

Anatomy of Risk Management Practices in the Mortgage Industry

***Mortgage Bankers Association
National Secondary Conference
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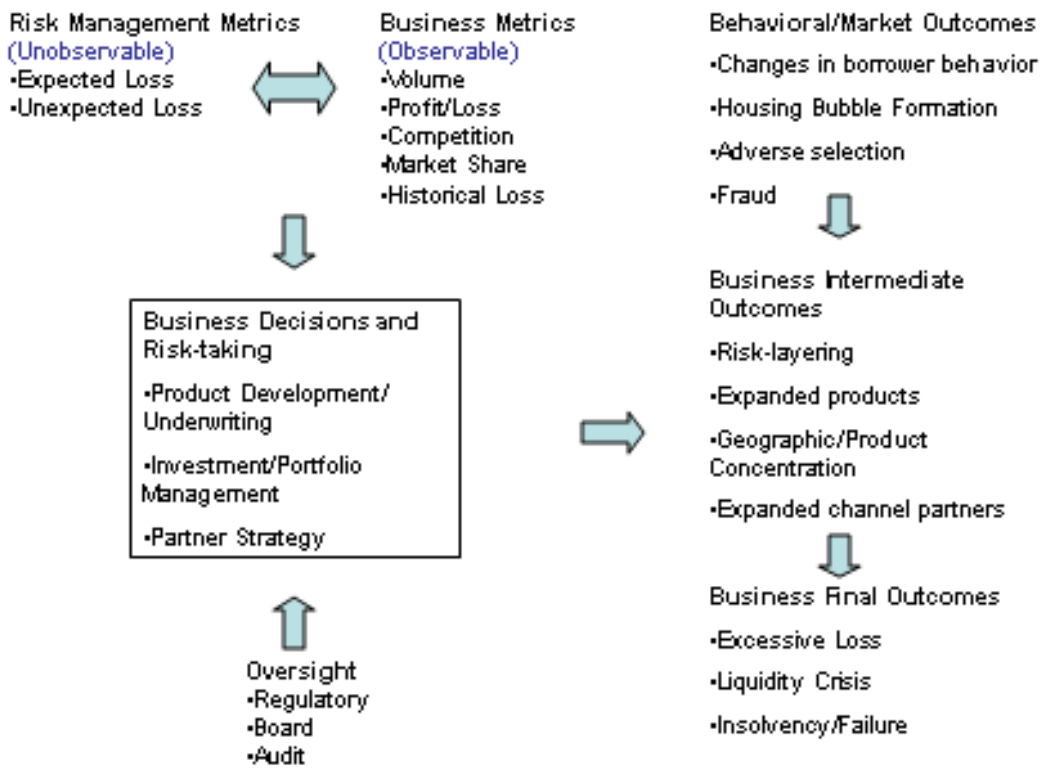
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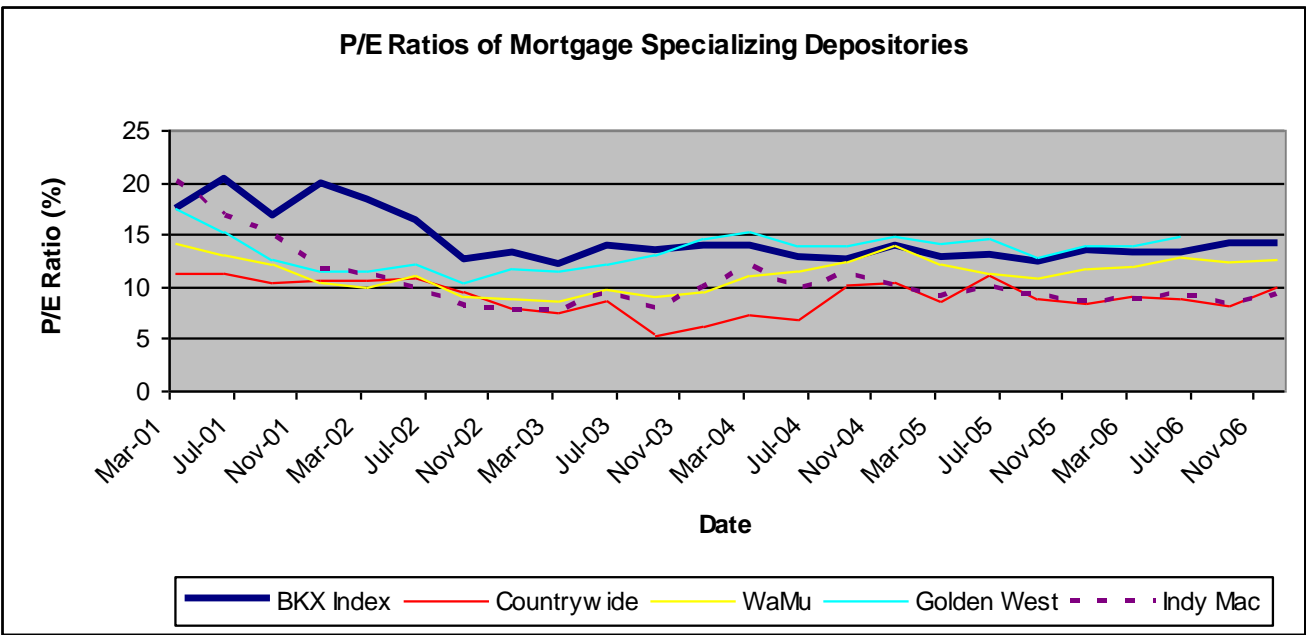
Why did so many well regarded and successful financial institutions fail to see the signs so apparent to us today?

- Business strategy influenced by performance metrics not properly adjusted for risk-taking
- Data, process, and analytical deficiencies
- Management biases
 - “Virtuous cycle” mentality
 - Herd mentality
 - Uncertainty bias
- Regulatory incentive issues
 - “Fee-for-Service” model promoted conflicts of interest
 - Conflict of interest in regional Fed governance structure
 - Gaps in coverage and expertise

How Information and Process Affects Mortgage Decision Outcomes



➤ Mortgage-specializing banks lagged the bank industry in stock performance: Why?



Misguided Risk-Taking: Return on Equity-based Strategy

- Boosting ROE can directly improve P/E

$$\frac{P}{E} = \frac{DPR}{k - ROE(1 - DPR)}$$

- Where DPR = dividend payout ratio,
- E = earnings per share
- P = stock price
- K = market capitalization rate
- ROE = return on equity capital

ROE vs Risk-adjusted Return on Capital (RaRoC)-based Strategy

- Regulatory capital requirements for mortgages assign the same level of capital for a low-risk prime mortgage as a high-risk subprime loan – 4% leverage ratio

Input/Result	Prime Mortgage	Subprime Mortgage
Coupon Rate	6.0%	9.0%
Cost of Debt	5.0%	5.0%
Expected Loss	.5%	2.5%
Economic Capital	2.0%	11.0%
Regulatory Capital	4.0%	4.0%
Net Income _{EC}	.6%	2.0%
Net Income _{RC}	.7%	1.7%
RaRoC	30.0%	18.64%
ROE	17.5%	42.50%

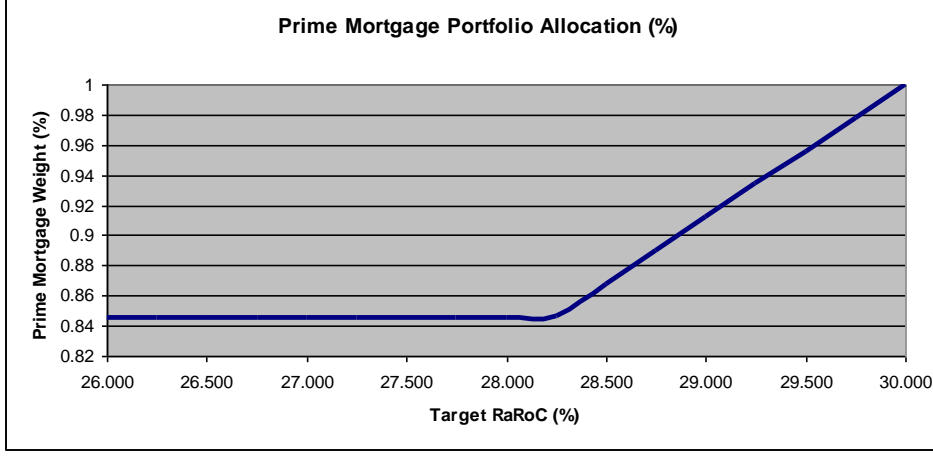
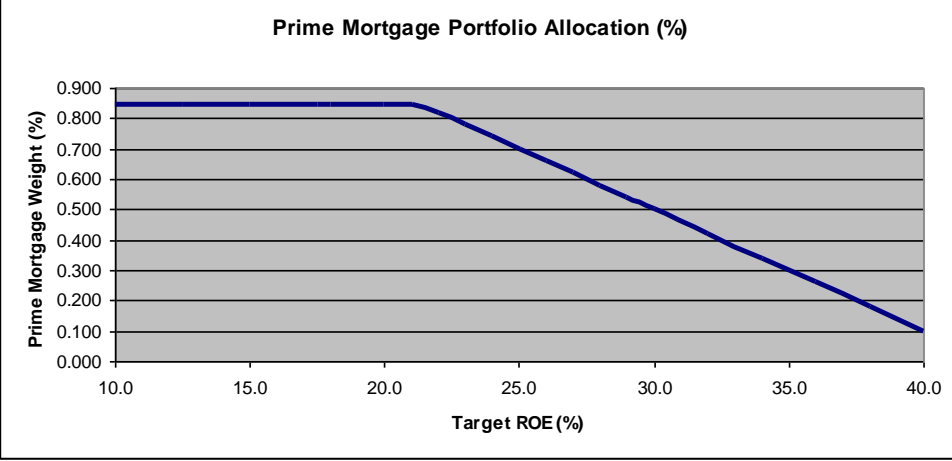
- Decision: Subprime loan preferred investment under ROE

Portfolio Optimization Simulation:

➤ Varying target portfolio ROEs from 10–40%, percentage of prime loans declines, reflecting additional return needed from riskier product

➤ Switching to RaRoC dramatically affects both target portfolio return and product allocation

➤ Note target portfolio returns over 30% using RaRoC infeasible given product RaRoCs



How Could Large Complex Institutions Not Apply Such Metrics as RaRoC?

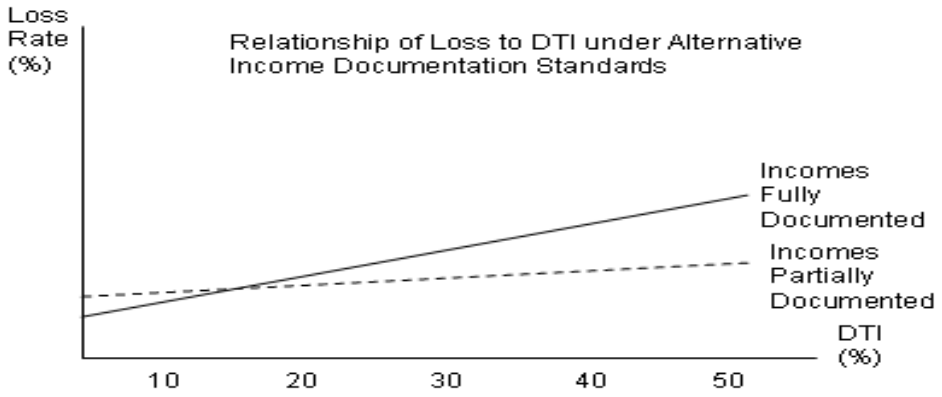
- Building economic capital models a nontrivial exercise
 - Data requirements extensive
 - Systems requirements considerable
 - Sophisticated modeling expertise required
 - Basel II not in place (and even so would have missed)
 - Hard to communicate to nontechnical audiences

Data and Model Limitations Also Greatly Affected Risk-taking

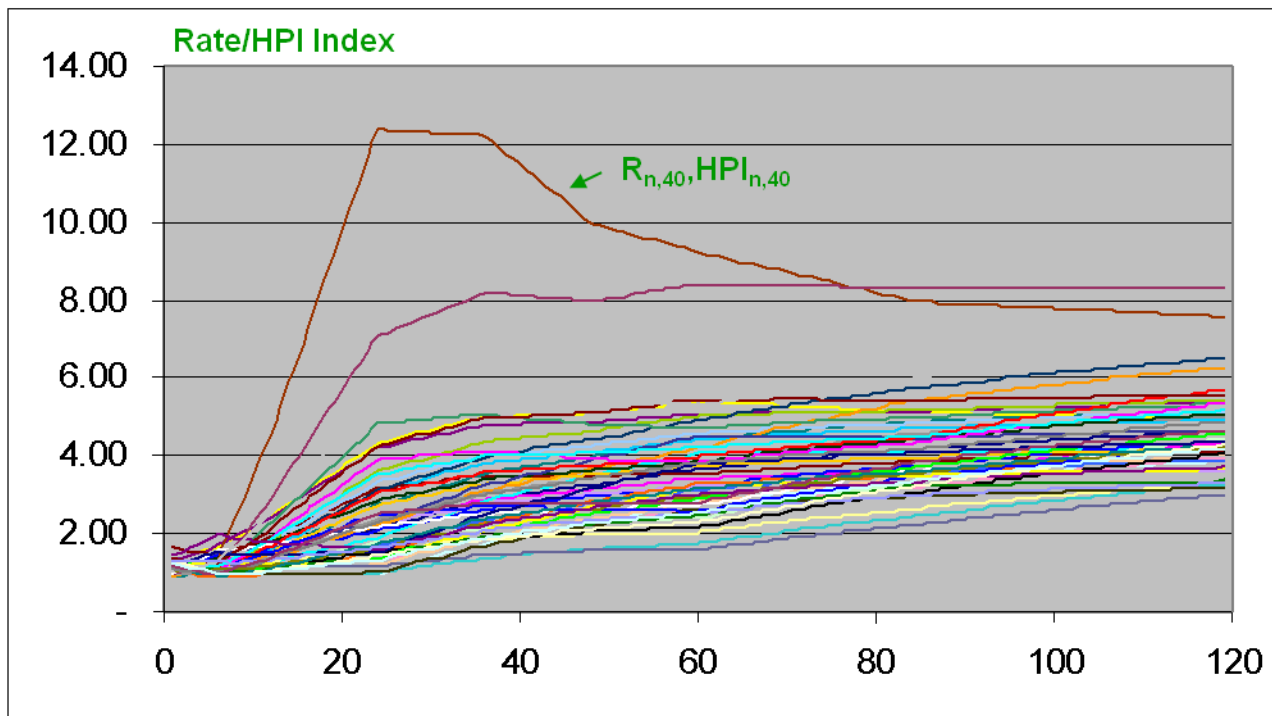
- Home price assumptions affected analysis
- Product and geographic correlations
- Risk layering impacts morphed existing products into new products with limited/no performance history
- Rearward looking models biased on benign conditions
- New products introduced data errors
 - Low doc (“Liar”) loans
 - Investor-owned properties

Lender Underwriting Practices Distorted Data Used to Build Risk Estimates

- When incomes are fully validated, important default indicators such as debt-to-income (DTI) ratios remain strong predictors of future mortgage problems
- When underwriting is relaxed and borrowers can “state” their income, eventually more borrowers with low DTIs default, thus causing the DTI-default curve to flatten



Historically strong economic conditions dampened house price path dispersion and in the process limited the utility of stress tests to inform risk-taking



Changes in Product/Geographic Correlations also Influenced Risk-taking

- Negative correlations between housing markets moving toward positive correlation as bubble burst suggest holding more prime loans

Prime Mortgage Allocation

Sensitivity to Changes in Asset

Correlation (ROE-based)

Target ROE	ρ	Prime Percent
10	-0.5	0.753
	0	0.845
	0.5	1.000
15	-0.5	0.753
	0	0.845
	0.5	1.000
20	-0.5	0.753
	0	0.845
	0.5	0.900
25	-0.5	0.700
	0	0.700
	0.5	0.700
30	-0.5	0.500
	0	0.500
	0.5	0.500

Prime Mortgage Allocation

Sensitivity to Changes in Asset

Correlation (RaRoC-based)

Target RaRoC	ρ	Prime Percent
26	-0.5	0.753
	0	0.845
	0.5	1.000
28	-0.5	0.824
	0	0.845
	0.5	1.000
30	-0.5	0.978
	0	0.978
	0.5	1.000

What Explains Risk Concentrations?

Option ARM Concentrations 2004-2007 of Top 5 Originators

Company	Option ARM Investment (\$B)
Wachovia	122.0
WaMu	52.9
Countrywide Financial	25.4
Downey Savings	6.9
Indy Mac	3.5
TOTAL	210.7

Option ARM Expected Cumulative Loss Performance

Origination Year	Prime Hybrid ARM	Prime Fixed-Rate 30	Option ARM	Option ARM Loss Multiples Over Prime ARMs	Option ARM Loss Multiples Over Prime Fixed-Rate
2003	0.37	0.12	1.86	5.03	15.50
2004	2.40	0.97	5.29	2.20	5.45
2005	10.28	5.69	21.79	2.12	3.83
2006	15.56	9.09	41.57	2.67	4.57
2007	18.50	11.13	44.50	2.41	4.00
Total	9.46	5.98	28.53	3.02	4.77

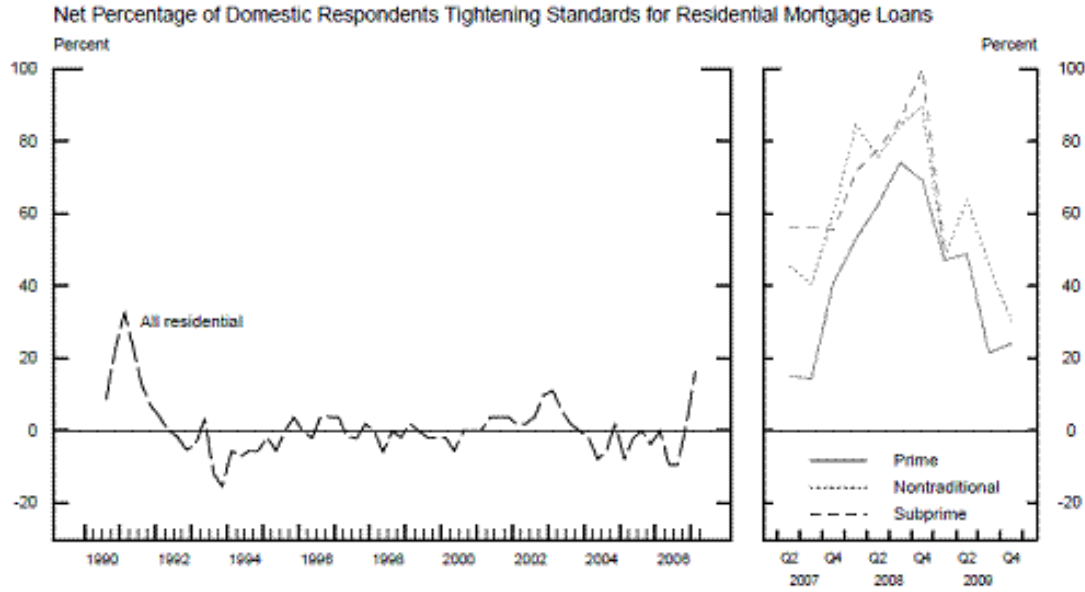
Note: Wachovia includes Golden West option ARMs. Source: JP Morgan, Securitized Products Weekly, March 12, 2010.

Share of California and Florida Mortgages of Major Mortgage Lenders

Company	California %	Florida %	Combined %
WaMu	50	13	63
Countrywide	43	7	50
IndyMac	71	7	78

Source: WaMu 8/11/2008 10-K, Countrywide 2/29/2008 10-K, IndyMac 3/31/2008 10-K

What Explains Relaxation in Underwriting Standards Over Time?



Note: For data starting in 2007:Q2, changes in standards for prime, nontraditional, and subprime mortgage loans are reported separately.

Cognitive Biases of Senior Management

- Field of behavioral economics provides some explanation of risk-taking during the period
- Cognitive bias
 - Sustained period of strong economic and business performance lowered loss aversion – “Virtuous Cycle” phenomenon
 - Herd Mentality
 - Uncertainty Bias

Regulatory Incentive Issues

- Fee assessments imposed by safety and soundness regulators
 - 21% of OTS assessment base from WaMu
 - Regulatory capture?
- Bank Influence on Regional Federal Reserve Banks?
- Regulatory Oversight Stretched
 - Manpower
 - Expertise

Lessons Learned

- Overreliance on performance metrics not properly adjusted for risk
- Data and analytical limitations leading to underestimation of risks
- Cognitive biases among senior management leading to:
 - Lower aversion to risk due to perceptions of continued low losses based on prior experience
 - Poor risk management culture and stature and uncertainty bias
 - Herd behavior in development and expansion of riskier products
- Possible regulatory capture and resource/complexity issues of regulators

Recommendations

- Utilize measures of risk-adjusted returns to create appropriate incentives for employees and management
- Invest in data integrity and analytics
 - Watch out for hidden integration costs of M&As
 - Stress test models and data
 - Augment models with judgment where appropriate
- Require FDIC to impose higher risk-based deposit premiums on banks not demonstrating sufficient independence in risk organization
- Require risk heads to report into an independent director of the Risk Committee of the Board
- Don't blindly follow the herd
- Replace safety and soundness regulatory fee assessments with a general appropriation