



March 23, 2016

Weekly Post: Importance of Managing EVE Duration

Dear Clients-

Soon after the publication of the Ho-Lee Model, the interest rate model which I co-developed in 1986, Salomon Brothers introduced the interest rate risk measure effective duration. Salomon Brothers used a Ho-Lee term structure model to calculate duration in the publication Effective Duration of Callable Bonds: The Salomon Brothers Term Structure-based Option Pricing Model.

Over the past 30 years, duration has become widely used in capital markets, investments, valuation and risk analysis. But many community banks and credit unions have yet to embrace this risk measure and valuation as part of their risk management process.

I believe economic value of equity (or net economic value) duration is the most important risk measure and also the least understood. Ignoring this EVE duration can have a negative impact on earnings. This Post explains “why.”

Challenges

- The assets and liabilities on the balance sheet are mostly Held to Maturity. Therefore, why should I care about the economic valuation?
- The interest rate risk exposure is already measured against EVE and EaR stress test policy limits. Why should I use duration as well?
- How can measuring duration enhance earnings?

Solution

Duration is the % EVE value change under 100 bpt shock in rate. Suppose your EVE is \$100mm and the EVE duration is 3 year. A 100 bpt up-shock in rates would lead to the EVE value to drop to \$97mm. And 10 bpt up-shock in rates would result in the EVE value to drop approximately to \$99.7mm.

To address the challenges above, let me start with a simple analogy. Suppose you sold an S&P call option and collected the option premium as income. Under this scenario, you would incur a significant loss when the S&P rises sharply. One possible approach to offset the loss would be to support the trade by committing a lot of capital, “risk capital”, which is an unrealistic solution. Another approach would be to buy back shares of the S&P index and keep adjusting the hedge ratio to manage the change in risk exposure as the S&P index moves. This is the preferred approach.

Loan Market Commentary

Art Hilliard*

A recent scratch and dent loan transaction had an average net price of 84, see TRAP report attached in the conference room.

- *many loans traded in the mid-high 90s.*
- *wide mixture of products ranging from Conforming to non-conforming to FHA to California bond program loans.*
- *generally higher quality performing loans, reasons for rejected by the agencies are provided in Risk Officer/Loan Transaction Network.*



Likewise, many of you have sold options on your balance sheet in the following forms: options for customers to prepay loans, and options for agencies to call bonds or advances. And you collect the option premium for selling these options as net interest income. However, with this approach, you would also be incurring option risk.

Dynamic hedging

While the assets and liabilities are mostly held to maturity, many assets and liabilities weighted average life changes with the interest rate level. Residential mortgage loans have prepayment and extension risks. Furthermore, your balance sheet changes with new loan production and as deposits are withdrawn and many other moving parts. Therefore, even if your balance sheet items are not sold [HTM], your interest rate risk still continually changes with market conditions. By managing the EVE duration, you are in essence adjusting the “hedge ratio” to manage your risks.

A Risk Management Tool

Unlike EVE and EaR policy limits that focus on the safety and soundness of the institution under stress tests, Duration measurement can be used as an effective risk management tool. Duration measures the risk exposure under a small change in interest rate. I always encourage our clients to determine a duration target over a period, say 3 or 12 months. This target will enable you to determine the appropriate risk exposure that you are willing to take, no different than adjusting the “hedge ratio” of a call option. *By dynamically managing the interest rate risk, you can release significant risk-capital that you may be holding, and in the process, generate higher income.*

Numerical Example

Duration is akin to weighted average life (WAL) of an asset. Indeed, the duration is often misunderstood as the weighted average life. Let's take the below sample of assets with different current coupon rate % (CPN), term to maturity years (Term), duration years (Dur) and weighted average life years (WAL) as an example. WAL is calculated based on the principal amount projected under the base case scenario, and therefore, WAL is not the same as the maturity because of prepayments and extension options.

Instrument	CPN	Term	Dur	WAL
30Y FRM	4.00	30.00	5.18	7.70
15Y FRM	4.00	15.00	3.33	4.07
3/1 ARM (with coupon structure 6/2/6)	3.00	30.00	3.49	5.48
1/1 ARM (with coupon structure 2/2/6)	3.00	30.00	2.12	6.21
Bullet Agency	2.13	7.86	7.15	7.86
Agy Callable fixed in discount (price @ 97.5)	2.00	6.64	4.32	6.64
Agy Callable fixed in premium (price @100.7)	2.50	4.41	1.64	4.40

- The 30 yr and 15 yr fixed rate mortgage loans have durations shorter than their respective WAL because of the mortgagors’ prepayment options.
- As expected, the ARM’s WAL is longer than duration because these loans are repriced sooner. But the duration is mostly based on the first repricing date but not entirely because of the caps and floors, which are again options embedded in the loans.



- Bullet agency and other bullet instrument confuse the definition of duration. For these instruments, the durations are similar to the WAL, even though the duration is calculated using economic values, based on a valuation model, while, WAL is simply the projected cashflow. This “coincidence” has confused economists for many years.
- The callable agency shows that discount agency duration is closer to the WAL, while the premium agency duration is not, because the premium bond is more likely to be called.

The results show that for some instruments, WAL can be significantly different from duration. Since WAL cannot capture the interest rate risk, the duration is the reliable risk measure to determine the optimal “hedge ratio.”

Conclusions

If economic values are not used in managing your balance sheet, you are ignoring 30 years of progress made in interest rate risk management. You are not properly valuing your equity for risk management purpose. If you embrace the use of EVE duration, then you would believe:

- there is no asset too risky (interest rate), only the balance sheet risk is relevant because you can adjust the EVE risk exposure mitigating individual asset interest rate risk;
- duration can be adjusted to exploit the Fed interference in the yield curve or yield curve movements contrary to your belief;
- the risk capital attributed to interest rate risk can be reduced to enhance earnings.

For these reasons, I asserted that the duration is one of the three most important levers for performance in my 3/1 Post.

Please do not hesitate to contact me if you have any questions about the use of duration.

Regards,
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