ALVAREZ & MARSAL READINGS IN QUANTITATIVE RISK MANAGEMENT

CECL and the Present Value of Troubled Debt

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INTRODUCTION

The new accounting standard for Current Expected Credit Loss (CECL) is coming into force in January 2018 and will require significant changes for many banks and other institutional investors who own troubled debt. In particular, it requires that loan losses be estimated over the remaining life of the debt and not just over the immediate future or the next year.

This new standard has been set by the Financial Accounting Standards Board (FASB). It requires investors in a debt asset to establish provisions and reserves depending on that asset's expected losses, even if the borrower or issuer has not defaulted. This differs significantly from today's accounting standard, which requires increasing loan loss reserves only when it becomes highly probable that a loss is imminent and only if the amount of that loss can be reasonably estimated.

At its core, then, CECL concerns the forecasting of future streams of revenue on a debt instrument, determining if those cash flows will take place as planned and how any interruption impacts the value of the instrument. If the principal and interest are paid in full and as planned, then the loan or bond will be worth its intrinsic (par) value. If a default stops or delays payments of interest or principal, then the value of the instrument will be worth less than par.

As a result, CECL means that holders of debt will have to forecast these defaults and losses, using methodologies that many of them do not use today. Four methodologies for forecasting default are prominent:

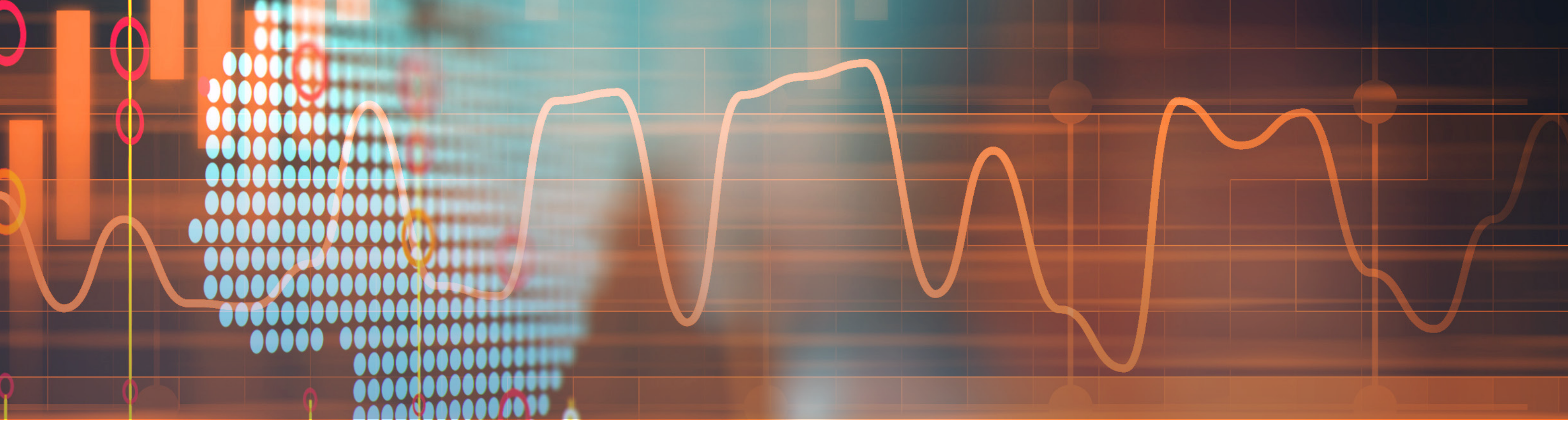
- Methods based on Probability of Default (PD) and Loss Given Default (LGD), such as internal ratings models, Basel models, and stress testing models;
- Methods based on loss rates, using average charge-offs, static pool analysis and vintage analysis;
- Migration analysis or roll-rate methods;
- Discounted cash flow analysis.

This paper examines the discounted cash flow methodology and some limitations of this widely-accepted approach to valuing financial assets.

THE TIME VALUE OF MONEY AND ITS IMPORTANCE TO CECL

One of the most effective ways to measure the value of a future stream of revenue is through present value (PV) calculations. The PV of future revenues represents the discounting of those revenues to reflect the time value of money, according to the investor's target rate of return.

[1] A previous issue of Readings in Quantitative Risk Management explored some of the methodological implications of modeling PD for CECL.



That is, a dollar earned in the near term has more value to the investor than a dollar earned in the more distant future since the investor will realize the utility (value) of the dollar sooner. The value of the future dollar is less due to the erosion caused by inflation and due to the delay in realizing the value. A dollar in the investor's hand today is worth its maximum value.

In one sense, quantifying loan impairment under CECL is an exercise in estimating future cash flows on loans, bonds or other credit instruments, as they may be interrupted by defaults and prepayments. Specifically, the PV of a stream of repayments on a bond will be equal to the sum of the face value of the bond if those repayments are discounted at the bond's coupon rate. Should those repayments be interrupted, both the aggregate repayments will be reduced and, typically, their present values will change, often dramatically.

We will address two types of interruptions to future cash flows on bonds and loans that are relevant to CECL:

1. prepayment by the borrower that interrupts and reduces contractual interest payments and accelerates repayment of principal and
2. default by the borrower that interrupts and reduces contractual interest payments and typically reduces the principal repaid by the borrower.

Absent these interruptions, the value of a loan or bond is the sum of the interest and principal payment (noting that the initial outlay of principal – the amount loaned – is expressed as a negative). In present value terms, the stream of interest and principal payments is worth the par value of the instrument (e.g., 100 cents on the dollar) if the stream of future cash flows is discounted at the same rate as the interest payments.

(In this paper, we ignore the subject of reinvestment risk, which typically is very important for prepayments when the investor receives his principal back early, often in a market with lower interest rates than the coupon on the prepaid instrument. CECL does not address reinvestment risk and we believe that including a treatment in reinvestment risk unnecessarily complicates the central message of this paper).

PREPAYMENT AND PRESENT VALUE

A loan or bond that repays in full will yield a PV that is equal to its face, or par, value if the future revenues on the bond (interest and payments) are discounted at the same interest rate at which interest payments are made. If the future cash flows are discounted at a rate lower than that on which interest payments are made, the PV will be greater than the par value. Conversely, if the discount rate is greater than the contractual interest rate, then the PV will be less than the par value. In fact, the PV will vary geometrically across the range of discount rates.

In Table 1, we show the example of a $100 million bond that has a 12-year contractual maturity and that pays a 5 percent annual interest rate. Principal is repaid in the final year.

If the bond issuer pays all interest and principal as agreed upon contractually, the bond investors receive a total of $60 million of interest payments and the repayment of the original $100 million. The PV of those cash flows will vary with the discount rate used. If the discount rate is the same 5 percent at which interest payments are made, then the bond's PV is the $100 million par value (Table 1).

Table 1

Present Value of a $100 Million Bond of 12 Years Maturity and 5 Percent Interest Rate
All Interest and Principal Payments Made in Full
Valued at a Range of Discount Rates

Discount Rate	Present Value
2.00%	$131,726,024
4.00%	$109,385,074
5.00%	$100,000,000
6.00%	$91,616,156
8.00%	$77,391,766
10.00%	$65,931,541
12.00%	$56,639,380
14.00%	$49,057,371
16.00%	$37,688,077

If the discount rate is 2 percent, then the bond is worth $131.7 million in PV terms, and if the discount rate is 12 percent, then the PV is $56.6 million.

Repayment of outstanding debt prior to the contractual maturity date is known as prepayment or early refinancing. Prepayment is a case in which the investor receives all of his original principal and loses only those interest payments originally scheduled to be paid but are not once the outstanding debt is repaid.

In nominal terms, the investor suffers a loss – that is, the unpaid interest – and he also faces reinvestment risk or the risk that his investment principle will earn a lower rate of return. As noted earlier, since reinvestment risk is not considered in CECL, we ignore it in this paper.

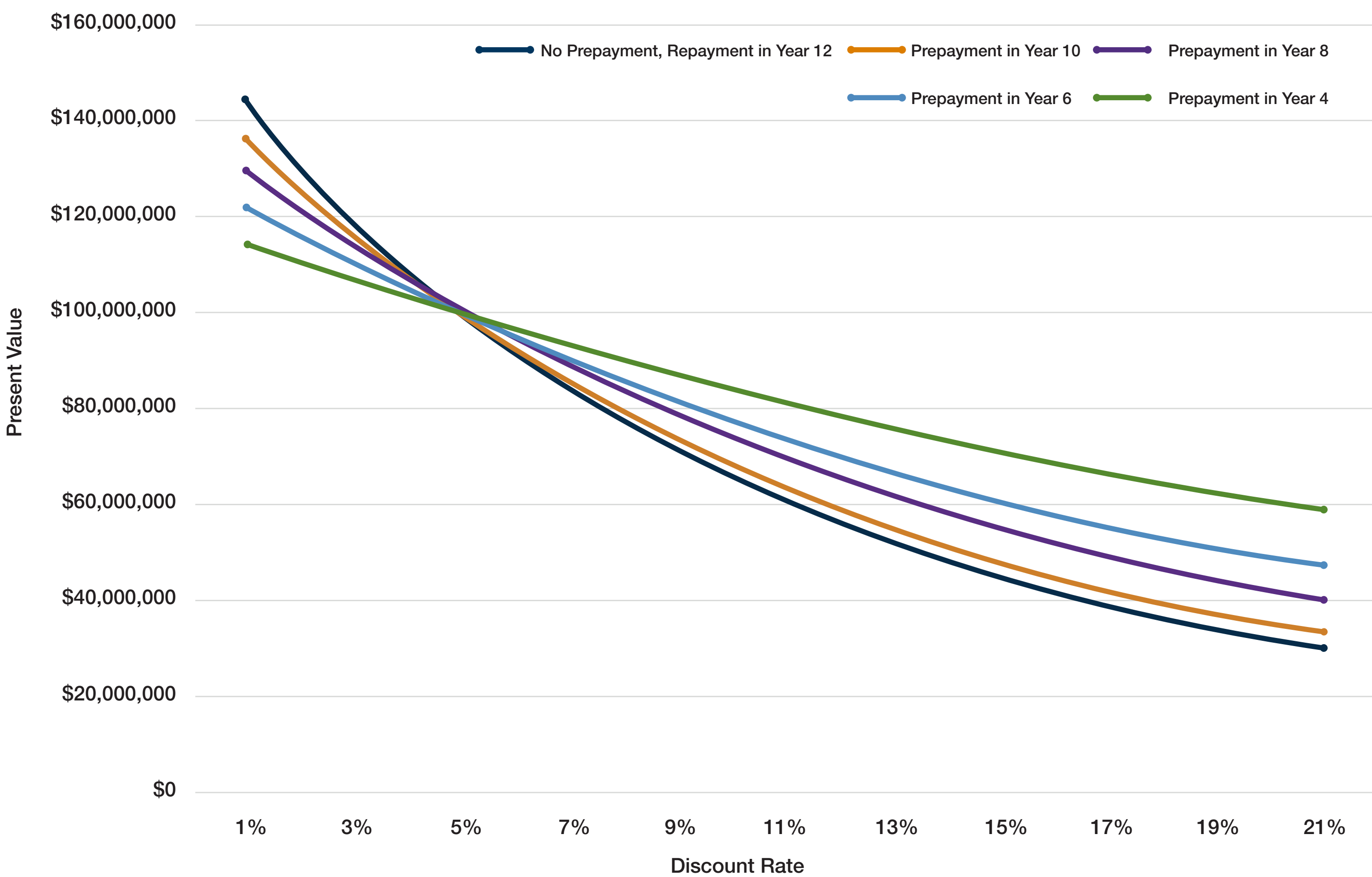
However, the investor does not lose in present value terms. If the loan or bond is retired early by repayment of the outstanding principal and the final interest payment with no periods in which payments are zero, the PV is equal to the par value of the debt regardless of the timing of early repayment. In Figure 1, we show the patterns of PV for the $100 million 12-year, 5 percent bond in which the bond is subject to various assumptions about early refinancing. If the cash flows are discounted at the same 5 percent rate on which interest payments are made, then the bond's PV is always equal to its par value (in this case, $100 million).

As expected, if these cash flows are discounted at rates different from the contractual interest rate, then the PVs are different from the par value. In the case of discount rates less than the contractual

Figure 1

Present Value of Cash Flows

$100,000,000 Bond Valued with Different Discount Rates
12-Year Contractual Maturity and 5 Percent Coupon



interest rate, the PV is greater than the par value (Figure 1) and the timing of repayment matters since that timing impacts the amount of interest paid to the investor. PVs are greatest for prepayments that come relatively late (i.e., close to the contractual maturity date) and PVs are lowest for those repayments that come relatively early.

In the cases in which the discount rates are greater than the contractual interest rate, the opposite result is true: PVs are greatest for prepayments that occur relatively early and they are lowest for prepayments that occur later (Figure 1).

It is important to note that just because the issuer repays principal early, the PV doesn't necessarily have to be less than the par value. However, as we will see with default and loss, PV is highly sensitive to the timing of default and recovery as well as to the level of recovery. This sensitivity poses significant challenges for CECL.

DEFAULT AND PRESENT VALUE

If cash flows on a debt instrument are interrupted by the default of the borrower, both the nominal total of the future cash flows will be less than expected under the terms of the debt agreement and the PV will be less than the par value of the instrument. Unlike prepayment in which there are no periods in which cash flows are zero, defaults create exactly such situations and it may be some time after the event of default when the lender or investor receives principal payments.

In Table 2, we show the PV estimates of the future income stream of our $100 million unsecured bond with a 12-year contractual maturity that pays investors 5 percent annual interest. We use a discount rate of 5 percent to calculate the PV and we assume (for

Table 2

Present Value of Repayments on a $100 Million Bond of 12-Years Maturity and 5 Percent Coupon Rate
Subject to Different Assumptions About the Timing of Default
Discount Rate is 5 Percent

Scenario	Present Value of Repayment
No Default, Repayment in Full	$100,00,000
Default in Year 10, 50% Recovery in Year 12	$63,280,979
Default in Year 8, 50% Recovery in Year 10	$59,627,530
Default in Year 6, 50% Recovery in Year 8	$55,489,351
Default in Year 4, 50% Recovery in Year 6	$50,927,010
Default in Year 4, 50% Recovery in Year 8	$47,458,208
Default in Year 4, 50% Recovery in Year 10	$44,311,903
Default in Year 4, 50% Recovery in Year 12	$41,458,111

Table 3

Present Value of Repayments on a $100 Million Bond of 12-Years Maturity and 5 Percent Coupon Rate
Subject to Different Assumptions About the Timing of Default and Recovery
As Well As the Level of Recovery. Discount Rate is 5 Percent.

Scenario	Present Value of Repayment
No Default, Repayment in Full	$100,00,000
Default in Year 10, 85% Recovery in Year 12	$82,870,289
Default in Year 10, 65% Recovery in Year 12	$71,733,541
Default in Year 10, 50% Recovery in Year 12	$63,380,979
Default in Year 6, 50% Recovery in Year 8	$55,489,351
Default in Year 6, 65% Recovery in Year 8	$65,641,942
Default in Year 6, 85% Recovery in Year 8	$79,178,729
Default in Year 6, 100% Recovery in Year 8	$89,331,320

consistency with CECL) that cash flows are not reinvested. This bond has a "bullet" maturity in which the principal is repaid in the last period (year 12) and the investor receives 5 percent annual interest payments in year one through 12.

In the case labeled "No Default, Repayment in Full," all contractual cash flows are paid by the bond issuer and received by the investors in the bond. As expected, the PV is equal to the face value of the bond.

We also show various cases of default for this bond, ranging from a default in year 10 to a default in year four. We also assume that the bond is unsecured and recovery is 50 percent of the principal which is a typical recovery amount for unsecured bonds.

Table 2 shows that the PV is very sensitive to the timing of the default: the earlier the default occurs, the lower the PV. This result is directly attributable to the lost interest revenue that occurs with a default – the earlier the default occurs, the more interest revenue is lost. Timing of default matters to PV and this conclusion is important to the use of present value methodologies in CECL. This approach to quantifying CECL must rely on accurate estimation of the timing of default.

The PV on a defaulted bond is less sensitive to the timing of the recovery (Table 3). By holding the time of default constant and varying the timing of recovery, we can see that delays in the constant 50 percent recovery reduces the present value of the bond's cash flows. Nevertheless, the timing of recovery is less important to cash flow PV than timing of default.

The significance of recoveries to PV estimation lies in their size (Table 3). As the investor recovers more of the face value of the debt, the greater is the PV. This conclusion also is important to the PV approach to CECL.

These conclusions are apparent in Figure 2 as well. Here, we graph the PV of future cash flows on the $100,000,000 bond subject to varying dates of default and dates of recovery (with the amount of recovery held constant at $50,000,000). For example, if we hold the year of recovery constant (e.g. at year 10), we can see that the difference in PV is approximately $28 million across the displayed range of years of default (year two to year nine). In contrast, the difference in PV is only $16 million when we examine a comparable range of years (seven) of recovery (e.g., default in year two).

What are the implications of these findings for using PV methodologies to estimate the value of future cash flows for CECL? The following findings stand out:

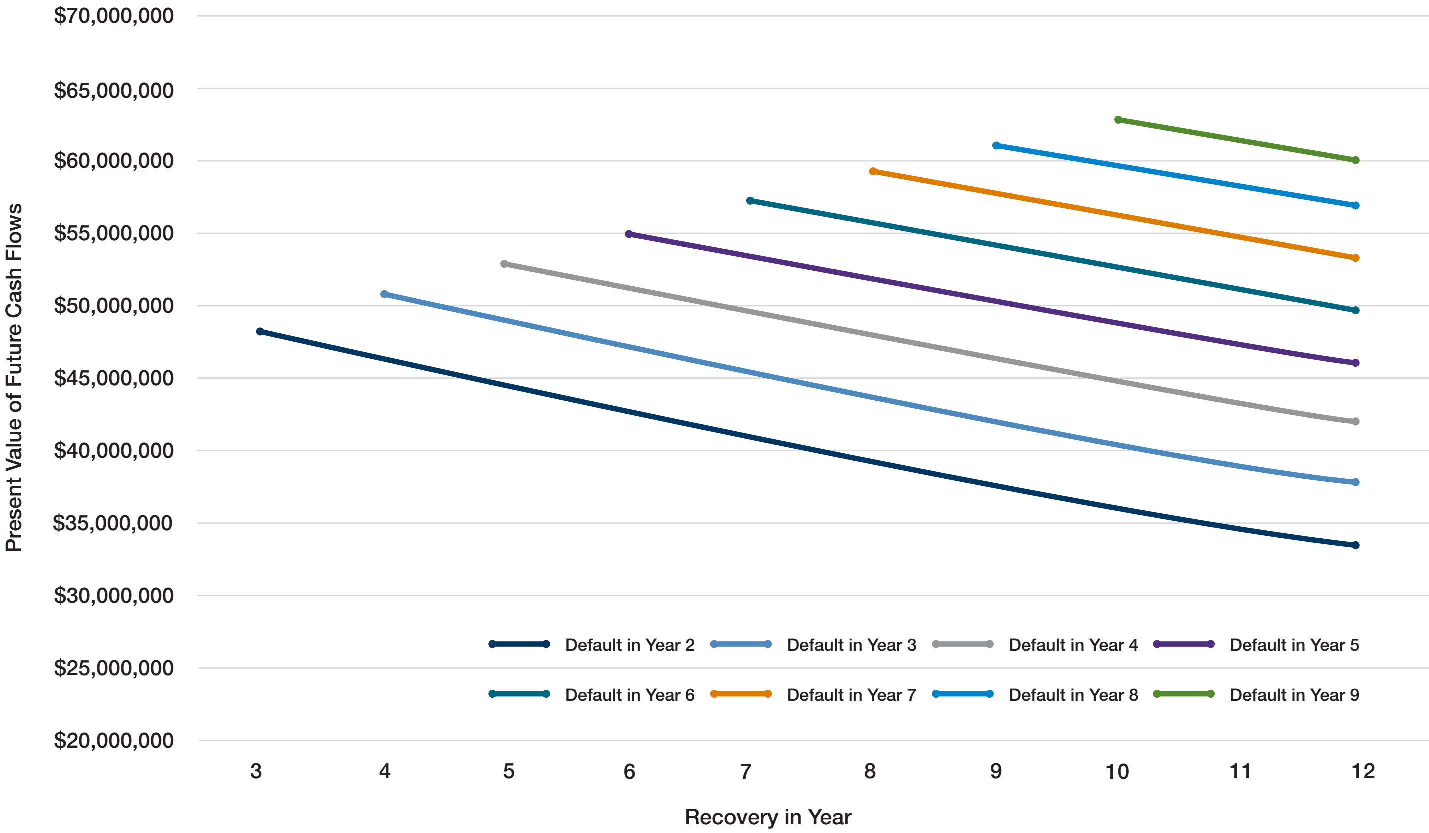
1. Estimating the timing of default is critical to the valuation of a defaulted bond or loan. A debt instrument that experiences default later in its contractual life of a debt instrument will have a greater PV than one that experiences an earlier default, all other factors being equal.
2. Estimating both the timing and magnitude of recoveries is also critical to the valuation of the defaulted loan or bond. Larger recoveries are worth more to the PV of the defaulted debt instrument than smaller ones, and recoveries that occur later in default contribute less to the PV than equal-sized recoveries that occur earlier.

However, it is not a simple matter to estimate the timing of default. As we demonstrated in our last issue of Readings in Quantitative Risk Management, modeling the probability of default within one period is a difficult exercise. In particular, modeling the actual date of default is an especially difficult task since the FASB also requires that various scenarios of the U.S. macroeconomy be considered.

Figure 2

Present Value of Cash Flows

Defaulted $100,000,000 Bond with $50,000,000 Recovery
At Varying Times of Default and Recovery



It may be an easier exercise to predict the size of recoveries on a defaulted loan or bond since there is extensive literature on the level of recoveries on defaulted debt. Predicting the timing and level of recovery is also facilitated by these studies of historical defaults. For loans, recoveries through sales of assets that are collateral generally take place soon after default and the PV on the loan is enhanced by this quick action.

Moreover, the adoption of a CECL methodology that relies on the prediction of default and loss represents a shift to an expected loss methodology (probability of default times loss given default) that is outside of the scope of this paper.

AN ALTERNATIVE TO PREDICTING DEFAULT AND LOSS

Nevertheless, sensitivity of PV estimates to the timing of major events makes this methodology difficult to implement for CECL.

One potential way around this is to embed the probability of default (PD) and loss given default (otherwise known as the inverse of the recovery rate, or LGD) into the discount rate. That is, estimate the default- and loss-adjusted PV not by adjusted cash flows as we have done in the preceding examples but to estimate the risk-adjusted discount rate. To do so, one takes the contractual coupon on the bond or loan and adds the expected loss (EL) and unexpected loss (UL) associated with the PD and LGD.

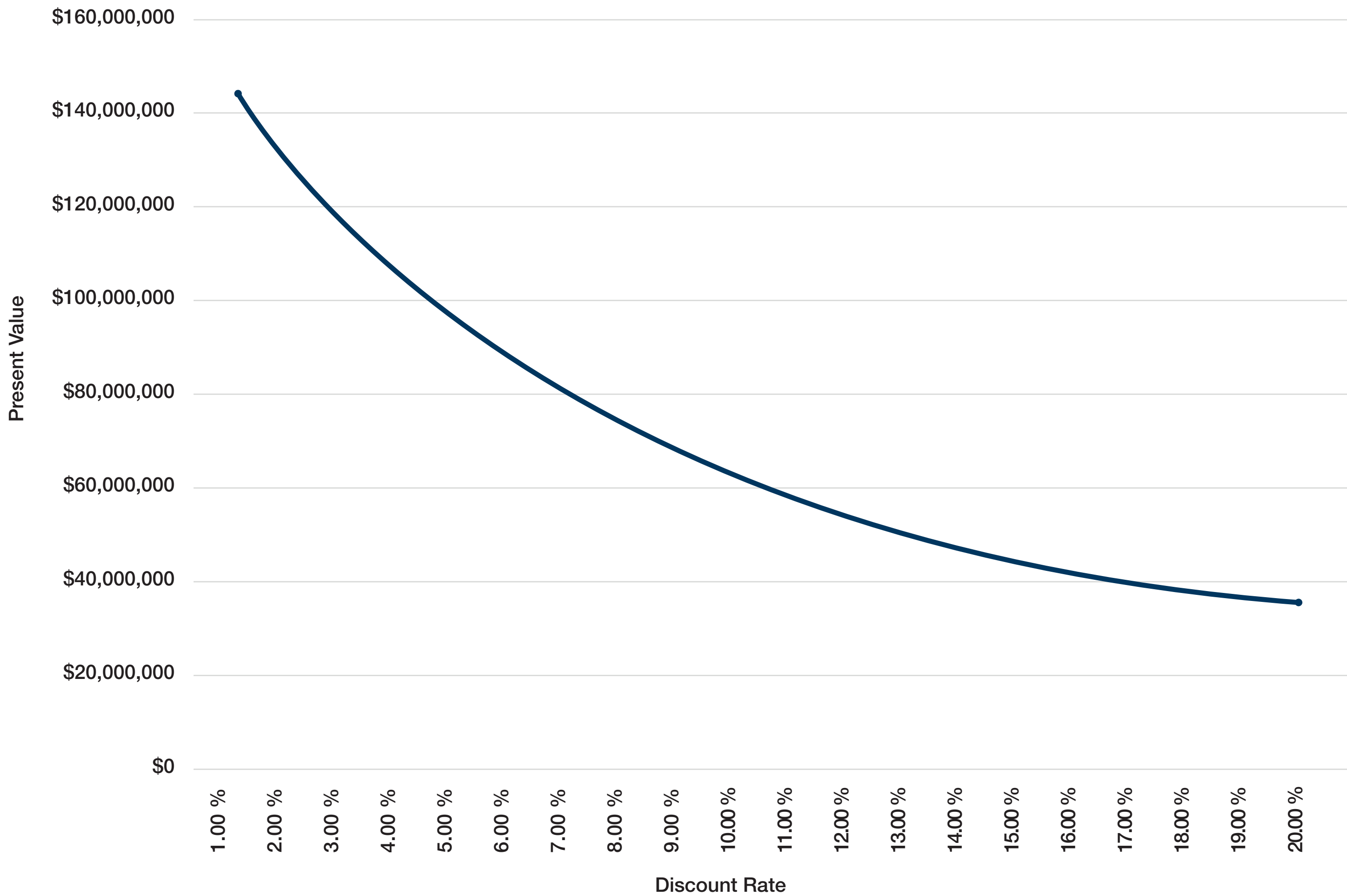
As the PD of the borrower or issuer increases to a maximum of 50 percent, both the EL and the UL increase. The same is true for LGD. As both variables increase to their respective maxima of 50 percent, EL and UL both increase. Consequently, a discount rate that is the sum of the contractual coupon on the debt plus the EL and the UL will change in proportion to the changes in EL and UL.

Figure 3 displays the PV of our non-defaulted $100 million bond of 12-years maturity determined over a range of discount rates. As expected, the PV varies geometrically with the discount rate, with the PV of the bond equal to its par value ($100,000,000) when

Figure 3

Present Value of Cash Flows

$100,000,000 Bond Valued with Different Discount Rates
12-Year Contractual Maturity and 5 Percent Coupon



the discount rate and the coupon rate are identical. In the cases in which the discount rate is less than the 5 percent coupon, the PV exceeds the par value. In the cases in which the discount rate is greater than the coupon, the PV is less than the par value.

These are the cases that interest us for CECL. What are the discount rates that will produce PVs comparable to those seen when we simulated the actual defaults and recoveries?

It turns out that those discount rates are very high.

Let us take the case of our $100,000,000 12-year bond paying 5 percent interest that experiences a default in year six with a 50 percent recovery in year eight and yields a PV of $55,489,351 (see Table 2). To approximate this PV without an actual interruption of cash flows, one must use a discount rate of about 12.3 percent (that results in a PV of $55,402,738). Note that the discount rate on this example of a non-defaulted loan is more than twice that of the original coupon on the bond.

So-called "vulture" investors use a variant of this approach to assess the purchase prices of distressed debt. Typically, these investors set a target rate of return or yield to maturity (YTM), say 20 percent, for debt that is troubled but for which the likelihood of default is low. This YTM consists of the coupon on the bond plus the capital appreciation of buying at a discount.

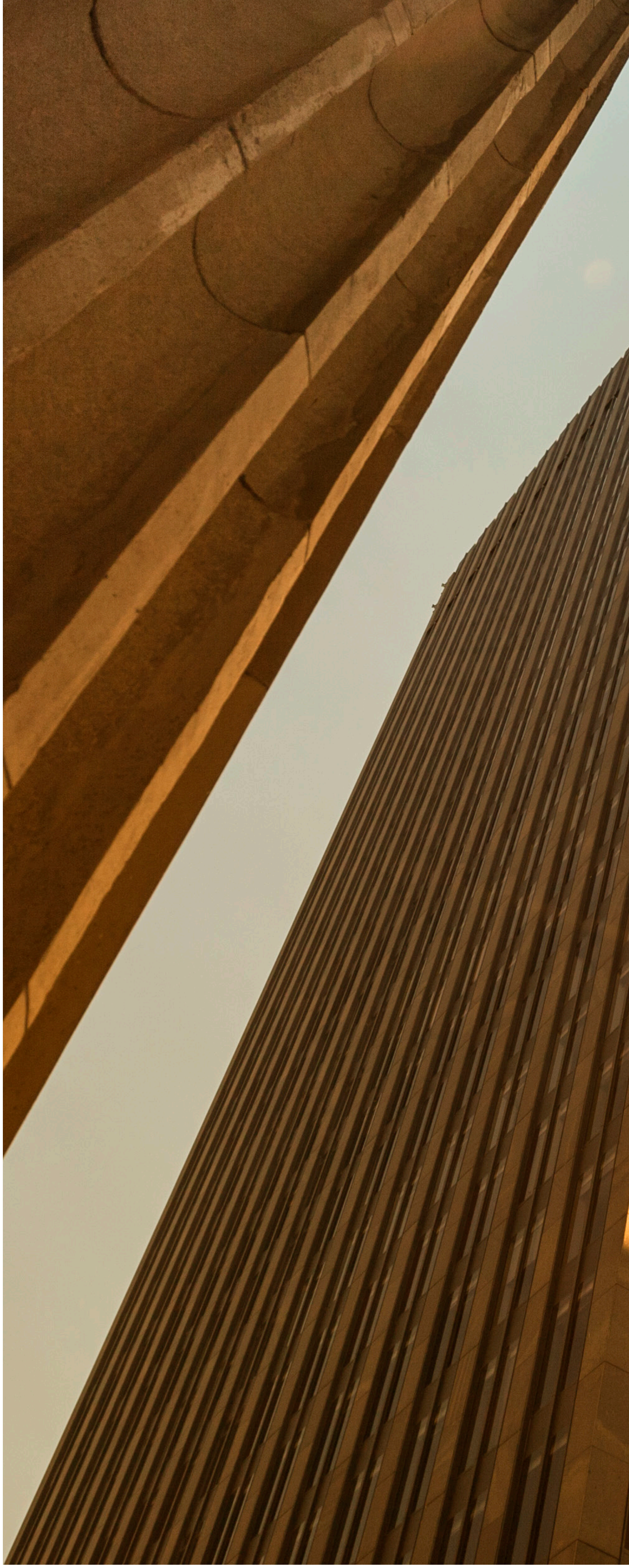
For our 12-year, 5 percent bond, a discount rate of 20 percent would create a PV of $33,411,749 or a discount of 67 percent off the par value (Figure 3). For bankers and investors attempting to assess the loan loss provisions on a troubled loan, a discount rate of 20 percent likely will be seen as untenable as it implies a valuation that the bankers will see as overly pessimistic. Yet, the interruption of contractual cash flows is critical to the assessment of a troubled loan – so these high discount rates are necessary if one is to use this approach of PV analysis for CECL.

If this bond is traded in the secondary market, the quoted prices will indicate the market's view of the "correct" discount rate. This implies discount rate is likely to be more optimistic than the discount rate of vulture investors but higher than the contractual interest rate on the bond.

CONCLUSION

Banks typically value investment assets using PV, and this approach could be applied to valuing troubled debt as required by CECL. Nevertheless, we find that this valuation of troubled debt may be low and, under some circumstances, very low. This is the conclusion from our simulation of possible events of default and loss and from adjusting discount rates according to those risks.

This analysis also suggests that CECL will have significant impact on the valuation of debt portfolios. Banks' loan loss provisions and reserves will likely increase under CECL for at least two reasons. The first reason, which we have shown, is that the portfolio subject to loan loss provisions will increase from non-accruing loans to all troubled loans. Second, the PV of these loans will be lower than the accrual values currently recognized under GAAP. We urge banks to prioritize modeling these losses and planning for the accounting change.



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