



Advances in Quantifying Risk in Commercial Real Estate Lending

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There are strong forces in the commercial real estate industry pushing banks and investors to take more quantitative approaches in assessing risks. This quantification will affect everything from loan approvals to deal structures and loan pricing. There are four main drivers for the use of quantitative tools: 1) the Basel II regulations that require banks to have risk models to calculate their minimum capital requirements; 2) the pressure to increase returns by using more complex financial structures; 3) the need to ensure that senior managers can monitor the effect of these complex structures on the risk of the portfolio; and 4) concern that the world has become more interlinked, increasing the risk of several sectors melting down simultaneously. This article discusses some of the ways that risk can be measured, the requirements of the new regulations and how risk measurement tools can be used to increase profitability and reduce risk in structuring new deals.

RISK METRICS IN COMMERCIAL REAL ESTATE

Real estate professionals are quite familiar with assessing risk using gross ratios such as loan to value (LTV) and the debt service coverage ratio (DSCR). The new metrics being introduced to the industry include probability of default (PD), loss given default (LGD) and exposure at default (EAD)¹. These metrics have been used for more than a decade in asset classes such as corporate loans, but have not been widely embraced in the CRE industry because reliable estimates of PD, LGD and EAD were unattainable for the more complex structures prevalent in CRE lending. However, Basel II has forced the issue, at least in Europe, and its mandates have driven the development of risk measurement techniques specifically designed for CRE.

APPROACHES FOR MEASURING RISK

The traditional approach to risk measurement has been to create a cashflow model for each loan in a deal, then project its net income, debt servicing costs and debt outstanding. The expected LTV, interest-service-cover-ratio and DSCR would then be estimated from the model. CRE professionals have well-established rules of thumb as to what levels of these ratios represent an acceptable risk. This intuition is typically backed up by stressing the cashflows, (e.g., assuming that interest rates rise, property values fall, or a major tenant defaults). In doing these tests, the lender wants to ensure that the deal will survive a “worst case” scenario. But what is the worst case scenario? The problem with static cashflow models like these is that there is no measure of probability. Also, the correlations between risk factors are not captured. For example, when interest rates rise, real estate property values tend to fall, and it is important but difficult to capture the probability and consequence of such movements.

¹ The EAD is typically defined as the expected loan balance at the time of default. LGD is measured as a percentage of the EAD and is the NPV of write-offs, or equivalently one minus the percentage recovery rate.

REGRESSION ON HISTORICAL DEFAULT DATA

The most common approach used today in risk measurement for estimating PD and LGD is to gather a large number of historical default cases, see what proportion of deals defaulted, and try to identify the characteristics of the deals that were more likely to trigger the default. This regression technique has been used very successfully for assets where there are massive data sets, such as credit cards, and somewhat successfully for large corporate loans.

However, the use of regression for commercial real estate is more limited because of the paucity of data, especially for the innovative, profitable deal structures. In Europe there is very little historical default information for commercial real estate. In the US, data has been available for the gross levels of defaults across the whole CRE asset class and this has led to approaches that attempt to forensically recreate what the portfolio must have looked like, and what the risk of the individual assets must have been to generate actual, incurred losses. However, the approach of using industry-level losses is weakened considerably by the assumptions that are needed to guess what the portfolio must have looked like.

More recently, detailed default data has been available in the US for standardized CRE loans that are originated for immediate securitization. This data is good for building models to estimate the overall risk of a portfolio but is insufficient to model the details of individual deals. Understanding these details is vital when aiming to close profitable deals by using innovative structures. Almost by definition, it is difficult to use historical default data to meaningfully model deal structures that have never been done before.

SIMULATION FOR ADVANCED RISK MEASUREMENT

A more flexible approach to risk measurement is to take a lesson from options traders and use simulation. In simulation the deal is tested under thousands of possible outcomes. Each scenario includes projections for the major drivers such as property values, rental rates, interest rates, inflation, tenant defaults and foreign exchange rates. For construction (development) deals, uncertainties also include construction cost, completion time and timing of sales and lease-ups. The multitude of possible scenarios are created by looking at the variability in historical market data such as interest rates, rental levels and property value indices. This type of market data is much more readily available than default data. Each scenario is then put into a cashflow model and through a cash waterfall to give the profit and loss. This way, all detailed deal features such as covenants and reserves can be taken into account.

The process is very similar to the cashflow models that lenders are already familiar with, but enhanced to allow the model to respond to all the major types of uncertainties. The simulation approach makes use of all known information: deal structure, historical market volatilities, market forecasts, lease ratings, defaults and even behavior. With simulation, PD, LGD, loss and profitability can be estimated for any market in which there is historical property information. This includes most of the developed world and many corners of the less developed world.

BASEL II'S REQUIREMENTS FOR RISK MEASUREMENT

One of the primary instigators for developing risk simulation models is the Basel II capital regulations. It is giving strong incentives to all European banks and a few internationally-active US banks, to quantify the risk of their assets. Under Basel I, banks were required

to hold capital equal to a flat rate of 8% of the balance of all assets. Under Basel II the capital percentage for low risk assets will be evaluated on a case-by-case basis and greatly reduced. This affects the cost of funds and pricing. As capital typically costs banks 10% more than debt, a reduction of capital from 8% to 2% would mean a reduction of 60 basis points in capital funding costs. This can either be passed on to the customer as a reduced margin, or if the margin is maintained, to produce a greater profit between the margin and the funding cost.

Under Basel II there are three main approaches for estimating the minimum required regulatory capital: Slotting, Foundation IRB (Internal Ratings Based) and Advanced IRB. Slotting requires the bank to simply “slot” assets into ranges according to their perceived credit quality. Each range has its own capital percentage, which tends to be relatively high compared with the IRB approaches.

Either IRB approach calculates the amount of capital based on the banks’ in-house risk models. The two main risk factors that are considered in the calculation of capital are the PD and the LGD. To qualify for the Foundation IRB approach, the bank must have models that estimate the probability of default. In the Foundation approach the LGD is fixed at 45%. For the Advanced approach the bank must also have reliable models to estimate LGD. For assets with an LGD less than 45% there will be a saving in capital. For example, under the Advanced approach, an asset with an LGD of 15% would require 1/3 of the capital that would be required if the bank had only adopted the Foundation approach.

Figure 1 shows the Basel capital for a range of assets with different credit grades. Banks that can qualify for the more sophisticated approaches are allowed to hold less capital. The rationale for allowing reduced capital is that if the risk is shown to be carefully monitored and measured, the regulators have more faith that the bank is under control and there is less need to add capital to cover the unmeasured risks. The reduced minimum capital leads to a direct savings due to a lowering of the capital tied up on the balance sheet, or a reduction in the cost of debt.

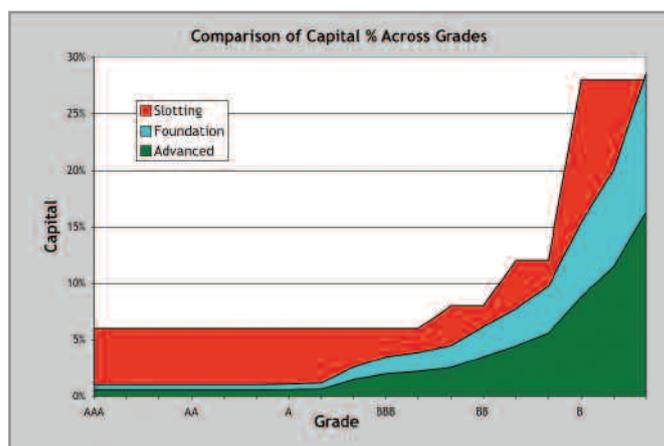


Figure 1: Comparison of Capital % Across Grades

Table 1 pulls out the results for BBB assets and shows the amount of capital to be held under each approach. Overall, a bank with \$10 Bn of BBB assets would save around \$4-5 M for every year that it qualifies for the Advanced approach—a material cost savings.

Table 1: Capital to be held for \$1 Bn of BBB assets

Basel II Approach	Capital (\$ M)*	Reduction in COF (\$ M)**
Slotting	60	—
Foundation (45% LGD)	45	1.5 (15 bps)
Advanced (20% LGD)	20	4.0 (40 bps)
Advanced (5% LGD)	5	5.5 (55 bps)

*Capital includes both UL required capital and EL reduction in available capital

**Calculation of the Cost of Funds (COF) assumes that capital costs 10% more than debt

USING RISK MEASUREMENT TOOLS TO GUIDE THE STRUCTURING OF MORE PROFITABLE ASSETS

Basel II assesses the capital to be held once the loan is on the books, and, therefore, it does affect loan pricing. This increases the incentive for the lending officer to structure the deal in a way that minimizes the risk while still satisfying the customer’s needs and maintaining a good margin. If the risk measurement tools used for Basel II offer no new insights into the deal, then they will remain as backoffice administrative tools. However, there is also the option of using Basel II as an opportunity to adopt tools that aid the lending officer in structuring competitive new loans. This is illustrated in the example of a plain vanilla deal below.

This deal was assessed using simulation and the result for the probability of default per year is shown in Figure 2. It shows the two peaks in risk at years 5 and 10. The first peak is when one of the large current tenants expires and there is the danger of a loss in income before a replacement tenant is found. The second peak is at the end of the loan. This peak is due to possible failure to pay off the loan by refinancing.

In the base case there is no amortization which results in an 18% probability that by the end of the loan, the property value will have dropped, or interest rates will be so high, that another lender would be unwilling to take the deal.

Let us first address the risk of the lease expiration. If the tenant agrees to build up a small reserve fund by the time the lease expires, the cumulative PD drops from 36% to 24%. This is shown in Figure 3. Now to tackle the refinancing risk, consider adding a fixed principle plus interest amortization each year. Figure 4 shows that this reduces the refinancing peak, but the higher debt servicing requirement brings back some of the risk at lease expiration.

Table 2: Sample Deal

Property	Financing
<ul style="list-style-type: none"> Market value \$1.8 M, 6.6% yield Two good tenants, one expiring in 5 years Fixed leases, at market 	<ul style="list-style-type: none"> 80% LTV 1.3 ISCR Floating rate loan No amortization 10 Year remaining maturity

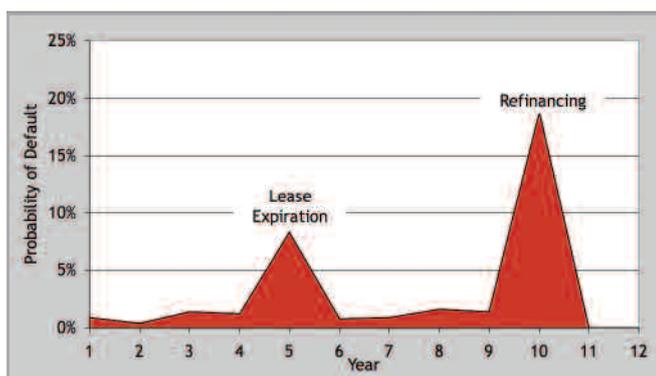


Figure 2: Initial Structure with Cumulative PD of 36%

This could be dealt with by increasing the reserve further, or by removing the principle payment for the expiration year. Alternatively if the investor could be persuaded to sweep all residual net operating income either into a sinking fund or to pay down the loan, the effective amortization can be achieved without increasing the probability of default, as shown in Figure 5. Here, the PD is now only one sixth of the original PD. When combined with the results for the LGD, the risk cost has dropped by a factor often allowing the bank to charge a lower margin whilst maintaining profitability.

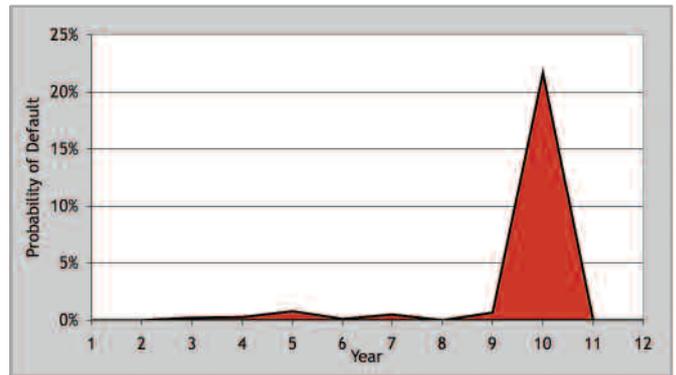


Figure 3. Reserve of \$25,000 and Cumulative PD of 24%

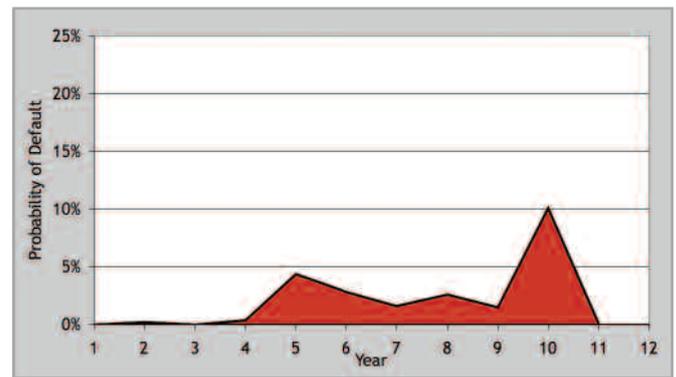


Figure 4. Fixed P & I of \$100,000 / year with Cumulative PD of 24%

This is an example of how the quantification of risk can be used to guide the structure of individual deals. It allows the lending officer to gauge the effect that structural changes will have on a deal’s risk profile and profitability, therefore, making the case for more highly structured transactions.

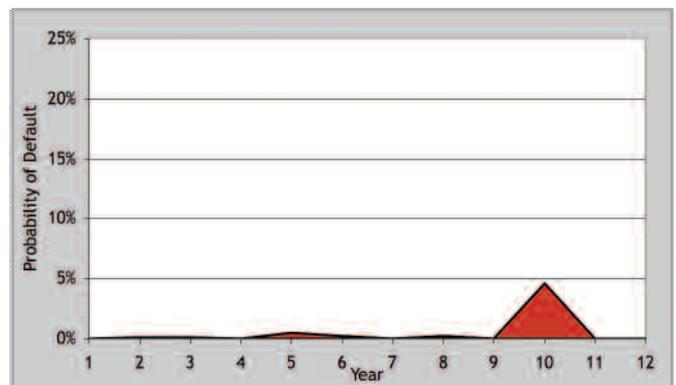


Figure 5. Sweep with Cumulative PD of 6%

This example was for a relatively simple deal with traditional deal terms. The same approach extends to portfolios of loans and extends to deals including both interest rate derivatives and property derivatives.



CONCLUSION

A useful analogy when thinking about the effect that risk quantification will have on the real estate market is to consider what happened to options trading when pricing models were introduced. Before pricing models, traders used their gut instincts to price options and therefore the options that they traded had to be relatively simple. After the introduction of pricing models, the volume of options trading exploded but margins on simple options became razor thin. In the interest of maintaining profits, the leading players provided customers with products that were much more complex and tailored to exactly fit their needs. The traders were able to structure these exotic options because they now had a robust method for measuring the effect of adding additional layers of sophistication. This same process of risk measurement driving deal sophistication is now coming into play in the CRE market.

However, in options trading as in commercial real estate, the mathematical “machines” did not completely usurp the trader’s intuition. Intuition is needed to estimate the unquantifiable sentiment of a market. The models simply provide guidance when traders (or CRE lenders) roam into the sophisticated territory where a solid model and a good intuition are unbeatable.

BIOGRAPHY

Dr. Chris Marrison is the author of *The Fundamentals of Risk Measurement* (McGraw-Hill 2002), as well as numerous journal articles on risk topics. A former Managing Principal with The Capital Markets Company and senior engagement manager at Oliver Wyman & Company, he has consulted to numerous banks, multilaterals and governments in North America, Europe, Asia and Africa.

Dr. Marrison founded Risk Integrated with Dr. Yusuf Jafry to fill a void in the marketplace for advanced risk management systems that are fully integrated into companies’ existing business processes. The system they developed now enables more competitive pricing for lenders, slashes away at the amount of capital needed in reserve, and clarifies the risks they have across the portfolio.

Before founding Risk Integrated, Dr. Marrison served in the Royal Air Force as an engineering officer with the primary task of keeping sixty aircraft aloft. He received his Ph.D. in engineering from Princeton University where his thesis was on using simulation to assess the risk in aircraft control systems. ■