



## Risk Management Modelling

CREDITO AL CREDITO 2016

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# Agenda

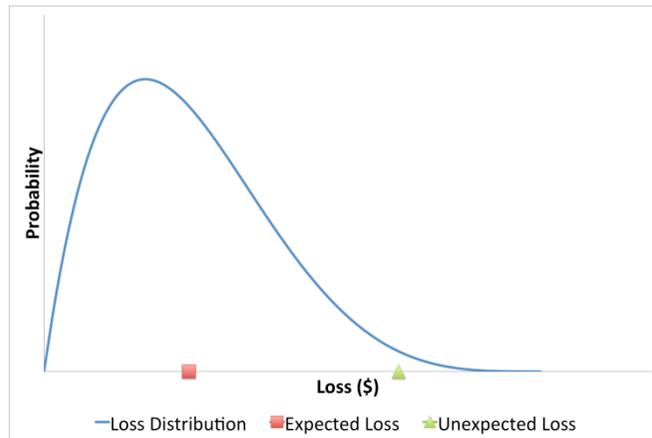
- Introduction to Risk Management Tools, Metrics
  - Credit & Counterparty Risk metrics
  - Market Risk Metrics
  - Linkage to Capital Risk Management
  - Credit Risk Transfer and Hedging
  - Duff and Phelps Valuation & Risk Advisory Services
- Model Governance & Risk Management
  - Holistic risk management practices
  - Best practice around model governance

# Credit Risk

When a bank enters into a loan agreement, it creates a risk for the bank as lender. The terms and conditions of repayment may not be fulfilled as previously agreed. For example, the borrower may miss a scheduled periodic, e.g., monthly in the case of consumer loans, payment, or may default altogether. This is a description of credit risk.

In other words, it is the risk of failure by a counterparty to a contract. Credit risk factors are those that affect the borrower's probability of default, loss to the lender given default and the lender's exposure at default. There may be events that are specific to the individual borrower or market wide events that affect all borrowers.

## Typical Credit Risk Metrics: LGD, PD, EL, EAD



The modelling of a bank's portfolio credit risk requires a specification of credit loss.

- If the borrower does default, then we obtain the expected loss by multiplying per below, as per  $EL = PD * LGD * EAD$  where:
- **PD = probability of default** (also called, expected default frequency) which is the probability that the borrower will default at the end of a pre-determined time period (e.g., one year) and expressed as a percentage
- **LGD = expected loss given default** that is also defined as  $LGD = 1 - RR$  (where  $RR =$  expected recovery rate and is usually expressed as a percentage);
- **EAD = expected exposure amount at default**, expressed in monetary amount.

We illustrate by means of an example, Example (calculation of EL).

- Loan portfolio EAD = \$10 million; LGD = 10 percent; PD = 15 basis points (i.e., 0.15 percent)
- $EL = PD * LGD * EAD = 0.0015 * 0.10 * \$10 \text{ million} = \$1,500$ .
- This means that the portfolio is expected to lose \$1,500 at the end of the loan period.

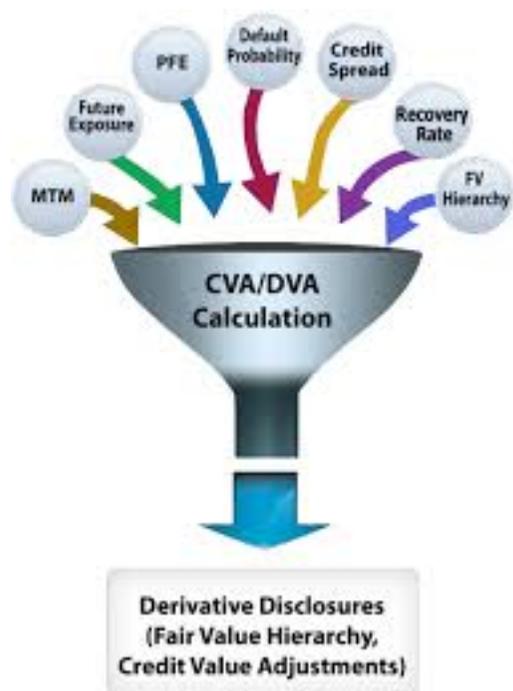
### Caveats

- Assumption that PD and LGD are not correlated in above is usually not true.
- Expected Loss does not quantify specter of unexpected losses. These need to come from a volatility based distribution model

# Typical Counterparty Risk Metrics

There is an increased focus on counterparty risk management practices as participants try to bolster their systems and infrastructure to correctly assess and monitor these risks. This calls for building sophisticated Monte Carlo simulation engines for calculating key exposure measures such as **Potential Future Exposure (PFE)** and **Expected Positive Exposure (EPE)**.

- **PFE** is the maximum amount of expected exposure (EE) on a future date with a certain degree of statistical confidence.
- **EPE** is the average exposure on a future date. Further, these exposures could be positively or negatively correlated with the credit risk of the counterparty resulting in wrong way or right way risk.
- A simulation engine computes the exposure levels by aggregating along each path/scenario, for a counterparty, the value of all trades while considering the netting and collateral arrangement with that counterparty. These netting and collateral arrangements together with hedging form an important way of mitigating counterparty credit risk.



For uncollateralized and “non-perfectly” collateralized transactions, the industry seems to have gravitated towards incorporating the cost of the funding in the fair value of the instrument.

- This additional charge is referred to as **Funding Valuation Adjustment (FVA)**, and the (initial) margin valuation adjustment is the MVA. This is the funding cost of the margin.
- In addition to these adjustments, the solvency of counterparties of financial transactions directly contributes to determining the ultimate fair value of a financial instrument.
- Specifically, the industry is moving towards a practice where the erstwhile fair value needs to be enhanced with a **credit and a debt valuation adjustment (CVA and DVA** respectively).
- The CVA charge is to account for the potential loss for an entity due to the default of the counterparty at a time during the life time of the trade when the fair value is in its favour.
- Similarly, the DVA charge is to account for the potential gain arising from not having to pay for its liability on account of its own default.

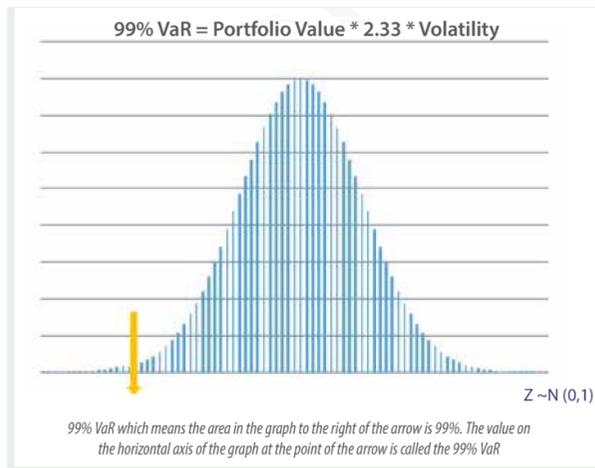
# Market Risk

The change in the value of the bank's investment portfolio, balance sheet valuation, coupled with any risks to its earnings due to alterations in an underlying market factor, including the price of shares, interest rates, prices of commodities or foreign-currency exchange rates is defined as the Market Risk of the firm.

## Typical Market Risk Metrics: VaR, ETL

**Value at Risk (VaR):** Financial service firms use VaR as a core metric in setting minimum capital requirements. VaR is increasingly accepted as a key tool in measuring risk-exposure.

VaR is a single, summary, statistical measure of possible portfolio losses, due to normal market movements. It is defined as the loss level that will not be exceeded with a certain confidence level during a particular period of time. As an example, if the 10-day, 95% VaR of a portfolio is £1 million, then it is considered that there's a 5% chance that losses will exceed £1 million over the 10-day period.



**VaR** provides a single, easily-digestible metric that reflects the riskiness and diversification benefits for a portfolio given severe perturbations to underlying prices or curves. Caveats:

- It is typically derived based on assumed (normal market) distribution conditions, and is not a very good predictor of extreme situations and outcomes with fat tails.
- It may underestimate or overestimate diversification benefits, and may not be able to capture quickly and dynamically changing fundamentals that might alter the short term returns and correlations across asset classes.

### Expected Tail Loss (ETL)

- Expected Tail Loss (ETL), sometimes referred to as Conditional VaR (CVaR) or Expected Shortfall (ES), aims to quantify extreme losses.
- Where VaR aims to capture how bad things can get, the ETL provides a quantification of what the expected loss will be in a tail event.
- ETL is the expected loss during a determined period of time, with a percentile probability that puts it further out on the tail.
- For e.g. ETL could entail the expected shortfall over the same 10-day period, however at a 99th% percentile of the loss distribution. In other words the chances of the loss getting any worse would be 1%.

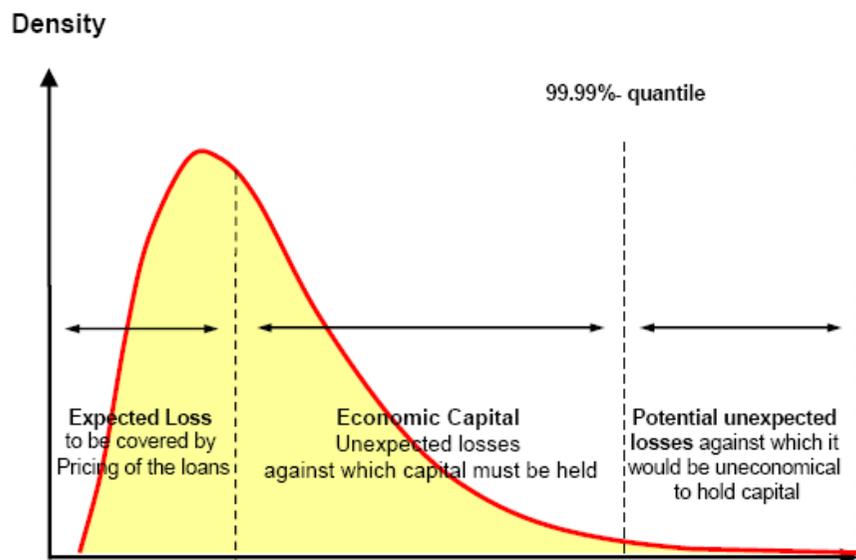
# Integration of Credit, Market and other Risks: Capital Risk Management

After the global financial crisis of 2008, the opportunity cost of allocating resources to risk management has been affected by the need of averting future financial crises.

Nowadays, risk management is not simply viewed as a diversion of resources from profitable activities, but as a fundamental tool for sound business and financial decisions.

The increased scope and complexity of regulatory requirements poses greater challenges for financial institutions. In particular, with the gradual introduction of MiFID II, CRR/CRD-IV, PruVal and Basel III, a more detailed level of risk management reporting is required.

Regulators increasingly want banks to estimate their **Economic Capital or ICAAP** Requirements by quantifying all of the inherent risks the bank is exposed to.



- Economic capital is defined as the amount of capital needed to absorb losses over a certain time horizon, with a certain confidence level.
- It is meant to ensure survival in a worst case scenario and covers in a granular manner - market, credit, liquidity, operational risks
- The estimation of economic capital is done by using a combination of Portfolio Valuations at Risk (VaR) calculations and/or Stress Tests, on portfolio valuations and earnings models
- The development of Economic Capital models enable better quantification of tail risks.
- The ICAAP processes specifies the amount of capital required to be held by banks on a Pillar 1, 2 and 3 basis, depending on the composition of assets and liabilities, the underlying risk exposures, and the illiquidity profile of risks the bank is exposed to.

# Credit Risk Transfer & Hedging by EU Banks

Table 1 Overview of the credit risk transfer markets

	"Banking/capital market solutions"			"Insurance solutions"			
	Credit derivatives	Structured products		Loan sales	Surety bonds	Underwriting of guarantees	Credit insurance
		Asset-backed securities	Synthetic products				
Typical products	Credit default swap, Total return swap, Credit spread option, Credit-linked note	Asset-backed commercial paper, Mortgage-backed securities etc., Collateralised debt obligation (CDO)	Synthetic CDO	Syndicated loans	Construction, Performance, Customs bonds	Financial guarantees	Trade credit insurance, Export credit insurance
Typical protection buyers ( <i>risk shedding</i> )	Banks (as well as insurance companies, other financial institutions)		Commercial banks (secondary loan market)	Banks, other financial institutions, non-financial firms			
Typical protection sellers ( <i>risk taking for investment purposes</i> )	Banks and investment banks, insurance companies, other financial institutions		Various investors	Not relevant; no transfer to third parties typically occurs			
Typical intermediaries/providers (insurance solutions)	Banks and investment banks		Commercial banks	Specialised surety companies and multilines	Monolines (and multilines)	Credit insurance companies	

- Credit risk has been transferred between counterparties since at least the 1970s, when bank loan syndication emerged as a widespread activity, followed shortly afterwards by the now traditional securitization.
- The Credit Risk Transfer and hedging markets have grown very rapidly in recent years due to the progressive demand for and development of new innovative instruments in the banking/capital market sphere.
- These instruments are also increasingly traded. A number of factors have contributed to this growth. These include the increased focus of financial institutions on risk management and risk diversification; lower funding costs associated with taking risk positions; new risk/return profiles offered by structured products.
- Engaging in these risk transfer or "hedging practices" could lead to additional risk if the infrastructure for valuation, risk analytic, model governance, hedging governance and data management tools are inadequate.
- Banks need to be aware that these structures also entail regulatory and capital charges

# Duff & Phelps Valuation & Risk Advisory Services

Derivative Risk & Valuation Solutions	Commodity Valuation & Risk Management	Regulatory Financial Solutions	Treasury, Finance & FX Advisory Services	Valuation of Structured Fixed Income Products
<ul style="list-style-type: none"> <li>• Derivative Valuations of Vanilla and Exotics for all Fixed Income, FX, Commodity and Equity products</li> <li>• Calculation, Reporting of “Greeks”</li> <li>• Computation and valuation of VaR, PVaR and ETL for client portfolios</li> <li>• Estimation of PD, LGD and EAD for all categories of asset types</li> <li>• Computation of PFE and EPE for portfolios of financial assets.</li> <li>• Valuation of CVA, DVA, XVA charge and sensitivities on portfolios of derivatives and complex assets.</li> <li>• RNIV, RIFLE frameworks</li> <li>• Hedging strategies for CVA, DVA.</li> <li>• Hedge Accounting Advisory</li> </ul>	<ul style="list-style-type: none"> <li>• Commodity asset valuation using real option, DCF, fundamental and stochastic approaches, for all categories of assets (Power Gen, Gas &amp; Oil Assets, Renewables etc.)</li> <li>• Valuation of Equity, Debt, Project Finance structures</li> <li>• Valuation of Loans, Structured Notes</li> <li>• Commodity Lease, Park &amp; Loan, Off-take agreements, financially settled and physically delivered forward contract valuations</li> <li>• Macro and asset specific hedge strategies for value conservation through challenging price regimes</li> <li>• Volumetric, congestion, unit contingency, physical constraints, operational risk assessments</li> <li>• RAROC, ROI, ROA analysis for Commodity Assets</li> <li>• Credit Risk Management and Counterparty Management tools and reporting</li> <li>• Trading book valuations</li> <li>• Procurement and sourcing cost management tools</li> <li>• Commodity storage, transportation, inventory finance valuations</li> <li>• Weather derivative valuations</li> <li>• Index, commodity basket valuations</li> </ul>	<ul style="list-style-type: none"> <li>• FAS 133 Hedge Accounting and Reporting analytics</li> <li>• Model Validation and Governance Assurance per SR11-7</li> <li>• Assistance with IFRS 9 / IAS 39 compliant valuation of financial assets</li> <li>• AIFMD compliant valuation and risk reporting</li> <li>• FAS 157, IFRS 13 compliant fair valuation and disclosures</li> <li>• Solvency II compliant reporting for Insurance Co’s</li> <li>• MiFID II And EBA compliant reporting</li> <li>• Prudential valuation and risk management advisory</li> </ul>	<ul style="list-style-type: none"> <li>• FX Risk Management and valuation models</li> <li>• Cash &amp; liquidity management</li> <li>• Cash flow forecasting</li> <li>• Working capital management</li> <li>• Asset/liability management best practices, modelling and optimization</li> <li>• Best practice Treasury Risk Management Policy &amp; Procedures</li> <li>• CIO valuation and risk management services</li> <li>• Collateral Management</li> <li>• Review and design of funding models</li> <li>• FP&amp;A forecasting, simulation and P&amp;L attribution services</li> </ul>	<ul style="list-style-type: none"> <li>• CLO/CBO—legacy and new issue “CLO 2.0”</li> <li>• ABS/Multi-sector CDO</li> <li>• Trust Preferred CDOs</li> <li>• CDO-squared</li> <li>• Synthetic CDO/CSO</li> <li>• Regulatory Capital CLOs, equity</li> <li>• Agency &amp; non-Agency RMBS and derivative</li> <li>• CMBS, CRE CDOs</li> <li>• Consumer and Esoteric ABS</li> <li>• Auction Rate Securities</li> <li>• MUNI PACE bond securitizations</li> <li>• SIVs, REITs</li> <li>• Credit-Linked and Structured Notes</li> <li>• CDS/ABCDs</li> </ul>
		<b>Capital Risk Management and Reporting</b>	<b>Whole Loan Valuation &amp; Advisory</b>	<b>CLO Structuring and Advisory</b>
<b>Employee Incentive Program Valuations</b>		<ul style="list-style-type: none"> <li>• Economic Capital Model development for CRD IV, CRR, COREP, Basel compliance and reporting purposes</li> <li>• Development of suitable market and credit risk models, stress testing and scenario assessment models</li> <li>• Development of CCAR, IAIS compliant capital adequacy and reporting models and processes</li> </ul>	<ul style="list-style-type: none"> <li>• Residential, Commercial and Consumer</li> <li>• Loan valuation, marketplace lending/P2P</li> <li>• Performing and nonperforming pools</li> <li>• MSR valuations</li> <li>• Retail loss reserve modeling</li> <li>• Target portfolio due diligence</li> <li>• Probabilistic consumer credit loss analyses</li> </ul>	<ul style="list-style-type: none"> <li>• Proprietary deal structuring analytics—cash flow/ optimization modeling</li> <li>• Rating agency securitization process advisory</li> <li>• Manager fee and equity holding valuations for financial reporting</li> <li>• Structured synthetics, structured leveraged loan fund</li> <li>• Regulatory capital deal advisory</li> </ul>
<ul style="list-style-type: none"> <li>• Stock option and warrant grant valuations</li> <li>• Restricted, Preferred equity valuation</li> <li>• Convertible bond and option valuation</li> <li>• Full complex capital structure analysis</li> <li>• Contingent claim analyses</li> </ul>				

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## Holistic Modelling Risk Management Processes

Modeling valuations and risks by their very definition are incomplete or approximation exercises.

- The valuations and risks being modeled and quantified are mostly non-linear and complex
- Various factors need to be calibrated, and various aspects assumed to arrive at an estimation
- Testing historical performance using a back testing, suitability testing process for risk management tools is essential
- Calibration to observed inputs, and market comps whenever possible are essential to keep modeling outputs honest
- Challenging the results from a front office, mid and back office stand point, coupled with a shared and strong risk management culture are required to keep modeling efforts prudent

## Best Practice Model Governance

When it comes to the Model Risk Control process overall, there is a model lifecycle that organizations should institute with clear responsibility and ownership at each point of the process.

Aspects of an effective Model Risk Framework include:

- Independence of various functions, in particular, the model development, risk control and audit functions
- Clear definitions of ownership with accountability
- Effective change management processes with checkpoints and defined criteria at each stage
- Emphasis on documentation at each stage in the model lifecycle
- Dissemination of model risk scores and user education along with model results
- Recognition of models as a “work-in-progress” that need to be continually re-examined and improved
- Recognition of the fact that quantitative finance and technology skills are separate, but require close collaboration



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Real Estate Advisory Group



## Competitivi per la crescita - Credito Responsabile

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Davide Cattarin, MD REAG 4 Loans dept.

GIOVEDÌ 17 NOVEMBRE

- ✓ Caratteristiche – presenza di collateral / Garanzie ipotecarie (prevalentemente di natura **immobiliare**) poste ad ipoteca/garanzia del finanziamento stesso
- ✓ Mercato di Riferimento – circa il 45% del mercato dei finanziamenti (dato per importi)
- ✓ Durate medie – Medio/Lungo periodo

## Le garanzie immobiliari

- ✓ Tipologie: prevalentemente RESIDENZIALE per il mercato Famiglie, COMMERCIALE per mercato Imprese/Corporate
- ✓ Gli elementi di Cambiamento nel Tempo:
  - Mercato
  - Caratteristiche dell'immobile/Urbanistiche
  - Tipologie immobiliari (Strumentali - Income Producing – Residenziali - Sviluppi)
  - Eventi straordinari

La Mitigazione del Rischio passa necessariamente attraverso la Valutazione Immobiliare/Perizia.

### VALUTAZIONE IMMOBILIARE/PERIZIA:

- ✓ Attori/Soggetti e relativi Ruoli, Qualifiche e Responsabilità
- ✓ Evoluzione normativa
- ✓ Quando operare
- ✓ Strumento per la mitigazione del rischio (e relativa riduzione del rischio informativo)

### ..... E LA RELATIVA FREQUENZA:

Nell'ottica di un credito ipotecario responsabile, la valutazione del sottostante immobiliare assume un ruolo determinate durante tutta la durata del finanziamento

La valutazione è uno strumento per accompagnare la vita di un finanziamento, non limitandosi ad essere un'analisi fatta una tantum, ma piuttosto uno strumento di conoscenza dell'asset inserito nella sua piu' ampia vita del credito.

- ✓ Fase Istruttoria: **Erogazione/Surroga**
- ✓ Fase di Monitoraggio/Sorveglianza: **Attività di sorveglianza e monitoraggio**
- ✓ Fase Critica: Strumento decisionale nelle fasi critiche per la predisposizione di piani di ristrutturazione e nelle decisioni di cessione/acquisizione di beni riconducibili alle categorie **NPL**.

## MONITORAGGIO:

- ✓ Frequenza di esecuzione
- ✓ Metodologie
- ✓ Caratteristiche specifiche
- ✓ Disponibilità/Predisposizione di uno strumento di organizzazione delle informazioni tali da permettere la migliore gestione del Risk Mitigation/Modelling. Data Base strutturati e pronti all'uso

Rappresenta ed incarna le esigenze espresse da Basilea, dal Regolamento (UE) 575/2013 e dalla Circolare Bankit n. 263 in cui gli Istituti debbono condurre le attività di «sorveglianza sui valori immobiliari e sulla valutazione».

1. **LA SORVEGLIANZA** dovrà essere condotta con frequenza di **1 volta all'anno per asset non residenziali e una volta ogni 3 anni per il residenziale** o con cadenza inferiore qualora il mercato sia soggetto a variazioni significative.
  - ✓ Sorveglianza: applicazione di indici, AVM's, **modelli statistici** in genere e selezione dei beni oggetto di rivalutazione
2. **RIVALUTAZIONE DELL'IMMOBILE** deve essere condotta, dove, rispetto alla sorveglianza o andamento del mercato, possano emergere variazioni rilevanti e comunque ogni 3 anni per i beni con finanziamenti superiori ai 3 mln di €.
  - ✓ Rivalutazione: analisi con protocolli Desktop, **Drive By**, Full.

## RESIDENZIALE

Sorveglianza: ogni 3 anni

Rivalutazione: ove si rilevino variazioni significative

Metodologie: Mass Appraisal:

Analisi Statistiche (AVM's)

Valutazioni (Full -Drive-By – Desktop)

Analisi con mix di metodologie adeguatamente calibrate



## NON RESIDENZIALI:

Sorveglianza: ogni anno

Rivalutazione: ove si rilevino variazioni significative e comunque ogni 3 anni (>3 Mio)

Metodologie: Mass Appraisal:

Analisi Statistiche (AVM's) - Risk !!!

Valutazioni (Full - Drive-By – Desktop) –

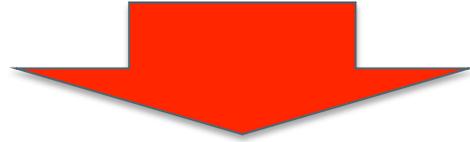
Analisi con mix di metodologie adeguatamente calibrate



## CATEGORIE SPECIALI: Industriale/Strumentale - Sviluppi immobiliari/cantieri - Income Producing Asset (Retail/Shopping Center, Hotel/RSA, Centri Direzionali..):

Monitoraggio/Rivalutazione condotto con frequenze anche superiori per:

- ✓ Variazioni dello stato d'uso (Dismissione di Asset Produttivo)
- ✓ Project Monitoring x Cantieristica;
- ✓ Variazioni stati locativi e rinegoziazioni dei canoni ...



- ✓ Maggiore conoscenza del proprio portafoglio Crediti
- ✓ Mitigazione del rischio Informativo anche attraverso informatizzazione dei dati
- ✓ **Opportunità di procedere con Early Warning nell'interesse dell'Istituto e del Debitore per gestire strategicamente situazioni critiche in via preventiva ed in particolare per quelle operazioni dove la componente immobiliare riveste un ruolo strategico e strumentale per il buon esito del finanziamento.**
- ✓ Adeguata rispondenza alle normative nazionali ed internazionali in termini di Sorveglianza e Vigilanza
- ✓ Miglioramento dei processi di gestione/dismissione ed acquisizione dei portafogli NPL's
- ✓ Maggiore attrattività per mercato/operatori internazionali per NPL's

Si rileva come negli ultimi anni (dalle fasi pre-AQR ad oggi) si è visto una decisa crescita di attività di **ricostruzione/ bonifica** e analisi ed aggiornamento di portafogli di collateral sia per ottemperare agli Enti preposti alla Sorveglianza/ Vigilanza che per operazioni di straordinaria gestione su portafogli di NPL's.

Durante l'esecuzione di queste attività si sono evidenziati spunti di miglioria nella esecuzione ed efficienza del processo:

- ✓ dalla pianificazione e programmazione delle attività,
- ✓ al set di informazioni disponibili/archivate
- ✓ informatizzazione/digitalizzazione e qualità delle stesse

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