

ACTUARIAL METHODS FOR VALUING ILLIQUID ASSETS

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Section I INTRODUCTION

In summer 2010, the Joint Risk Management Section of the CAS/CIA/SOA and the SOA Committee on Finance Research issued a Request for Proposals – Actuarial Methods for Valuing Illiquid Assets (RFP). The RFP specified at least two components for the research, a literature review and a case study. In July 2010, a proposal was submitted by Doug Andrews, the Principal Investigator (PI) on behalf of the University. In September 2010, the University's proposal was accepted by the organizing bodies. This report is the final report regarding the research performed.

The valuation of illiquid assets is a vast topic, which is very much in a state of development. Based on comments made by investment professionals during the preparation of the proposal, this is a very challenging area of research. Generally, the investment industry will look with great interest on the outcome of this research.

The research proposal was restricted in two ways. The literature review was focussed on the valuation of private placement debt (PPD) and real estate. The case study was limited to analyzing valuation methods with respect to PPD.

There were a number of reasons for these restrictions. First, in order to limit the scope of the project to one that can be conducted within a time frame and for a budget in the amount typically awarded by the organizing bodies for such research. Second, in order to increase the relevance of the research to the membership of the organizing bodies, the project focussed on assets that are held by many pension funds and insurance companies. Third, there is significant information on these asset classes, available through private sources, so that a meaningful case study could be conducted. Fourth, although there is not agreement on a single valuation model for these asset classes, there are some common approaches, which will facilitate the performance of the case study, unlike asset classes such as private equity and infrastructure, which often involve proprietary models that would make difficult the elicitation of information.

This report has been organized as follows. The remainder of this Section presents the background regarding this research. Section II reviews the literature with respect to valuation methods for illiquid assets relevant to PPD and real estate. Section III describes how a case study was conducted and the results of that case study. Section IV concludes, provides some guidelines for consideration in the development of professional standards, and suggests additional areas for further research.

Objectives

The objectives of this research project are listed below. This research was conducted with respect to PPD and real estate, to a limited extent, as agreed by the PI and the organizing bodies.

1. To identify and review relevant literature with respect to the valuation of illiquid assets in the agreed classes.

2. To develop a case study examining the effectiveness of an actuarial valuation method for PPD.
3. To propose guidelines that could be used by the organizing and other professional bodies in developing professional standards regarding the valuation of illiquid assets.
4. To produce a report summarizing this research that could be published by the organizing bodies.

Outline of Approach

There are many classes of assets that may be illiquid on a valuation date. Moreover, assets may be illiquid for a variety of reasons. For example, private equity, infrastructure and timber investments are typically long-term investments intended to be held for a long period of time, for which a market (bid-offer prices) is not typically available. Alternatively, there may be a market in a comparable product, although the extent of comparability is debatable. For example, real estate, PPD, asset-backed securities and other over-the-counter agreements incorporating securities or commodities that may be valued but which involve credit risk.

The valuation of illiquid assets falls into three broad classifications. For thinly or rarely traded assets for which there are quoted prices in active markets, the standard approach (referred to as Level 1) to valuing such assets is to use quoted prices. This is an area in which the benefit of research for the SOA membership is limited. Valuation of illiquid assets is particularly interesting where either a Level 2 or Level 3 approach is used. Level 2 uses inputs other than quoted prices within Level 1 that are observable for the asset either directly or indirectly. Level 3 uses unobservable inputs for the assets. Although, the classification by Level is straightforward, the valuation approach in Levels 2 and 3 is anything but straightforward. It is these valuation techniques, for the asset classes specified, that are the subject of this research.

This project involved the following elements:

- Search and review of relevant literature
- Interviews with investment practitioners in Canada, the United States (US) and the United Kingdom (UK)
- Construction of a case study using historical data to estimate the effectiveness of various asset valuation methods
- Discussions with the POG, appointed by the organizing bodies, regarding the on-going research, particular areas of interest, and the findings
- Preparation of a report

A significant challenge in performing this research was the obtaining of relevant data in order to conduct a case study. During the project, discussions were held with the SOA Private Placement Committee to see if its work could be coordinated with this project or if the participant companies in its studies could be approached to provide data. The SOA Private Placement Committee focuses on valuation in the event of a credit event whereas this research focuses on valuation on an on-going basis. After discussion, it was decided that there was not a feasible way for the SOA Private Placement Committee to work with this project. Ultimately, it was determined that data with respect to PPD could be purchased from the Private Placement Monitor (PPM). As this data is predominantly with respect to PPD in the United States, the case study only pertains to the United States.

Section II LITERATURE REVIEW

The majority of the literature is from this century. Given the strong bull market in publicly listed equities throughout the 1990s had ended, this may reflect an increased interest in less liquid assets as a source of additional return. The literature review focussed on papers related to the PPD and real estate asset classes. It was completed in early 2011. The literature reviewed may be divided into three broad classifications: valuation, premium determination, and theoretical. The papers in the valuation classification present guidance with respect to valuation of illiquid assets. The papers in the classification of premium determination present the results of empirical studies regarding the illiquidity premium. The papers in the classification of theoretical present valuation methods that might be used, without reference to actual data, or derive factors to be considered in a complete theory of illiquid asset valuation.

Valuation

1. CIA Committee on Pension Plan Financial Reporting (2007) provides guidance with respect to asset valuation for pension plans, and specifies that:
For a going concern valuation, the value of the assets may be any of
 - their market value,
 - their market value adjusted to moderate its volatility,
 - the present value of their cash flows after the calculation date, and
 - their value assuming a constant rate of return to maturity in the case of illiquid assets with fixed redemption values.

2. Crow and Harms (2008) is a PowerPoint presentation of fair value accounting under SFAS 157. There are three levels on input quality within the fair value hierarchy. Level 1 inputs are direct (unadjusted) quoted prices from an active market for identical assets. Level 2 inputs are quoted prices for similar assets using observable data such as interest rates and yield curves. Level 3 inputs are unobservable inputs not derived from the market. Common Level 3 inputs include: cash flow forecasts for private companies; default probabilities and loss severities for private placement debt and asset-backed securities; growth expectations based on revenue or earnings; required returns on illiquid assets; anticipated holding periods for illiquid assets.

For assets measured under SFAS 157 the disclosure requirements include the level within the fair value hierarchy in which fair value measurement in their entirety fall and the valuation techniques used to measure fair value. For measurements using significant Level 3 inputs the following must be disclosed: beginning balance; total gains or losses (both realized and unrealized); purchases and sales of assets; transfers in and out of Level 3. Within the Global Investment Performance Standards hierarchy, the first choice for valuation is market transactions, next market-based multiples, and finally discounted expected future cash flows.

The following best practices for valuing illiquid portfolio assets are stated: recognize that valuation matters; disclose the valuation process and conclusions; designate a member of senior management to be responsible for oversight of the valuation process; document

valuation procedures to follow; create contemporaneous and consistent documentation of valuation conclusions and rationale; solicit relevant input from professionals; check your math.

3. In a short article, Gillman states that the typical method for valuing residential real estate is comparable sales but states that the following method should be used for valuing income producing real estate. Determine the capitalization rate for real estate in the area, which is the rate of return expected by investors. Next calculate gross income, deduct all expenses other than loan payments, and then divide by the capitalization rate. A third method, not mentioned by this author, is the cost approach.
4. Michailetz et al. (2007) state that it proposes a technique for determining values-in-exchange for illiquid assets. It uses the discounted cash flow (DCF) method. It focuses on the determination of the discount rate over multiple periods. The formula for the DCF is the following:
$$PV = \sum [NOI_k / \prod (1 + r(i))] + [S_{res} / \prod (1 + r(i))]$$
Where in the first term, NOI_k is the Net Operating Income in year k , \sum is summed from 1 to n using an index of k , \prod is multiplied from 1 to k using an index of i , and $r(i)$ is the discount rate in year i . Where in the second term, S_{res} is the residual value at time n , \prod is multiplied from 1 to n using an index of i , and $r(i)$ is the discount rate in year i .

The paper discusses how discount rates should be established, from the buyers' and the sellers' viewpoints. The discount rate is interpreted as being the rate of return available on alternative investments.

The paper goes on to show how various methods used in valuation can be derived from the generalized formula, by making certain simplifying assumptions. Specifically the paper refers to the Gordon Formula, Inwood Framework, Hoskold Formula and the Ring Formula.

Premium Determination

5. Amihud and Mendelson (1991) begin from the premise that in equilibrium, the expected returns on capital assets are increasing functions of both risk and illiquidity. Illiquidity costs can be separated into the following distinct components: bid-ask spread; market impact costs; delay and search costs; direct transaction costs. The cost of illiquidity constitutes a relatively small fraction of the assets' prices, but has relatively large effects on their values. It is the present value of illiquidity costs that constitutes the effect of illiquidity on asset prices.

The authors develop an equilibrium model that shows how asset prices depend on their liquidity when rational investors consider transaction costs amortized over their investment horizons. Assets are characterized by their transaction costs and investors are characterized by their holding periods. The main finding is that, in equilibrium, the lower the liquidity of an asset, the lower its price. The effects of illiquidity costs are stronger, the more liquid the asset. Transaction costs are incurred more frequently for liquid assets; accordingly, liquid assets have higher present values (and lower returns) than those of less liquid assets.

Using a sample that included 37 randomly selected days between April and November of 1987, the authors examined differences in liquidity and yields between U.S. Treasury

bills and notes with maturities less than six months. They found an average yield differential between notes and bills of 0.43 per cent per annum, with a standard error of 0.021 per cent. They developed an equation that says the yield difference between notes and bills increases with the reciprocal of the time to maturity and that the yield differential is smaller the greater the coupon rate on the note. They also examine stock returns. The authors observe that a decline in asset liquidity should bring about a decline in asset prices and use the stock market crash of October 1987 as an example. The authors argue that the benefits of liquidity make it profitable to buy illiquid financial claims and transform them into liquid ones, by securitization, thus generating value.

6. Elton and Green (1997) examine daily data from intra-dealer government bond brokers for the period June 17, 1991 through September 29, 1995 for tax and liquidity effects. The authors use two approaches to create cash flow matching portfolios of similar securities and look for pricing discrepancies associated with liquidity or tax effects. They find evidence of tax timing options and liquidity effects. However, the effects are much smaller than previously reported. The effects of liquidity are primarily due to high volume bonds with long maturities, being approximately 13 basis points more than for low volume bonds.
7. Kempf and Uhrig-Homburg (2000) acknowledge that empirical studies suggest that the (risk-adjusted) average return of an asset increases with its illiquidity. This paper contributes to the literature by analysing the impact of liquidity on bond prices for the German bond market. The paper assumes perfect, frictionless, arbitrage-free markets in which securities trade in continuous time. The authors find that on average, the illiquid bonds trade at a significant discount of DM 0.40 per DM 100 nominal value and that the discounts tend to increase with the bonds' maturity, i.e., the smallest discount is obtained for the maturity segment between zero and one year and the maximum discount is obtained for the segment between nine and ten years.
8. Koziol and Sauerbier (2003) present an option-theoretical approach applicable to quantifying liquidity spreads of bonds. The authors assume that an illiquid bond is tradeable only on a certain set of dates during its lifetime. The benefits of liquidity are identified as exotic interest rate option payoffs, with the difference of the option prices being the illiquidity discount. After valuing these look-back options in a framework with interest rate uncertainty, this approach yields liquidity spreads for bonds that cannot be traded continuously. The liquidity spreads show plausible properties: they are humped-shaped functions of the maturity and increase with the interest rate volatility. Liquidity spreads depend on the distribution of possible trading dates but are independent of the short rate.

The authors present an empirical analysis, comparing German government securities to German Jumbo Pfandbriefe market data, which are considered the less liquid asset. Pfandbriefe are straight bonds that are backed by mortgages or loans to the public sector. The institutional design of the Pfandbriefe bonds makes them very comparable to German Government bonds regarding their interest rate and credit risk. The authors find several parallels between theoretical and empirical liquidity spreads.

9. Riddough et al. (2005) examine investment performance of commercial real estate over a 1980 – 1998 sample period and finds an annual return difference of over three percentage points remains in favour of public market asset ownership. Three potential explanations

for this gap are provided. First, not all of the important risk factors have been identified, including liquidity and asset location. Second, the sample period may not be representative of investment performance fundamentals. Third, public market ownership of commercial real estate assets may simply be more efficient than private ownership.

Theoretical

10. The paper by Childs et al. (2002) is directly applicable to real estate assets but could be applied to other noisy assets. Examples of noisy contingent claims in a real estate setting include the valuation and exercise of proprietary development options in untested local real estate markets, strategic interaction among developers when investment outcomes are a public good, the exercise of leasing options, and the exercise of default options on debt that is securitized by property.

In another paper these authors developed a theory for valuing claims on noisy assets when noise is mean reverting. A major difference between the two papers is that the other paper showed how to optimally value a noisy real estate asset using current and historical information, whereas this paper examines contingent-claims pricing, which is explicitly forward-looking.

This paper shows that revealed variance, which is the total variance of the time-filtered value as measured over a specified time interval, is bounded from above by the total information in the system. A noisy asset's forward value is simply its expected value conditioned on the current value estimate. The value and exercise policy for an option on a noisy real asset are shown to depend critically on the revealed variance. Discretionary option exercise also depends on the rate of information arrival.

11. Longstaff (2001) examines the situation when investors face liquidity constraints. A fundamental assumption underlying the traditional inter-temporal portfolio choice paradigm and standard option pricing theory is that securities can be traded continuously in unlimited amounts.

The existence of liquidity constraints on trading is a subtle form of market incompleteness that exposes investors to additional risks not present in the traditional portfolio choice problem. The paper shows that the investor's optimal strategy with respect to assets that have liquidity constraints is to trade as much as possible, whenever possible. This finding contrasts with the optimal strategy for an investor facing transaction costs but no liquidity constraints who trades only when large changes in value occur. Because the investor facing liquidity constraints can trade only at a limited rate, he has less control over the support of his wealth distribution.

An important implication of this is that the investor endogenously acts as if facing borrowing and short-selling constraints, even though these constraints are not imposed. Despite this cautious behaviour, the investor may choose to hold more of the risky asset than would be optimal in the absence of liquidity constraints. The paper shows that the discount for illiquidity can be substantial, particularly for assets that are traditionally margined or leveraged, such as stock, partnership interests, derivatives, and hedge-fund holdings.

12. Longstaff (2005) studies the asset-pricing implications of illiquidity in a two-asset exchange economy with heterogeneous agents. It presents examples in which a liquid asset can be worth up to 25 per cent more than an illiquid asset even though both have identical cash flow dynamics. The paper finds that there is a breakdown in the usual risk-return relation stemming from the extreme polarization of the agents' portfolios.

The paper makes four key points about asset pricing and illiquidity. First, illiquidity affects optimal portfolio choice profoundly. Second, the type of illiquidity considered can have first-order effects on equilibrium asset prices. Third, the value of a liquid asset can be greater than the simple present value of its cash flows. Thus, in asset pricing, it is not directly the dividend cash flows that matter, but rather the consumption stream that asset ownership generates. Fourth, differences in patience across investors can have major asset-pricing effects.

13. Koren and Szeidl (2001) investigate the portfolio allocation decisions of an investor with infinite horizon when available financial assets differ in their degrees of liquidity. Using a model with risk neutral agents, the authors calculate the liquidity premium. Based on their calculations and the calibration of their model, they conclude that reasonable parameter values imply a liquidity premium of 1.7% for the risk neutral case on a hypothetical asset with an infinite dividend stream.
14. Peng (2001) provides a discussion regarding a number of methods of estimating the returns of an illiquid asset portfolio. The Repeat Sales Regression (RSR) estimates the time series returns using observed transaction prices for a subset of assets. A variation on this approach is the Arithmetic Repeat Sales (ARS) estimator. Some other methods use both transaction data and data of asset characteristics such as "hedonic repeated measures".

This paper proposes a method based on the generalized method of moments (GMM). The mathematical model for returns specifies that the expected return is dependent on common factors that affect all asset values and a set of characteristics of the specific asset at the specific time. Common factors for all assets could be macroeconomic variables such as the risk-free interest rate, inflation rate, unemployment rate, etc. Asset characteristics could be location and square-feet of floor space for houses; P/E ratio, B/M ratio, capitalization for equities; bond maturity, rating, coupon rate for bonds.

The author observes that a desirable property of the estimators calculated is that when all assets are frequently traded, the estimators are averages of the individual asset returns, which are the actual portfolio returns. This model provides estimates for all unobserved prices. The paper does not use any actual data but uses a simulation procedure to compare the various methods mentioned.

15. Roll et al. (2007) begin with the observation that finance scholars have long recognized that deviations from no-arbitrage relations are related to the frictions associated with transacting, in particular illiquidity indicators such as the bid-ask spread. Financial market liquidity may play a key role in moving prices to an appropriate level, where the futures-cash basis is zero. A wide basis may trigger arbitrage trading, which may, in turn, affect liquidity.

The paper looks for both long-term and short-term horizon (daily) time series relations between the basis and liquidity. The principal liquidity indicators used are the quoted and effective bid-ask spreads. The authors conclude that over the lifetime of a futures contract, the basis mean-reverts faster when the market is more liquid and that liquidity shocks forecast future shifts in the long-term basis. These results suggest that illiquidity impedes the movement of futures and cash market prices toward the frictionless ideal of a zero basis.

16. Shleifer and Vishny (1992) analyze what prices non-redeployable assets fetch in asset sales or liquidations relative to their value in best use. The difference between price and value in best use is referred to as asset illiquidity. When firms have trouble meeting debt payments and sell assets or are liquidated, the highest valuation potential buyers of these assets are likely to be other firms in the industry. But these firms are themselves likely to have trouble meeting their debt payments at the time assets are put up for sale as long as the shock that causes the seller's distress is industry-wide or economy-wide. When they themselves are hurting, these industry buyers are unlikely to be able to raise funds to buy the distressed firms' assets. This implies that forced liquidations can have significant private costs to the asset seller as well as significant social costs to the extent that assets do not end up owned by the highest value user. This implies that liquidated assets are under-priced in recessions and therefore that asset illiquidity is a potentially important cost of leverage.

Section III CASE STUDY

It is difficult to construct a case study with respect to the valuation of illiquid assets. Because by their nature illiquid assets are traded infrequently, there is uncertainty regarding their market value in between trade dates. For this case study, a publicly traded debt (PTD) security, which had very similar characteristics to a PPD security, was selected and the annualized difference in coupon yield was calculated. The success of this approach depends on the elimination of all other sources of the difference in yield other than illiquidity. The PTD and PPD securities were matched on all of the following characteristics: credit rating, term to maturity, coupon frequency, coupon type, call provision, and tax treatment.

The case study was designed to answer the following questions.

- Is there an illiquidity premium? And if so
- What is its magnitude?
- Does it remain constant over time?
- If not, does it maintain a discernable structure?

Data Gathering and Compilation

Data with respect to PPD in the United States issued in the years 2005 – 2010 was purchased from the PPM. There were approximately 1100 PPD transactions per year, including corporate bonds, municipal bonds, U.S. Treasuries, prior to filtration. Data with respect to PTD in the United States issued in the years 2005 – 2010 was extracted from the Thomson Reuters database to which the University of Southampton has purchased access using the Datastream software. There were approximately 2000 PTD transactions per year, including corporate bonds, municipal bonds, U.S. Treasuries, prior to filtration. Because the volume of data on PTD was significantly larger than that available on PPD, the data on PPD was used as the basis to which the PTD data would be filtered and matched. Due to the significant volume of PTD data available there was a significant data management exercise to select PTD that could be matched to comparable PPD. The PPD debt had been rated using Standard and Poor's classifications and the PTD had been rated using Moody's classifications. It was assumed that Standard and Poor's BBB rating corresponded exactly to Moody's Baa rating.

The matching and filtering process applied the following comparisons:

- Credit rating – Securities not rated were eliminated. Securities rated below BBB were excluded as they were less likely to be considered investments suitable for insurance companies and pension funds, which is the primary interest of SOA members. The credit ratings for comparison were A and BBB;
- Term to maturity in years;
- Frequency and type of coupon – only securities with semi-annual fixed coupons were considered;
- Call provision – securities with a call provision were eliminated as this could impact the pricing and would make the matching more difficult;
- Issue date by calendar year, with a further comparison within six month intervals, i.e., January – June and July – December;
- Non-municipal issues. The coupon payments on municipal debt are non-taxable and as such may appeal to different types of investors depending on their own tax status and so the illiquidity premium may not be the only differential in pricing.

Because all debt in the filtered comparison was issued at par with semi-annual coupons, the method of comparison was to calculate the ratio of the coupon rates of the comparable PPD to the PTD and then to annualize to determine the additional annual premium from the PPD, i.e., the illiquidity premium.

After all of the filtering, there were only meaningful amounts of data for non-municipal BBB rated debt with term to maturity of 10 years. There were some useful amounts of data for certain time periods for taxable A rated debt with term to maturity of 10 years. The number of comparisons by time period is shown in the following table.

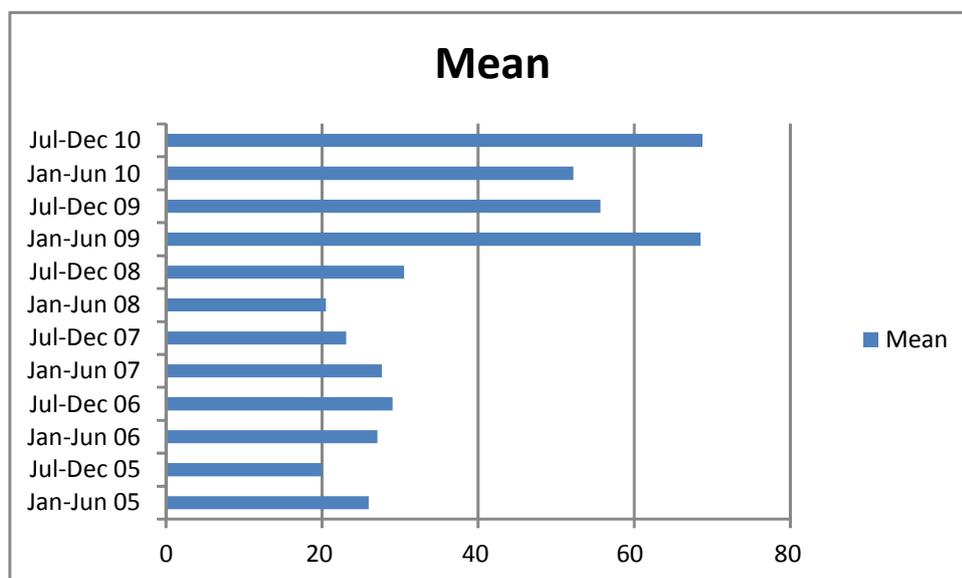
Table 1: Filtered Comparisons of Debt of 10 Years to Maturity

Year	A Rated	BBB Rated
2005	4	11
2006	3	9
2007	1	6
2008	5	8
2009	2	3
2010	1	6

Analysis

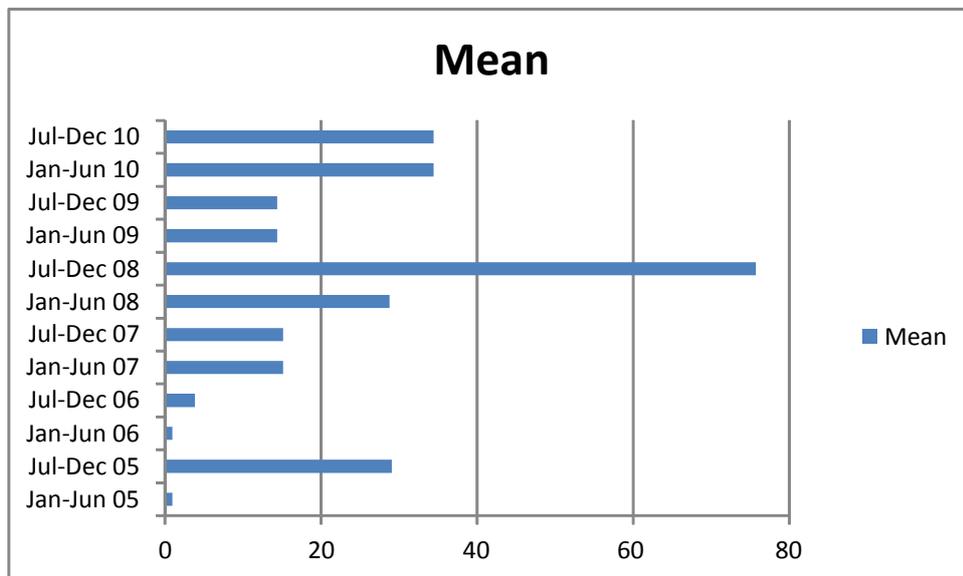
The analysis of the data showed that there was an illiquidity premium. The mean illiquidity premium was calculated for all years keeping the data separate by credit rating. From an observation of the data it was evident that the illiquidity premium increased significantly post 2008 compared to pre 2008, undoubtedly as a result of the financial crisis and the resulting liquidity squeeze. Therefore the illiquidity premium is not constant. The table below for BBB rated debt of 10 years to maturity illustrates this change.

Table 2: Mean Illiquidity Premium for BBB Rated Debt of 10 Years to Maturity (in basis points)



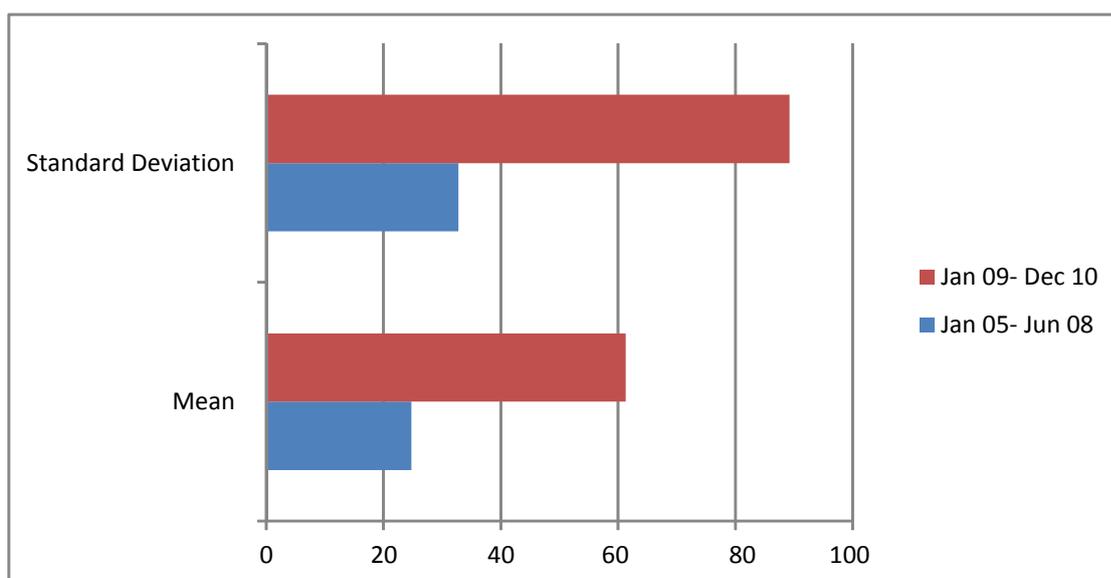
The data for non-municipal A rated debt of 10 years to maturity are not sufficient to draw statistically significant conclusions, but they do show that the illiquidity premium increased during the period July – December 2008. See Table 3.

Table 3: Mean Illiquidity Premium for A Rated Debt of 10 Years to Maturity (in basis points)



It was decided to analyze the data on non-municipal BBB rated debt of 10 years to maturity by excluding the data for the period July – December 2008 and in two separate groups: up to June 2008; after December 2008. The following table shows the mean and standard deviations calculated for these two groups.

Table 4: Further Analysis of Illiquidity Premium of BBB Rated Debt (in basis points)



The numerical values corresponding to Tables 3 and 4 summarized with respect to the periods January 2005 to June 2008 and January 2009 to December 2010 are shown in Tables 5 and 6 below.

Table 5: A Rated Debt Numerical Values (in basis points)

Period	Mean	Standard Deviation
Jan. 2005 – Jun. 2008	14	20
Jan. 2009 – Dec. 2010	21	34

Table 6: BBB Rated Debt Numerical Values (in basis points)

Period	Mean	Standard Deviation
Jan. 2005 – Jun. 2008	25	33
Jan. 2009 – Dec. 2010	61	89

From this analysis it may be concluded that for non-municipal BBB rated debt of 10 years to maturity that the illiquidity premium increased post 2008 compared to the period to June 2008. 2008 is well recognized as a period of significant economic and financial turbulence, which included severe disruptions in credit and debt markets. Therefore the illiquidity premium is not constant and does vary depending on other economic or market circumstances.

In order to determine if the illiquidity premium varies by term to maturity, the following analysis was performed. The values in Tables 5 and 6 were used to create 95% confidence intervals. The confidence intervals were constructed for A and BBB debt separately. The illiquidity premiums calculated on 20 year and 30 year maturities, separated by credit rating, were examined to see if they lay within the confidence interval. There were very few comparisons but each one lay within the confidence interval.

This suggests that the illiquidity premium does not vary by maturity. More research would be required to confirm this result, but if it were confirmed then this would make the analysis even more robust.

Section IV

CONCLUSIONS AND FURTHER RESEARCH

As shown in the previous two sections, this research has contributed to the body of knowledge regarding the valuation of illiquid assets, in the following ways:

1. It has documented the significant contributions to the English literature through 2010 with respect to the valuation of illiquid debt and real estate and has classified these contributions by valuation, premium determination, and theoretical.
2. It developed a case study for PPD in the United States for the period 2005 – 2010, which showed that for non-municipal BBB rated debt with 10 years to maturity that:
 - There is an illiquidity premium for PPD.
 - The illiquidity premium is not constant over time but appears to be affected by economic and market conditions.
 - When the data for July 2008 – December 2008 are excluded from the analysis, which was an extremely turbulent time for global financial markets and included credit disruptions, the illiquidity premium is relatively stable in the period 2005 – June 2008 and relatively stable in the period January 2009 – 2010 but at a higher level.
 - The mean and standard deviation of the illiquidity premium for the period January 2005 – June 2008 were 25 and 33 basis points respectively and for the period January 2009 – December 2010 were 61 and 89 basis points respectively.
3. Although there was insufficient data to draw a statistically significant conclusion, the analysis suggests that the same illiquidity premiums calculated for non-municipal debt with 10 years to maturity that apply by credit rating, i.e., considering A rated and BBB rated debt separately, may be able to be used for the analysis of non-municipal debt with 20 and 30 years to maturity, with the comparable credit rating.

Professional Guidance

A further objective of this research was to propose guidelines that could be used by the SOA and other professional bodies in developing professional standards regarding the valuation of illiquid assets. In this section some guidelines, derived from the research, are proposed. The responsibility for the development of professional standards rests with the professional bodies themselves, and is beyond the scope of this project.

In the development of professional standards, the guidance from the CIA Committee on Pension Plan Financial Reporting (2007), the presentation from Crow and Harms (2008), and any other existing professional guidance, such as SFAS 157, should be considered. Crow and Harms (2008) provides a partial list of sources providing guidance on valuation. Some of the points in the Crow and Harms (2008) presentation that are worth noting specifically are the following:

- Valuation matters and should be undertaken rigorously at regular intervals.
- The valuation process and conclusions should be disclosed.
- A member of the senior management team should be responsible for oversight of the valuation process.
- The valuation procedures to be followed should be documented.

- Contemporaneous and consistent documentation of the valuation conclusions and rationale should be created.
- Relevant input should be solicited from professionals, e.g., professionals in investment or audit.

This research project shows that the illiquidity premium is not constant over time and may be affected by economic and market conditions. These results suggest the following considerations when developing professional standards.

- Consider the periods in respect of which the valuation is being conducted, and any associated information regarding economic and market conditions.
- Regularly update the valuation and the data on which it is based and increase the frequency of updating during periods of economic or market turbulence.
- Since valuations will be in respect of potential cash flows in future periods, there will necessarily be uncertainty regarding the result. In such situations, it is advisable to include some margin of conservatism. Whether such a margin should be incorporated directly in the valuation or indirectly as a general allowance, should be determined by the appropriate professional body.

Further Research

The valuation of illiquid assets is a vast subject, which is very much in a state of development. This research has produced meaningful quantitative results with respect to non-municipal BBB rated debt of 10 year maturity in the United States in respect of the period 2005 – 2010. There are many other illiquid assets, which the membership of the organizing bodies may be asked to value, such as real estate, private equity, infrastructure, hedge funds. Further research regarding valuation methods for any or all of those asset classes would be of interest.

Given that this research project concluded that the illiquidity premium was relatively stable within different time periods, and observed that the illiquidity premium was likely affected by economic and market conditions and that the quantitative results might be applicable with respect to other terms to maturity, the following research might be undertaken with respect to PPD.

- Research with respect to non-municipal BBB rated debt of various terms to maturity.
- Research with respect to non-municipal debt other than BBB rated.
- Research to develop a methodology to value municipal debt.
- Research with respect to other countries.

The organizing bodies may wish to determine from their membership if there is sufficient interest in the establishment of a committee to conduct a study of all or some of the foregoing, using inter-company data.

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