Handbook of Asset and Liability Management
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Handbook of Asset and Liability Management

From models to optimal return strategies

Alexandre Adam

John Wiley & Sons, Ltd
To Géraldine and to my family
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During the past decade, Asset and Liability Management (ALM) departments have become key departments for balance sheet management and for the profitability management in banks, in insurance companies, in asset management teams and even for financial directions of non-financial companies. Due to the complexity of the subject, it has always appeared difficult to develop a unified vision of what an ALM team should do: optimizing the return, hedging the risk, smoothing the margin . . .

Nevertheless, the external pressure for explanations is growing.

In many countries, the International Accounting Standards (IAS or IFRS) have changed managers’ behaviour, obliging them to account their balance sheet in a uniform standard, to better explain their hedging strategies and sometimes to show their residual positions as in the norm IAS 32.

For Banks with Basel II, for insurance companies with Solvency II, the needs for a global understanding of the business is also increasing.

In this context, and in order to prepare the future of ALM, this book tries to give an operational point of view on the business.

This book is written as a handbook for existing or future operational Asset and Liability Managers. It describes all the rules useful for managers to make the activity safe and profitable. It is also meant for all kinds of Asset and Liability managers from banks to financial directors of non-financial companies and on to insurance companies and asset management departments.

The first goal of this book is to explain all the written and unwritten rules of ALM in details, making it easier for everybody to understand the business.

After a presentation of the ALM and of the balance sheet, the new accounting and reporting principles given by IFRS/IAS standards are presented and the FTP (Fund Transfer Price) are introduced. To ensure a better control of results, it is essential to have a basic understanding of the accounting principles.

A large part of the book concentrates on the description of the possible products present in the balance sheet: deposit accounts, prepayments, life insurance contracts . . . The treatment of inflation in balance sheet management is included. Many different up-to-date models are proposed. We propose an operational approach for the management of all these products: from the models to the hedging strategy. The treatment of options in the indicators is described.
Because ALM deals with risk management, the following Parts describe all the inherent risk in a balance sheet. For each risk, we describe:

- the nature of the risk;
- an example;
- the impact on the results;
- the indicator to monitor this risk;
- the better way to simulate this risk;
- the hedging solutions.

We dedicate an entire Part to the useful technical tools used by ALM managers giving a mathematical and statistical background.

The final Parts of the book try to give a global approach for the business using an economic capital approach.

The head of an operational research team (with eight-year’s experience including operational management in ALM in one of the best performing ALM Departments in Europe) wrote this book.

Many parts of this book have never been explained in detail. For example, modern models for the demand deposits, for the prepayments are proposed. Developments in economic capital in an ALM context are included. These subjects are only now arising in scientific journals. When we see how the credit risk and the operational risk became of prime importance, with the regulatory pressure of the Basel II Pillar 1, we understand that it will become the same for ALM with Basel II Pillar 2 and 3.

This book first aims to reach Asset and Liability Managers (in banks, insurance companies, financial direction of non-financial companies and asset managers); quantitative ALM researchers, operators and managers, etc.

This book is also written for ALM consultants and advisors, ALM software providers, students in finance their finance lecturers and for actuaries.

This book also seeks to reach many people working with A/L managers:

- risk managers and risk controllers;
- fixed income strategists and sales;
- financial directors;
- auditors and regulators.

The approach is didactical and allows the book to be used as a reference for ALM lecturers. Many lessons provided in universities are not up to date and do not include the latest improvements in this area developed during the last decades. The book tries to fill this gap and to bring the latest findings made by university researchers and professionals.

Whenever it is possible, a quantitative approach is developed. Nevertheless, an economic explanation is provided for each equation, so that the book is understandable by all the people involved in ALM and not only quantitative researchers. The aim of this book is to give a quantitative approach of the subject. Of course, we wrote this book so that a non-mathematician will be able to read it. However, this book includes technical chapters as the job is becoming more and more quantitative.
We took many examples in this book from the ALM banking industry but the main ideas of this book are available to all the other kinds of ALM teams.

As a conclusion, this book is not made for the ALM of yesterday but for the ALM of today (Basel II, IAS/IFRS, etc.) and for the ALM of tomorrow. It will explain which developments the managers have to make in order to improve their competitiveness.
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Alexandre has published many articles on ALM in specialised journals.
Le rêve est une seconde vie. (Gérard de Nerval)

To introduce Asset and Liability Management (ALM), this part will start with an interesting history of ALM activity. This history is important in order to understand why at the end of the 80s, banks and insurance companies decided to create ALM departments.

The next Part tries to give a brief overview of the existing ALM activity before exposing in detail what the assets and the liabilities of the balance sheet we will discuss throughout the book could be.
The History of ALM

Scribitur historia ad narrandum, non ad probandum. (Quintilien)

It is not possible to present ALM history without presenting Banking industry history even if it is possible to make a parallel with the Insurance industry. This Part is an opportunity to present the links between ALM and the other types of business such as investment management, hedge funds and financial directions of corporate industries, etc.

1.1 THE HISTORY OF THE BANKING INDUSTRY FROM ANTiquity to the Middle Ages

1.1.1 Origins of banking

The origins of banking go back to antiquity. Historians discovered hints of banking activities dating from 3000 B.C. in Mesopotamia. The temples were places of trades and the priests used to take on the role of banker, taking money as deposits and lending money to the King or to the merchants. Temples were considered as the safest places where gold could be stored.

The first records of loans dating from the 18th century B.C. made by temple priests to merchants were discovered in Babylon.

Remember that in the Bible, Christ drives the moneychangers out of the temple...

In Ancient Greece, the temples conducted not only loans and deposits but also currency exchange and validation of coinage. Each Greek city was independent and minted its own money. Moneychangers appeared in order to develop trade between cities.

The letter of credit made its appearance: in return for a payment, a moneylender in one Greek city would write a credit note and the client would cash the note in another port. Thus, travel was less risky for the client.

In Ancient Rome, banking activities developed greatly and financial operations were established on a juridical basis. The idea of an interest rate on loans and on deposits was born.

1.1.2 The Middle Ages and the Renaissance

After the collapse of the Roman Empire in the late 5th century, monetary circulation slowed down drastically. Economic depression and deflation took place.

The influence of Christianity restricted banking activity: charging interest and usury were seen as immoral.

By the dawn of the 12th and 13th centuries, bankers were grouped into three distinct categories: the pawnbrokers, the moneychangers and the merchant bankers. The cathedral squares remained the centre of the money changers’ activity.
At this time, work became a positive virtue: profits were supposed to come from the performance of a duty. The usurer was considered to be a person who earned money without working. The Church condemned usury; in the Third Lateran Council, usurers were excommunicated, usurers’ offerings were forbidden as well as their inhumation in Christian ground. Yet, usurers remained in practice.

In the Middle Ages, each Lord or each independent city had the right to strike its own money. Moneychangers changed the money, charging a fixed fee for the transaction. This profession was respectable since it did not involve credit.

Pawnbrokers were considered to be deliberate public sinners, linked to prostitutes. It is at this period that the word “bank” from the Italian word “banca” appeared. “Banca” meant “bench”: in the Middle Ages moneychangers or pawnbrokers used to practice their activities on wooden benches. The flat surface of the bench was necessary to display the wares of the lender or the borrower. Note that the term bankruptcy comes from the Italian term “banca rota” which means that the “banca” has been broken.

At the beginning of the 11th century, the Lombards in Italy introduced new financial techniques and started a new era for the banking activity. The centres of operation were established in Italy: Florence, Genoa, Lucca, Venice and Rome were some of the city-states that gave birth to these banking activities.

That period saw the invention of the customer account: clients received a moderate interest rate on this account on which they could receive and make payments. The depositor was sometimes allowed to overdraw his account within certain limits.

Italian banks developed the letter of credit again; clients could buy a product in a city abroad and see the cash withdrawn on their principal account in their city of origin.

In these times, the notion of liquidity was introduced. The moneylender’s business model was simple: lend at a high interest rate and borrow at a usury rate. To survive, banks had simply to ensure the appearance of liquidity and dependability to see the stability of the loans and of the deposits.

1.1.3 From the 17th century to the 20th century

Till the beginning of the 17th century and the invention of the paper check, the value of money was determined by its weight in gold, giving stability to the interest rates.

Trade centres moved to international ports such as Amsterdam or London. Banks started to take risk on the shipping industry: the ships associated with their letters of credit might sometimes not return from the place where they were supposed to carry the exotic goods back from (the voyage to India or America was very uncertain).

Central banks such as the Central Bank of England revolutionized the states’ finances before becoming the Bank for the banks in each country.

Napoléon Bonaparte created the French Central Bank, “la Banque de France”, on 18 January 1800.

The 19th century was the banks’ golden age with the growth and stability of the system and the development of paper money and of scriptural money.

With the First World War, the United States with New York as the new world’s leading financial centre became the major lender to the Allied Powers. This resulted in the large growth of the US economy.

After the First World War, the USA started to take a considerable place in the banking system.
1.1.4 The 1929 crisis
In 1929, the crash occurred followed by the “Great Depression”. All over the world, markets collapsed and banks were accused of having caused the crash.
In American banking, the reaction was the creation of the Federal Deposit Insurance system and of the Glass–Steagall provisions to separate commercial banking and securities activities.
In the banking industry, from the crisis to the 60s, activity did not grow as fast as before: deposit and loan growth were weak while government influence on financial activity decisions grew faster.

1.2 THE MODERN BANKING INDUSTRY AND THE HISTORY OF ALM

1.2.1 The role of today’s bank
Since the Renaissance, banks have been credit institutions providing various types of bank operations:

- receiving deposits;
- granting credits to individuals or corporations;
- providing cash management, means of payment (checks, ATM, credit cards . . .), currency money change;
- storing valuables in safe deposit boxes;
- providing fortune management and financial investment consulting . . .

Banks are the service industry for money, a safe place to deposit money at a moderate interest rate. In banks, we can borrow money so we do not have to wait to make an investment project come true.
Banking activity requires a licence commonly issued by the local bank regulatory authority. This licence gives the right to issue loans and collect deposits. Some financial institutions may provide banking services and are called non-banking financial companies.
The Central Banks of the 18th and 19th century have kept the same role as yesterday: they often control interest rates, inflation rates and money supply. In the case of a liquidity crisis, they may act as “lender of last resort”.
An Interbank market has developed to ensure the liquidity of the market: a bank with too many assets may ask other banks for money.
Banking books include reserves and a minimum capital requirement to allow the bank to repay debtors and depositors in case of potential bankruptcy. Basel Committee regulation is the international standard for the calculation of the capital requirements.
Bank profits arise from the fees on financial services and on the difference between the lending rate and the borrowing rate. The overall banking objective is to make profitability on a long-term horizon within the banking system as stable as possible. In fact, the role of regulation is to provide this stability but we will see in this book that his role is also given to ALM.
1.2.2 Types of bank

Nowadays, the banking system recognizes two major types of bank: retail banks and investment banks. It is common to split universal banks between these two different departments: retail and investment banking. In financial service companies, we may find other service types: leasing, factoring, security services and even insurance (in Europe mainly with the “bank-insurance” companies), etc.

Considering retail banking, the customers are individuals or SMEs (small and medium businesses or enterprises).

We may find different types of retail banks: postal saving banks (associated with the national post in the US, in France, etc.), private banks (for wealthy individuals), community development banks (for isolated populations), ethical banks (only investing in socially responsible assets), and mutual bank companies (where shareholders are the customers).

Savings banks are retail banks that took their roots in the 19th century, with the objective of providing saving products to all the categories of savers and usually with a large distribution network.

As for investment banking, the customers are corporations or large businesses willing to act directly with the financial markets. The investment bank may trade for its own accounts but its main activity is to advise corporations on capital markets and to sell financial products to these corporations. Corporations may need advice from investment banks for their mergers and acquisitions, for their financial risk management hedging and for their capital structure refinancing.

The commercial banks are a type of retail bank in the USA that deals with deposits and loans from corporations but not with the capital markets.

1.2.3 The American banking crisis of the 1980s and the necessity of regulation and the implementation of ALM

From 1929 till the mid 60s, the interest rates did not move a lot: bankers used to play according to the 3-6-3 rule: taking deposits at a 3% rate, lend at 6% rate and go to play golf at 3 o’clock.

In fact, however, banks are susceptible to many forms of risk: liquidity risk, credit risk, interest rate risk, etc. When a risky scenario becomes true, a banking crisis may follow. Since 1929, prominent examples include the US Savings and Loan crisis in the 80s and early 90s, the Japanese banking crisis during the 90s, etc.

The following figure shows the number of Bank Failures in the United States from 1934 to 1995.

1.2.3.1 The Savings and Loans (S&L) insolvencies

The historically high interest rates between 1980 and 1982 caused insolvencies in the S&L industry.

In 1980, the total assets of S&Ls insured by FSLIC (Federal Savings and Loans Insurance Company) were $604 billion. The vast majority of these assets were held in traditional S&L mortgage-related investments. Because of an asset/liability mismatch with a steep ascent of interest rates, net S&L income went down from $781 million to negative $4.6 billion and $4.1 billion in 1981 and 1982.

From 1980 to 1982, 118 S&Ls with $43 billion in assets failed, costing the FSLIC an estimated $3.5 billion. There were also 493 voluntary mergers and 259 supervisory mergers of S&L institutions.
The first lesson of the S&L crisis was a regulatory lesson: a need for a qualified, strong, and effective supervision independent from industry with adequate financial resources.

The second lesson of this crisis was the need for indicators to monitor the mismatch risk between assets and liabilities: ALM was born.

1.2.3.2 The real estate crisis

Shortly after, at the end of the 80s, another financial crisis arose with the real estate crisis. Commercial construction activity boomed at the beginning of the 80s due to a large demand for real estate investment. This boom was followed by banks that started to lend within an atmosphere of strong concurrence. Total real estate loans of banks more than tripled. Credit risk taken by banks was very important since the loan-to-values were often close to 100% and the constraints imposed on customers were weak.

The real estate bubble burst in the late 80s and real estate values collapsed. Loan quality deteriorated and this deterioration caused many banks to fail, especially banks involved in commercial real estate lending.

This crisis was caused by weak credit risk modelling in balance sheet. The Basel regulation framework was a result of this crisis experience.

Consequently, risk management teams and especially credit risk teams found their place in banks’ organizations.

1.3 THE HISTORY OF THE INSURANCE INDUSTRY AND ALM

1.3.1 The history of insurance

The will to protect ourselves from the hazards of life is as ancient as human society and leads to the early appearance of the solidarity organization.
The first risk transfer experiences belong to the Chinese and Babylonians (3rd and 2nd Millennia B.C.). At this time, travel was uncertain and the risk of losing wages was important: by paying a premium, insurance on ship wages could be settled easily.

The Greeks and the Romans invented health and life insurance: “benevolent societies” cared for families exposed to a member’s death. Similar “friendly societies” or in the Middle Ages “Guilds” existed in Europe till the late 17th century.

Modern insurance was invented at the same time (14th century) and in the same place (Italy) where modern banking was created. New insurance contracts that are still used for the shipping industry separated insurance from investment.

Marine insurance, as with the banking industry, moved north during the 17th century. London became the world insurance headquarters with companies that still exist today, such as Lloyd’s. Organized forms of insurance based on a mathematical risk approach came into being at this time.

After the Great fire of London, English insurers invented fire insurance and exported it to many countries including the USA.

During the 18th and 19th centuries, with mechanization and industrialization, the number of accidents increased. With new risks and with an urbanized population, insurance found new areas in which to develop.

In the 20th century, it became an obligation to be insured, with new insurance types such as health insurance, work insurance, etc. Contracting for insurance became common practice after World War II.

In the 70s, with inflationist pressures, individuals started to invest in highly remunerated assets, sometimes using their life insurance as a pledge. In life insurance contracts, many options are sold implicitly to the client. However, it is only at the end of the 70s that insurers began to worry about the risk related to these options.

Options may be of different types:

- option of repayment (right to choose between rent and capital);
- pledge optionality (the client may borrow money on the basis of the market value of his life insurance contracts);
- early prepayment of contracts;
- renewal option (option to extend the term of the contract with its initial terms);
- extra-deposit option (right to invest more than the contractual investment at the initial terms) . . .

A poor understanding of the options sold implicitly caused the insolvency of some insurance companies: First Capital Holdings and First Executive Corporation in 1991, Baldwin-United in 1983, insurance companies with at least $10 billions of Assets.

1.3.2 Today’s insurance industry

Nowadays, insurance is the simplest way to protect against the risk of some uncertain financial losses. Providing this protection against a predictable but significant risk, the insurer charges a premium proportional to the risk.

The risk cannot be an extreme risk in order to provide sufficient solvency for the insurer. Even if insurers may use reinsurance to insure themselves against their extreme risks, customers are protected from insurers’ insolvency by systems of Guaranty Funds.