ADJUSTABLE RATE PREFERRED STOCK

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ABSTRACT

The introduction and continuing innovation of adjustable rate preferred stock is discussed in light of institutional, regulatory and tax considerations. The observed volatility in the market prices of these securities is explained by the caps on their dividend re-set formulas and by the changing credit-worthiness of their issuers. An econometric model is developed which explains 76 percent of the variation in the market prices of seasoned issues and which is reasonably stable across time and across issuers.

In May 1982 four banks issued \$725 Million of a new financial instrument: adjustable rate preferred stock (ARPS). This innovation was received with enthusiasm. Since then over \$20 billion of ARPS have been issued in the original form - in which dividends are re-set by formulas - as well as in several new forms. Thus, ARPS are today one of the most popular sources of external equity. This paper reviews the still short history of ARPS. In addition, a pricing model is estimated using the market prices of seasoned issues traded on the New York Stock Exchange. This pricing model is used, in turn, to determine if the introduction of ARPS was, as has been argued by Van Horne [10], a period of "excess" associated with a financial innovation.

1. The Introduction of ARPS.

In 1981, out of concern for commercial bank capital adequacy, the Comptroller of the Currency, the Federal Reserve Board and the Federal Deposit Insurance Corporation issued new regulations indicating that bank capital would be more closely scrutinized. This action forced banks into equity markets.

However, since prices of bank common stocks were below book values, it was thought that the sale of new common stock would result in dilution

for incumbent stockholders. In addition, interest rates were still high in 1982 so that (fixed rate) preferred stock did not offer an attractive alternative source of equity funds. The solution to this apparent dilemma was the innovation of adjustable rate preferred stock. In May 1982, Chase Manhattan, Chemical, Manufacturers Hanover and Republic, N.Y., floated issues which found surprisingly strong demand, and banks and other corporations floated additional issues [4].

Dividends on preferred as well as on common stock are subject to "double-taxation;" i.e., profits are taxed both at the corporate level and, when distributed, at the individual level. Dividends do, however, offer a tax advantage to corporate investors. This is because dividends received by corporations are 80 percent (85 percent prior to the 1986 Tax Reform Bill) excludable from taxable income. As a result, corporations with funds to invest are attracted to preferred stock, and rates of return on preferreds are less than those on bonds of comparable risk.

In spite of this tax advantage, (fixed rate) preferred stock is of only limited use to corporations for the purpose of cash management. This is because of market risk. Since preferreds are perpetuities, their prices move inversely

with interest rates. ARPS substantially remedy the problem of market risk. Dividends on ARPS are re-set each quarter according to the (changing) level of interest rates. Therefore, prices of ARPS remain (relatively) stable. This opens investment in ARPS to corporate money managers [8].

In 1984 Congress tightened certain tax codes affecting ARPS. Stocks or shares in mutual funds of stocks had to be owned for at least 49 days, up from 14 days, before dividends received qualified for the exclusion. In response, American Express issued a new form of ARPS: Money Market Preferred Stock (MMPS). MMPS feature holding periods of 49 days, the minimum necessary for the exclusion. In addition, the dividend is re-set not by formula but by auction. In 1985, another new form of ARPS was issued: Re-marketable Preferred Stock. Like MMPS, these issue feature 49-day holding periods. However, re-set rates are determined by investment bankers based on their feel for market conditions instead of by auction. Re-marketable Preferred Stock, by eliminating auctions, lower the administrative costs involved in non-formula-based preferreds.

2. Dividend Re-Set Formulas.

Dividend re-set formulas of the original form of ARPS usually identify their index rate to be the highest of the 3-month Treasury Bill rate, the 10-, and 20-year constant maturity Treasury Bond rates. Dividend rates are re-set each quarter, equal to the index rate plus or minus a margin, subject to minimum and maximum rates. For example, the first ARPS, Chemical's A series, featured a margin of +50 basis points, and minimum and maximum rates of 7.50 and 16.25 percent.

The margins, minimums and maximums of ARPS are designed in consultation with investment bankers. Of course, without prior experience or feedback from secondary markets, con-

figuring the right re-set formulas for the first issues of ARPS was difficult. The first four ARPS carried small, positive margins. Chemical's A series, as well as Chase Manhattan's F series and Manufacturers Hanover's A series, all Aa's issued in May 1982, carried margins of +50 basis points. Within months, margins on new issues were reduced to below zero. These negative margins reflect the tax advantage ARPS offer corporate investors. Manufacturers Hanover's B series and Chemical's B series, issued in July and August, featured margins of -60 and -65 basis points. Margins on new issues continued to decline through the remainder of 1982. Bank America's A series and Irving's, issued in October and November, featured margins of -200 and -225 basis points.

In the initial months of 1983, margins on new issues reached their lowest points. Among February issues, Bank America's B series and Citicorp's 2nd series carried margins of -400 and -412.5 basis points. The volume of new issues and the very large negative margins of the first quarter of 1983 over-reached the market. There were very few new issues during the next quarter. During this time the market absorbed the first quarter's glut and investment bankers back-tracked from over-aggressive pricing.

Were markets efficient in introducing ARPS? In retrospect, it is clear that the market searched for the correct re-set formula, and did not infer the correct formula from a (fully known) model. Observing that demand was strong for the first issues, investment bankers decreased margins. Investment bankers continued to decrease margins as long as demand remained strong until demand was discovered to be weak. That is, the market conducted a trial-and-error search for an appropriate pricing formula. Van Horne [10] describes this episode as a bubble associated with a financial innovation. However, an appropriate model was not

"publicly available information" in 1982.

In 1984 two shocks depressed prices of seasoned ARPS. The first was the reorganization of Continental Illinois and (downward) reassessment of the investment quality of bank issues. The second was the stiffening of interest rates. That the first shock depressed the prices of outstanding ARPS is not surprising. Issues will obviously sell for less when their investment quality deteriorates.

That the second shock - rising interest rates - depressed the prices of outstanding ARPS is difficult to understand. After all, ARPS are supposed to eliminate market risk. Actually, formula-based ARPS do not completely eliminate market risk because of the specification of minimum and maximum dividends. In 1984, when interest rates rose, dividends on many ARPS were pushed close to and some actually hit their maximums or "collars."

ARPS with dividends at their collars are priced at a discount relative both to adjustable rate preferreds within their collars and to fixed rate preferreds. The reason for the discount relative to adjustable rate preferreds within their collars is that the dividend rate on a "collared" ARPS no longer offers the possibility of upward adjustment. The reason for the discount relative to fixed rate preferreds is that the dividend rate on a "collared" ARPS still offers the possibility of downward adjustment.

ARPS of a given investment quality usually features a lower yield than the comparable Moody's (fixed rate) preferred rate. This reflects ARPS's (partial) hedge against market risk. However, in mid 1984, ARPS featured a higher yield. This was when interest rates were high and many ARPS dividends were pushed to their collars.

The next section estimates an ARPS pricing model from the prices of sea-

soned issues observed on the New York State Exchange. The model is able to successfully explain the changing prices of seasoned ARPS, and therefore indicates the sources of their price volatility ([13] discuss volatility further).

3. An Econometric Model.

The value of preferred stock has been modeled in the context of the Capital Asset Pricing Model [2], in the context of the Black-Scholes option pricing formula [5], and as a hedonic function of characteristics such as investment quality [6], [9]. Emanuel [5] shows that a simple form of preferred stock would, with sufficient security, be priced like a consol. He also indicates that complexities such as variable dividends may be beyond closed form solution (see [7] for a simulation approach to pricing ARPS). This section estimates a hedonic pricing model from the prices of seasoned ARPS traded on the New York Stock Exchange.

The sample consists of the prices of 61 non-convertible, formula-based ARPS over the 14 quarters from 1982 III to 1985 IV. Prices are the averages of daily highs and lows for the last five trading days of quarters. Prices are not observed for all 61 issues every quarter. Many ARPS were issued during the period and, obviously, only exhibit prices in quarters following their issue. Many ARPS, once issued, were not traded during the last five trading days of some quarters. As a result, the sample - a pooled, time-series and cross-section, sample - is said to be "imbalanced."

Analysis based on the pooled, time-series and cross-section, sample is necessitated by the small number of time-series observations for any one issue, and the small number of cross-section observations at any one point in time. The pooled sample, however, contains a large number of observations, and supports extensive investigation. Fortunately, the estimated pricing

model is found to be reasonably stable across sub-samples, justifying pooled estimation.

The basic idea of the econometric model is that the price of a share of ARPS is determined by the future dividends promised - as will be determined by the dividend re-set formula - and by the investment quality of the issue, as indicated by agency ratings.

$P = f(\text{Re-set Formula, Investment Quality})$

$= f(\text{Margin, Maximum, Moody's Rating, S\&P's Rating})$

In order to better approximate the market's implicit pricing model, a number of non-linearities are incorporated into the regression equation through linear spline variables. These splines enable the model to approximate whatever may be the underlying nonlinear functional form. The knot points, or kinks, in these splines were determined by grid searches. The basic form of the model, with these linear spline variables, is:

$$\begin{aligned} P(i,t) = & a + b \text{Margin}(i) + c \text{Margin}^*(i,t) \\ & + d \text{Maximum}^*(i,t) + e \text{Rating}(i,t) \\ & + f \text{Rating}^*(i,t) + g \text{Diff}(i,t) + h Z(i,t) \\ & + E(i,t) \end{aligned}$$

$P(i,t)$ is the price of share i at the end of quarter t , expressed as a percent of stated value. $\text{Margin}(i)$ is the margin in the dividend re-set formula, in percentage points. $\text{Margin}^*(i,t)$ is a linear spline variable, equal to $\text{Margin}(i) + 2.0 - 0.5 * \text{Rating}(i,t)$ if > 0 , designed to identify ARPS with large margins. $\text{Maximum}^*(i,t)$ is a second linear spline variable, equal to $\text{Index Rate}(t) + \text{Margin}(i) + 4.5 - \text{Maximum}(i)$ if > 0 , designed to identify ARPS close to their maximum dividend rates. $\text{Rating}(i,t)$ is the average of Moody's and Standard &

Poor's ratings, where $\text{Aaa/AAA} = 0$, $\text{Aa-1/AA+} = 0.33$, $\text{Aa-2/AA} = 0.67$, ... , $\text{Ba-3/BB-} = 4$. $\text{Rating}^*(i,t)$ is a third linear spline variable, equal to $\text{Rating}(i,t) - 2$ if > 0 , designed to indicate ARPS with investment quality below A-3/A- . $\text{Diff}(i,t)$ is the absolute difference between Moody's and S&P's ratings. $Z(i,t)$ includes certain other variables described below and $E(i,t)$ is the regression residual. Note that some variables, such as $\text{Margin}(i)$, are constant for a specific issue over the sample period, and other variables, such as $\text{Rating}(i,t)$, vary for specific issues over the sample period, in this case because of changing credit-worthiness.

A total of 28 outliers were identified in a preliminary regression. These were dropped from the sample, and the regression was estimated again. Econometricians have become concerned with "bad data" as can result from coding errors and frivolous responses in surveys [1]. In the present investigation, outliers probably result from market use of information which is not incorporated into the regression equation. For example, outliers of 1985 include the ARPS of First National City Bancorp of Texas, Reading & Bates, and Bank America. These are obviously cases where rating agencies lagged the deterioration which occurred in the investment quality of these issues.

The complete model, estimated with 433 observations, is given on the following page.

4. Discussion.

The variable $\text{Margin}(i)$ enters the regression with a coefficient of +8.97. Thus, the market recognizes that the larger is the margin, the larger will be dividends when they are re-set every quarter. Interestingly, the negative coefficient on the variable $\text{Margin}^*(i,t)$ indicates that large margins do not increase price by as much. Specifically, large margins increase price by only 1.83 ($= 8.97 - 7.14$). One explanation for

$$\begin{aligned}
P_{it} = & 130.84 + 8.97 \text{ Margin}_i - 7.14 \text{ Margin}^*_{it} - 2.65 \text{ Maximum}^*_{it} \\
& (1.86) \quad (0.41) \quad (0.77) \quad (0.32) \\
& - 5.67 \text{ Rating}_{it} - 4.32 \text{ Rating}^*_{it} - 1.91 \text{ Diff}_{it} \\
& (0.72) \quad (1.30) \quad (0.55) \\
& - 2.65 \text{ Ex-Div}_{it} - 4.69 \text{ Bank}_i(1984) - 2.65 \text{ Bank}_i(1985) \\
& (0.80) \quad (0.75) \quad (0.71)
\end{aligned}$$

$$\bar{R}^2 = 0.76, \quad \text{S.E.E.} = 5.47, \quad (\text{standard errors in parentheses})$$

this result is that these are margins larger than necessary to set price equal to stated value. Accordingly, issuers of these ARPS stand to gain, and holders to lose, through a call of these shares.

The variable $\text{Maximum}^*(i,t)$ measures "closeness" of the re-set dividend rate to the maximum rate. It is re-calculated every quarter taking the (changing) level of the index rate into account. Its coefficient indicates that the market discounts ARPS by 2.65 when the re-set rate is 3.5 percentage points from its maximum, by 5.30 when the re-set rate is 2.5 percentage points from its maximum, and so on.

Since the price of ARPS is discounted when re-set dividend rates are close to their maximums, it would seem natural for the price to be increased when re-set dividend rates are close to their minimums. After all, ARPS with a re-set rate at its minimum, compared to ARPS within its minimum, offer protection against reductions in dividends. However, no such effect from being "close" to minimum rates was found. When a variable, analogous to $\text{Maximum}^*(i,t)$, measuring closeness to the minimum rate was added to the regression its coefficient proved incorrectly signed, absolutely small and insignificant. Possible explanations for this result are: (1) markets did not believe interest rates would fall any further; and, (2) markets believed ARPS with binding minimums would be called.

The next set of variables incorporated into the regression refer to investment quality rating. To be sure, inclusion of quality ratings in the model does not imply that ratings themselves "cause" price (see [11] and [12]). Rather, it is the financial strength of issues of which ratings are a useful proxy which "cause" price.

The investment quality variables are constructed as follows: First, Moody's and Standard & Poor's ratings were tracked from issue to the present. To be in the sample, an issue had to have a rating from at least one agency. In addition, the rating had to be at least Moody's Ba-3 and S & P's BB-. Second, the letter ratings of each agency were transformed into numbers by the scale described above. Third, the variable $\text{Rating}(i,t)$ was set equal to the average of the numeric scales of the two agencies's ratings, when both ratings were available, and, otherwise, as the numeric scale for the one which was available. In addition, the variable $\text{Diff}(i,t)$ was computed as the absolute difference in the numeric scales, when both were available.

The coefficient of $\text{Rating}(i,t)$ indicates that the price of ARPS falls by 5.67 per letter grade, such as going from AA-2 to A-2. The coefficient of $\text{Rating}^*(i,t)$ indicates that this discount increases to 9.99 per letter grade ($= 5.67 + 4.32$) for ARPS rated Baa-1/BBB+ or lower. The significance of

the coefficient of $\text{Rating}^*(i,t)$ indicates the market either treats default risk as a non-linear transformation of Moody's and Standard & Poor's ratings or prices lower quality issues more harshly for default risk (i.e., is risk averse).

The coefficient of $\text{Diff}(i,t)$ indicates that the market discounts price by 1.91 for each letter grade of difference between the two agencies' ratings. Actually, the two ratings are usually quite similar, the mean value of the absolute difference being only about one-third. Nevertheless, when there is a difference in rating, the market appears to price according to the minimum rating, not the average rating (see [3] for a similar finding with bonds).

The variable $\text{Ex-Div}(i,t)$ is a dummy variable, equal to 1 if the ARPS just went ex-dividend, to 0.5 if it went ex-dividend two to four weeks prior, and to -0.5 if it will go ex-dividend in less than two weeks. Its coefficient indicates that the market reduces price after ARPS go ex-dividend. This is expected since preferreds, like common stocks and unlike bonds, are not quoted on an "and interest" basis. The coefficient itself, -2.65, is about the (absolute) size of what quarterly dividends on \$100 ARPS averaged during the period.

The variables $\text{Bank84}(i)$ and $\text{Bank85}(i)$ are dummy variables indicating bank ARPS in 1984 and 1985. The coefficients on these variables indicate that the market discounted bank issues by 4.69 in 1984, and by 2.65 in 1985, relative to comparable non-bank issues. These discounts probably reflect the lag in reassessment of the investment quality of bank issues by rating agencies upon the reorganization of Continental Illinois.

5. Stability.

The model explains 76 percent of the variation in price exhibited in the sample. This is especially high given

that prices of ARPS are not supposed to differ from stated value. Even so, it is important for the model to be reasonably stable across sub-samples, both based on cross-section and time-series criteria, for the model to be used with confidence.

To test the cross-sectional stability of the model, a Chow test was conducted with the sample split between bank and nonbank issues. The F statistic, distributed (8, 407), that the coefficients are the same for the two sub-samples equals 1.01, which is well below conventional levels of significance.

To test the time-series stability of the model, a Chow test was conducted with the sample split three ways among 1982-83, 1984 and 1985 prices. The F statistic, distributed (16, 407), that the coefficients are the same for the three sub-samples equals 2.78, which is marginally above the 1 percent level of significance. However, while some perturbation in the set of coefficients is indicated, none of the individual coefficients exhibits significant variation across the sub-samples.

In additional tests of the stability of the model the 3-month Treasury Bill rate and the difference between the 20-year Treasury Bond rate and the 3-month Treasury Bill rate were added to the model. These two variables can be viewed as proxying the level and slope of the yield curve. Neither variable proved significant, indicating that the model could be used for pricing over a considerable range of interest rates. Also, a dummy variable was created denoting stocks which were within six months of their original issue. Its coefficient proved to be insignificant, indicating that the model works reasonably well for new as well as for seasoned issues.

The stability of the pricing model indicates that it could be used with confidence. For example, the pricing model could be used to configure re-set

formulas on new issues of ARPS and - if it had been available - could have been used to avoid the mistakes in configuring the re-set formulas of some of the first issues. That is, the pricing model could have been used to set margins which were neither too large (i.e., positive) nor too small (i.e., -400 basis points).

However, this pricing model and the data from which it is estimated were simply not available in 1982. Instead, re-set formulas for the first issues of ARPS had to be configured using theory and intuition, without the benefit of directly-related experience. Even if investment bankers had known what would eventually become the correct re-set formulas, they had to price ARPS for investors which could not have been expected to be as sophisti-

cated. What this means is that the introduction of ARPS, rather than being an "excess" associated with an "innovation," is instead a period of discovery resulting from a process of trial-and-error.

Finally, while the pricing model performs reasonably well, some potential problems should be emphasized. First, not all issues of ARPS are priced by the model. From time to time, certain issues "fall off the regression line," which appears to happen when investment quality suddenly deteriorates and rating agencies lag in their reassessment. Second, with reduction of the dividend exclusion to 80 percent, and with minimum dividend rate now binding for some issues, there is reason to suspect that the model may need to be updated as new data becomes available.

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