INVESTIGATING THE DARPS MARKET MELTDOWN THROUGH AN INVESTMENTS PROJECT

Lynda S. Livingston, University of Puget Sound
Amy R. Kast, University of Puget Sound
Kyle M. Benson, University of Puget Sound

ABSTRACT

Dutch Auction Rate Preferred Stock (DARPS) was created in the 1980s as a way for fully taxable corporate investors and tax-exempt issuers to share the tax benefits of the dividends received deduction. DARPS dividend yields were reset every few weeks through an auction, minimizing price risk and allowing corporate treasurers to use the shares like a money market asset. However, as tax regimes changed, the appeal of DARPS to corporate investors waned, and broker/dealers began to market the assets more heavily to retail clients. When these dealers stopped supporting the DARPS auctions in early 2008, the individual investors lost all of their liquidity, learning the hard way that preferred stock is not a cash equivalent. In this paper, we explain how we incorporated this market drama into a traditional, Excel-based project for an undergraduate investments course.

JEL: G01, G32, A22, K34

KEYWORDS: Preferred Stock, Auction, Investments Pedagogy

INTRODUCTION

> *Auction rate preferred securities is the largest fraud ever perpetuated by Wall Street on investors. It dwarfs all frauds in history, including Madoff. There are three takeaways from this fraud. First, you cannot believe anything—absolutely anything—that anyone on Wall Street tells you. Second, Wall Street is only interested in the fees it can extract from you. Third, Wall Street (i.e. its representatives) has absolutely no interest in whether the item(s) it sells you has any long-term (or short-term) value whatsoever. - Harry Newton, investment blogger*

In early 2008, the $330 billion market for auction-rate securities froze. The broker/dealers who had been providing liquidity for the market suddenly stopped supporting the auctions, stranding investors with billions of dollars' worth of virtually illiquid "cash equivalents." Two years later, some investors are still trying to access their cash. Issuers stuck with assets that are either prohibitively expensive for them or profoundly unattractive to investors (or both) are scrambling to devise alternatives. Meanwhile, attorneys general and other authorities are struggling to understand what went wrong, and to hold someone accountable.

Dutch Auction Rate Preferred Stock (DARPS) was created in the 1980s as a cash management tool for corporate investors. Corporations are able to exclude from tax a majority of their dividends received. DARPS was designed to allow corporate investors to take advantage of this tax benefit while protecting themselves from price risk. However, DARPS was tailored to very specific market conditions, and when those conditions changed, DARPS became much less relevant and attractive to its traditional corporate clientele. To keep the DARPS market afloat, broker/dealers in recent years expanded their marketing efforts to individual investors. These investors enjoyed no special tax breaks from preferred stock; they were simply using DARPS as a money-market alternative, based on the advice of these broker/dealers. Given their desire for liquidity, these retail investors were devastated when auctions began to fail, prohibiting them from accessing their savings. Without auction buyers—including broker/dealers—

investors were essentially stuck holding their preferred stock. They learned the hard way that preferred stock is not a cash equivalent.

Dramatic market events like these can stimulate students' interest in finance course material. In this paper, we describe our efforts to incorporate the auction-rate meltdown into a comprehensive project for investments students. This is a project covering the traditional scope of an investments course, addressing, for example, the characteristics of single assets, measures of comovement, portfolio creation, and performance measurement. However, while including an extensive project in investments is common, using that project to explore a current market event is not. Broadening the project's scope in this way may make the material more interesting and memorable for the students—making it worth the instructor's effort.

The paper proceeds as follows. In the next section, we give some background on DARPS, first explaining briefly how the rate reset auctions work, then describing the breakdown of the market in early 2008. In the third section, we describe some of the resulting fallout, especially the legal actions initiated by the regulators of New York and Massachusetts. We then turn to the investments project, describing the relevant literature and outlining how we incorporated elements from the DARPS debacle into the traditional project structure. Finally, we present some of the output from the project, and conclude.

LITERATURE REVIEW AND BACKGROUND

Auction Rate Preferred Stock (ARPS), the precursor to DARPS, was created in 1982. Corporate investors sought high-dividend stocks for dividend-capture programs in order to take advantage of the dividends-received deduction (DRD), which was then 85%. As attractive as the DRD was, however, it was coupled with the risk of holding the stock that produced the dividend. ARPS helped corporate cash managers avoid the price risk of preferred stock by resetting the dividend rate every quarter. However, since the new rate was always set at a fixed spread over the highest-yielding Treasury, it could not compensate for changing credit risk of issuing companies. ARPS also forced investors to wait three months for a reset, which was much longer than the 46-day minimum holding period for dividend capture. ARPS therefore mitigated, but did not eliminate, the price risk of a dividend-capture program.

Investment bankers addressed these drawbacks of ARPS when they designed its successor, Dutch Auction Rate Preferred Stock (DARPS). The dividend rate for DARPS was reset through a Dutch auction every seven weeks, a term that matched investors' required holding period much more closely. In addition, since the new rates were determined at auction, they could better account for the relative credit risk of issuers. This worked as follows. Investors who wished to enter the market would place a competitive bid—a desired yield and dollar quantity—to the broker/dealer running the auction, who then ranked the bids by yield. The available DARPS shares were allotted to the lowest-yield bidders first, and so on; the highest yield accepted (the clearing rate) then set the dividend rate for the entire auction. If the quantity of bids at the clearing rate exceeded the number of shares available, current investors bidding at that rate were allocated shares pro rata, but new investors bidding at that rate were excluded. (This auction process is nearly identical to the single-price format for Treasury auctions, although the Treasury system does not discriminate against new investors bidding at the clearing rate, as DARPS does.)

The DARPS auction rates were often constrained by collars, or maximum and minimum allowable reset rates. In the early days of DARPS, the common "max rate" was 110% of the contemporaneous AA-rated commercial paper (CP) rate. This ceiling was meant to compensate investors for possible auction failure; if there were insufficient demand at auction, DARPS would pay a penalty rate of 110% of the yield on a comparable money market asset. For corporate cash managers, this was reassuring: should an auction fail, they would receive a higher rate that they could get investing in CP, and would still not be taxed on 85% of the dividend received (while CP returns would be fully taxable). On the other hand, the collar's floor was designed to equate the after-tax DARPS rate with the after-tax CP rate, making a corporate investor indifferent between the two assets. (Thus, if demand were very strong, the corporate investor would be no worse off than he would have been by investing in CP.) While the floor rate fluctuates depending on the tax regime, for the 85% DRD and 46% marginal tax rate that existed when DARPS was created, this equilibrating minimum rate was 58% of the AA CP yield. (We demonstrate this equivalence later in the paper.)

The design of Dutch Auction Rate Preferred Stock was meant to accommodate the tax-based incentives of scarcely taxed issuers and highly taxed investors. DARPS issuers were not concerned about the tax benefits of debt, either because they were not taxed or because they were utilizing some other tax shelter. DARPS was attractive to these issuers because it allowed them to obtain financing at a lower rate than with they could with debt (for example, with commercial paper). As discussed above, corporate cash managers were seeking to obtain higher after-tax returns than they could earn on money market assets, by buying dividend-yielding preferred stock and capitalizing on the DRD. DARPS was a financial innovation that allowed these corporate investors to achieve this goal with relatively little risk.

While the DARPS design initially was successful, it was meant to cater to very specific needs and market conditions. When those conditions changed, DARPS became less valuable to its traditional clienteles. The Tax Reform Act of 1986 lowered marginal corporate tax rates to 34% and the DRD to 80%. (The DRD fell further the following year, to 70 %.) At the same time, the number of non-debt tax shields available to issuers decreased. As these exogenous factors changed, the market for DARPS deteriorated. Issuers became more attracted to debt because they had fewer alternatives. Investors, required to pay taxes on more of their DARPS dividends, but taxed less heavily than before on alternative assets, became less interested in DARPS. As the traditional players left the market, broker/dealers began to search for new markets for this specifically tailored asset. Ultimately, they expanded into the retail market, despite the fact that individual investors cannot take advantage of the DRD—the benefit DARPS was created to exploit.

The new investors in DARPS appeared to be less aware of auction failure than their predecessors had been. The risk of auction failure is unavoidable—in fact, without this risk, DARPS could not qualify for the DRD at all (see Alderson and Fraser, 1993). However, as the dealers pushed the market farther from its original clienteles, the new retail participants—who were buying the DARPS as cash equivalents, not as tax shelters—may have misunderstood the attendant liquidity risks. (In the next section, we discuss the contention that retail buyers were deliberately misled about these risks.) They were therefore ill prepared for the breakdown of the market in early 2008.

A DARPS auction fails when the number of sell orders exceeds the number of hold or buy orders. This insufficient demand results in current investors' having to hold onto their shares. The auction rate is set at the contractual "max" or "penalty" rate—the upper half of the collar discussed above. (As noted earlier, when the DARPS market was young, this rate was usually 110% of the AA CP rate. In more recent years, it has evolved, with contracts setting fixed or floating max rates—or both—often tied to LIBOR. See McConnell and Saretto, 2009.) One result of downturn of the subprime mortgage market was a general reassessment of credit risk, and ultimately a rash of credit downgrades. Given that the DARPS market is highly credit-sensitive (see Alderson and Fraser, 1993), increased risk aversion led investors to retreat from the DARPS market.

In the face of this investor retreat, broker/dealers stepped in and bid themselves in the auctions they facilitated, to ensure sufficient demand. This kept the market afloat for a while. However, as their positions grew, continued support became untenable. As the Regional Bond Dealers put it in their testimony to the Congressional Committee on Financial Services hearing on the matter:

> *Many lead managers began to recognize internally that they were accumulating imprudently large ARS [auction-rate securities] inventories and that they would have to stop bidding at auctions. However, that information was never disclosed to the market at large, neither to investors nor to distributing dealers. By mid February 2008, the capacity of the ARS lead managers to continue to support the market by buying securities was exhausted and ARS auctions began to fail on a widespread basis. (CFS, 2008)*

It is worth noting that these broker/dealers were well aware both that their concentrated DARPS positions were risky and that investors were retreating from the market. To divest their holdings, they had to make a concerted effort to market DARPS as a cash equivalent to individual investors—investors who may have been unaware of the inherent risks of DARPS and of the market conditions that were increasing the probability of auction failures. As more and more auctions failed, these retail investors suffered an abrupt wake-up call. They had been promised that DARPS were liquid cash equivalents, but without clearing auctions, they could not sell their shares at par. Instead, they were forced to hang onto their shares (and receive the penalty dividends), or to sell for a loss. As may be expected, this unsustainable situation—involving individual investors—has led to a wealth of legal ramifications. We briefly examine these in the following section.

CRISIS FALLOUT

The evaporation of liquidity in the auction rate market, and its devastating consequences for individual savers, begged a regulatory response. As with the mutual fund debacle of 2003, the New York state attorney general (albeit now a different person) was at the forefront of this response. In this section, we describe several of the actions taken by New York Attorney General Andrew Cuomo, as well as some by the Secretary of State of Massachusetts, William Galvin.

Cuomo and Galvin have asserted that many investors were told that auction-rate securities were cash equivalents—as Galvin put it, as "liquid, safe and risk free." (Auction rate securities, or ARS, include both auction rate preferred stock and auction rate bond issues.) Cuomo obtained audio recordings of sales members from Charles Schwab telling customers that, "If you need to have that access to them [your funds] at any time, that's [ARS] a good place for those to be. You know if you think you might need to get into that money, that's probably as good a place if not better than anywhere to leave them." (All of the quotes in this section are from Cuomo, 2008a, 2008b, 2008c, or CFS, 2008.)

Customers receiving such a sales pitch might not have been briefed properly on the risk of auction failure. (In fact, neither may those who were doing the pitching: for example, one Schwab employee was taped asking, "How could an auction fail?") Thus, when auctions failed, customers felt "blindsided by the very people who were supposed to have their best interests at heart."

At the broker/dealer firms, there may have been a strong disconnect between what salespeople knew and what management knew. Some managers surely knew that auctions could fail, since they were busy propping them up. Actions by both Galvin and Cuomo against UBS provide a case in point.

Cuomo obtained e-mails showing that UBS's short-term desk had "exceeded multiple times in 2007 and early 2008, the amount of capital it was authorized to use to support auctions," and that the group had repeatedly requested an increase in its funds cap. Corporate cash managers were removing their capital from the market, forcing UBS to increase its support for the auctions—thereby building up its ARS inventory to unsustainable levels. In August of 2007, insiders at UBS were emailing each other about the vulnerability of the auction market and the increasing likelihood that UBS would pull out of the market. Finally, not wanting to get caught holding billions' worth of illiquid securities, the company began a marketing campaign to help offload their ARS. They created a new group specifically tasked with selling the securities, and gave them a goal to double sales. In December of 2007, the Global Head of Municipal

Securities Group and Head of Fixed Income Americas pushed the salespeople to stress to customers—people saving for college, preparing for retirement, or running small businesses—the "value" in ARS at the prices for which UBS was selling them. Meanwhile, he proceeded to sell his personal holdings of ARS because his "risk tolerance from a credit perspective was something that drove me to want to sell." He was not alone: seven top UBS executives also sold off $21 million in personal auction rate securities.

Galvin's investigations tell a similar story. His office was contacted by customers of UBS who had placed money into ARS after being told it was a safe instrument—100 percent principal-protected and liquid, thanks to auctions held every 7 to 28 days. His complaint alleges that the company had to closely monitor bid rates on ARS so they would be just high enough to allow auctions to clear, but just low enough not to upset the issuers (the underwriting clients). UBS knew that auctions would fail if it did not continue to bid; in fact, UBS did allow certain auctions to fail because the company did not want to add to its ARS inventory. On February 13, 2008, UBS stopped supporting its auction rate program completely, without notice to its customers, rendering their ARS completely illiquid.

The Merrill Lynch case demonstrates the same sort of conflict of interest. In August 2007, a Merrill analyst published the research piece expressing concerns about the ARS market. After company management, including the managing director of the auction desk, reviewed its content, they called the analyst and told him to retract the report and replace it with a "sales friendly piece." The analyst initially refused, because he felt the report represented what was happening in the market. The managing director of the auction desk then forwarded her complaint to her boss and to the senior research analyst. One particular email sent to persons in the Financial Products Group included the following, in all caps:

> *I HAD NOT SEEN THIS PIECE UNTIL JUST NOW AND IT MAY SINGLE HANDEDLY UNDERMINE THE AUCTION MARKET. IF YOU ARE GETTING ANY CALLS, PLEASE LET ME KNOW. I HAVE ASKED FOR AN IMMEDIATE CLARIFICATION TO BE PUBLISHED AND A RETRACTION OF THIS.*

The report was replaced with a piece endorsing ARS as a "buying opportunity for investors who are looking for short-term" investments. The offending analyst ran future reports past his superiors to ensure that they did not upset the auction desk.

On February 12, 2008, Merrill Lynch ceased supporting ARS program, allowing auctions to fail the following day. The firm had made approximately $90 million in profits from its auction rate program over the previous two years.

The avalanche of failures in February 2008 left investors stuck with billions in auction rate securities. Retail investors, charities, and small- to mid-size business could not get their cash out of their "cash equivalents." They felt the broker-dealers had breached their trust by stopping their support for the auction market.

New York Attorney General Andrew Cuomo stepped in to resolve the impasse. "Our goal has been to give investors relief from the collapse of the auction rate securities market," by making deals with investment banks to buy back the securities. Cuomo's jurisdiction comes from New York's Martin Act, a 1921 "blue-sky" law (a state securities law) that Cuomo's predecessors have used to bring actions against (and get settlements from) companies like Tyco, WorldCom, Qwest, and Citigroup. The Martin Act can be a "fierce sword in the hand of a zealous prosecutor" (McTamaney, 2003). Cuomo has gotten settlements requiring firms to fully reimburse all retail investors who sold their auction rate securities at a discount after the market failed; to consent to a special, public arbitration procedure to resolve claims of consequential damages suffered by retail investors as a result of not being able to access their funds; and to reimburse all refinancing fees to any New York State municipal issuers who issued auction rate securities since August 1, 2007. More directly, he has returned over $61 billion to investors of auction rate securities. “Not only are we returning liquidity to these investors, we are also restoring investors’ faith in their ability to invest with the assurance that authorities will protect their interests.” “The industry is now taking responsibility for correcting a problem they helped create, and we’ll continue to make all investors whole.”

William Galvin is making similar efforts, using his authority under state laws such as the Massachusetts Uniform Securities Act. For example, he has reached settlements with UBS, Merrill Lynch, Bank of America, and other underwriters and sellers of ARS to purchase their ARS back at par or to compensate investors who had already sold their securities at a discount. Firms have agreed to repurchase tens of billions of dollars’ worth of these securities from retail and other customers. Galvin has also made five important suggestions for improving regulation of institutions to prevent such a meltdown from happening in the future: (1) conflicts of interest need to be monitored more aggressively and, when appropriate, disclosed to investors; (2) financial advisor incentives need to be disclosed and training of financial advisors should be enhanced; (3) (supposedly) objective research reports need to be regulated more tightly; (4) regulators need to recognize that principals-based regulation is not effective to prevent scandals such as this one; and (5) state regulators, in conjunction with their federal counterparts, need to continue to be involved actively in enforcement actions.

Having introduced DARPS and the recent market drama surrounding it, we now describe how we incorporated its study into the investments project.

EXPLORING DARPS THROUGH THE INVESTMENTS PROJECT

Erickson (1999) describes the pedagogical benefits of bringing a finance course “alive” by using real data. (See also Faulk and Smolira, 2007.) It is common for investments instructors to accept this challenge by incorporating into their courses a data-driven experiential learning component, allowing students to explore portfolio construction. For example, Kalra and Weber (2004) outline a basic task-based investments project covering the standard metrics for a single stock. Other authors have shown how this simple structure can be enhanced: for example, Neumann (2008) describes a project motivated by the *Wall Street Journal’s* long-running dartboard contest, making the project more relevant and accessible; Girard, Pondillo, and Proctor (2005) demonstrate the incorporation of performance attribution analysis, perhaps making it more professionally practical. For more academically rigorous courses, Carter, Dare, and Elliott (2002) demonstrate the creation of an Excel-based spreadsheet to find mean-variance efficient portfolios; Johnson and Liu (2005) extend this procedure to allow for short sales. However, while these papers suggest a broad embrace of investments projects and real-world data, none of these exercises incorporates contemporary market events.

In our work, we extend the investments project to consider the DARPS-market meltdown of 2008. (See Livingston, 2005, for extensions to both the 9/11 attacks and the 2003 mutual fund scandal.) As with traditionally structured projects, our basic scope covers portfolio theory and efficient markets topics. The main changes for the DARPS inquiry were in the choices of assets, the subjects of the hypothesis tests, and the timing of the event study and beta stability tests. Table 1 outlines the scope of the project, including the DARPS additions.

Table 1: Overview of the DARPS Investments Project

I.	**CHARACTERISTICS OF SINGLE ASSETS**
	collect data
	calculate daily and weekly returns; arithmetic and geometric means (compare)
	calculate variances and standard deviations; coefficient of variation; skewness and kurtosis
	compare CP discount percentage summary statistics with CP BEY values
II.	**HYPOTHESIS TESTS**
	investigate the S&P's returns by day of week
	investigate autocorrelation by comparing S&P's daily and weekly variances
	tabulate and plot CP BEY, the actual DARPS rate, and the equilibrating DARPS rate against time (from Plesko)
	design an empirical test addressing either the DARPS/CP spread or the DARPS/LIBOR spread
III.	**COMOVEMENT AND PORTFOLIO BASICS**
	calculate covariances and correlations
	create and plot multiple 2-asset portfolios, both using actual correlation values and using assumed value of -1
	create an equally weighted portfolio; track it over the sample period; compare its summary statistics to earlier results
	create and plot multiple 3-asset portfolios; compare 2- and 3-asset cases, looking for dominance
	compare 1-, 2-, and 3-asset equally weighted portfolios; consider the potential benefits of naïve diversification
IV.	**THE CAPM**
	identify the risk-free asset; describe its comovement with all other assets
	plot the CML
	find covariances and correlations with M of various portfolios on the CML
	find asset betas using regression and cov(i,M)/var(M); compare results
	find published beta values and compare to calculated betas
	plot empirical SML; compare to theoretical
	decompose asset variances into systematic and unsystematic components
	compare actual covariances with estimates from Single Index Model
V.	**TESTING BETA STABILITY**
	run a t test on the null hypothesis that an asset's beta in the first subperiod equals that in the second subperiod
VI.	**TECHNICAL ANALYSIS**
	test for autocorrelation by regressing daily error terms on lagged errors
	test for autocorrelation by performing a runs test
	plot high-low-close charts for both subperiods; create a technical trading rule using the first subperiod; test in the second
	compare technical rule results to buy-and-hold
VII.	**EVENT STUDY**
	use a 2-day event period to perform an event study, testing for significant reaction to February, 2008 auction failures
VIII.	**PORTFOLIO MEASUREMENT TECHNIQUES**
	Find Sharpe ratio, M^2, Treynor measure, T^2, Jensen's alpha, and the information ratio for assets
	plot cumulative raw and adjusted returns for assets v. S&P
	determine length of abnormal performance required for statistical significance, using calculated alpha values
IX.	**OPTION PRICING**
	use natural logs of stock price relatives to estimate annual volatility
	use Black-Scholes model to determine call value; compare to actual call premium; explain any discrepancies

This table lists the basic elements of the investments project. The underlined steps are specific to the DARPS project, and demonstrate how current event considerations can be incorporated into the basic project framework.

Data

The traditional project format has students choose groups of stocks. However, we used four types of reference assets, all of which have been used in prior DARPS research: Treasuries, money market rates, a general market indicator, and SIFMA indexes. The market indicator was the S&P500, the standard benchmark used for beta calculation in the traditional investments project. (See, for example, Neumann, 2008.) Below, we briefly discuss the other assets and their use in earlier empirical work.

Winger *et al.* (1986) note that adjustable rate preferred (ARPS, the precursor to DARPS) is priced relative to the highest of three Treasury rates: the 91-day T-bill, the 10-year T-note, and the 20-year T-bond. We use all of these rates as benchmarks. Since we wanted to limit the number of series assigned to each student group, we tracked the longer assets only for various subsets of our full period. However, since T-bills are such common benchmarks for DARPS, we tracked them for the full period (see, for example, McConnell and Saretto, 2009, who used the 1-month bill, and Alderson, Brown, and Lummer, 1987, who use the 2-month).

While Treasuries were used to price ARPS, and are common general benchmarks in many other applications, commercial paper (CP) has traditionally been the standard reference asset for DARPS. As Alderson, Brown, and Lummer (1987) note, original DARPS collars were usually defined relative to contemporaneous AA commercial paper rates. For example, as discussed above, under the original 85% DRD/46% tax rate regime from the early 1980s, DARPS collars were often set at 110%/58% of the AA CP rate. (The 58% floor was set by equating the after-tax return on DARPS with the after-tax return on CP. We explain this calculation below, using equation (1).)

(A pedagogical note about commercial paper: CP is quoted on a discount basis, using a 360-day year. This discount data should be converted to a bond equivalent yield; see, for example, Alderson, Brown, and Lummer, 1987, footnote 7. The instructor may wish to have students examine the discount and BEY series to compare their relative variances and covariances with the other assets.)

Using CP as the common benchmark, researchers have examined both the potential tax benefits of DARPS and its changing risk premiums. In the earliest study, Alderson, Brown, and Lummer (1987) compare before- and after-tax yields on DARPS and CP to estimate the potential value to both the issuers and corporate investors from tax benefit sharing, finding that both sides gain. Plesko (2005) updates these findings, measuring the implicit tax on DARPS by comparing it to fully taxable CP. While he finds that the tax benefits of DARPS are still shared by the issuer and investor, they devolve heavily toward the issuer over time. One explanation for this shift is changing risk expectations about DARPS. For example, Alderson and Fraser (1993) cite risk to explain issuers' redemption decisions after the Tax Reform Act of 1986. Measuring cost as the ratio of the dividends rate over the contemporaneous AA CP yield, they find that higher-cost shares were more likely to be redeemed. They conclude that "much of the observed redemption activity can be explained by the exit of issuers that experienced declines in credit quality, making their shares unsuitable for the cash management clientele." Similarly, Winkler and Flanigan (1991) show that DARPS yields rise relative to commercial paper in unstable market conditions, concluding that DARPS therefore is not an acceptable substitute for money market assets.

While early auction-rate securities were tied to commercial paper, more recent issues have used a much wider variety of benchmarks, as have more recent empirical studies. For example, to investigate the allegation that investors were tricked into buying auction rate securities by broker/dealers selling them as "cash equivalents," McConnell and Saretto (2009) compare ARS to T-bills, 7-day certificates of deposit, and money market funds. We follow their lead, also using CDs (ours are one-month, as is our commercial paper), and three comparison funds/ETFs: SPDR Barclay's Capital 1-3 month Treasury bill fund (BIL; inception date 5/23/07), iShares Barclay's Short Treasury ETF (SHV; inception date 1/5/07), and PowerShares VRDP Tax Free Weekly Portfolio (PVI; inception date 11/15/07). (We covered only the ETF SHV for the full sample period, given the late inception dates for the other funds.)

For our auction-rate yields, we used the Securities Industry and Financial Market Association's (SIFMA) auction-rate preferred 7-day taxable index and the comparable tax-exempt index (using the latter primarily for comparison purposes). The SIFMA indexes are averages of the rates set at qualifying weekly auctions. Only securities whose resets are based on 7-, 28-, or 35-day auctions are used, and these assets must be public (private deals like 144A issues, or issues sold only to qualified institutional buyers or other accredited institutional investors, are excluded). These indexes are reported weekly. Students therefore had to create comparable weekly series from their daily money market data in some parts of the project. (This also meant that the number of observations for some of the hypothesis tests were very low, making them less powerful. This is one of the instances when our empirical methodology was sacrificed for project tractability.)

Having described the assets used in the DARPS version of the investments project, we now consider the new empirical tests, starting with the hypothesis tests.

Tests

The project has always included some hypothesis testing. Early on, we compare weekly returns and variances for the S&P500 to their daily counterparts, testing, for example, for autocorrelation. We also look for seasonalities in day-of-the-week returns, especially for Mondays: are Monday returns systematically different (i.e., worse) from those of other days, as French (1980) found? In the DARPS version of the project, we added an additional set of questions that had students apply these hypothesis-testing skills to updating several empirical DARPS results, both old and new.

The first of these questions was based on Plesko's (2005) study of the DARPS market. He has two main findings: that investors' share of the potential tax benefits of DARPS declines over time, and that the marginal tax rate implied by the relative yields of DARPS and commercial paper is lower than the maximum marginal corporate rate. The students were tasked with updating both of these findings using more recent data, including some surrounding the meltdown of 2008.

Plesko demonstrates his results in both graphical and tabular form, as the students must do. His Figure 1 demonstrates his first result by plotting the actual commercial paper and DARPS rates along with an equilibrating DARPS rate. The latter is the DARPS rate at which a corporate investor would be indifferent between DARPS and the CP. This theoretical lower bound for the DARPS rate is found as:

$$\text{equilibrating DARPS rate} = \frac{CP*(1-T)}{\left[1-T*(1-DRD)\right]}, \tag{1}$$

where DRD is the dividends received deduction, CP is the actual before-tax rate on AA commercial paper, and T is the maximum marginal corporate tax rate. (The right-hand side simply multiplies the CP rate by the relative tax burdens: CP is fully taxable, leaving the investor only CP*(1-T), while a corporate DARPS investor is only taxed on (1-DRD)% of her dividends.) The difference between the CP rate and the equilibrating DARPS rate represents the potential tax benefit to be shared between issuer and investor. A difference of zero, for example, would obtain if the marginal investor were tax exempt—he would suffer no tax liability from CP, and would receive no tax benefit from DARPS. Larger differences imply larger tax burdens for the marginal investor, as he becomes more willing to accept lower DARPS rates because of their tax benefits.

Plesko's plots show that the actual DARPS rates move closer to the implied lower bound over his sample period. He quantifies this migration toward the bottom with the "premium as share of yield difference"—that is, the amount by which the actual DARPS rate exceeds the lower bound, expressed as a proportion of the difference between the CP rate and the lower bound. As relative DARPS yields fell, so did this premium (falling from 43% in 1985 to 17% in 1992 and 24% in 1993). His interpretation of this decline is that issuers began taking a larger share of the potential tax benefits from DARPS, forcing investors to accept lower yields. This is the result that students updated in the project, by both recreating his graph and recalculating the relative premiums.

Plesko's second result is that actual relative yields imply marginal tax rates less than the maximum. He asks what marginal corporate tax rates are implied by the observed DARPS rates: that is, if the observed rates are interpreted as the lower boundary, what T is implied? If we substitute the actual DARPS rate for the implied equilibrating rate, we can see that the answer to this question involves simply a rearrangement of equation (1):

$$\text{equilibrating tax rate} = \frac{(actualDARPS - CP)}{[actualDARPS * (1 - DRD) - CP]}. \tag{2}$$

All else equal, the larger the share of tax benefits taken by issuers—the closer the actual DARPS rate gets to the lower boundary from (1)—the higher is this implied marginal tax rate. Investors facing higher taxes are more anxious for a tax shelter, and will accept lower DARPS yields.

(We can also use equation (2) to consider the implications of the DRD. As long as the actual DARPS rate is less than the CP rate, as was the case throughout Plesko's sample period, $\delta T/\delta DRD < 0$. As the DRD rises, the actual DARPS rate implies a lower equilibrating tax rate. A higher DRD means less of a tax burden; we would expect this to translate into lower acceptable DARPS rates. However, for a *given* difference between CP and DARPS rates, a higher DRD implies that the marginal investor is demanding a higher rate on DARPS despite the potentially large benefit from the DRD. He must be less able to capitalize on the DRD—because he faces a lower marginal tax rate, and is less driven by the search for a tax shelter.)

The second empirical question tackled by the students required them to design a test updating one of two historical DARPS findings: that in the late 1980s, the spread between DARPS and CP widened significantly when the market became less stable (Winkler and Flanigan, 1991); or that, during the 2008 crisis, the spread between auction rate securities and 1-month LIBOR "increased markedly" (D'Silva, Gregg, and Marshall, 2008).

The first result came from a time when DARPS was still the exclusive province of corporate investors. Winkler and Flanigan (1991) compare DARPS to CP (as do all papers from that period) to see if DARPS deserves its status as a cash equivalent. They find that DARPS had an 83-bp default premium over CP during stable market conditions, but that this premium increased to 192 bp in November 1987 after the October 19 market crash. (The default-premium increase for lower-rated DARPS was even larger.) They conclude that DARPS is "not an acceptable substitute for commercial paper during times of unsettled equity markets."

D'Silva, *et al.* (2008) study the more recent DARPS market meltdown of 2008. They compare their auction-rate indicator (the SIFMA index) to LIBOR, finding that LIBOR was 175 bp higher before the crisis, but that the "rates converged on January 9, 2008, and subsequently the average ARS rate exceeded the LIBOR—a historical anomaly."

As discussed in the next section, the students' updated results were quite different from some of these historical findings, underscoring the dramatic shift in the auction-rate market over the last few years.

SAMPLE OF PROJECT RESULTS

As noted above, our investments project has always included beta stability tests and an event study. In this section, we will first briefly review the students' work on these issues for the DARPS project. We then will discuss more fully their updates of the empirical literature just described.

In the beta stability tests, students compare the betas for their assets, and for an equally weighted portfolio of their assets, over two different periods. (These tests are motivated by Blume, 1971.) We assigned student groups to subperiods that they covered throughout the project. (All groups covered January and February, 2008, plus either January/February 2007, August/September 2008, or September/October

2008.) As expected, the students found that the portfolio's betas were relatively stable over their two subperiods; the test statistics for these t-tests were usually low in absolute value, and never were significant. However, there were some interesting findings elsewhere in our sample. For example, the T-bill series was fairly volatile: an abnormally large 6% return on September 18, 2008 caused the series' beta to be over 6 for the subperiod (although still not different enough from the earlier subperiod to be statistically significant). The nontaxable SIFMA index also exhibited high variability in 2008. Its beta was over 3 for the early part of the year, but negative in the fall. While this was not statistically significant (our tests had few observations, and therefore low power), it is suggestive, especially since the taxable index was relatively stable, with betas close to 1. The nontaxable index would pick up the very high penalty yields suffered by many municipal issuers, some of whose issues did not even have rate caps. (Issues backed by tax revenue were deemed able to avoid default without the added assurance of rate caps. While these issues' rates may now be very high, their auctions have not failed in nearly the numbers of their rate-capped counterparts. See CFS, 2008.) On the other hand, the taxable index—comprised in part of closed-end funds' issues, which often benefitted from low, fixed penalty rates—would remain relatively stable, despite auction failures. (See McConnell and Saretto, 2009.)

In the event study, students evaluated the performance of their SIFMA indexes around February 12, 2008, the day that the market truly melted down. (67% of the auction rate securities' auctions—258 of 386—failed on the 12th, followed by 87% on the 14th, and 66% on the 20th; Committee for Financial Services, 2008; Plancich and Starykh, 2008.) Students performed a traditional event study, following Partch (1987). They did not find significant results, despite the tremendous disruption in the market. There are several possible explanations. First is our small sample size: we only had up to eight weekly observations for our estimation periods, so that our tests were not powerful. In addition, as noted above, the penalty rates for the taxable issues were often not that different from the rates set at auction, so we would not expect a significant result for the taxable SIFMA index.

Having described the results from the parts of the project that we use every year, we now turn to the sections specific to the DARPS version. The students' updates of Plesko's (2005) results and their self-designed empirical tests provided the most interesting outcomes from this application. We now discuss these findings. Quotations come directly from the students' reports.

As described above, Plesko's results revolved around the tax benefits of DARPS to corporate investors—the dividends received deduction. The asset yields during his sample period reflected this tax differential, with CP > actual DARPS > implied lower bound for DARPS. However, when our students updated these relationships using data from 2007 and 2008, they found something very different (but consistent with the "historical anomaly" described by D'Silva, *et al.* in 2008): the CP rates for all subperiods were always lower than the actual DARPS rates. (See Figure 1.) "In Plesko's results, the CP rate maintains a premium of anywhere between 67 and 193 basis points above the DARPS rate. In our results, the DARPS rate maintains a premium over the CP rate of anywhere between 188-150 basis points." They explained their results by noting that "the DARPS auctions [were] starting to fail and having to reset the yield at over 100% of the commercial paper yield." (For example, for the SIFMA nontaxable average, "the actual DARPS rate went from 2.7% to 5% to 12.05% in the span of three consecutive weeks in September of 2008.")

This reversal of relative yields, of course, led to vastly different results than Plesko's for the equilibrating tax rates and yield spread premiums. Since the actual DARPS rates are higher than the CP rates, Plesko's "premium" (the difference between the actual and implied DARPS rates) is greater than the difference between CP and the lower bound—making the "premium as a share of yield difference" (i.e., $\frac{actualDARPS - lowerbound}{CP - lowerbound}$) no longer fractional, but greater than 1 (100%). (In fact, much greater than 1 in some cases: no values were less than 2, and there was one observation of 20.7.) Equivalently, given the higher DARPS rates, all of the "equilibrating tax rates" (from equation (2)) were *negative*. "A NEGATIVE equilibrating tax rate—what does that even mean?!" "There are almost no data points where the equilibrating tax rate makes any sense at all." Then, addressing their own observations: "This leads us to believe that the DARPS market was being propped up with absurdly high yields," "making the investor much better off during our observation period." (Of course, while their yields were higher, investors were now stuck with their DARPS; the higher yields were partial compensation for the complete loss of liquidity during this period.)

Figure 1: The students Updated Plesko's (2005) Results About the Relationship between DARPS and Commercial Paper (CP).

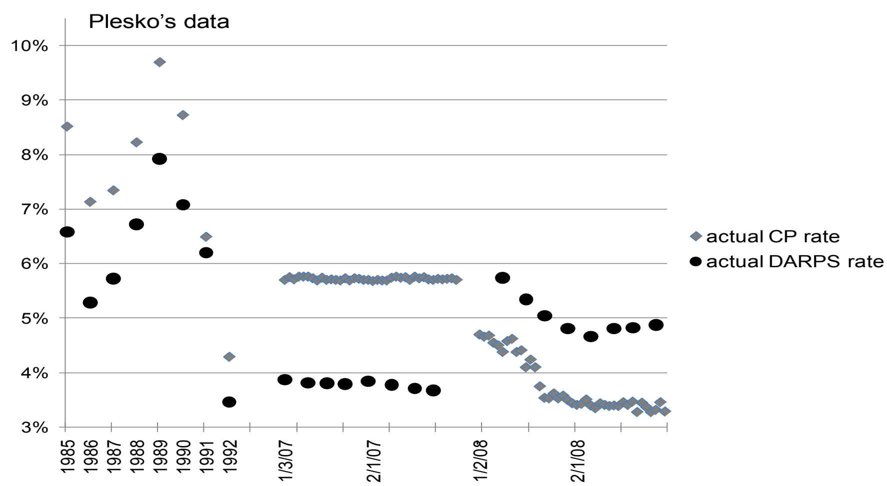

Figure 1. The students updated Plesko's (2005) results about the relationship between DARPS and commercial paper (CP). While Plesko's data shows the traditional relationship—DARPS is less than CP, as illustrated in the far left section of the graph—the students found that this relationship reversed during 2008 (the far right section of the graph). This reversal meant that our 2008 values for "premium as share of yield difference" were much greater than 100%, while our equilibrating tax rates were negative.

The second empirical addition to the project required students to design a test updating either Winkler and Flanigan's (1991) finding on the DARPS/CP spread or of D'Silva *et al.*'s (2008) on the DARPS/LIBOR spread. One group chose the former, regressing the DARPS rate on the equilibrating DARPS rate from equation (1) for both the January-February and September-October, 2008 subperiods. For the earlier period, which encompasses the initial wave of auction failures, their model's R^2 was 0.85, so that the realized commercial paper and DARPS rates were highly correlated. However, this relationship evaporated in the fall (p-value = .242). Interpreting the latter period as "more unsettled," this student group pronounced their results consistent with Winkler and Flanigan's.

The rest of the teams chose to update the more recent DARPS/LIBOR result. One group tested the null hypothesis that the SIFMA and LIBOR values were equal against the alternative that SIFMA was larger. (Note again that, historically, SIFMA would be smaller.) They used both the tax-exempt and taxable SIFMA indexes over the January-February and September-October, 2008 periods. While they failed to reject the null for the tax-exempt issues, they did so for both subperiods using the taxable index ($p < .001$ for both tests). Another team created a spread variable (SIFMA – LIBOR, again recognizing that the traditional relationship had reversed), then tested the null that this variable's behavior during a 2007 base period was the same as that during the meltdown in winter, 2008. They found that the spread was significantly larger in 2008, changing from a mean value of -0.0154 to 0.7073. They attributed this behavior to the increased relative default risk of DARPS, noting that the relationship changed coincident with the auction failures of mid-February, 2008. Graphing the SIFMA and LIBOR series over 2008, they note that "[t]he LIBOR rate remains relatively unchanged until September, when the risk in the financial system translated in to [a] higher LIBOR rate. Note that even at the peak return (and probably perceived risk) of LIBOR in September, the [DARPS] were considered exponentially more risky."

PROGRAM ASSESSMENT

To gauge students' impressions of the DARPS application, we conducted a student-only focus group after the completion of all relevant parts of the project. We explored a number of questions, including: Did the project enhance students' understanding of DARPS beyond what had been learned in Financial Markets (for those who have taken that preceding course)? Did students learn anything about asset classes by incorporating DARPS into their project work? Did studying DARPS enhance their understanding of investment vehicles or did it hinder their ability to internalize investments/portfolio concepts? How was their experience working with real data, and with the assigned asset classes? Would they have been more engaged working with a stock of their choosing? What impressions did the event study analysis of the February 2008 auction failures leave? We report our findings in this section.

Overall, the students thought that the project did not enhance their understanding of Dutch Auction Rate Preferred Stock. They felt instead that the project was a basic overview of how assets move and how risk is determined, not an in-depth study of DARPS in particular or of the other assets with which they were working. They were especially confused about the SIFMA indexes and their construction, and about how to interpret their quoted yields. Thus, instructors who wish to attempt an application like this should devote adequate class time to its motivation. Our investments class is designed to be the second course in a senior-level sequence—a quantitative follow-up to the qualitative fall-semester course in financial markets. We discuss DARPS at length in the markets course, with special emphasis on its use during the 1980s (the period for which it was designed). In investments, we provided the readings from the earlier course for background reading, and we spent one class day reviewing DARPS. In addition, as part of the project, students were required to write a description of the methodology behind the SIFMA indexes. However, this motivation was insufficient; students still had questions about the DARPS application. While we did have some new students in the investments course (students who had not taken financial markets), that alone probably does not explain the residual confusion about DARPS. Students in the focus group thought that having a presentation and a question and answer session (and actually reading the background papers) may have helped them internalize the meaning of the DARPS data.

Students did identify some beneficial aspects of incorporating DARPS into the investments project. For example, they felt it increased their understanding of how assets are securitized, how they are employed in different environments, and how they continue to be used even when the environment changes. Additionally, this project gave them perspective on financial innovation, and on Wall Street's creation of assets for specific purposes. This exposure allowed the students to make newly informed inferences and judgments about financial institutions and their incentive-based behavior.

In general, the students were also glad to have had exposure to real data, in addition to the theoretical concepts that are taught in class. Specifically, students noticed that the application ensured thoughtful consideration of results, given that real data is messy and unexpected results occur. Students reported that they learned the most from two specific parts of the project: the event study and the updating of Plesko's results and graphs. We received the most positive feedback about analyzing the event of February 12, 2008 and on the graphing the compared yields of commercial paper and DARPS.

Overall, while the students did not feel that incorporating DARPS into the project hindered their ability to internalize investment and portfolio concepts, neither did they feel that it gave them a better understanding of the mechanics of different investment vehicles. They also doubted that they would encounter DARPS in the real world. They would have preferred to have been able to analyze a stock of their choosing.

CONCLUSIONS

Incorporating a data-based Excel project in the investments course allows students to get practical, hands-on experience. However, most projects focus exclusively on applications of textbook concepts, missing the potential enrichment that comes from incorporating current events. In this paper, we describe our experience integrating the project with a study of the 2008 meltdown of the DARPS market. Using assets employed throughout the DARPS literature, our project had students evaluate the relative performance of DARPS and money-market comparison assets; update prior studies' empirical results, such as Plesko's (2005) result that more of the potential tax benefits of DARPS were accruing to issuers; test DARPS' beta's stability over various periods from 2007 through the fall of 2008; and perform an event study test around the onset of systemic auction failures in February, 2008. These practical, timely applications give special context to students' study of investments. Their completed project will also be a unique "deliverable" to showcase for potential employers.

Instructors who attempt an application like this should be prepared to motivate the extension thoroughly early on. Using real data presents challenges that students will be more willing to negotiate if they are more "bought in." Throughout the semester, frequent writing assignments requiring students to address their empirical work and to reflect on the broader implications might enhance student engagement. Encouraging students to describe the project to potential employers also should allow them to take more ownership of it. From the feedback that the instructor has received from earlier project applications (addressing the 2001 terrorist attacks and the 2003 mutual fund scandals), we believe that student appreciation of such an application grows over time, as they compare their experience to those of their future coworkers. Studying an asset—even one as apparently arcane as DARPS—does enhance student outcomes from the investments course, as long as the instructor is willing to devote the requisite time to developing the necessary context.

REFERENCES

Alderson, Michael J., Keith C. Brown, and Scott L. Lummer (1987) "Dutch Auction Rate Preferred Stock," *Financial Management*, vol. 16(2), Summer, p. 68-73

Alderson, Michael J. and Donald R. Fraser (1993) "Financial Innovations and Excesses Revisited: The Case of Auction Rate Preferred Stock," *Financial Management*, vol. 22(2), Summer, p. 61-75

Blume, Marshall (1971) "On the Assessment of Risk," *Journal of Finance*, vol. 26(1), March, p. 1-10

Carter, David A., William H. Dare, and William B. Elliott (2002) "Determination of Mean-Variance Efficient Portfolios Using an Electronic Spreadsheet," *Journal of Financial Education*, vol. 28, Fall/Winter, p. 63-78

Committee on Financial Services (U.S. House of Representatives), "Auction Rate Securities Market: A Review of Problems and Potential Resolutions," Serial No. 110-140, September 18, 2008

Cuomo, Andrew (2008a) *Attorney General Cuomo Announces Settlement with UBS to Recover Billions for Investors in Auction Rate Securities (8/8/08)*. Retrieved July 1, 2010 from Office of the Attorney General—State of New York: www.oag.state.ny.us/media_center/media_center.html

Cuomo, Andrew (2008b) *Attorney General Cuomo Brings Martin Act Fraud Case against Charles Schwab & Co. for Fraudulent Sales of Auction Rate Securities (8/17/08)*. Retrieved July 1, 2010 from

Office of the Attorney General—State of New York:
ww.oag.state.ny.us/media_center/media_center.html

Cuomo, Andrew (2008c) *Attorney General Cuomo Announces Release of Assurances of Discontinuance in Auction Rate Securities Settlements with Citigroup and UBS (12/11/08)*. Retrieved July 1, 2010 from Office of the Attorney General—State of New York:
ww.oag.state.ny.us/media_center/media_center.html

D'Silva, Adrian, Haley Gregg, and David Marshall (2008 "Explaining the Decline in the Auction Rate Securities Market," *Chicago Fed Letter*, Number 256, November 2008

Erickson, Suzanne (1999) "Bringing the Introductory Finance Course to Life," *Journal of Financial Education*, vol. 25(2), Spring, p. 75-81

Faulk, Gregory K. and Joseph C. Smolira (2007) "Implementing a Comprehensive team Project in an Introductory Finance Class," *Journal of Financial Education*, vol. 33, Fall, p. 74-87

French, Kenneth (1980) "Stock Returns and the Weekend Effect," *Journal of Financial Economics*, vol. 8(1), March, p. 55-69

Girard, Eric, Anthony Pondillo, and Richard Proctor (2005) "Conducting Performance Attribution Analysis in the Classroom Using Real Market Data," *Journal of Financial Education*, vol. 31, Fall, p. 57-76

Johnson, Larry J. and Yaru G. Liu (2005) "An Excel-Based Method to Determine Investible Mean-Variance Efficiency Portfolios with Short Sales," *Journal of Financial Education*, vol. 31, Winter, p. 89-99

Kalra, Rajiv and Marsha Weber (2004) "A Comprehensive Stock Analysis Project For The First Course In Investments," *Journal of Financial Education*, vol. 30, Summer, pp. 44-55

Livingston, Lynda (2005) "Using Current Events to Enhance Student Interest in the Investments Project" *Advances in Financial Education*, vol. 3, Fall, p. 89-105

McConnell, John J. and Alessio Saretto (2009) "Auction Failures and the Market for Auction Rate Securities," working paper, April

McTamaney, Robert A. (2003) "New York's Martin Act: Expanding Enforcement in an Era of Federal Securities Act," *Legal Backgrounder*, vol. 18(5), February 28

Neumann, John J. (2008) "Integrating Market Statistics, Institutional Features and Theory: An Experiential Approach to Teaching Investments," *Journal of Financial Education*, vol. 34, Fall, p. 112-136

Partch, M. M. (1987) "The Creation of a Class of Limited Voting Common Stock and Shareholder Wealth," *Journal of Financial Economics*, vol. 18(2), p. 313-339

Plancich, Stephanie and Svetlana Starykh (2008) "2008 Trends in Securities Class Actions," NERA Economic Consulting, December

Plesko, George A. (2005) "Tax Effects in the Market for Auction Rate Preferred Stock," working paper, MIT Sloan School of Management

Winger, B.J., C.R. Chen, J.D. Martin, and S.C. Hayden (1986) "Adjustable Rate Preferred Stock," *Financial Management*, vol. 15(1), Spring, p. 48-57

Winkler, Daniel T. and George B. Flanigan (1991) "Default Risk Premia in the Near-Cash Investment Market: The Case of Auction Rate Preferred Stock Versus Commercial Paper," *The Journal of Financial Research*, vol. 14(4), Winter, p. 337-343

BIOGRAPHY

Lynda S. Livingston is Professor of Finance at the University of Puget Sound. School of Business and Leadership, 1500 North Warner #1032, Tacoma WA, 98416. llivingston@ups.edu

Amy Kast is a recent graduate of the University of Puget Sound, where she majored in Business and Leadership with minors in Economics and Mathematics. She is currently working at Dodge and Cox in San Francisco. akast@pugetsound.edu

Kyle Benson is currently a senior at the University of Puget Sound, pursuing a Bachelor of Arts in Business with an emphasis in finance. kbenson@pugetsound.edu