THE PRICING OF DUTCH AUCTION RATE PREFERRED STOCK

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The emergence of dutch auction rate preferred stock (DARPS) in 1984 created a new security which offers features to meet the needs of short-term corporate investors. The instrument offers attractive after-tax yields due to the preferential dividend income exclusion and an adjustable yield. In addition, DARPS are recognized as being safer than unhedged "dividend-capture plans." Dividend-capture plans, where dividend income is "captured" by trading into and out of high yield stocks, have recently become popular as a means of earning attractive returns on cash reserves. The Wall Street Journal (1987:6) notes, that during the October 1987 stock market ,..."corporateorate treasurers who had been earning as much as 10% after taxes on dividend captures — much more than from traditional short-term investments like treasury bills — faced big losses."

This research investigates the pricing of DARPS and focuses on the instrument's distinctive features to develop and test a pricing model. This study of factors which influence the pricing of the instrument is believed to be the first of its type in the finance literature. This work complements previous research by Sorensen and Hawkins (1981) on the pricing of regular preferred stock, Winger et al (1986) on the investment performance of adjustable rate preferred stock, and Alderson et al (1987) on the investment performance of DARPS. Further, the prior research by Alderson, et al, is limited to the 201 dutch auctions held during the introductory period of the instrument in the first six months of 1986. This paper utilizes a sample over five times larger than Alderson, et al, spanning a 21/2 year period.

This paper describes important characteristics of DARPS and develops pricing insights derived partially from call option characteristics implicit in the instrument; develops a pricing model for DARPS based on the developments of the characteristics; describes the data and presents the empirical findings; and highlights the major conclusions of the research.

Characteristics of DARPS

DARPS offer a variety of attractive features to meet the needs of short- term corporate investors. The par value is either $100,000 or $500,000, depending on the particular issue. The dividend yield is adjusted every forty- nine days through a telephone auction of existing and potential purchasers as dealers relay buy and sell orders from customers to the designated trust company. The auction-determined reset rate is the highest of the low accepted purchase bids at which the

entire issue can be sold and reflects market conditions and credit risk of the issue. The forty-nine day interval corresponds closely with the forty-six day holding period required for the special tax exclusion of dividend income.

The auction reset has three important risk-reducing advantages. First, the frequency of the dividend adjustment greatly reduces interest-rate risk compared to the formula determined yields on the older adjustable rate preferred stock. Second, the auction reset more effectively prices changes in the credit quality of issuers compared to the formula-determined rate on adjustable rate preferred stock (Alderson, et al, 1987). Third, investors who disagree with the auction-determined rate may sell the stock outright at par.

Like the formula-determined rate on adjustable rate preferred stock, the auction-determined dividend rate fluctuates within a pre-specified range referred to as the "collar." The lower reset collar (floor reset), normally 58-59 percent of the average Aa commercial paper rate, reflects the tax-advantaged nature of the instrument. The lower reset collar rate occurs when all holders of DARPS decide to roll-over the asset noncompetitively. Conversely, the upper collar reset (ceiling reset) is normally set to 100-125 percent of the average Aa commercial paper rate. As market conditions and the credit quality of issuers change, the dividend rate on subsequent auctions can rise to the maximum dividend rate (ceiling reset).[1]

Virtually all DARPS issuers retain the right to call with the call privilege expressed in two ways. Typically, issuers may call the stock at a premium of 103 percent of par in the first year, with the call premium declining by one percent each year over the subsequent three years. However, should the auction-determined dividend yield exceed a hundred percent of the commercial paper rate, the issue is immediately callable at par. This last call condition is especially advantageous to issuers in the event of an incomplete auction resulting in the maximum dividend rate reset. The incomplete auction would result in issuers incurring more dividend expense than they might choose to tolerate. The opportunity to call at par provides a cost-saving exit from the market under such circumstances. These distinguishing features of DARPS should be important for investors and provide a framework for viewing the yield determination process.

Empirical Pricing Model

The nature of DARPS lends itself to viewing the instrument as an auction- determined floating-rate bond with special call features. The following functional relationship is used to examine factors influencing the auction- determined dividend yields.

$$Div_t = f(CP_t, UNCER_t, RATE_t, OPTION_t, CALL_t)$$

where:

Div_t= The auction-determined dividend yield of the DARPS issue occurring at auction date (t).

CP_t= The average commercial paper rate of 30-59 day Aa commercial paper rate on the DARPS auction date (t).

$UNCER_t$ = The absolute change in the Aa commercial paper rates over the five days prior to the auction date (t); a measure of uncertainty of market conditions.

$RATE_t$ = Binary variables designating Moody's rating of the issue with Aaa-Aa (Ratel), A (Rate2), Baa (Rate3), Ba (Rate4) and B (Rates) at auction date (t). The highest quality issues of Aaa-Aa rating serve as the reference point (omitted regression variable).

$CALL_t$ = A binary variable representing the sliding call price of the issue at auction date (t) at 103 (Cain), 102 (Ca112), 101.5-100.5 (Ca113) and 100 (Ca114) at auction date (t).[2] Issues callable at 103 are the reference point (omitted regression variable).

$SPCALL_t$ = A binary variable denoting a special call at par occurring when the dividend yield exceeds one hundred percent of the commercial paper rate at auction date (t), and the issue had been previously callable above par.

The dividend yield Div, is determined on the auction date at 49 day intervals. Due to short-term nature of the instrument, the more traditional yield to maturity or yield to call is not applicable to the analysis of DARPS. Since DARPS are money market instruments with call provisions tied to commercial paper rates, the dividend rate should respond to commercial paper rates. The tax-advantaged nature of DARPS suggests that DARPS rates should change on a less than one-to-one basis with commercial paper rates. The other market variable, UNCERt, accounts for interest rate uncertainty. Previous research has shown a positive relationship between interest rate volatility and the pricing of bond and preferred stock instruments (Marr and Thompson, 1984; Sorensen and Hawkins, 1981). Higher dividend yields reflect investor's compensation for assuming greater interest rate risk.

The credit rating of a DARPS issue should partially determine the DARPS dividend rate (Sorensen and Hawkins, 1981). The assigned credit rating of each issue reflects a credit rating agency's assessment of the probability of default by the issuer on the par value or periodic dividends. Consequently, lower rated issues should have higher dividend resets, reflecting higher default risk.

Of special interest to the DARPS holder is the dividend reset rate relative to the prevailing commercial paper rate. The special call provision allowing call at par is in effect when the dividend reset rate exceeds the commercial paper rate. The impact of the special call feature is greatest for lower-rated DARPS, because the likelihood of the dividend rate exceeding the commercial paper rate increases as initially high rated DARPS are subsequently down- rated.[3] Under this condition, the potential value change to the DARPS investor is the difference between the higher call price that would otherwise exist and a call at par. The dividend yield should increase as the auction process renders the issue to be callable at par, reflecting the increased likelihood of a call.

Empirical Tests and Results

The Dutch Auction Rate Preferred Stock History published by Salomon Brothers, Inc., reports the auction resets of 199 DARPS issues beginning in August 1984. Credit rating and call price data were obtained from monthly isues of Moody's Bond Record, and commercial paper rates were acquired from the Bank and Quotation Record.

The 1st quarter 1986 through 1st quarter of 1988 time period was chosen for this study.[4] This two-year time period represents a period in which a minimum of 15 auctions occurred for 80 DARP issues. Of the 80 available issues, 65 issues had sliding call provisions based on the Aa commercial paper rate.

Table 1 describes the characteristics of the final sample in detail. Of the 65 chosen issues, 18 experienced at least one credit rating change by Moody's. The remaining 47 issues retained their initial rating over the duration of the period. The complete sample of 65 issues had 1,142 auctions over this two year period. The mean yield on Aa commercial paper of 6.65 percent exceeds the mean DARPS dividend yield of 5.27 percent by 138 basis points.

Table 1. Selected DARP Issue Data

Characteristics:	Sample Size
Number of Issues	65
Number of Issues with Rating Changes	18
Total Number of Auctions	1,142
Aaa Rating (Auctions)	438
Aa1 to Aa3 Rating (Auctions)	160
A1 to A3 Rating (Auctions)	474
Baa1 to Baa3 Rating (Auctions)	47
Ba1 to Ba3 Rating (Auctions)	7
B1 to B3 Rating (Auctions)	16
Auctions with Dividend Reset > CP; callable at par	62
Mean Dividend Yield	5.27%
Standard Deviation of Yield	1.12%
Mean Aa Commercial Paper Rate	6.65%
Standard Deviation of Commercial Paper Rate	0.58%
Mean Sum of Commercial Paper Volatility	0.31%
Std. Deviation of Commercial Paper Volatility	0.39%

Regression analysis was used to examine the relationship between DARPS dividend yields and the factors in the functional relationship specified in the section on Empirical Pricing Model.

Because the Durbin-Watson statistics in the OLS regressions reveal the presence of serial correlation, a transformed maximum likelihood (ML) model was used to control for serial correlation through a generalized differencing procedure.[6] The ML model estimates the autoregressive parameter and regression parameters simultaneously (4,9). The ML regression results are shown in Table 2.

Table 2. Transformed Maximum Likelihood Regression Equation for the Pricing of DARPS with Dividend Yield as the Dependent Variable, 1986 - 1988.

Explanatory Variables	Model 1	Model 2	Model 3
Constant	-0.015 (-0.057)	-1.003 (-4.575)***	-0.928 (-5.304)***
CP (Aa Commercial Paper)	0.784 (20.286)***	0.909 (27.739)***	0.850 (33.206)***
UNCER (Volatility in CP)	0.237 (6.030)***	0.216 (5.423)***	0.131 (3.837)***
RATE2 (A Rating)		0.015 (0.303)	0.067 (2.090)*
RATE3 (Baa Rating)		1.426 (12.252)***	0.746 (8.860)***
RATE4 (Ba Rating)		3.843 (15.344)***	2.273 (11.210)***
RATE5 (B Rating)		5.094 (26.395)***	3.300 (21.618)***
CALL2 (Call at 102)			0.183 (3.813)***
CALL3 (Call at 101.5-100.5)			0.358 (8.741)***
CALL4 (Call at 100)			0.646 (9.905)***
SPCALL (Div. > CP)			1.956 (23.477)***
Adjusted R^2	29.15	61.28%	80.38%
Durbin Watson	2.28	2.04	2.02

*Significant at 0.05
**Significant at 0.01
***Significant at 0.001

The results of the ML analysis are shown under three specifications to highlight the marginal contribution of the variables. In each successive model, additional variables enter the regression equation. Model (1) captures the response of the dividend reset to prevailing market conditions. Specifically, 29.15 percent of the variation in the dividend reset rate is explained by the commercial paper rate and commercial paper volatility. When the default measures are added to model (1) as shown in model (2), the explained variability increases to 61.28 percent. Model (3) adds the call option variables to model (2), increasing the regression's explanatory power to 80.38 percent. The F-values indicate these three models are statistically significant at, the 0.001 level.

Consider the coefficients of model (3) found in Table 2. Model (3) regression coefficients show significant and positive coefficients for all variables. The intercept of —0.928 corresponds to an average DARPS reset of 93 basis points below the prevailing Aa commercial paper rate for DARPS issues with the highest rating which are callable at 103 percent of par. As expected, the DARPS reset rates appear to respond to incremental changes in the commercial paper rate with a less than one-to-one correspondence. The commerical paper rate coefficient of 0.850 is consistent with the tax-advantaged nature of DARPS.

This commercial paper rate coefficient is based on the tax laws from three different tax code changes from 1986-88. Thus, the coefficient for CP reflects an average value for the three years of the study. Given the tax rates and dividend exclusions for 1986-88, the average after-tax yield

spreads between DARPS and commercial paper were 25.13 percent, 12.20 and 10.33 percent for 1986, 1987 and 1988 respectively.[6] The average of these three after-tax spreads is 15.89 percent, indicating a slightly higher return for DARPS holding constant proxies for the market condition, credit rating and call provisions.

The credit rating dummy variables show significant increases in the DARPS reset rates for credit rating decreases. The A rated issues have a yield differential of 6.7 basis points more than the highest rated issues. The difference in yield between Baa and A rated issues is substantially larger at 74.6 basis points. Lowering the rating from Baa to Ba results in a 153 basis point difference in the dividend yield. The lowest rated issues (B) yield 103 basis points more than Ba rated issues. Given the tax disadvantage to the DARPS issuer of paying dividends on an after-tax basis, low rated DARPS appear to represent an expensive form of financing short-term capital needs.

The sliding call price increases the dividend reset, particularly those issues callable at par. Investors require 65 basis points more for issues with the possibility of a call with a stated 300 basis point differential (103 versus 100), and 36 basis points more for an average stated 200 basis point differential (100.5-101.5). The 18 basis point differential between a call at 103 and 102 suggests investors believe the company is less likely to call the issue at either of these prices.

The significance of the special call variable (SPCALL) indicates DARPS yields adjust to reflect the call risk presented by the special nature of the instrument as the auction-determined rate exceeds the commercial paper rate. Investors require an average of 196 basis points yield compensation for the loss of the call premium.

Conclusion

This study examines the pricing of dutch auction rate preferred stock by viewing the instrument as an auction-determined floating-rate bond with special call features. The commercial paper rate, call risk, and credit risk characteristics appear to explain and establish the DARPS yields. The call features require additional yield when investors are exposed to call risk.

Given the close correspondence between commercial paper movements and DARP yields, DARPS offer the corporate investor a close substitute for commercial paper. The decision to invest in DARPS may ultimately depend upon the investor's ability to take advantage of the DARP's preferential tax status.

Endnotes

1. The dividend yield relationship can be conceptually expressed as follows:

$$Div_t = F_t + Max[(Aucdiv_t - F_t), 0] - Max[Aucdiv_t - C_t, 0]$$

The floor reset collar (F_t) is 58-59 percent of the Aa commercial paper rate and is the "guaranteed" minimum rate to the investor, regardless of whether the auction-determined dividend (Aucdivt) is lower than the floor. The second term refers to the excess return above the floor when the auction- determined dividend is above the floor reset collar. If the auction-determined dividend exceeds the floor, the value of term two is ($Aucdiv_t$ — F_t), otherwise the term equals zero. Similarly, if the auction-determined dividend is below the ceiling reset, the

third term is zero. When the auction-determined dividend is above the ceiling rate, investors incur a loss of — ($Aucdiv_t$ — C_t), since the maximum dividend reset (Div_t) investors receive will be set to the ceiling reset rate. Special thanks to the anonymous reviewer suggesting this option pricing insight.

2. A small sample problem results when creating separate variables for calls at 101.5, 101 and 100.5 percent of par. Combining these call prices stabilizes the call price regression coefficient.

3. Most DARPS receive the Aaa or Aa rating upon initial issuance, since issuers collateralize the principal and accrued dividends. The issuer must own high quality short-term assets with a market value exceeding that of the outstanding DARPS. Further, the discounted value of cash and money market securities maturing within 49 days must equal the dividend payment.

4. The scarcity of DARPS during 1984-85 prohibited an adequate sample size for a pricing analysis during this period. For consistency, all auctions for various issues had to occur over the same time period.

5. Statistical analysis was performed to consider nonlinear specifications. Since the sliding and special call variable category dummy variables are contingent upon the DARPS dividend yield exceeding the Aa commercial paper rate, observations were ranked by the dividend yield divided by the prevailing Aa commercial paper rate. Separate regressions were conducted for various low and high percent of commercial paper groups [4]. The linear specification chosen for this study remained robust to these different sub- samples of data.

6. The after-tax DARPS yield is calculated under a 46 percent marginal corporate tax rate in 1986 with an 85 percent exclusion, a 40 percent tax rate in 1987 with an 80 percent exclusion, and a 34 percent tax rate in 1988 with a 70 percent exclusion. As an example, a 100 basis point increase in the commercial paper rate before tax during 1988 would net the purchaser 100 (1 — .34)=66 basis points after tax. A corresponding 85 basis point increase in the DARPS rate would net 85 ((1 — .30(.34))= 76.33 basis points after tax; a 10.33 point differential.

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