Setting the bridge between strategic planning, risk measures, and economic capital

Max Bezard
Hedging some operational risk

All opinions presented here are the ones of their author and cannot be taken as those of BNP Paribas
Some questions to be addressed ...

- How to link a value based management approach with economic capital?
- Does economic capital need to reflect bank’s risk aversion rather than regulators’ one?
- Are there some risks that should not be covered through capital?
- What is the appropriate notion of time horizon / risk schedule (ie multiperiod notion) for risk measures and capital need?
- How to make sure to identify and leverage on correlation and diversification effects?
- Is there anything else than catastrophic events to be taken into account in economic capital?
Capital management is oriented towards shareholder value creation.

Three time horizons:
- **short term**: budget
- **medium term**: detailed strategic plan
- **long term**: beyond detailed strategic plan

Several complementary analyses:
- Shareholders and investors expectations
- Growth scenarii and oportunities
- Available ressources (capital, IT, RH) and risk profile/appetite
- Constraints set by regulators and/or rating agencies

Value based management is a reference tool for the bank management.

It helps to make sure the shareholder interest and the (internal) strategies of the businesses are consistant to one another.

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Global capital level → Performance reporting → Capital allocation → Portfolio optimisation
Value based management is the reference tool for the bank management

- It helps to make sure the shareholder interest and the (internal) strategies of the businesses are consistant to one another

Shareholders
- Targets: growth, ROE, and risk profile

Bank’s senior management

Group Finance
- Capital management
- Setting targets
- Profitability analysis
- Financial and regulatory reporting

Businesses
- Targets: growth, ROE, and risk profile
Define the target position in terms of expected return/risks for the group, in order to beat markets’ expectations, under the constraint of fixed prudential ratios.

Expected profitability (TSV return)

- Group’s target profitability
- View of optimal portfolios
- Actual group’s portfolio

Sub-optimality of capital allocation or business performance

Efficient frontier for Group’s business portfolio

Defining bank’s risk appetite, in compliance with prudential ratios, is a board/senior management decision.

Risk taking target as defined by senior management

Risk taking

Perceived risks (Economic Capital)
Maximise the profitability of the group’s business portfolio, for a given level of risk taken, by optimising capital allocation to each segment.

- Improve profitability of the activity at a given level of risk
- Increase risk taking on this type of business for a given profitability

Segment 1: Business portfolio as of today
Segment 2
Segment 3
Segment 4
Efficient frontier

Expected profitability vs. Perceived risks

Group’s optimal target portfolio

Allocated equity
Capital rebalancing target

Group’s risk appetite
Valuation as a core ingredient
1 - Set up a segmentation that include a number of segments (BU) tunable according to the accuracy and detail at which the bank wants to implement TSV analysis

BNP Paribas: between 40 and 150 segments

2 - Identify key shareholder value creation factors and analyse the relative positionning (as of today and anticipated) of the segments

3 - Set up a shareholder value creation analysis from key shareholder value creation factors imbedded in specific benchmark analysis

End up with classical financial indicators for each segment: P/B, PER, TSV....

4 - Wrap up the information in a value map showing the level of allocated capital and the expected value creation by segment

5 - For each segment (business) start a revisit of the capital allocation and of the profitability targets on the basis of the TSV analysis
### Segment valuation method

3 - **Set up a shareholder value creation analysis from key shareholder value creation factors imbedded in specific benchmark analysis**

| Taux sans risque | 5.4% |
| Prime de risque | 4.0% |
| Bêta | 2 |
| Coût du capital | 13.4% |
| Croissance années 4 à 10 | 30.0% |
| Taux de rémun. FP alloués | 6.5% |
| Taux d'impôt | 33% |

### Real. (M€)

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### TCAM 00-03

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### Somme ÉVA Actualisées 2001-2003

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| TSV | 198 |
| M/B | 2.7 |
| P/E 2001 | 12 |
The valuation methodology underlying the TSV analysis rests on a time split in three periods that is finer than the one used by equity research.

**Gordon Shapiro**

- **Perpetual constant growth**
- Terminal value

\[
M/B = \frac{(ROE - g)}{(COE - g)}
\]

**Leibowitz**

- **10 years growth period**
- Terminal value

\[
\sum EP(1-10) + \text{terminal value}
\]

**BNP Paribas**

- **Business Plan**
- **Sustainable growth**
- Terminal value

\[
\sum EP \text{(Business Plan)} + \sum EP \text{(sust growth)} + \text{terminal value (0 growth, declining profitability)}
\]

**EP** = Economic Profit (year n)

\[
= \text{NR}_{(n)} - \text{All}_\text{Eqty}_{(n)} \times \text{cost of capital}
\]

This method allows us:

- to emphasise the proactive character of a business plan and to identify the management objectives the business are responsible for on the medium term
- to take a cautious and homogeneous set of hypotheses on the long term that incorporates the bank’s strategic position
Capital issues
Capital issues (economic?)

- Shareholder vs debtholder vs regulators vs solvency...
- Different components: are they homogeneous?
- Ke for medium/long term management
  - Compatible with different time horizons from budget, plan, and TSV analysis: multiperiod capital analysis
- Ke for stormy weather
- What about stress tests?
- Coherence, law invariance and additive comonotony
- Risk appetite/aversion
  - concentrations
  - structural positions
Which ideas are hidden in the economic capital concept?

- What do we need? (risk measure)
  - against which risks do we intend to provide protection?
  - How reliable (efficient) should be this protection?
  - When do we need this protection? (i.e. time horizon vs forward starting blow-up risk)
  - For how long do we need this protection? (i.e. which time horizon?)

- Which available resources?
How we measure the economic needs of capital today?

Aversion measure is a linear convex sum (discrete or continuous) of expected shortfall at different confidence levels

Aversion measure

EL

VaR (99.97%)

Solvency

Management

Need of capital

Provisions

Frequency of losses

Level of losses

Aversion measure is a linear convex sum (discrete or continuous) of expected shortfall at different confidence levels
**Tier 1 allocation, prudential solvency and economic solvency**

- **Tier 1 allocation**: prudential solvency and economic solvency

- **Allocated capital to business lines**

- **Non allocated capital**

- **Total prudential capital**

- **Need of capital**

- **Distribution of losses**: 1 year horizon

- **Frequency of losses**

- **Aversion measure**

- **Gains**

- **Frequency of losses**: VaR (99.97%)

- **Economic measure of businesses standard risk**

- **Prudential measure of unsolvency risk (Pillar 1)**

- **Economic measure of unsolvency risk**

- **Tier 1**

- **Tier 2**

- **Tier 3**

- **Tier 1 prudential capital**

- **Tier 2 prudential capital**

- **Tier 3 prudential capital**

- **Total prudential capital**

- **Non allocated capital**

- **Allocated capital to business lines**
Aversion measures: piling up expected shortfalls

Aversion profile

losses at fixed horizon
probability

- type 1
- type 2
- aversion
Capital for credit risk as (VaR - EL) for a corporate loans portfolio under various confidence levels

- 20.0% : 0,7 MMEur
- 10.0% : 1,5 MMEur
- 5% : 2,3 MMEur
- 1% : 4,1 MMEur
- 0.5% : 4,8 MMEur
- 10bp : 6,6 MMEur
- 3bp : 8,3 MMEur
- 2bp : 8,6 MMEur
- 1 bp : 9,4 MMEur

NB: 1 year probability of default of a AA corporate may range from 0,6 bp to 3,7 bp (source S&P credit pro, US corporate 1981-2001)
VaR weaknesses as a global measure
Information captured by a VaR computation
VaR weaknesses as a global measure

VaR: three loss distributions leading to the same result

Losses

probability

type 1
type 2
type 3
VaR weaknesses as a global measure

Which part of the loss distribution is important?
**Capital issues (economical?)**

- **Diversification and reallocation**
  
  $$K(X + Y) \leq K(X) + K(Y)$$
  
  $$A \subset X \subset Y \Rightarrow K(A; X) \geq K(A; Y)$$

- **Comonotonicity**
  
  $$K(X + Y) = K(X) + K(Y)$$

  if

  $$\rho(X, Y) = \rho_{\max} (X, Y)$$
Diversification difficult to rely on!

Reallocation of Group diversification effect under the classical scheme: VaR + contribution to volatility

Division 1
Corporate stand-alone

- 7.6%

Division 1
as part of Division 1 stand-alone

- 14.2%

Division 1 Corporate
as part of Group

- 21.2%

Division 1 Retail
as part of Group

- 15.4%

Division 1 Retail
as part of Division 1 stand-alone

+23.3%

Division 1 Retail
as part of Group
VaR and diversification effect
Example (2)

- 1,000 different types of distinct corporate bonds
- independent defaults
- for each type
  - PD = 0.4%
  - LGD = 100%
  - Face value: 100
  - Present value: 99.7

Which optimal portfolio?

- Allocate initial wealth on the different securities
- to minimise portfolio’s VaR(99.5%)

Portfolio 2

- 1 bond of each type
- the most diversified (common sense)
- VaR(99.5%) > 700

Portfolio 1

- 1000 bonds of type 1
- the most concentrated (common sense)
- VaR(99.5%) = -300

Portfolio 1 is the optimal portfolio under a VaR criterion!....

Portfolio optimisation under VaR criteria may drive to undesirable concentrations
Aversion measures: be discriminant on your risks!

Different aversion profiles

Losses vs. probability for types 1 and 2 with aversion 1 and aversion 2.
Risk aversion measure: securitisation like...
# A tentative synthesis

<table>
<thead>
<tr>
<th>Global computation of Ke</th>
<th>Allocation of Ke</th>
<th>Global level of capital</th>
<th>Reallocation, contribution</th>
<th>Profitability analysis</th>
<th>Portfolio optimisation</th>
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<tr>
<td>VaR ( \partial \sigma )</td>
<td>VaR ( \partial \text{VaR} )</td>
<td>TVaR ( \partial \text{TVaR} )</td>
<td>Aversion ( \partial \text{Aversion} )</td>
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</table>
No medium term strategic plan without a capital allocation plan

1. Business plan and reassessment of capital allocation
2. Available capital results from allocated equity and created value
3. TSV analysis and return on capital lead to a rebalancing of the business portfolio
VBM (only six) commandments

- Base your capital on diversification
  - sub-additivity
  - homogeneity
  - monotony
  - comonotone additivity

- (Economic) capital includes risk measures and bank’s risk aversion

- Economic capital balances the interest and views of shareholders, debtholders, regulators, rating agencies….
  - Risk profile
  - concentrations
  - structural positions

- Economic capital is a key ingredient of strategic plans
  - No medium term plan without capital allocation plan
  - A multi period vision on economic capital is to be implemented

- Portfolio effects have to be identified and business can take benefit of them

- Business should maximise their value for a given level of allocated capital. The bank will optimise the global TSV under the global regulatory constraint.
Setting the bridge between strategic planning, risk measures, and economic capital

Max Bezard
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■ How to make sure to identify and leverage on correlation and diversification effects?
■ Is there anything else than catastrophic events to be taken into account in economic capital?
At times we can lose sight of the ultimate purpose of models when their mathematics become too interesting. The mathematics of financial models can be applied precisely, but the models are not at all precise in their application to the complex real world. Their accuracy as useful approximation to that world varies significantly across time and place. The models should be applied in practice only tentatively, with careful assessment of their limitations in each application.

(Nobel lecture by Robert Merton, 9th December 1997)
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