Infrastructure and Real Estate

Advanced Modeling Techniques for Pricing and Valuations

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Introduction

As capital market returns have become less stable over the last decade, increasingly investment managers have been looking to other markets to generate returns on their portfolios. This has led to an increased asset allocation into real estate, infrastructure and other non-capital market based assets. Aside from return generation, another perception is by adding these types of assets into a portfolio the investor is adding one which is "non-correlated" to the typical bonds and stocks capital market products in their portfolio.

From a risk management perspective the primary goal is help risk managers and investment managers answer the question of what will be the value of their portfolio at some future time horizon and what is driving this valuation. These questions can be answered by developing scenarios on the risk factors driving the pricing models of the securities both public and private in the portfolio. The scenarios on the risk factors can be correlated or non-correlated.

Two methods are highlighted to capture the risk of real estate and infrastructures holdings within the portfolio.

Cash Flow Replication

The section below highlights some common modeling choices IBM clients have pursued to model different private market asset classes.

Real Estate or Land

Rather than trying to model the asset classes using the direct variations in the appraised values, many clients will use a Cash Flow Replication approach to capture the risks in real estate or land and to calculate the residual value of the asset. In this approach, the client assumes the volatility of the factors driving the value of the asset class is comparable to the securities in the replicated portfolio. The securities in the replicated portfolio do not necessarily need to be tradable and are intended to only capture risk.

Instruments in the Cash Flow Replication are selected and weighted such that they represent the economic payoffs and risks of the asset. This is done either using an optimization process or based on expert judgment.

As an example, the following factors can be modeled for real estate:

- Property Lease Rates—can be modeled as fixed income bonds with different coupons and maturities to account for yearly projected increases or decreases.
- Mortgage Debt—can be modeled as shorting a structured product security with an attached prepayment model.
- Inflation—the effects of inflation on property returns can be modeled using inflation linked bonds.
- Tenant Renewal Probabilities—to represent the fluctuations in supply and demand the investment sensitivity to the local economic region can be modeled by over/underweighting instruments in portfolio to participation in the local economic sectors.
- Interest Rates and Discount Rates—interest and discount rates are taken into account by explicit modeling of these factors.
- Vacancy Rates—given certain macro-environments vacancy rates may increase. An increase in vacancy would represent lower cash flows and can be applied in the model by introducing optionally on property leases. Such that given a certain event that increases vacancy rates, the property lease will be hair cut or capped.

Infrastructure

Infrastructure modeling covers such investment projects as power plants, airports and toll roads. Many IBM clients use a Cash Flow Replication approach to capture the risk in the investment rather than modeling the direct variation in price which maybe difficult to obtain.

So, for example, one might look at a power plant and determine if cash flows are similar and dependent on the price of a tradable energy commodity. The cash flows may also be dependent on demand which will be influenced by growth in the surrounding areas, which is a regional growth component. Additionally, the cash flows would also have exposure to seasonality effect which would need to be accounted for in the model.

In another example, an investment in an airport could be regarded as similar to a real estate holding where part of the facility is rented out by merchants and the other part by airlines. The airport cash flows are then subject to property leases, inflation and regional exposures. Additionally, a large portion of the cash flows will be subject to airlines that service the airport, these airlines paying landing fees. One must also account for the nuisances in the airline industry, as changes in their behaviors and routes have a probability of them continuing to frequent the airport.

Distributions

Real Estate

Another method some IBM clients have selected is to model real estate by assigning marginal distributions to the unobservable or non-market risk factors in private market or real estate holding. For example, one might want to capture "downtime" in the model. Downtime is the gap between the time a prior tenant stops paying rent and a replacement tenant beginning to pay rent. This is a hidden cost of tenant retention because its not a direct outlay by the landlord, but rather a gradual erosion of cash flow caused by diminished revenue. The client may feel that based on past experiences, downtime risk follows a standard log normal distribution. This marginal distribution can be assigned to the downtime risk factor and can then be aggregated together with the observable market risk factors such as inflation and interest rates. In order to aggregate the risks, the first step is to assign a correlation between downtime and the market risk factors. The Downtime factor will then be represented as a single financial instrument with a single correlated Normal(0,1) risk factor that is then translated into the corresponding marginal distribution (log normal) via IBM tools during the simulation process.

Using this method a client is able to determine the risk on the real estate investment including both market and non-market sensitive risk factors.

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