

The RAROC as an Alternative Model of Analyzing the Lebanese Banks' Performance and Capital Allocation

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Abstract

This paper attempts to depict the required equations for applying the RAROC paradigm for the Lebanese banks as it is currently the only practicable solution to capital budgeting problems. We used the RAROC as a proxy for value creation assessment. Our empirical study showed an outstanding economic profit for the home loans line of business; earnings exceeded the required return on capital by 5.2% compared to a hurdle rate of 8.5%. This line of business has positively contributed to the overall value of these banks. We were unable however to measure the diversification benefit of this line of business.

Keywords: Lebanese banks; Risk Management; RAROC; Economic profit; Capital structure

Introduction

The Lebanese banks are subject to many forms of risks, of which credit and market risks. The credit risk is defined as the default on a promised payment when the counterparty fails to honor the contractual obligation related to mortgage, loan, or swap agreement [1]. The market risk involves the risk that the values of, or the cash flows from, assets will change as a result of market factors fluctuations, such as interest or exchange rates. The regulations of the Central Bank of Lebanon (CBL) focused on credit risk, the quality of assets, and internal control systems [2]. The purpose of regulations is not to control the risk a bank can take but rather to limit the probabilities that unfavorable outcomes happen and negatively affect the bank's capacity to bear losses. A bank's capital helps establish a level of confidence sufficient to attract deposits to fund its operations and serves as a cushion to absorb unforeseen losses so that the bank can continue in business [3]. Agreement on what constitutes sufficient capital is not easy to accomplish. Bankers and regulators are continuously trying to define capital adequacy: what constitutes "capital" and what is "adequate" are still not appropriate for the case of the Lebanese banks.

Capital allocation plays a vital role for the Lebanese banks. Regulations, such as those promulgated by the Basle Committee, prescribe minimum equity capital based on the risk of the bank's assets, which can change quickly due to asset allocation decisions and the volatility of asset markets. Banks and other financial institutions tried to base their capital allocation processes on shareholder value concepts such as Risk Adjusted Return On Capital, RAROC, and Economic Value Added, EVA¹. Some of the motivation for these approaches has come from the initiatives of the Basle Committee in defining international capital requirements [4]. The academic literature has provided limited guidance on the optimal form of such capital allocation mechanisms, especially in the presence of multiple divisions subject to agency problems of asymmetric information. Alternative capital allocation methods include using regulatory risk-based capital standards; assignment based on the size of assets; benchmarking each unit to "pure-play" peers that are stand-alone; and measures of each line of business's riskiness [5]. The primary purpose of the risk-based standards is to make bank capital requirements more responsive to

the risk in a bank's portfolio of assets. Although capital ratios at banks have increased since the risk-based standards took effect, the question is to what degree these increases are a response to risk-based capital. The adoption of an international risk-based capital standard under the Basle accord reduces some of the deficiencies in measurement of capital adequacy.

The purpose of this paper is to suggest for the Lebanese banks an optimal capital allocation mechanism using the RAROC (Risk-Adjusted Return on Capital), for a better profitability and risk evaluation. The RAROC has never been implemented by the Lebanese banks as shown by the complete absence of academic literature and empirical studies related to this sector.

Section 1 justifies the need for a strong framework for risk management in banks and outlines the related review of literature. Section 2 defines the RAROC and depicts the RAROC model that compares the risk adjusted performance measure to equity return. Section 3 builds the RAROC model for the Lebanese banks home loans line of business. Section 4 offers some concluding remarks.

Risk Management in Banks and the Review of Literature

There is a complete absence in the neoclassical finance theory literature regarding the importance of conducting risk management at the bank level in order to enhance value. The neoclassical theory has developed many useful theories like the Capital Asset Pricing Model². However and according to Damodaran [6], in such a current, risk management at the bank level becomes irrelevant and can even be harmful since incurring higher costs for conducting risk management would be a value-destroying scheme. Only the traditional Discounted Cash Flow approach was adopted as the rule for capital budgeting where only the systematic risk counts. According to Mason [7], under

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¹Uyemura, Kantor and Pettit (1996) discussed the use of these concepts in general.
²Sharpe 1964, Lintner 1965, and Mossin 1966 and the Modigliani and Miller (M&M – Modigliani and Miller 1958).

the strict assumptions of the neo-classical theory there would be no reason for banks to exist.

On the other hand, the neo-institutional finance theory found that managing risk can increase the value of a bank as a result of decrease in agency costs of equity (through the increase of leverage without increasing the probability of default), debt and transaction costs.

Froot et al. [8] summarized that neither the neo-classical nor the neo-institutional theory offered a guideline on how risk management strategies can be applied in practice. In fact all the previous academic researches focused on why risk management is a must at the corporate level in terms of value creation and neglected the development of risk management instruments and approaches to be used for a better optimization of value.

Stulz [9] and Perold [10] showed that risk management is inseparable from capital budgeting decisions and the capital structure choice since both affect total risk costs. Therefore, there is a need to define an adequate total risk measure for banks. Merton and Perold [11] identified the economic capital often called "risk capital" which is similar to the Value at Risk (VaR) and where economic capital is measured on the basis of the potential loss of value over a given period of time at a certain confidence level, or the VaR. Schröck [12] detailed the determination of economic capital based on the market, credit, and operational risks and showed how the impact of any transaction on the bank's overall risk can be measured.

None of the approaches to calculate a bank's profitability such as ROA, ROE or DCF adjusts for (total) risk [13]. Only economic capital totally reflects the overall riskiness of the bank's transactions. Therefore banks developed a capital budgeting rule called the RAROC which determine the economic profitability (return on economic capital). This is called Risk-Adjusted Performance or Profitability Measures.

Understanding the RAROC

Risk-adjusted performance measures, or RAPM, have been one of the mottos of the banking industry. The term embraces a number of concepts and has been given different definitions, but all RAPM techniques have one thing in common: they compare risk-adjusted return against an appropriate hurdle rate that reflects the bank's cost of capital or the opportunity cost to stockholders in holding equity in the bank.

Zaik et al. [14] consider that the determination of economic capital is required for risk management and economic profitability purposes. The main objective being to measure the contribution of each transaction to the overall bank's value creation for optimal capital budgeting, appropriate incentive compensation decisions and clear identification of the bank's competitive advantage [15]. RAROC is used by banks for the economic profitability purposes. The right definition of RAROC still suffers from perplexity.

Irrespective of other RAPM-variants such as the RORAC (= Return on Risk-Adjusted Capital) or

RARORAC (Risk-Adjusted Return on Risk-Adjusted Capital), RAROC is usually derived by dividing excess return by the total amount of economic capital (or risk capital).

$$\text{RAROC} = \text{Risk-Adjusted Net Income (RANI)} / \text{Economic Capital (EC)} \quad (1)$$

The purpose of RAROC is to quantify the amount of equity capital necessary to support all of the bank operating and trading activities, as well as traditional lending in order to limit the exposure of the

bank's depositors and debt holders to a specified probability of loss. The process consists of capitalizing each business unit in a consistent way with a sound credit rating. Therefore measuring and adjusting the stand-alone risk of each unit become a must. The stand-alone risk of a business unit is measured by the expected volatility of its operating value. The aggregation of all the capital allocations related to each unit will then build optimal level of equity capital for the entire bank.

According to Zaik et al. [14], Kimball [16], Crouhy et al. [13], RAROC is a modified return on equity measure, namely the return on economic capital, where

$$\begin{aligned} \text{Risk-Adjusted Net Income}^3 = & \\ & \text{Expected Revenues (Gross Interest Income + Other Revenues (e.g. fees))} \\ & - \text{Cost of Funds} \\ & - \text{Non-interest Expenses (Direct and Indirect Expenses + (Allocated Overhead)} \\ & \pm \text{Other Transfer Pricing Allocations}^4 \\ & - \text{Expected (Credit) Losses} \\ & + \text{Capital Benefit}^5 \end{aligned}$$

RAROC is a single period measure and is similar to the Sharpe ratio (Sharpe and Alexander (1990)), being defined as:

$$S_i = (R_i - R_f) / \sigma_i \quad (2)$$

where

S_i = Sharpe ratio for transaction i ;

R_i = return of transaction i ;

R_f = risk-free rate of return;

σ_i = standard deviation of the rate of return of transaction i .

Assuming Risk-Adjusted Net Income equals R_i , subtracting R_f from the RAROC numerator and assuming Economic Capital (or risk capital) equals σ_i , it is easy to show that some banks apply RAROC (without capital benefit) with the aim of maximizing the value of the ratio. Economic Capital and the risk-adjusted net income are both calculated over the same measurement period (one year). The only risk-adjustment in the numerator is the deduction of expected losses⁶ related to credit.

Concretely, the Economic Capital is the amount of (risk) capital required for a transaction on a marginal basis [10]. The transformation of RAROC into Economic Profits (economic income) shows that the economic profit isn't but a function of the economic capital where

$$\text{Economic Profit} = \text{Risk-Adjusted Net Income (RANI)} - \text{Cost of Economic Capital} \quad (3)$$

And:

$$\text{Cost of Economic Capital (COEC)} = \text{Economic Capital (EC)} * \text{Hurdle Rate (KHR)} \quad (4)$$

Since management is concerned whether earnings exceed the firm's required return on capital, the minimum required return, or cost of equity, represents a hurdle rate, or stockholders' minimum required rate of return. Therefore, Economic Profits reflect the contribution of a transaction into the overall value of the bank while taking into

³in absolute dollar terms

⁴Kimball (1998) describes the challenges of designing allocation and transfer pricing systems in banks at length.

⁵Capital benefit is the cost saving for refinancing assets by using (economic) capital instead of debt. Alternatively, it is assumed that the asset is 100% refinanced and that the required economic capital, considered as additional asset, is invested into a risk-free asset, generating a return that is equivalent to the capital benefit.

⁶Or standard risk costs.

consideration the opportunity cost. A positive amount implies a positive contribution and a negative one is destruction.

Rearranging equations (1) and (3) leads to the following one:

$$\text{Economic Profits (EP)} = \text{RAROC} - \text{KHR} \quad (5)$$

Therefore, a positive value creation entails a RAROC exceeding the hurdle rate.

Allocated Risk Capital for the Lebanese Banks

It is necessary for all the Lebanese banks to assign capital to each line of business. The amount of assigned capital should equal the total capital for the bank. This requirement will force senior management to recognize the diversification aspects of each line of business. Many procedures can be followed to assign capital such as asset size, regulatory risk-based capital standards, perceived riskiness of the business unit, benchmarking versus “pure-play” stand-alone business, etc. In fact the appropriate measure would be the volatility in the market value of common stock. Unfortunately, most of the Lebanese banks common

stock are not listed or traded. Alternatives such as the volatility of book capital⁷ or volatility of earnings can't be applicable for the Lebanese banks because rating agencies do not exist for banks in Lebanon and earnings can be easily manipulated. Moreover, most line of business do not have market value balance sheets which makes it very difficult to assess how much each line contributes to the overall riskiness of the entire bank's market value. We suggest the use of economic earnings volatility, called earnings-at-risk (EAR) for the Lebanese banks.

One way to measure the required risk capital is to relate it to the volatility of earnings from each line of business. This analysis is referred to as EAR. Earnings being defined as Risk-Adjusted Net Income, RANI, (see above). Using historical data for each of the last past 30 months, estimate one standard deviation of RANI. This is earnings at risk. The risk capital is then estimated as one (or two or three) standard deviation(s) of earnings divided by the risk-free interest rate (Risk Capital = $\sigma\text{RANI}/R_f$). This capitalizes earnings or equals the amount a business would have to invest at R_f to generate revenue that just covers a pre-determined one, two, or three standard deviations of earnings.

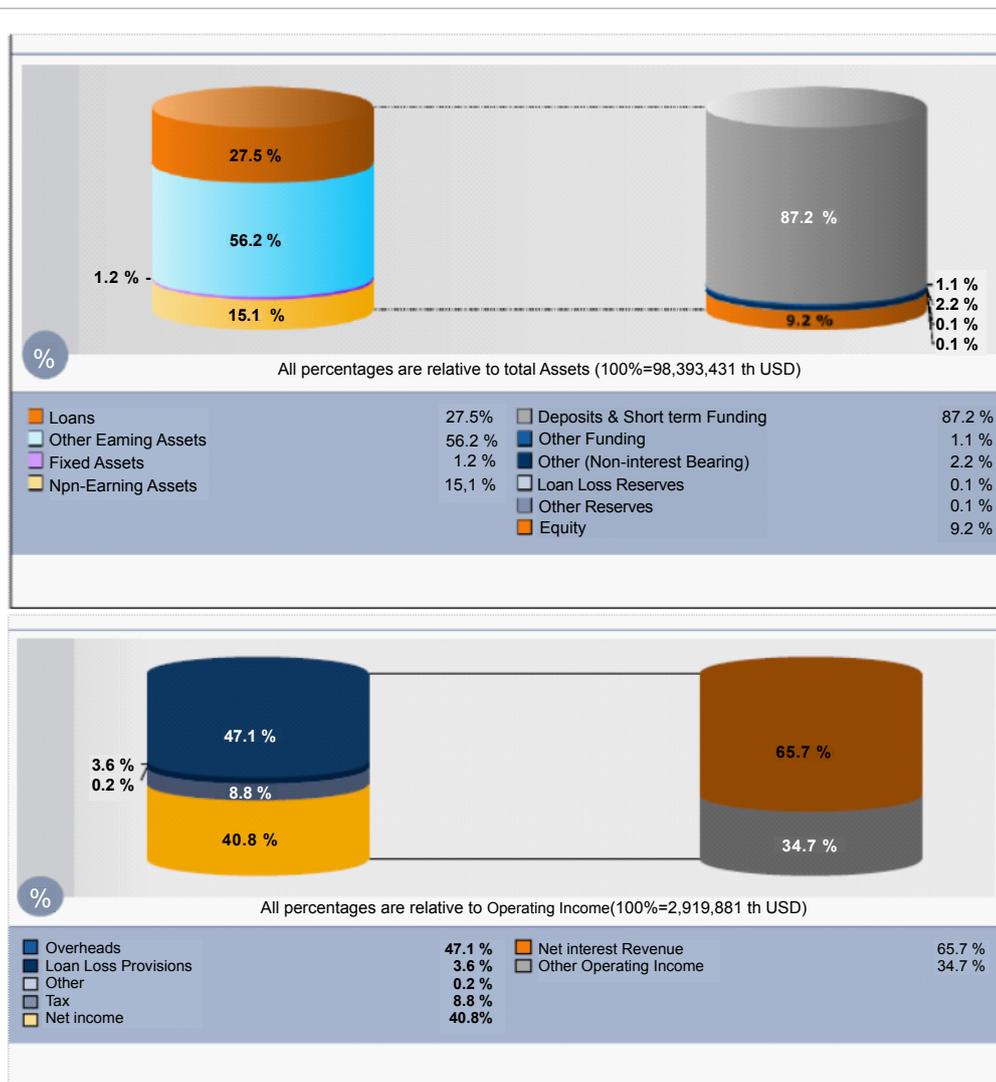


Figure 1: Structure of the Balance Sheet and Income Statements (2010) for the Eight Selected Banks.

⁷Knowing that book value provides no information accurate for the rating agencies

Once the allocated risk capital is determined, the RAROC calculation becomes straightforward by dividing the risk-adjusted net income by the already determined risk capital. The difference between the RAROC and the hurdle rate will determine the bank's value creation. Very few are the Lebanese banks that use such performance assessment. Due to severe lack of data regarding the financials of the Lebanese banks, we tried in this paper to perform the RAROC assessment for the line of business related to home loans without applying the required accurate adjustment for net income.

The sample

We limited the objective of our empirical study to calculating the economic profit of the home loans line of business. Our sample is constituted of the largest eight operating banks in Lebanon in terms of total assets as per the rating of 2010 (Figure 1). Financial statements of these banks have been gathered from Bankscope, a comprehensive database of balance sheet and income statement data for individual banks across the world, from the CBL8, and from data communicated through personal contacts with these banks (Table 1). However, the calculation of the RAROC is carried out with few adjustments due to the impossibility of having access to all the needed data such as the transfer pricing allocations, the capital benefits, etc.

Methodology

For the calculation of the economic profits related to the home loans line of business, we respected the following steps:

1. We extracted the monthly revenues less expenses for the most recent last 24 months. It is quite impossible to find the RANI for this line of business. We used some personal estimation because it was difficult to accurately assign the revenues and costs across this line of business: the allocation of the overhead costs or the litigation costs when different lines share customers was complex. However, the key is that we were consistent over time, which enables meaningful comparisons.
2. The mean and standard deviation in USD were accordingly calculated.
3. We determined the risk capital assuming a risk-free interest rate of 2.84% (annual). This rate represents the average rate of the most recent twenty weighted average rates on US\$ deposits. The

Bank Name	Total Assets mil USD Last avail. yr	Latest ac- counts date	Country rank by assets, roll.	World rank by assets, roll.
Bank Audi SAL - Audi Saradar Group	28,688	06/2011	1	627
BLOM Bank s.a.l.	22,344	12/2010	2	743
Byblos Bank S.A.L.	15,288	06/2011	3	960
Fransabank sal	12,244	12/2010	4	1133
Bankmed, sal	11,186	12/2010	5	1209
Banque Libano-Francaise	8,642	12/2010	6	1413
Bank of Beirut S.A.L.	7,998	06/2011	7	1478
Crédit Libanais S.A.L.	6,494	06/2011	8	1688

Source: Bankscope

Table 1: List of the Selected Banks per Total Assets.

most recent observed rate was for August 2011. Therefore, we estimated the risk capital as two standard deviations of earnings times the risk-free rate divided by 12.

4. The RAROC for the most recent month was deduced by dividing the most recent net income by the already determined risk capital.
5. Finally, we compared the RAROC with an average Hurdle rate of 8.5 % for this line of business.

Economic profits and RAROC

The main objective is to assess the value creation produced by this line of business within the Lebanese banks through the RAROC model. Irrespective of whether the final result is comprehensive or not, the main idea or intent is to provide the Lebanese banks with a complete and detailed model according to which the implementation of the RAROC becomes simple, accessible and feasible. Unfortunately almost all of the Lebanese banks do not put the RAROC into practice despite all its multifaceted advantages and benefits in terms of risk management and performance evaluation.

In fact, earnings exceeded by far the required return on capital for this line of business by 5.2% as illustrated in table 2. Therefore, Economic Profits reflect an outstanding contribution of this line of business into the overall value of these banks.

It is worth mentioning that when evaluating the banks' different lines of business, it is inappropriate to view each as a stand-alone operation because what matters is how much risk the line of business adds to the entire bank. In fact, almost all the different lines of business available at the Lebanese banks share customers and expenses; therefore, measuring the diversification benefits of each line is very difficult. On the other hand, if we consider the huge public debt financed up to 70% by the local Lebanese banks, and if we consider the different forms of "window dressing" techniques and "transactions" to over pass the existing prudential practices and standards, the calculation of capital risk will then require serious net income adjustments and we might notice in this case negative economic profits and a remarkable capital risk.

Discussion and Conclusion

Banks use risk management in order to avoid financial distress conditions. Both systematic and specific risks are behind such distress. An accurate and well designed risk management instruments increases the bank's value. The examination of the RAROC throughout this paper led us to compare the risk adjusted performance measure to equity return. However, the standard RAROC approach can be biased especially that economic capital is a fictional amount of money which may lead to wrong or inaccurate decisions and that risk measure has completely different assumptions from the hurdle rate. In addition RAROC is concerned with the risk contribution to the total risk of

	Value / Formula	Comments
RANI	Last 24 months	Revenues less expenses using personal estimation for risk adjustment
Rf	2.84%	Average rate of the most recent twenty weighted average rates on US\$ deposits
Risk Capital	$(2 * \sigma \text{ RANI} * 2.84\%) / 12$	
RAROC	13.7%	$\text{RAROC} = \text{KRH} + 5.2\% \equiv \text{Value Creation}$

Table 2: RAROC Output.

the bank not with the systematic risk. Such inconsistency should be eliminated by the introduction of some original approaches to capital budgeting.

Despite the deficiencies of the RAROC, it is still very appropriate to be used within the Lebanese banks assessment system. In fact, it combines two factors: the factor that illustrates the contribution of a business line to the total bank's risk and that of the market risk. RAROC could be easily used as a proxy for value creation assessment. Our empirical study, despite its limitations, showed an outstanding economic profit for the home loans line of business and hence a satisfactory level of value creation of the selected banks. We were unable to measure the diversification benefit of this line of business. In addition to the endogenous boundaries related to data collection and RAROC adjustment and measurement, we faced serious dilemma with the overall performance analysis of these banks when considering the monumental public debt amount they are financing; capital risk estimation will then be at least multiplied by five and the value creation concept will be entirely reversed. Further research needs to be done in order to measure the diversification benefit of each line of the banks' businesses for an optimal capital allocation. The RAROC model is considered operational and easily implementable for the Lebanese banks' equation despite its few biased aspects.

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