Information and the Credit Crisis: Culprit? Savior? Both?

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Teradata
Brief Bio of Dilip Krishna
“Financial Data and Technology Guy”

Engagement Partner, North-East Financial Services, Teradata

> Former Director of N.A Enterprise Risk Management practice
> Consulted on ERM and Basel II initiatives - U.S and Canadian banks

Long experience in technology and business consulting in the financial industry

Large-scale projects including Basel II implementations.

Authored numerous articles about risk management and data architecture

Engineering degrees from the Ohio State University and the Indian Institute of Technology

CFA and FRM designations.
A Colorful, Worldwide Cast of Characters

Wall Street and International Banks
- O’Neal
- Fuld
- Weill
- Goodwin

GSEs
- Raines

Hedge Funds
- Devaney

Lenders
- Sandler
- Mozilo

Home-Builders
- McCarthy

The Consumer

Regulators
- Gramm
- Greenspan
- Paulson

Ratings Agencies
- Corbet

Foreign Governments
- Oddsson
- The Chinese

* Time Magazine: 25 People to Blame for the Financial Crisis

They are all interconnected!
Agenda

- The Credit Crisis: Why, What, Who?
- Financial Risk Management: What does all this have to do with Information?
- Data and Technology: From Theory to Practice
- Governmental Transparency: An example of data in action
The Credit Crisis – Why, What, Who?
Leading to the crisis

**Housing bubble forms**
- Interest rates drop
- Buyers in market increase
- Home values increase

**Banks relax lending standards**
- Issue flood of mortgages
  - Borrowers with shaky credit
  - Risk passed on via pooled mortgages securities

**Investors**
- Worldwide purchase of mortgage securities

**Housing bubble deflates**
- Interest rates increase
- Borrow defaults and foreclosures rise
- Home values drop
• Mortgage Brokers issue loans to borrowers with poor credit
  > Sub-prime
  > Alt-A
  > “No-doc” or “Liar” loans
• Investment banks make money securitizing mortgages
• Everyone is happy
Madness Takes Hold

- Amount of mortgages being securitized grows
  - More than doubles in 1 year
- Risk grows in non-bank mortgage finance cos
- Investment bankers are still happy
Peak Of The Boom

- Risk rises significantly in NBFCs
  - Some bankruptcies
- GSEs (Fannie and Freddie) get swept up in sub-prime securities
- Some banks get swept up in the fever as well
Fat, Dumb and Happy

- Massive risk in the system, but little realization (and monitoring)
- All areas of financial system are affected
- Few overt signs of crisis
Storm Clouds Gathering

- Crisis boils over
  - Large NBFC bankruptcy
- Large write-downs and losses declared by IBs
  - Merrill Lynch, UBS, Citi etc.
Apocalypse Now

- Massive Losses ($550 billion)
- Bankruptcies – Bear, Lehman, AIG, Fannie, Freddie
- Bond-insurers
- Credit Freeze
- Government Intervention - TARP
Following a series of ad hoc measures, the U.S. government announces a broad $700 billion rescue plan for the financial system, including a program to buy hundreds of billions of dollars of bad mortgages and other forms of toxic debt that have been weighing down U.S. financial companies. The Fed and Treasury Dept. shore up money market funds, which had also come under siege during the crisis, and the SEC temporarily bans short-selling -- a way of betting that a stock will fall -- against shares in 799 financial stocks.
Financial Risk Management

What does all this have to do with Information?
Why didn’t we have an early warning system like this?
What is Risk Management?
An Example

• A sample portfolio
  > 1000 shares each of NCR (NCR @ $38), Suncor (SU-U.TO @ $67), United Airlines (UAUA @ $34), Merck (MRK @ $34)
  > 10000 shares of SureThing.com (SUTH) @ $20, bought on margin of 50% (broker swears “This’ll go to 100 by the end of the year”)
  > $100,000 of US Treasury’s
  > $100,000 of GM bonds
  > 1 multi-family rental property = $300,000
  > Primary home = $500,000
  > Cash = $100,000

• Total Value of portfolio ~ $1.5 million

• Financial Goals
  > Retire in 20 years with $10 million (~10% annualized return)
  > Pay for kids college in 10 years = $500,000x2
Bad things can happen

<table>
<thead>
<tr>
<th>Type of “bad thing”</th>
<th>Risk Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Stock market can tank</td>
<td>Market Risk</td>
</tr>
<tr>
<td>2. Interest rates can sky-rocket</td>
<td>Market Risk</td>
</tr>
<tr>
<td>3. Oil can go to $100</td>
<td>Market Risk</td>
</tr>
<tr>
<td>4. GM can declare bankruptcy</td>
<td>Credit Risk</td>
</tr>
<tr>
<td>5. One of the renters refuses to pay the rent</td>
<td>Credit Risk</td>
</tr>
<tr>
<td>6. SureThing.com turns out to not so sure a thing, and tanks. Broker puts out a margin call because you can’t sell the shares fast enough</td>
<td>Liquidity Risk</td>
</tr>
<tr>
<td>7. April 15 comes around, and gains are not calculated correctly resulting in IRS penalty</td>
<td>Operational Risk</td>
</tr>
<tr>
<td>8. The portfolio does not grow fast enough to meet goals (kids get McDonald's jobs!!)</td>
<td>Asset-liability Management</td>
</tr>
<tr>
<td>9. Any others??</td>
<td>?????</td>
</tr>
</tbody>
</table>

* Some elements have been simplified
## Calculating the risks

<table>
<thead>
<tr>
<th>Type of “bad thing”</th>
<th>Probability</th>
<th>Severity</th>
<th>Net Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock market can tank</td>
<td>20%</td>
<td>$40,000</td>
<td>$8,000</td>
</tr>
<tr>
<td>Interest rates can sky-rocket</td>
<td>5%</td>
<td>$8,000</td>
<td>$400</td>
</tr>
<tr>
<td>Oil can go to $100</td>
<td>10%</td>
<td>$5,000</td>
<td>$500</td>
</tr>
<tr>
<td>GM can declare bankruptcy</td>
<td>50%</td>
<td>$100,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>One of the renters refuses to pay the rent</td>
<td>10%</td>
<td>$3,000</td>
<td>$300</td>
</tr>
<tr>
<td>SureThing.com turns out to not so sure a thing, and tanks.</td>
<td>40%</td>
<td>$100,000</td>
<td>$40,000</td>
</tr>
<tr>
<td>IRS penalty</td>
<td>3%</td>
<td>$10,000</td>
<td>$300</td>
</tr>
<tr>
<td>McDonald’s Risk</td>
<td>3%</td>
<td>$2,000,000</td>
<td>$100,000</td>
</tr>
<tr>
<td>Any others???</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Risk</strong></td>
<td></td>
<td><strong>$199,500</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Some elements have been simplified*
A Paradigm shift in Housing

[Diagram showing traditional and sub-prime housing models, with steps and safeguards.

Key:
- Flow of money
- Bank checks
- Independent checks]
High-Level overview of Securitization

- Originator (Asset Seller)
- Special Purpose Vehicle (SPV)
- Investment Banks
- Capital Market Investors
- Obligors
- Other Key participants
- Rating Agency
- Monoline Insurers
- Servicer
- Trustee
- Issued Securities
  - Single
  - Multiple
  - Equity (unrated)

- Sale of Asset Portfolio
- Asset Cash Flows
- Purchase Price
- Placement
- Purchase Price
- Credit Enhancement, Liquidity Support
- Cash Flow

* Adapted from "Securitization in Financial Markets Development: An Emerging Market Perspective", Dr. JAY SA-AADU, Univ. of Iowa
Evolution of Securitization Technology

- **Primitive Assets/Receivables**
  - Illiquid Assets (Primitive Asset)
    - Mortgages, consumer credit (auto loans, credit card), equipment leases, commercial loans, student loans, aircraft lease, royalties, future flows, etc

- **Basic Structured Finance (ABS)**
  - Single Class Tradable Derivative Security
  - Structured ABS with Tranching
    - Multiple Class of Tradable Derivative Securities
  - Conventional CDO
    - Multiple Class Tradable Derivative Securities
  - Synthetic CDO Securitization
    - Extensive use of Credit Derivatives

* Adapted from "Securitization in Financial Markets Development: An Emerging Market Perspective", Dr. JAY SA-AADU, Univ. of Iowa
Structure of a Structured Asset

Issuer → SPV
Proceeds

Issuer → SPV
Coupons & Principal Repayment

Issuer → Investor
Cash paid for Asset

SPV → Investor
Structured Asset Cash Flows

SPV → Delta Hedge

Delta Hedge → Swaps

Delta Hedge → CDSs

Delta Hedge → Caps/Floors

Delta Hedge → Vanilla Options

* "Innovation in Financial Markets", by Salih Neftci
Some Types of Securities Generated by Securitization

Securitization

- Existing asset
  - Mortgage-backed
    - RMBS
  - Asset-backed
    - CMBS
- Future asset
- Risk
  - Credit risk
  - Operating revenues
  - Insurance risk

* Introduction to Asset Securitisation by Vinod Kothari
Risk Management Requirements
Ultimate in Information Flexibility

- Risk Management - “Predicting” future by looking at past
  > Study historical data
  > Perform statistical analytics on data
  > Determine future events – probabilistic basis

- Completeness and Flexibility
  > Capture all risks
  > Add new, different types of data to measure combined risk exposure

- Stress testing and scenario analysis
  > Detailed Historical data – include as many factors as possible
  > Ability to add new data as economic situation changes
  > Ability to ask new questions of old data
Data Impact on Risk Management
Securitization and Sub-prime Mortgages

- **Historical data**
  - Market only existed from about 2000
  - Data only about “the good times”

- **Data Completeness**
  - “Market practice” not to share data
  - Reliance on Ratings Agencies
  - Opaque Market in CDS

- **Data Quality**
  - Lot of the underlying data was incomplete or fraudulent

- **Metadata**
  - Different representations across participants
  - Semantics of data elements not universal
Data Impact on Transparency

• Ensure timely dissemination of information to market
  > Lack of Transparency can be one of the biggest risks

• Cautionary tales (March 2008)
  > Bear Stearns
    – Liquidity dries up when investors do not understand a Firm’s funding and ability to honor its obligations
    – Outcome similar to Long Term Capital Management, 10 years earlier
  > Compare with Lehman Brothers
    – Detailed Firm’s financial position and compared it with their competitors, via 2 pages of ‘talking points’
    – Temporary respite – transparency cannot salvage bad business decisions
Financial Sector Evidence

• One example from UBS*
  > Challenges with processing and distributing critical risk information to key management stakeholders in a timely manner.
  > Lack of granular data
  > Incomplete capture of risk attributes

* Shareholder Report on UBS’s Write-Downs - UBS AG (2008)

Report from Senior Supervisor’s Group March 6, 2008:

“Best practice firms that escaped most of the market turmoil could quickly vary assumptions regarding characteristics such as asset correlations in risk measures and could customize forward looking scenario analyses to incorporate management’s best sense of changing market conditions.”
Data and Technology

From Theory to Practice
Risk Technology Considerations
Perform Simultaneously across Multiple Dimensions

- Number of Concurrent Users: 10, 100, 1,000, 10,000s
- Frequency of Update: Monthly, Weekly, Daily, Now
- Level of Detail: Dimensional, Detailed, Summary
- Mixed Workload: Active Data Warehousing, Ad Hoc Interactive Analysis, Batch Reporting
- Parallel Operation: Total, Conditional, None
- Complex Analytics: 6-20 Way Table Joins, 3-5 Way Table Joins, Simple
- Rapid data loading: Manual, Automated, Integrated
- Large amount of data: Gigabytes, Terabytes, 100s Terabytes

TERADATA
Raising Intelligence
Data Management and Governance
Must Co-Exist with the Technology Solution

**Metadata Management**
- Data describing how, when, and by whom data was received, created, accessed, modified, and/or formatted

**Data Quality**
- Data is fit for intended use, including completeness and business rule compliance

**Security and Privacy**
- Security and privacy compliance across integrated subjects, includes audit capabilities

**Master Data Management**
- Data assets and relationships that define enterprise operations

**Governance**
- Strategic and tactical management, project ownership, and priority setting

**Data Stewardship**
- Program defining the continual, day-to-day activities of creating, using, and retiring data
Data Governance

• Risk Data is a *Corporate* responsibility
  > Need for Executive Sponsorship
  > Relate Business Need to Technology Implementation
  > Need adequate funding
  > Need “a big stick” to deal with the business

• The Data Czar
  > Ensure that data is recognized as a key asset
  > Focus resources on short-term benefits to build the long-term solutions
  > Develop well-defined communicated strategic roadmap
  > Assume ownership of the data management challenge
A Logical Data Model is Critical

- Efficient documentation of metadata (e.g. user will not inadvertently miss any pools of a tranche in risk calculations)
- Ad hoc questions easily answered
- Quickly verify the accuracy of views of portfolio risk
Getting Started
Assess Current State and Gaps to Desired State

- Many Constraints Exist
  - Existing Organizational Constraints
  - Short horizon for investment/improvement

- Data
  - Is all the data available?
  - Where will the missing data be sourced from?
  - Is this transactional data or reference data?

- Capability Gaps
  - Are data management disciplines for all aspects?
    - Typically one or more are missing
  - Is the organization “data-friendly”?

- Technology
  - Data Management Technologies (Metadata, Data Quality, Reference Data)
  - Data Visualization Technology
  - Data Warehousing
The overall goal for a comprehensive data integration program will be to outline a release strategy with incremental end-user deliverables every 3-4 months through a “factory-type” program.

- Initial 4-phased recommended activities sets the foundation for the long-range IMS program.
- Establish an overall program and technology governance (e.g. Managed Services).
- “Factory” model provides for focused team members supporting specific project activities across releases. This increases overall efficiencies.
- 3-4 months between releases.
Governmental Transparency

An example of data in action
"We've moved from a lunar world to a transactional world. Wal-Mart does not update every three months. Wal-Mart, Target, the best of the best update with every transaction, every key punch."

General Colin Powell

Sadly, the US Treasury does not keep pace with Wal-Mart...
Why Transparency for TARP?

• U.S. Government Capital Purchase Program
  > $145 billion to just the top 9 banks
  > $350 billion in total
  > 205 banks given funding as of December

• No way to tell what banks are doing with the capital
  > Loans to public
  > Foreclosure relief
  > Strengthening their balance sheets
  > Bonuses? Jets? Getaways in Vegas?

• Result – Public Outcry
The Solution

Transparency is a **Process**

- **Analysis**
  - Detailed data
  - Fact-based decision making

- **Disclosure**
  - Questions quickly answered engenders trust!

- **React quickly**
  - If disclosure shows goals not met – surgical precision to solve problems (scalpel not hatchet)
Transparency Solution
Leverage existing FDIC Process

- Quarterly Process
- Aggregate data - around 2000 data items
- Live filing in new process started October 2005
Transparency Solution
Enhance The Data

• Identify metrics to track progress of program
  > Economic metrics
  > Bank Capital
  > Bank Risk-Weighted Assets

• Data Enhancement
  > Foreclosure mitigation data: # of loan modifications, $ volume etc.
  > Detailed Data: Products (mortgages, cards), Geography, Risk Profile
  > Increased Frequency
TARP Dashboard – an Example
Data Analysis is a process

Drill-down of available capital vs. “Loanability” vs. loans made, by geography
Wrap-Up

1. *Data management has real impacts* on risk management and transparency
2. *Information Flexibility* is critical to Risk Management
3. *Poor management* of data much more common than *lack of data*
4. Data Management is a *mature discipline*
5. Successful data management requires *patience and organizational commitment*
6. Data Management is *best achieved incrementally*
7. If done right, the *benefits can be substantial*
Questions?