

A Critical Note on MCEV Calculations Used in the Life Insurance Industry

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Abstract. Since the beginning of the development of the so-called embedded value methodology, actuaries have been using the present value of future profits as yardstick when valuing life insurance activities. However, using profits as a fundamental input is subject to criticism because profits are no actual cash flows. In an attempt to create more transparency and robustness the CFO forum (2008) has set a definition for market consistent embedded value (MCEV). Nevertheless, this definition refers again to the present value of future profits. In this note we show that such a definition is misleading and, instead of creating more transparency, it could end up in creating more confusion.

Keywords: Embedded value, MCEV, fair value, cash flow projections, business valuation, profits, cash flows.

1 The History of Embedded Value

1.1 The Origins

The embedded value methodology was devised and developed in the nineteen eighties, mainly in Anglo-Saxon countries. The reason for such development was the increasing demand from shareholders and investors for more accurate and reliable information about the value generated by life insurance companies.

Shareholder value became a key concept and insurance companies started implementing internal processes to monitor the value created by their business activities. Due to the inherent characteristics of the life insurance contracts, i.e. the distribution of expenditure and income over a long period of time resulting from the usually long contract terms, there was a growing feeling that the traditional historically-oriented accounting information was inadequate to measure the intrinsic value generated by life insurance activities. Indeed the traditional accounting was not forward looking and did not allow answering key questions such as:

- How much value is locked up in the company?
- How sensitive is the value to changes in key assumptions?

All this gave a significant impulse for the development of the embedded value concept. While embedded value was originally used to determine a company's shareholder value

or the price in case of an acquisition or merger, it has been used gradually by insurance companies for the internal control and adjustment of their strategy.

1.2 The CFO Forum

The CFO Forum was created in 2002 and is a high-level discussion group composed by the Chief Financial Officers of major European insurance companies³. Its aim is to discuss issues that are related to financial reporting developments for their businesses, and to create greater transparency for investors.

In particular, in May 2004, the CFO Forum launched European Embedded Value (EEV) Principles, together with additional guidance on disclosures in October 2005, to address the treatment of guarantees and options and provided the insurance industry with improved sensitivities and disclosures within their financial statements.

In June 2008, the CFO Forum published a new set of so-called Market Consistent Embedded Value Principles (MCEV), which should bring additional consistency and improve disclosure.

The adoption of the MCEV Principles should deliver:

- A shareholder's perspective on value, being the present value of future cash flows available to the shareholder, adjusted for the risks of those cash flows;
- A market consistent approach to financial risk;
- A greater focus on disclosing cash emerging from covered business;
- Disclosure of combined Group MCEV information.

The MCEV Principles will replace the EEV ones and will be mandatory for CFO Forum members as of year ended 31 December 2009 with early adoption possible.

1.3 The MCEV Definition of the CFO Forum

According to the CFO Forum (2008) MCEV represents 'the present value of shareholders' interests in the earnings distributable from assets allocated to the covered business after sufficient allowance for the aggregate risks in the covered business has been made. The allowance for risk should be calibrated to match the market price for risk

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where reliably observable. The MCEV consists of the following components:

- free surplus allocated to the covered business;
- required capital; and
- value of in-force covered business (VIF).

The CFO Forum continues by providing the following clarifications for the different components involved.

Free Surplus

The free surplus is the market value of any assets allocated to, but not required to support, the in-force covered business at the valuation date.

Required Capital

Required capital is the market value of assets, attributed to the covered business over and above that required to back liabilities for covered business, whose distribution to shareholders is restricted.

Value of In-Force Covered Business

The value of in-force covered business consists of the following components:

- present value of expected future profits (where profits are post taxation shareholder cash flows from the in-force covered business and the assets backing the associated liabilities) (PVFP);
- time value of financial options and guarantees;
- frictional costs of required capital;
- cost of residual non hedgeable risks.

The purpose of this document is not to detail the different elements of the MCEV calculation, but rather to demonstrate that the definition provided is misleading. Indeed, this definition refers to different concepts such as shareholders' interests in the earnings distributable, profits or cash flows, but not all these concepts can be used for valuation purposes. While earnings and profits are similar concepts cash flows are of a different nature. The next section will first give a high-level overview of the major financial statements and will detail the relation and the differences between profits and cash flows.

2 Overview of Financial Statements

Accounting organises and summarises economic information so decision makers can use it. Accountants present the information in reports called financial statements. To prepare these statements, accountants analyse, record, quantify, accumulate, summarise, classify, report, and interpret economic events and their financial effects on the organisation.

Accounting helps decision making by showing where and when a company spends money and makes commitments, providing information for evaluating financial performance,

and illustrating the financial implications of choosing one plan instead of another. Accounting also helps to predict the future effects of decisions, and finally it adds to identifying current weaknesses, imperfections and inefficiencies as well as opportunities.

Listed companies prepare the following financial statements on a quarterly basis:

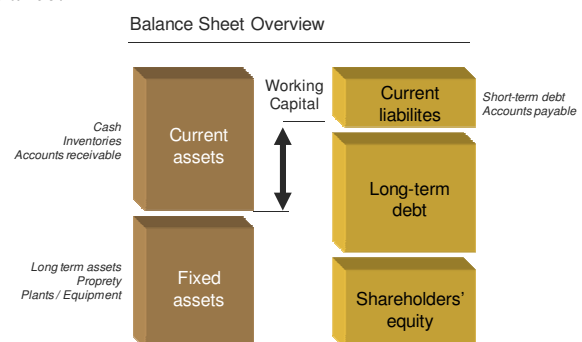
- the balance sheet which provides a financial picture at a set date;
- the income statement and cash flow statement which focus on the performance over time.

In this section, we detail the information provided by these financial statements and show how we have to liaise it with valuation models.

2.1 The Balance Sheet

One of the major financial statements prepared by the accounting system is the balance sheet. The balance sheet shows the financial status of a company at a particular instant in time. It is essentially a snapshot of the organisation at a given date. It has two counterbalancing sections. The left side lists assets, i.e. resources of the firm (everything the firm owns and controls – from cash to buildings, etc). The right side lists liabilities, i.e. the claims against the resources.

Every transaction entered into by a company affects the balance sheet. A transaction is any event that affects the financial position of an entity and that an accountant can reliably record in money terms. When accountants record a transaction, they make at least two entries so the total assets always equal the total liabilities plus shareholders' equity. Therefore, we must maintain the equality of the balance sheet equation for every transaction. An accountant who prepares a balance sheet that does not balance has made a mistake somewhere because the balance sheet must always balance.



Working capital (also known as net working capital) is a financial metric which represents the amount of day-by-day operating liquidity available to a business. Along with fixed assets such as plant and equipment, working capital is

considered a part of operating capital. It is calculated as current assets minus current liabilities.

2.2 The Income Statement

Measuring income is important to everyone, from individuals to businesses, because we all need to know how well we are doing economically. Most people regard income as a measure of the increase in the “wealth” of an entity over a period of time. However, there is less agreement on just what wealth is and how we should measure it. Nevertheless, accountants have agreed on a common set of rules for measuring income and wealth that all companies are supposed to apply (GAAP⁴ – IFRS⁵). Decision makers such as investors can more easily compare the performance of one company with that of another when both companies use the same measuring rules.

The calendar year is the most popular time period for measuring income or profits. However, companies can use a fiscal year that differs from a calendar year.

Revenues and expenses are the key components in measuring income. These terms apply to the inflows and outflows of assets that occur during a business's operating cycle. Companies gain assets when they sell products or services and record sales revenues which increase the owner's interest (equity) in the business by the amount of assets received in exchange for the delivery of goods or services to customers. In contrast, companies give up assets when they recognise expenses, which decrease the owner's interest. Expenses are measures of the assets that a company gives up or consumes in order to deliver goods or services to a customer. Together revenues and expenses define the fundamental meaning of income, which, is simply the excess of revenues over expenses. Common synonyms for income are profits or earnings.

One of the fundamental features of corporate financial reports is that they are prepared using accrual rather than cash accounting. Unlike cash accounting, accrual accounting distinguishes between the recording of costs and benefits associated with economic activities and the actual payment and receipt of cash. Another important concept in accounting is the matching principle which links revenues to the expenses that pertain to the revenues. When expenses are matched with revenues, they are not recognised until the associated revenue is also recognised. For instance, the cost of purchasing a fixed asset is spread over the period in which it is expected to generate revenue. Net profit is the primary periodic performance index under accrual accounting. To compute net profit, the effects of economic transactions are recorded on the basis of expected, not necessarily actual, cash receipts and payments. Expected

cash receipts from the delivery of products or services are recognised as revenues, and expected cash outflows associated with these revenues are recognised as expenses.

In other words, the income statement includes what we call non-cash transactions such as amortisation of intangible assets, depreciation of tangible assets or the increase/decrease in policyholder reserves to quote the most popular ones.

Therefore, if we define a cash flow as the term that refers to the amount of cash being received and spent by a business during a defined period of time, yearly profits are not cash flows.

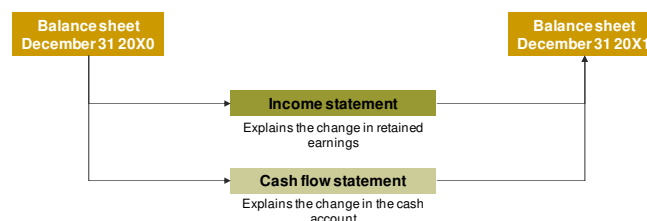
Nevertheless, the income statement is an important link between two balance sheets: *income statements are filling in the gaps between balance sheets*. The balance sheets show the financial position of the company at discrete points in time, and the income statements explain the changes that have taken place between those points. More specifically, income statements explain the change in one balance sheet item: *retained earnings (total cumulative shareholders' equity generated by profits)*.

2.3 The Statement of Cash Flows

The primary importance of cash makes the statement of cash flows one of the central financial statements. It explains the changes that occur in the firm's cash balance during the year. The statement of cash flows allows both investors and managers to keep their fingers on the pulse of any company's lifeblood – cash.

Although managers and investors benefit from watching cash flows, until recently many countries did not require a statement of cash flows. Today, both the IASB⁶ and FASB⁷ require a statement of cash flows.

Balance sheets show the status of a company at a single point in time. In contrast, statements of cash flows and income statements show the performance of a company over a period of time. Both explain why the balance sheet items have changed. The statement of cash flows explains where cash came from during a period and where it went.



⁴ Generally Accepted Accounting Principles

⁵ International Financial Reporting Standards

⁶ International Accounting Standards Board

⁷ Financial Accounting Standards Board

Managers affect cash by three types of decisions: operating, investing, and financing decisions.

Operating activities are transactions that affect the purchase, processing, and selling of a company's products and services. This information is summarised in the section of the statement of cash flows labelled cash flows from operating activities.

The statement of cash flows covers the results of investing decisions in a section labelled cash flows from investing activities. Investing activities are transactions that acquire or dispose of long-lived assets – assets that the company expects to provide services for more than a year.

The section of the statement of cash flows labelled cash flows from financing activities will help us to understand financing decisions. Financing activities are a company's transactions that obtain resources as a borrower or issuer of securities or repay creditors and owners.

The statement of cash flows can be summarised as follows:

Cash Inflows	Cash Outflows
Operating activities	
Collections from customers	Cash payments to supplier
Interest and dividends collected	Cash payments to employees
	Interest and taxes paid
Investing activities	
Sale of property, plant and equipment	Purchase of property, plant and equipment
Sale of securities that are not cash equivalent	Purchase of securities that are not cash equivalent
	Making loans
Receipt of loan repayments	
Financing activities	
Borrowing cash from creditors	Repayment of amounts borrowed
Issuing equity securities	Repurchase of equity shares
Issuing debt securities	Payment of dividends

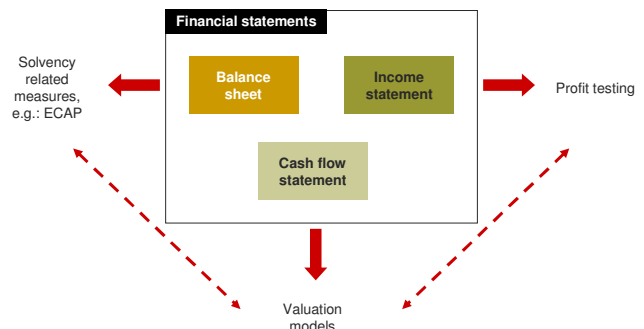
The difference between cash flows from operating and investing activities defines an important concept used for valuation purposes: *free cash flow (FCF)*. Free cash flow is the amount of cash that a firm can pay out to investors after paying for all investments necessary for growth.

The value of a business is usually computed as the discounted value of free cash flows out to a valuation horizon (T), plus the forecasted value of the business at the horizon, also discounted back to present value. In the context the insurance industry, the valuation horizon is generally the period to which all contracts will mature.

2.4 Extending the Use of Financial Statements

Financial statements provide the most widely available data on public corporation's economic activities. The projections of these reports over time provide useful information for the decision makers of firms.

For instance, projecting the balance sheet over time allows the assessment of the evolution of the solvability over time from which we can derive economic capital (*ECAP*) measures. Forecasting future income statements provides useful information on the profitability of firms. Finally, projecting cash flows is the key element for valuation purposes. The graph hereunder gives an overview of these different aspects:



3 Valuation Models

The economic value of the firm is intimately connected to the projected future cash flows. To show why this is actually true let us take a step back and draw a parallel with the pricing of fixed income securities in financial markets. Assume a simple risk free fixed income instrument which offers a cash flow of €1,05 to the buyer of the contract after a period of one year and let us assume that the risk free rate is 5%. One will realise that the value of this cash flow must be €1 otherwise arbitrage opportunities exist. For example, if the value is lower than €1 (say €0,95) then the buyer could simply borrow €0,95 to finance its investment, next reimbursing $0,95 \times 1,05$ Euros after one year and by receiving €1,05 making a profit out of nothing (the case that the value is higher than €1 can be similarly treated).

Often cash flows are not fixed but stochastic and this makes the valuation more complicated. However when these cash flows can be effectively associated to market instruments then the absence of arbitrage opportunities is again determining the pricing uniquely. In fact the market instruments can then be used to construct so-called replicating portfolios – which allow to mimic the cash flow under consideration – and in the absence of arbitrage opportunities the value of the cash flow stream must then be equal to the objective value of such replicating portfolio. In all these instances the pricing effectively amounts to calculating the expected cash flows using so-called risk neutral probabilities, next discounting these expected cash flows at the risk free rate.

On the other hand, when cash flows are stochastic but cannot be replicated using market instruments (e.g. non-life insurance liabilities) then the pricing becomes more subjective.

However as shown in Section 2, profits are not cash flows and, therefore, what actuaries traditionally called *PVFP* (i.e. present value of future profits) can in any case not be used to derive the value of life insurance portfolios. Indeed, profits are dependent on accounting rules while the valuation of a company is independent of these rules as it depends only on the cash this company is able to generate.

Hence for valuation purposes, we have to determine first the amount of cash that is left over for shareholders over time. Assuming that the company does not use external financing and does not accumulate cash, the amount of cash left over to shareholders is the free cash flow. Moreover, the consequence of this assumption is that valuation models have to focus only on investing and operating flows.

To get the free cash flow from net income, some adjustments are required. Hereunder, we detail the adjustments needed:

Revenues
– Expenses
(Operating) Profit
– Taxes
Net Income (<i>NI</i>)

1. Adjustments to reconcile *NI* to cash provided by operating activities:
 - + Depreciation of tangible assets (*D*)
 - + Amortisation of intangible assets (*A*)
 - + Δ Policyholder reserves (*PR*)
 - + Δ Provisions (*P*)
 - Δ Net working capital (*NWC*)
 - Losses/gains on sales of long-lived assets (*LG*)

Cash provided by operations (*OCF*) =
 $NI + D + A + PR + P - NWC - LG$

2. Adjustments due to investing transactions:
 - + Purchase fixed assets for cash (*PFA*)
 - Sell fixed assets for cash (*SFA*)
 - + Purchase investment securities of other firms that are not cash equivalent (*PIS*)
 - Sell investment securities of other firms that are not cash equivalent (*SIS*)
 - + Make a loan to another company or person (*ML*)
 - Collect a loan (*CL*)

Cash provided by investments (*ICF*) =
 $PFA - SFA + PIS - SIS + ML - CL$

The free cash flow is then defined as follows:

$$\text{Free cash flow (FCF)} = OCF - ICF$$

Based on this, the value of the business FV_{bus} is determined by the following equation:

$$FV_{bus} = \sum_{i=1}^T FCF_i \cdot df_i + PV_T \cdot df_T,$$

where FCF_i is the expected free cash flow generated on year i , df_i is the discount factor of year i , T is the valuation horizon and PV_T is the forecasted value of the business at T . When cash flows are stochastic and not replicable, their expectations are taken with respect to real-world subjective probabilities. The discount factor is then subjective as well and could be derived, for instance, from the weighted average cost of capital (WACC). In contrast when cash flows are replicable (also called hedgeable) a risk free rate should be used for discounting as well as risk neutral probabilities for calculating the expectations.

4 Determining the VIF: an Example

In this section, we present a simple example to show the relations between the balance sheet, the income statement and the statement of cash flows. We detail also where the information to value business activities can be found.

Let us assume that we have to determine the value of the in-force business of an insurance company having a bond portfolio with a book value of 100 (the bonds were issued at par and earn a coupon of 3%) and owing policyholder reserves of 100. The value of the differed acquisition costs (DAC) associated to these liabilities are worth 10. Therefore at time 0, the balance sheet of this company is as follows:

Assets	
DAC	10
Bonds	100
Total	110

Liabilities	
Policyholder Reserves	100
Retained Earnings	10
Total	110

For the sake of simplicity, we make the following assumptions:

- The remaining term of all insurance contracts is 5 years
 - They all guarantee a death capital of 600
 - The 1 year mortality rate is 3% for all ages (i.e. ${}_1q_{x+t} = 3\%, \forall t$)
 - The interest guaranty on premium and reserves is 2,5%
 - The total written premium are equal to 20 and are due at the beginning of the year
 - After 5 years, reserves are paid back to policyholders
 - No profit sharing is distributed.
- Administrative expenses are calculated as a percentage of the premium and are equal to 15%
 - Expenses are paid at the end of the year
 - DAC is amortised 20% per year.

- New assets (bonds and cash) earn the risk-free rate – 95% of the increase of reserves are invested, at the beginning of each year, in new bonds which are issued at pair with a maturity equal to the remaining term of insurance contracts.
- The risk-free rate is flat during 5 years and is equal to 5% – The tax rate is equal to 0% – Nobody will die during the next 5 years.
- The valuation horizon we consider is 5 years. In our example, we can neglect time value of financial options and guarantees, frictional costs of required capital and cost of residual non hedgeable risks.

We use traditional actuarial formulas to calculate future outcomes. The tables below present the evolution of the three financial statements:

Balance Sheet

Year	1	2	3	4	5
Assets					
DAC	8,00	6,00	4,00	2,00	0,00
Bonds	107,62	115,66	124,17	133,15	0,00
Total	115,62	121,66	128,17	135,15	0,00
Liabilities					
Policyholder reserves	108,02	116,49	125,44	134,90	0,00
Retained Earnings	7,60	5,18	2,73	0,26	0,00
Total	115,62	121,66	128,17	135,15	0,00

Income Statement

Year	1	2	3	4	5
Revenues					
Premium	20	20	20	20	20
Investment Income	4,00	4,38	4,78	5,21	5,66
Expenses					
Δ Reserves	-8,02	-8,47	-8,95	-9,46	134,90
DAC amortisation	-2,00	-2,00	-2,00	-2,00	-2,00
Benefits	0,00	0,00	0,00	0,00	-144,90
Admin Expenses	-3,00	-3,00	-3,00	-3,00	-3,00
Profit	10,98	10,91	10,83	10,75	10,66
Taxes	0	0	0	0	0
Net Income	10,98	10,91	10,83	10,75	10,66

Statement of Cash Flows

Year	1	2	3	4	5
Cash flow from operating activities					
Net Income	10,98	10,91	10,83	10,75	10,66
Δ Reserves	8,02	8,47	8,95	9,46	-134,90
DAC amortisation	2,00	2,00	2,00	2,00	2,00
OCF	21,00	21,38	21,78	22,21	-122,24
Cash flow from investing activities					
Bonds Purchase	7,62	8,05	8,50	8,99	9,50
Matured Bonds	0,00	0,00	0,00	0,00	-142,65
ICF	7,62	8,05	8,50	8,99	-133,15
Free Cash Flow	13,38	13,33	13,28	13,22	10,92

This example shows that net incomes and free cash flows explain the evolution of the retained earnings. More precisely, retained earnings of year i (RE_i) can be obtained as follows:

$$RE_i = RE_{i-1} + NI_i - FCF_i,$$

where NI_i and FCF_i are the net income and the free cash flow of year i respectively. Free cash flow has to be deducted in this formula as it is considered as the amount which is distributed to shareholders and paid back to them as dividend. By discounting net profits and free cash flows with the risk-free curve we get 46,91 and 55,74 respectively.

As for valuation purposes the only thing which matters is the cash left over to shareholders, the value of the in-force business is 55,74 – i.e. the present value of future cash flows.

5 Conclusion

In this document, we have presented a valuation approach which is consistent with modern financial modelling. Based on the projection of the standard financial statements, we make the link between post tax profits and cash flows.

As the objective of the CFO forum was to create greater transparency for investors, we do not think that this can be achieved if well-known concepts such as profits are redefined in the context of MCEV. Therefore, the CFO forum should avoid defining profits as post taxation shareholder cash flows because, by doing this, confusion is created. There is no reason why the definition of well-known concepts used in finance and accounting should be changed in an insurance context.

According to us, all reference to earnings and profits should be removed from the definition of the MCEV and should be replaced by cash flows. As a consequence, the PVFP concept, even if it is used since the creation of embedded value, should not be used anymore. We suggest to replace it by PVFCF, i.e. the present value of future free cash flows.

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