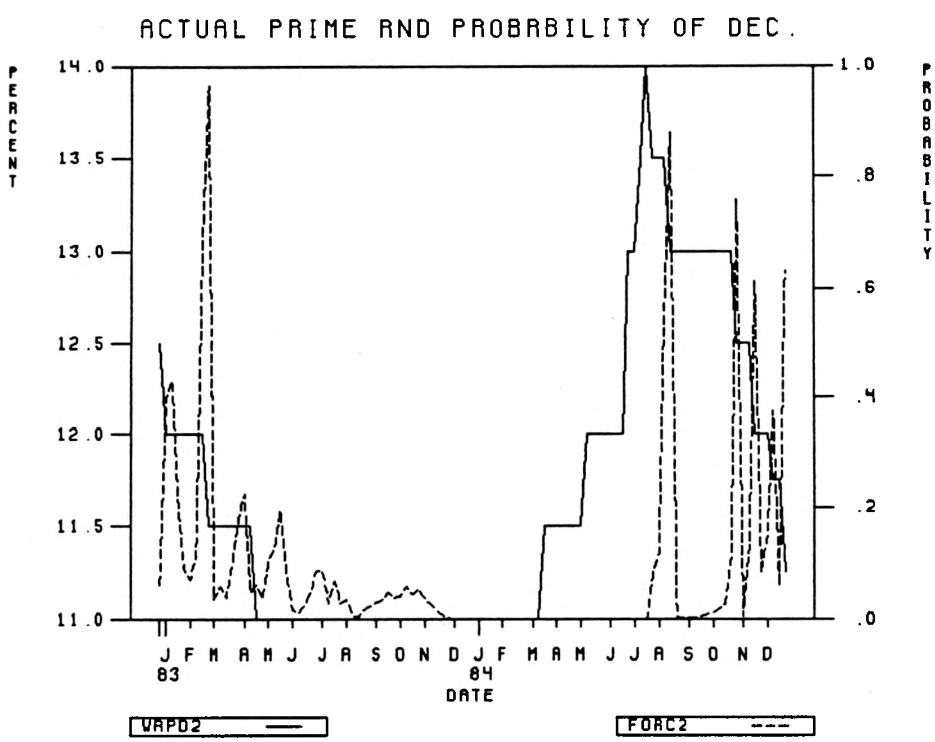

Chart 23

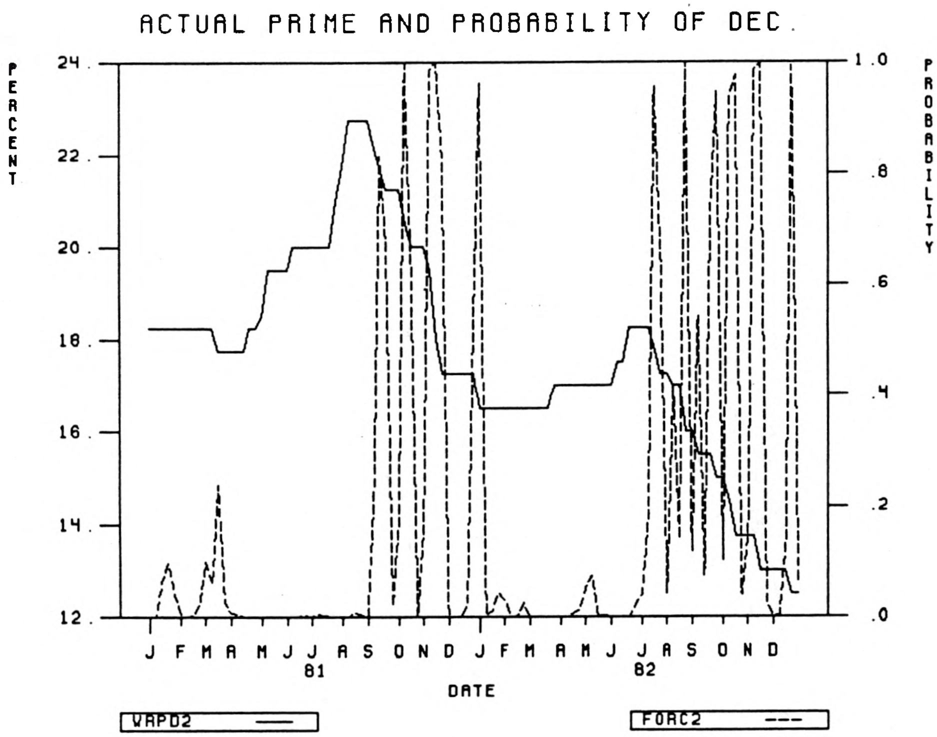

Chart 24

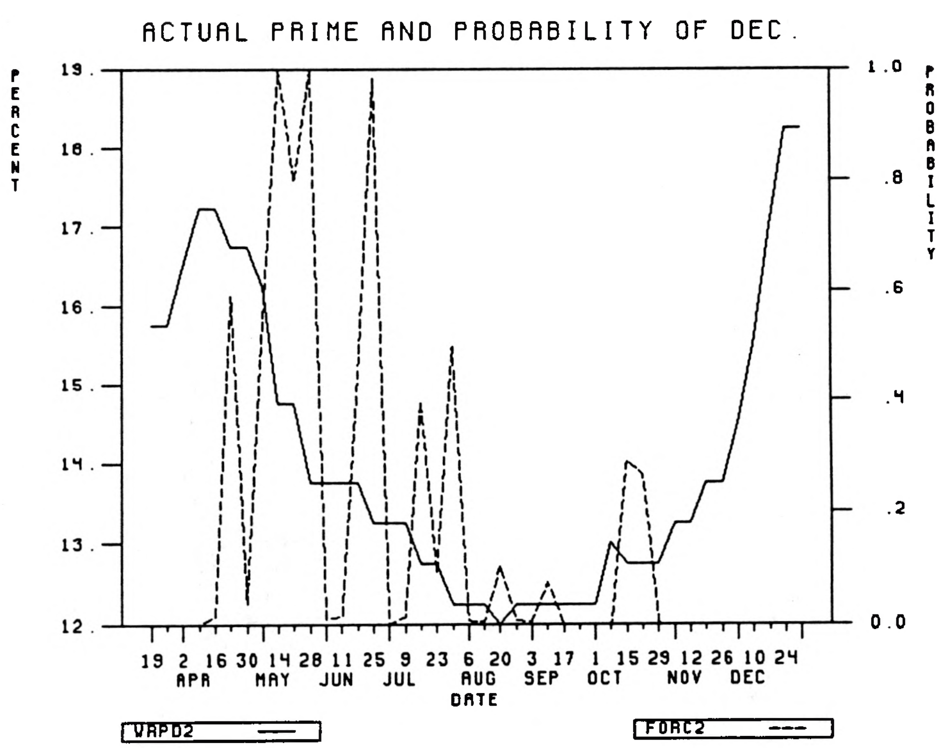

Chart 25

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