

Paper 026-2011**Using SAS® for Effective Credit Risk Management of the Commercial and Corporate Credit Portfolio after the Financial Crisis**

Boaz Galinson, Leumi -credit risk modeling and measurement, Israel

ABSTRACT

This paper addresses two main lessons: The first one is that credit risk management should be much more than just an add on to the credit process, but effectively implemented within the credit process and throughout decisions making.

The second one is how to create a complete view and understanding of the risk profile of the credit portfolio. A showcase of Effective Credit Risk Management with SAS describes the different stages of such of a project: the credit risk data base, the modeling of the risk parameters and the necessary IT modules to support advanced credit risk methodology.

INTRODUCTION

The showcase of Effective Credit Risk Management with SAS which is described here is of Leumi.

Leumi is Israel's leading bank with a domestic market share of 30% which is based on a wide and diversified clientele and a **multinational** institution. Leumi numbers 256 branches in Israel, \$85 Billion in total assets, 78 offices in 18 countries, 5 major subsidiaries located in UK, US, Switzerland, Luxemburg and Romania and 13,000 employees worldwide.

Leumi focuses on higher ROE segments and its policy includes conservative risk appetite and a target of an overall capital ratio of 14-14.5%. In spite of that consistent strategy has delivered shareholders' with returns that are superior to other benchmarks: Over a five year period, (17/05/2005-17/05/2010), Leumi delivered returns that are some 17% higher than the Tel Aviv banking index and significantly higher than those of developed markets indices (like MSCI world banks index), which we now belong due to Israel recent upgrade to a developed market status in may 2010.

One of the key contributors to leumi's success is an advanced and effective independent (but not isolated) credit risk management, which I would like to share with you.

My presentation focuses on a specific asset class in our credit portfolio, which its challenges are different from the credit retail portfolio which is often discussed and the risk methodology is well known for and can be well measured and managed. I refer to the commercial and corporate credit portfolio who is more complex (less

homogenous, rich variety of business needs, credits and collaterals, concentration risks on the credit level, etc.) than the retail portfolio and therefore requires a development of a specific methodology and IT tools.

Our commercial and corporate portfolio mainly consists of untraded companies and therefore don't have an external credit rating. Although the markets you operate in might be different from ours, I do believe that you'll find many relevant issues in interest. Our business environment is very competitive, the big borrowers are very sophisticated and price sensitive (they do shop among the banks), the corporate bonds markets finance corporate debts cheap (usually the debt is unsecured). I do get the feeling that the lessons from the crisis (which shouldn't be analyzed by economics, but by psychologies, but that's a different article) are already forgotten (Compensation for risk seems inappropriate). Does it sound familiar to you?

How can we create value to shareholders given Leumi's risk appetite in a competitive market like that? How could a bank effectively manage the risk return of such a credit portfolio?

Methodology and measurement tools of effective credit risk management

What can we learn from the global financial crisis? I would like to focus on two main lessons:

The first one is that credit risk management was more than an add on to the credit process, but wasn't really implemented within the credit process. Even when CRO's spoke up and gave a warning on the gap between the current credit risk profile of the credit portfolio and the risk appetite, their recommendations weren't seriously addressed as expected by senior management. If this input was embedded within the credit process and throughout decisions making maybe the outcome could have been different.

The second one is the lacking of a complete view and understanding of the risk profile of the credit portfolio usually as a result of insufficient credit risk data base. IT capabilities to support advanced credit risk methodology have mainly developed during the last years, while Banks' credit data bases and systems which operates for many years weren't built with that perspective. Hence, credit data bases and systems haven't yet fully contained all relevant risk data and risk parameters which allow effective credit risk management (for example mandatory data fields which are needed to build models and key credit risk parameters such as PD, LGD, EAD, Economic capital, Unexpected losses and concentration risks based on 1 million runs of Monte Carlo simulations).

Please allow me to introduce Leumi's solution to effective credit risk management project for the corporate and commercial credit portfolio.

There were 4 main stages:

Stage 1: Initiating RFP which included our whole credit risk vision translated to functionalities (although we knew that there wasn't one system that can deliver all). By the RFP we could ensure creating the required framework and the ability to identify the gaps between the current state and the desired one.

Stage 2: Building one data base using SAS Detail Data Store (DDS) to support all functionalities required in the RFP. This data base planned to support all relevant IT systems which will be chosen afterwards.

Stage 3: Choosing systems: Best of breed or of best of fit?

I am not aware of one system which provides all of our needs in credit risk measurement and management. There are statistical systems which enable building statistical models to generate risk parameters (such as PD, LGD, EAD, EL, UL). There are credit rating systems that focus on managing different types of rating questioners and their versions, workflows until approval and pre predefined controls (rating expiry, borrowers watch list, rating overrides). Credit rating systems usually lack the statistical modeling capabilities, can't support "what if" simulations (which generate new ratings and compare to the current ones in el, ul terms) and don't have Portfolio Management systems capabilities (regulatory and economic capital, concentration risk, stress tests on the portfolio level). In addition Portfolio management systems rely on risk parameters as an input and can't generate them.

Since one system can't answer all of the needs of effective credit risk management, one consistent and thorough risk data base is a necessary condition, but not sufficient. It's mandatory to ensure integration among the different risk systems (inputs and outputs) that will be in place. However, different vendors have different databases, architecture and business logic. As a result, planning ahead the integrated project is important, otherwise some of the requirements won't be delivered (for example, think how could you estimate the increase in EL and UL if the risk of specific sectors gets worse. Answering that question requires to change some of the inputs in the rating questioner, recalculate ratings, rerun economic capital and analyze current and simulated results on the portfolio level) and the risk data and the risk profile won't be the same among systems. Bank Leumi choose SAS Credit risk management solution as a platform that includes all tools & modules that ensures integration and consistency.

Stage 4: Leumi defined 3 projects for each SAS module and in addition an integration & consistency project on top of that as follows:

1. Laboratory Project for developing PD, LGD, EAD models and calculate EL, UL (see chart 1).

SAS Modules are detailed in chart 3.

2. Credit rating Project (based on 20 types of rating questioners, 3 different workflows for approving the ratings by Risk management).

3. The SAS solution is used to calculate the borrower rating based on the credit officer answers and the PD model.

In addition the SAS solution enables us to incorporate credit “forward looking” by defining scenarios and answering "what if" questions on the questioner level. SAS recalculates the new ratings based on the scenario and compares the affect on the EL and on the rating distribution.

SAS Modules are detailed in chart 3.

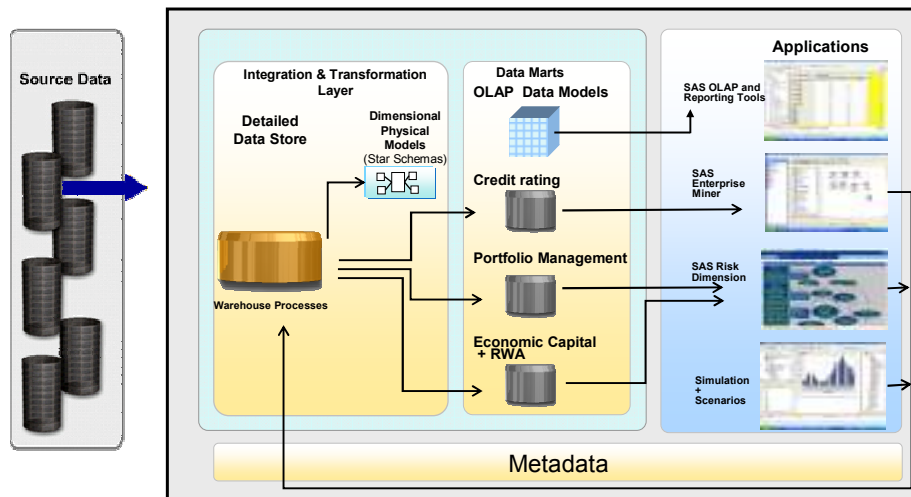
4. Credit Portfolio Management Project based on regulatory capital and economical capital, which takes into account concentration risk (by large obligor, by group of obligors, by economical sectors, by geography etc.) and the affect of a marginal loan on the concentration and on the loss of the current credit portfolio. (see chart 2)

SAS Modules are detailed in chart 3.

5. Report generator which allows to slice data from the DDS and other data sources in different perspectives such as understanding the risk profile of the credit portfolio, pricing commensurate with risk and improving RAROC.

The overall project:

Solution Architecture



While having a structure like that in place we can answer the business questions I mentioned above:

Example 1: If our economic unit delivers a bad forecast for a specific list of sectors (by informing the new risk rating for each sector), we can evaluate the effect on the portfolio's UL, and EL by changing the risk grade of these sectors in the rating questioner, re computing the obligor ratings (PD, EL are changed), and delivering the new risk parameters into Portfolio system. In the Portfolio Management system regulatory capital and Economic Capital are re computed. A comparison report between the current loss distribution and the new loss (or any other relevant variables) is generated to sum up the affect.

Example 2: How big is the exposure to the PIGS countries and what is the EL?

This is a tricky question because geographical exposure can be defined by more than one way. Geographical exposure can be defined by which countries contribute the most to the obligor's income, or can be defined by where the assets of the obligor are located.

In both definitions that kind of information exists in the rating questioner (or obligor basic data). Hence, we can identify these obligors by their country exposure and run a scenario where the relevant country rating is worse or by worsening the income ratios which are part of the financial questions in the rating questioner. Then, we

re- compute the obligor ratings (PD,EL are changed), deliver the new risk parameters into Portfolio Management system and re compute regulatory capital and EC . A comparison report between the current loss distribution and the new loss (or any other relevant variables) is generated to sum up the affect.

CONCLUSION:

After the financial credit crisis financial institutions revise the gaps between the current credit practices to the best practice of credit risk management. Narrowing the gaps begins with a consistent and a whole credit risk data base supporting different IT systems and follows with implementing effective credit risk practices within the credit process and throughout decisions making.

That's the only way to be able to create a competitive advantage and optimizing RAROC (Risk Adjusted Return On Capital)

Chart 1:

Modeling

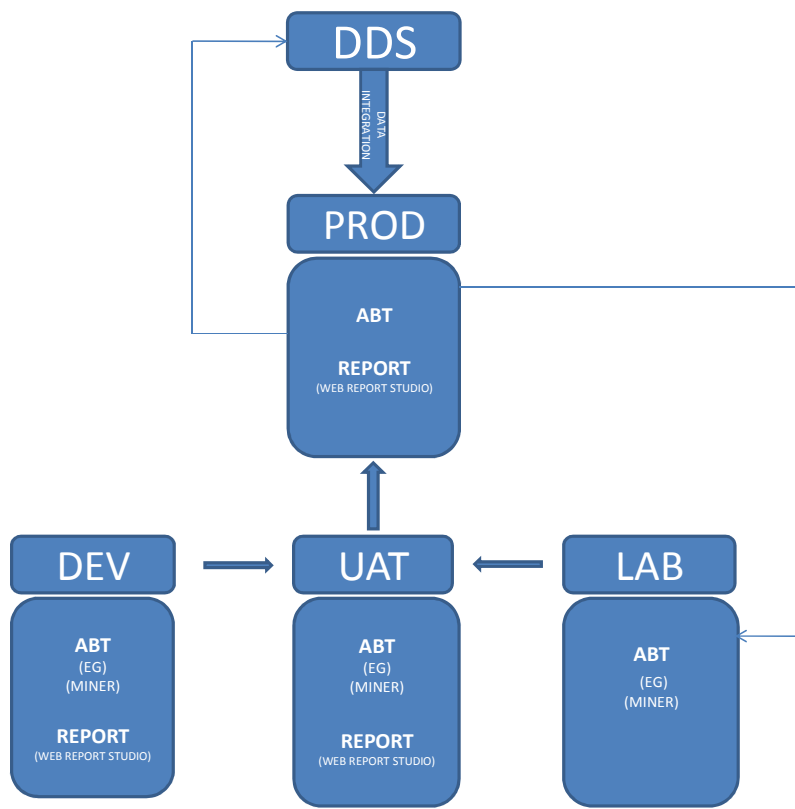


Chart 2:

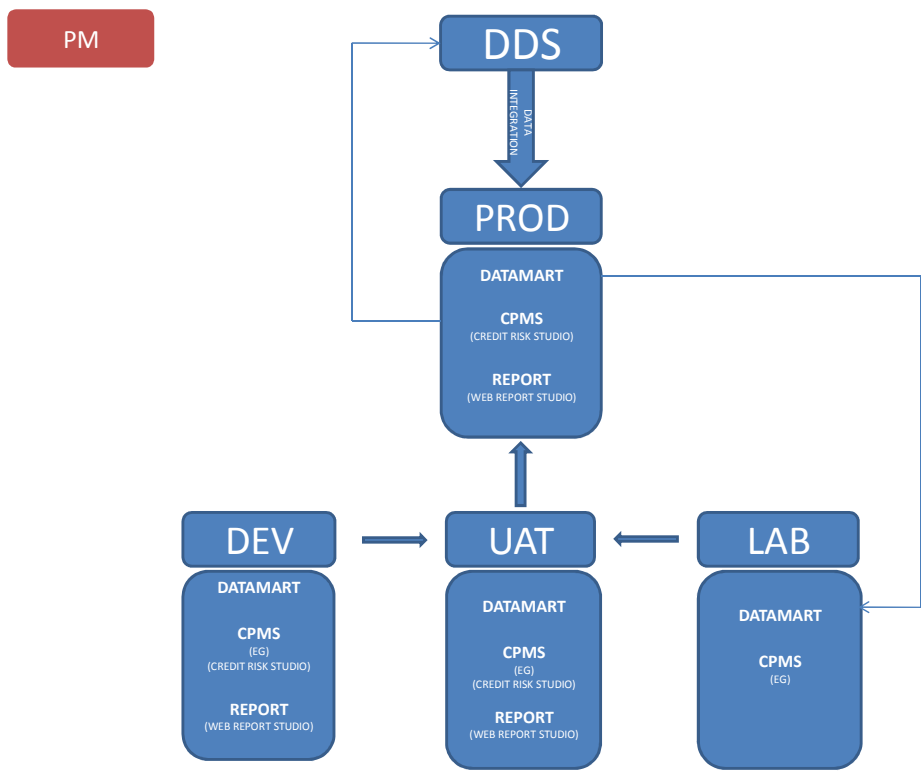


Chart 3: SAS Modules

Environment		Data Integration Studio	Web Report Studio	Credit Risk Studio	Enterprise Guide	Enterprise Miner
DDS (Detailed Data Store)		V	V			
PM (CPMS)	PROD (Production)		V	V		
	UAT (User Acceptance Testing)		V	V	V	
	LAB (Laboratory)				V	
	DEV (Development)		V	V	V	
Modeling	PROD		V			
	UAT		V		V	V
	LAB				V	V
	DEV		V		V	V

RECOMMENDED READING

1. John B. Caouette, Edward I. Altman, Paul Narayanan. 1998. "[Managing credit risk: the next great financial challenge](#)." John Wiley & Sons, Inc.
2. Darrell Duffi and Kenneth J. Singleton. 2003. "[Credit risk: pricing, measurement, and management](#)." Princeton University Press.
3. Bessis Joel. 2010. "[Risk management in banking](#)". John Wiley & Sons, Inc.

CONTACT INFORMATION

For questions and remarks contact the author at:

Name: Boaz Galinson Email: boazg@bll.co.il

Enterprise: Leumi

Address: 13 Echad Ha'am, Tel Aviv ,Israel

Work Phone: (972)35147765 Fax: (972)3514-9947

Disclaimer

This document presents the point of view of its author, which may differ from Leumi's.

It supports an oral presentation and is incomplete without it. The information is supplied in summary form and is therefore not necessarily complete.

The material doesn't constitute a prospectus, offering memorandum or offer of securities, and neither this document nor anything contained herein shall form the basis of or be relied upon in connection with any contract or commitment whatsoever.

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration. Other brand and product names are trademarks of their respective companies.