The Importance of Market Value of Equity

By Dallas Wells, Vice President, Asset Management Group, Inc.

Market Value of Equity (also known as Net Portfolio Value or Economic Value of Equity) is a tool for measuring long-term interest rate risk, but it is often misunderstood and underutilized. With the current level of interest rates, shape of the yield curve, and regulatory scrutiny of interest rate risk management practices, it is vital that bankers understand and apply Market Value of Equity (MVE) in the day to day management of the balance sheet. MVE should be used not only for measuring risk that already exists on the balance sheet, but also as a tool for determining ongoing strategy by testing the implications of specific campaigns or initiatives. In short, know before you go.

MVE: a misunderstood tool

The current regulatory guidance describes several tools for properly measuring the interest rate risk on the balance sheet of a financial institution. However, the guidance and the field examiners have stipulated that two primary measurement methods be used in essentially all banks. These methods are income simulation and market value of equity (MVE). With both methods a base case scenario is calculated, and then the impact of rate changes is measured to determine how much earnings or market value may be at risk.

While regulators deem both measures to be of equal importance, boards and management teams of community financial institutions often dismiss the market value of equity calculation as an academic exercise that has little practical application. Many reasons are given for this, but the explanations typically fall into two general categories.

Belief that MVE is only useful as a liquidation value

MVE is often misconstrued as the liquidation value for a bank. This misconception is due both to some of the historical uses of the measurement as well as the typical explanation of the calculation. During the S &L crisis in the 1980s, regulators often cited the MVE of an institution in their efforts to gauge the value of the firm and the potential loss in the case of liquidation. The use of this measurement for this purpose was quite appropriate at the time, as many of these firms were facing liquidation specifically because of massive exposure to rising interest rates. In addition, MVE is generally explained as a present value of the firm's balance sheet. Again, this is an appropriate and accurate statement. However, it leads many bankers to believe that the purpose of MVE is to determine the liquidation or sale value of the bank. Therefore, if the bank is not

being liquidated or is not for sale, the number is meaningless. This is simply not the case, as the number has value far beyond gauging the current market price of the institution.

The measurement of MVE is complex and difficult to explain

For most community bankers, much of the time spent on interest rate risk is used for education and explanation to other members of management and/or the board. This is a reality simply because these parties generally do not have regular exposure to the concepts, and must be brought up to speed on the terminology and principles each time it is covered (usually in monthly or quarterly ALCO meetings). The concept of an income simulation, while equally difficult to accurately execute, is easy to explain. This basic process of forecasting an income number through several different scenarios is common not only in banking, but also in most other businesses where bank directors may have far more experience. However, the idea of marking the balance sheet to market is far more difficult to explain. It is a concept that is unique to financial markets, and those with little or no exposure or experience in such markets require a more in-depth explanation of the mechanics and purpose of the calculation. Facing this reality, many bankers simply gloss over it as long as the measurements are within policy limits.

While the reluctance to rely heavily on MVE is certainly understandable, with current market and bank balance sheet conditions as they are, such reluctance is no longer acceptable to regulators. Field examiners are now spending far more time on the MVE calculations and underlying assumptions. In addition, they are asking far more questions of management and directors to ensure that they understand what they are measuring, how they are measuring it, and what the results mean to their institution. And, due to the extreme low rates and steepness of the yield curve, properly understanding and using MVE is not just a matter of regulatory importance. It is also an essential tool for managing the significant risk faced by *all* financial institutions and maximizing returns within a given risk parameter.

MVE: defined

Market value of equity is defined as the difference between the sum of the present values of all cash flows from assets and the sum of the present values of all cash flows from liabilities. This concept is often explained via the bond market, as the current market value of any bond is simply the present value of all of the future coupon and principal payments that the investor will receive. The same approach can be applied to all sectors of a bank balance sheet. For a loan, the current market value to a buyer of that loan would be the present value of all future principal and interest payments (including of course the likelihood that those payments will be received in full and on time). For a liability, the market value is the present value of interest and principal payments that are owed.

While this definition is mathematically accurate, it does not explain how the measurement is practically accomplished, or how it may be used in the day to day management of a financial institution. In practice, the value of each instrument on the balance sheet is determined by gauging the current market value of a comparable instrument. So, an agency bond with a duration of 1.51 is valued relative to the price at which other 1.51 duration agency bonds are trading. Any assets with returns greater than the comparable asset shows a gain, and any asset with returns less than the comparable asset shows a loss. An example is shown below.

	Book Value	Book Yld	Dur	Libor	+	Spread	=	Disc Rate*	Market Value	Gain/Loss
Total Treasuries	31,203,369	0.65%	0.86	0.67%	+	-0.16%	=	0.51%	31,286,216	82,847
Total Agencies	148,973,133	1.63%	1.51	0.89%	+	0.03%	=	0.92%	149,864,104	890,971
Total Municipals	142,053,935	3.93%	2.82	1.52%	+	0.04%	=	1.56%	144,905,289	2,851,354
Total MBS/CMO	14,099,487	2.31%	4.42	2.36%	+	-0.60%	=	1.76%	14,570,287	470,800
Total Corp & Other	21,656,204	3.63%	3.76	2.00%	+	0.48%	=	2.48%	21,932,741	276,537
FHLB Stock	1,680,300	0.35%	10.00	3.84%	+	-3.49%	=	0.35%	1,680,300	0
FRB Stock	660,000	3.50%	10.00	3.84%	+	-0.34%	=	3.50%	660,000	0
Other Equity	43,550	3.50%	10.00	3.84%	+	-0.34%	=	3.50%	43,550	0
TotInv - Adj	2,880,260	1.73%	1.83	0.97%	+	-0.97%	=	0.00%	2,880,260	0
Total Investments (B4 MTM)	363,250,237	2.59%	2.27	1.26%	+	-0.01%	=	1.26%	367,822,747	4,572,510
Total Commercial	161,355,867	5.60%	0.90	0.73%	+	4.23%	=	4.96%	162,216,911	861,043
Total Comm'l RE	242,605,503	6.17%	1.68	0.93%	+	5.44%	=	6.37%	241,838,019	(767,484)
Total Real Estate	46,672,280	5.82%	1.47	0.89%	+	4.67%	=	5.56%	46,834,989	162,710
Total AG	0	0.00%	0.00	0.00%	+	0.00%	=	0.00%	0	0
Total Consumer	34,946,918	5.49%	0.50	0.46%	+	4.97%	=	5.43%	34,956,166	9,248
Total Other	7,358,381	0.34%	0.08	0.24%	+	-0.24%	=	0.00%	7,358,381	0
Gross Loans	492,938,949	5.81%	1.30	0.82%	+	4.85%	=	5.67%	493,204,466	265,517
Net Loans	480,660,842	5.96%	1.33	0.84%	+	4.98%	=	5.81%	480,926,359	265,517
Total Earning Assets (B4 Inv MTM)	935,966,429	4.17%	1.69	0.93%	+	2.65%	=	3.58%	940,804,456	4,838,027

On the liability side, the same approach is taken, except that funding sources with a cost below the alternative are shown as a smaller liability (which equates to a gain in MVE, since it is a smaller subtraction from assets). So, a time deposit with a duration of 0.57 is valued relative to comparable funding sources, per the example below.

Total NIB DDA	219,346,620	0.00%	3.10	1.65%	+	0.00%	=	1.65%	208,614,707	(10,731,913)
Total NOW	141,923,110	0.09%	3.99	2.15%	+	0.00%	=	2.15%	130,976,021	(10,947,089)
Total MMDA	224,455,459	0.30%	2.51	1.33%	+	0.00%	=	1.33%	218,868,971	(5,586,488)
Total Savings	29,750,295	0.15%	2.89	1.57%	+	0.00%	=	1.57%	28,582,489	(1,167,806)
Total CD's	155,497,003	1.17%	0.57	0.51%	+	0.00%	=	0.51%	156,075,057	578,054
Total IRA's	25,196,413	1.89%	1.46	0.88%	+	0.00%	=	0.88%	25,556,568	360,155
Int. Bearing Dep.	576,822,280	0.55%	2.33	1.19%	+	0.00%	=	1.19%	560,059,107	(16,763,173)
Total Fed Fnd Pur.	0	0.00%	0.00	0.00%	+	0.00%	=	0.00%	0	0
Total FHLB	10,000,000	3.46%	1.71	0.95%	+	0.00%	=	0.95%	10,416,025	416,025
Total REPO	97,245,747	0.48%	0.00	0.24%	+	0.00%	=	0.24%	97,245,747	0
Total Other Borr	0	0.00%	0.00	0.00%	+	0.00%	=	0.00%	0	0
Total Borr.	107,245,747	0.76%	0.16	0.24%	+	0.00%	=	0.24%	107,661,772	416,025
Total Other Liab.	12,294,008	0.00%	0.08	0.24%	+	0.00%	=	0.24%	12,294,008	0
Total Liabilities	**915,708,656**	**0.43%**	**2.23**	**1.15%**	**+**	**0.00%**	**=**	**1.15%**	**888,629,594**	**(27,079,062)**

While the example illustrates the mechanics, it still does not explain what that gain or loss really means to the institution. Again, this can be thought of in terms of bonds. If an investor buys a 3 year bond with a yield of 2%, and rates

suddenly increase by 3%, then the investor is stuck with a 3 year investment at 2% in a world where they could be receiving 5%. The bond has a loss. Yes, this represents a loss in market value that will be realized if the bond is sold, as the investor will have to lower the price to get a buyer to take the 3 year asset with a substantially lower yield over the entire life. However, the loss in market value also shows that the investor will accrue that same loss over the life of the bond if it is held instead of sold. The investor makes a 3% lower return every year for the full 3 year life *because they took on interest rate risk by buying the three year asset instead of an overnight one*.

The same concept applies on the funding, or liability side. If a bank has a pool of non-interest bearing demand deposits in an environment where similar funding would cost 1.50%, then that funding has a clear value. The bank is able to invest that funding and make a positive spread over the life of the funds. If rates suddenly increase by 3%, and the alternative funding now costs 4.50%, then that pool of 0% funding has even more value since over its life it can be invested at a higher spread. Again, the position *could* be liquidated for a gain, but the measure also captures the fact that the position accrues a gain of 3% per year for the entire life of the liability.

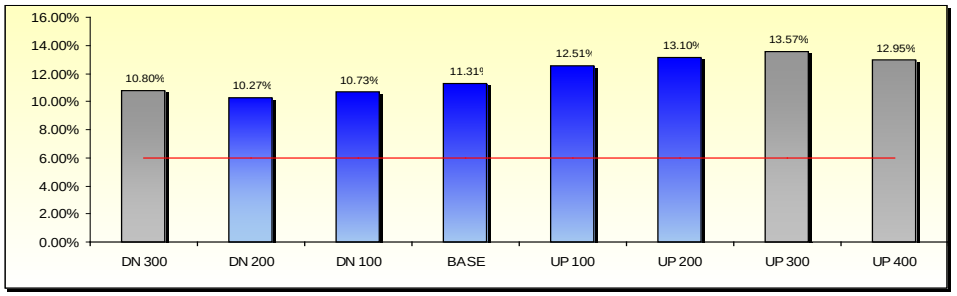
By netting the liabilities from the assets, the bank is able to determine the net market value, or the market value of the equity position. The number represents a theoretical value at which the bank would be able to sell all positions and pocket the difference between the assets and the liabilities. However, it also represents the value accrued to the bank *over the entire life of the balance sheet*. Think of the equity value of the bank itself representing an investment. The MVE represents the value over the life of the investment, and shocking it through different rate scenarios shows if the long-term returns are positively or negatively impacted. An example is shown below.

MARKET VALUE OF EQUITY (MVE)

(a.k.a NPV or EVE)

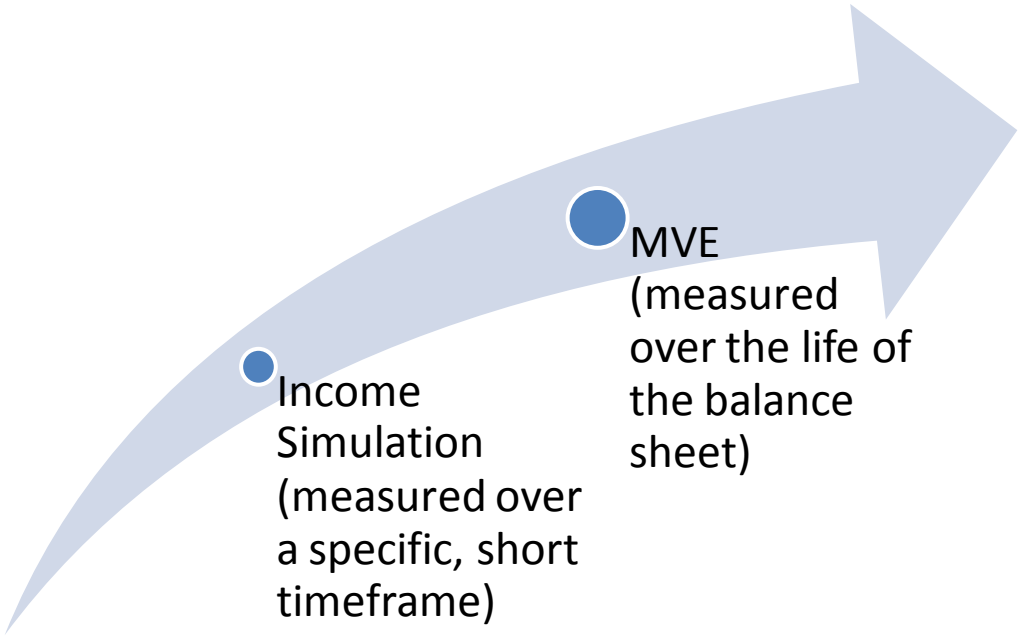
	Curr Pos	DN 300	DN 200	DN 100	BASE	UP 100	UP 200	UP 300	UP 400
Total Assets (000's)	1,001,762	1,029,537	1,023,111	1,016,343	1,001,990	994,411	980,398	965,606	939,297
Total Liab (000's)	915,709	918,342	918,064	907,327	888,630	869,996	851,966	834,535	817,680
Off Bal Sheet (000's)	0	0	0	0	0	0	0	0	0
MVE	**86,053**	**111,195**	**105,047**	**109,016**	**113,360**	**124,415**	**128,432**	**131,070**	**121,617**
MVE Ratio	8.59%	10.80%	10.27%	10.73%	11.31%	12.51%	13.10%	13.57%	12.95%
Min. Capital Ratio		6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%	6.00%
%Δ MVE v. Flat		1.91%	7.33%	3.83%		9.75%	13.30%	15.62%	7.28%
%Δ MVE Guideline		35.00%	35.00%	35.00%		35.00%	35.00%	35.00%	35.00%
Book Multiple		1.29X	1.22X	1.27X	1.32X	1.45X	1.49X	1.52X	1.41X
MVE Test 1: MVE ratio >= 6.00%		YES	YES	YES	YES	YES	YES	YES	YES
MVE Test 2: %Δ MVE < Guideline		YES	YES	YES	YES	YES	YES	YES	YES
MVE Test 3: MVE >= 90% Book		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

• This graph is designed to give the bank a view of the long term impact to earnings given the current balance sheet structure. It will highlight which interest rates scenarios have the greatest "adverse" impact to *long-term* earnings.



MVE is also referred to as Net Portfolio Value (NPV) or Economic Value of Equity (EVE).

Would an investor be happy buying a long term investment that performs well for the first two years, but over its life produces returns significantly below market returns if rates rise or fall? In that same vein, are the shareholders of a bank happy with a balance sheet that produces meaningfully subpar returns over the life of the investment if rates rise or fall? If not, then this is not a bet that management should be making. In this manner, the MVE is measuring true long-term interest rate risk. The impact of each instrument is captured over its entire expected life rather than a simple short-term snapshot as is captured in an income simulation. Measuring interest rate risk can thus be broken down into two time based components:



The short-term measure, the income simulation, is absolutely vital. Running the simulation allows the financial institution to be fully aware of the impact rate movements are expected to have on the income statement over a given time frame. But since financial institutions typically book assets that have lives beyond the simulation period (i.e. 30 year mortgages, or commercial loans with 10 year amortizations and rates fixed for 5 years), it is also vital to ensure that the institution is not adding undue risk beyond the simulation period. A theoretical bank balance sheet can be used to fully illustrate the implications.

MVE: an example

Consider a new bank that is formed, and immediately books $10 million in loans. These loans are 5 year balloon loans with a yield of 6%. Let us also

assume that the assets are funded with $2 million in capital, $4 million in 1 year CDs at 2%, and $4 million in 2 year CDs at 3%. The base earnings level is thus:

Item	Balance	Rate	Inc/Exp
Loans	$10,000,000	6.00%	$600,000
1 Year CDs	$4,000,000	2.00%	$80,000
2 Year CDs	$4,000,000	3.00%	$120,000
Capital	$2,000,000	0.00%	$0
Net Income			$400,000

This $400,000 income would remain in flat rates over the entire 5 years that the loans are outstanding, for a total of $2,000,000 in net income.

Now the bank can run a 2 year simulation. In the base case with flat rates, all instruments can be renewed at the same levels, making the two year income total $800,000. However, if it is assumed that rates immediately increase by 2%, the simulation would show income as follows for the first year (no change because all assets and funding are locked in for at least one year):

Year 1

Item	Balance	Rate	Inc/Exp
Loans	$10,000,000	6.00%	$600,000
1 Year CDs	$4,000,000	2.00%	$80,000
2 Year CDs	$4,000,000	3.00%	$120,000
Capital	$2,000,000	0.00%	$0
Net Income			$400,000

In the second year, the asset yield remains the same, and both the capital and the two year CDs remain unchanged. The one year CDs are repriced up by 2%, and now cost 4%. The result is:

Year 2

Item	Balance	Rate	Inc/Exp
Loans	$10,000,000	6.00%	$600,000
1 Year CDs	$4,000,000	4.00%	$160,000
2 Year CDs	$4,000,000	3.00%	$120,000
Capital	$2,000,000	0.00%	$0
Net Income			$320,000

A total of the two years of simulation shows net income of $720,000, or $80,000 less than the base case. This 10% of earnings at risk would be deemed as within policy and acceptable to nearly all financial institutions. What about the MVE? With the bank being brand new and rates unchanged, the base case MVE is $2,000,000, or 20% of assets. If rates immediately rise 2%, the calculation would be:

	Book Value	Book Yld	Duration	Disc. Rate	Mkt Value	Gain/Loss
Loans	$10,000,000	6.00%	5.0	8.00%	$9,201,458	($798,542)
1 Year CD	$4,000,000	2.00%	1.0	4.00%	$3,923,077	($76,923)
2 Year CD	$4,000,000	3.00%	2.0	5.00%	$3,851,247	($148,753)
Equity Value	$2,000,000				$1,427,134	($572,866)

In this case, the market value of equity is $1,427,134, or 14%. This is a nearly 29% decline in market value from the base case. While it may be within the policy guidelines, is this risk indicator showing management something that they should be paying attention to? Using the logic from earlier in the paper, it only matters if the bank is being liquidated. Since the earnings simulation only shows 10% of income at risk, the strategy is sound, and carries minimal risk.

However, what would happen in year 3? The 2 year CDs would reprice up 2% as well, resulting in:

Year 3

Item	Balance	Rate	Inc/Exp
Loans	$10,000,000	6.00%	$600,000
1 Year CDs	$4,000,000	4.00%	$160,000
2 Year CDs	$4,000,000	5.00%	$200,000
Capital	$2,000,000	0.00%	$0
Net Income			$240,000

This $240,000 net income is 40% below the base level, and more importantly, remains in years 4 and 5 of the life of the asset. The two scenarios are compared in this table:

Year	Net Income (Flat)	Net Income (Up 2%)	Variance ($)	Variance (%)
1	$400,000	$400,000	$0	0.00%
2	$400,000	$320,000	($80,000)	-20.00%
3	$400,000	$240,000	($160,000)	-40.00%
4	$400,000	$240,000	($160,000)	-40.00%
5	$400,000	$240,000	($160,000)	-40.00%
Total	$2,000,000	$1,440,000	($560,000)	-28.00%

Over the life of the balance sheet, income would be lower by 28%, which is nearly identical to the MVE measurement of value at risk (note they are not exact because the simulation ignores things like reinvestment of cash flows, etc.). Even though the bank was not liquidated, the risk on the balance sheet translated directly to lower returns. While this example is obviously oversimplified for a bank balance sheet, the overall impact is not exaggerated. It is simply an example to illustrate the math behind the concepts. The same logic applies to a bank that is booking mortgages with a duration of 7.0, and funding it with liabilities with a duration of 1.0. Over the short term, the impact of rate changes on income might be minimal, but over the long term, all of the liabilities

are repricing every year while only 1/7th of the assets are repricing. Over the full 7 year life of the assets, an increase in rates could have a detrimental impact on the institution's performance. This effect is true not only of entire balance sheets, but also at the margin for new business. Many banks are currently growing in their bond portfolios, and are adding duration in order to generate positive spreads. In the meantime, this growth is funded with shorter term deposits because they currently have such a low cost of funds. Each month these banks are adding interest rate risk to their balance sheets, and most do not measure the impact until it is already booked.

Conclusion

Although most bank balance sheets, especially those of community financial institutions, are relatively short in duration, nearly all have longer term assets and liabilities. These balance sheets most certainly have instruments with optionality and risk that lies beyond the scope of even a multi-year income simulation. MVE is a tool that allows bankers to gauge the long-term interest rate risk they are taking and determine if their returns are commensurate. Since MVE is a long-term measure captured in present day value, it also allows management to make strategic changes if necessary in order to hedge or mitigate the risk.

With rates at record lows, and the yield curve historically steep, regulators are concerned about the level of interest rate risk that banks are taking in an effort to recoup credit losses and/or cover rising overhead. This has led to a renewed focus on the process of measuring and managing interest rate risk, and regulators expect banks to be properly measuring and managing to both short-term and long-term interest rate risk. As prudent stewards of bank balance sheets, it is vital that bank management teams understand the importance of MVE and embrace it as a risk management tool, and not just an academic calculation being performed for the sake of the examiners.

When a new strategy is being planned and implemented, management should be testing the potential impact on MVE. Most asset liability management systems and providers allow for testing, or "what-if" scenarios, where future MVE can be estimated. For example, if a bank is considering a strategy of growing commercial and industrial loans and funding it with a premium money market account, then a balance sheet including those new balances being added should be measured for MVE. The new results can then be compared to the original measurement, and management can determine if the added income from the strategy justifies any long-term interest rate risk that may be added to the balance sheet. In this manner, the bank is managing interest rate risk in a prudent, dynamic, and forward looking way, and will choose the strategy that generates a better risk adjusted return to shareholders.

About the author

Dallas Wells is Vice President at Asset Management Group, Inc. He has more than a decade of banking experiencing, working in both large regional banks and community banks in a variety of roles. Mr. Wells has a degree in finance from Washington University in St. Louis, and is a graduate of the Southwestern Graduate School of Banking. He can be reached at dwells@countryclubbank.com, or via Asset Management Group's blog at http://assetmanagementgroup.blogspot.com/

About Asset Management Group, Inc.

Asset Management Group, Inc. (AMG) is a wholly owned subsidiary of Country Club Bank in Kansas City, and has been serving community banks since 1995 with their BancPath Asset Liability Management Service and asset liability management consulting.

AMG's staff is made up of professionals with years of experience in managing interest rate risk, liquidity risk, and net interest margins in and for community banks. AMG is owned by a community bank that uses the service, and has designed the proprietary model with community banks and their management teams in mind.

2024 Note: *This article was originally written in a low rate environment with a steep yield curve.*

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