



**Macroeconomic Adverse Selection:
How Consumer Demand
Drives Credit Quality**

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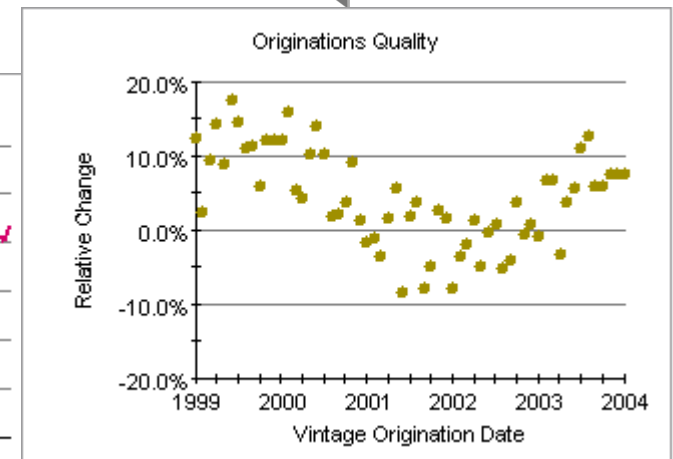
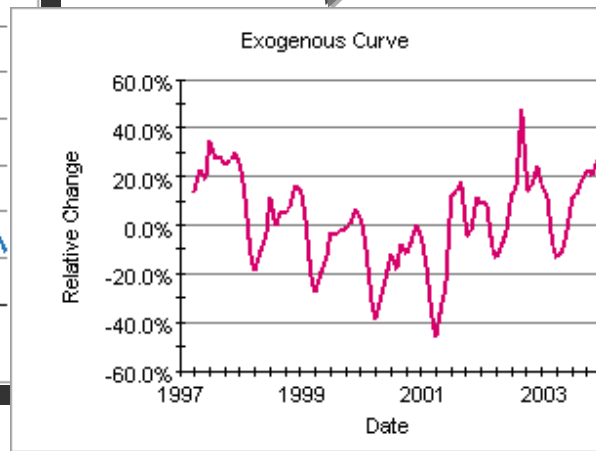
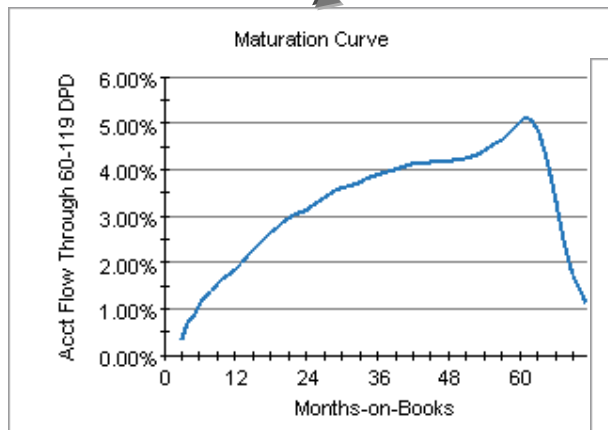
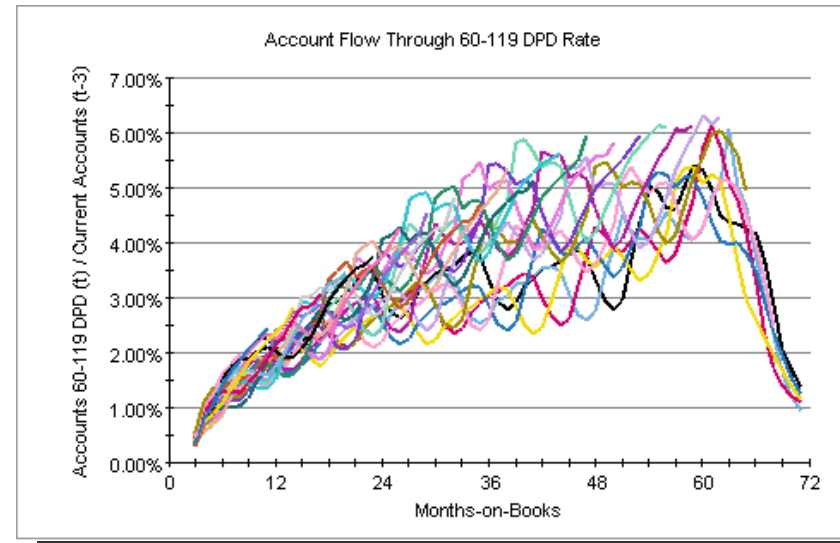
Preview

- Using Dual-time Dynamics, we extracted a measure of credit quality for all vintages originated since 1990.
- Those credit quality estimates were compared to other time series related to levels of lending activity.
- We will show how changes in the economic environment drive changes in consumer demand leading to strong adverse selection effects.

Measuring Credit Risk

- To study credit risk, we need to isolate effects.
- Vintage-level data is decomposed into functions of months-on-books (maturation), calendar date (exogenous), and vintage (quality) via Dual-time Dynamics (DtD).

$$r(v, a, t) = e^{f_m(a) + f_g(g) + f_Q(v)}$$



Point-in-Time Static Pool Modeling

- Segment using any information available at time of origination.
- Include vintage segmentation.
- Employ a model that can explicitly include lifecycle, credit quality, and environmental impacts. Distribution shifts in behavior scores are fully explained by these effects.

Model	Analysis Level	Lifecycle	Credit Quality	Environment
Survival ¹	Account, Terminal Events	Nonparametric	Application Scores, etc.	Macroeconomic Factors
Panel Data	Account, Any Events	Nonparametric	Application Scores, etc.	Macroeconomic Factors
Age Period Cohort	Vintage, Any Rate	Nonparametric	Nonparametric ²	Nonparametric ³
Dual-time Dynamics	Vintage, Any Rate	Nonparametric	Nonparametric ²	Nonparametric ³

¹ Leveraging recent developments in Survival and Proportional Hazards Models.

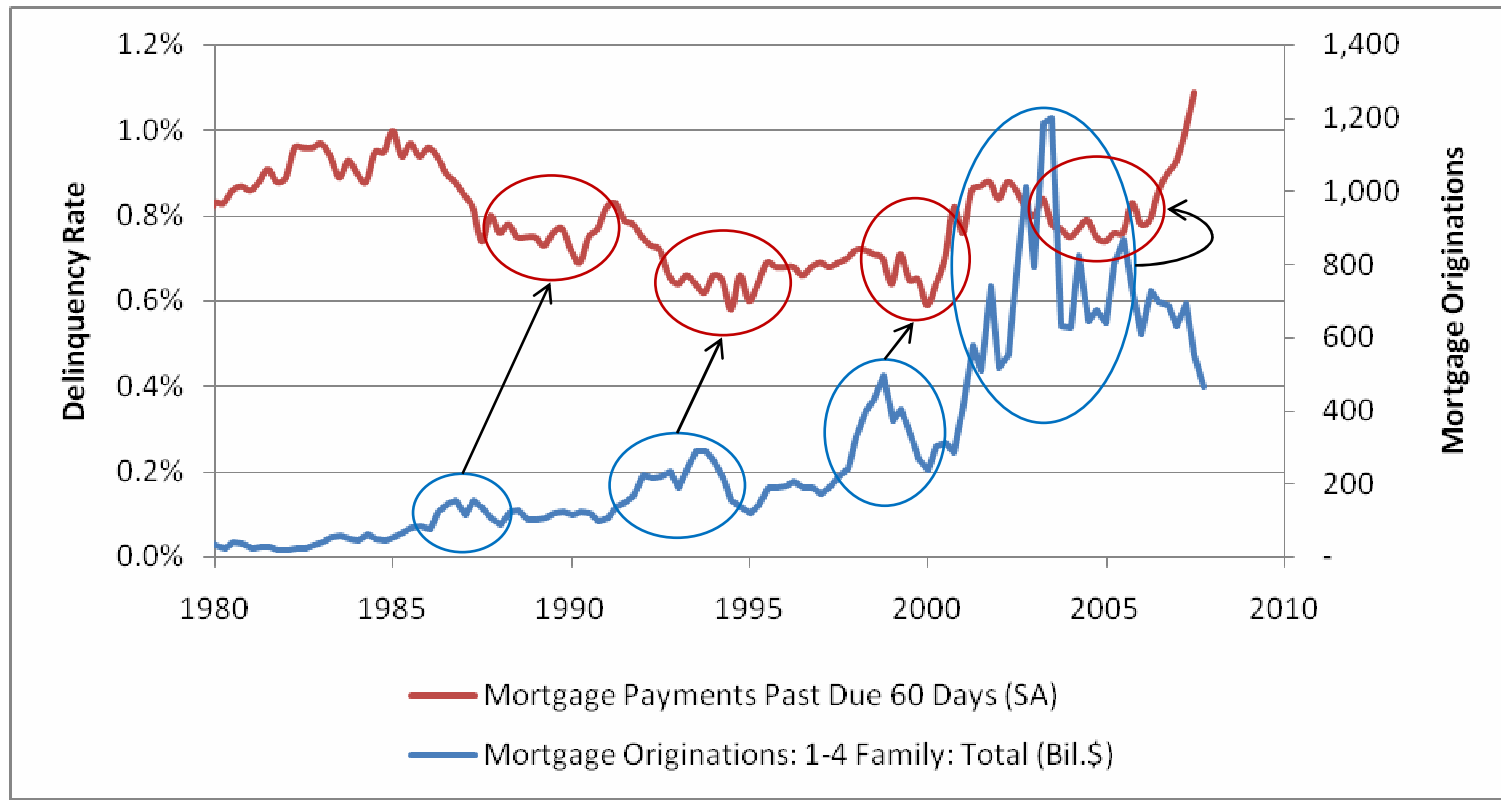
² A nonparametric approach avoids problems with adverse selection, such as was seen in the US Mortgage Crisis.

³ A nonparametric approach avoids explaining all portfolio trends with macroeconomic data, which is a common occurrence in portfolio modeling. Macroeconomic factors are brought in after removing management actions.

US Mortgage Analysis



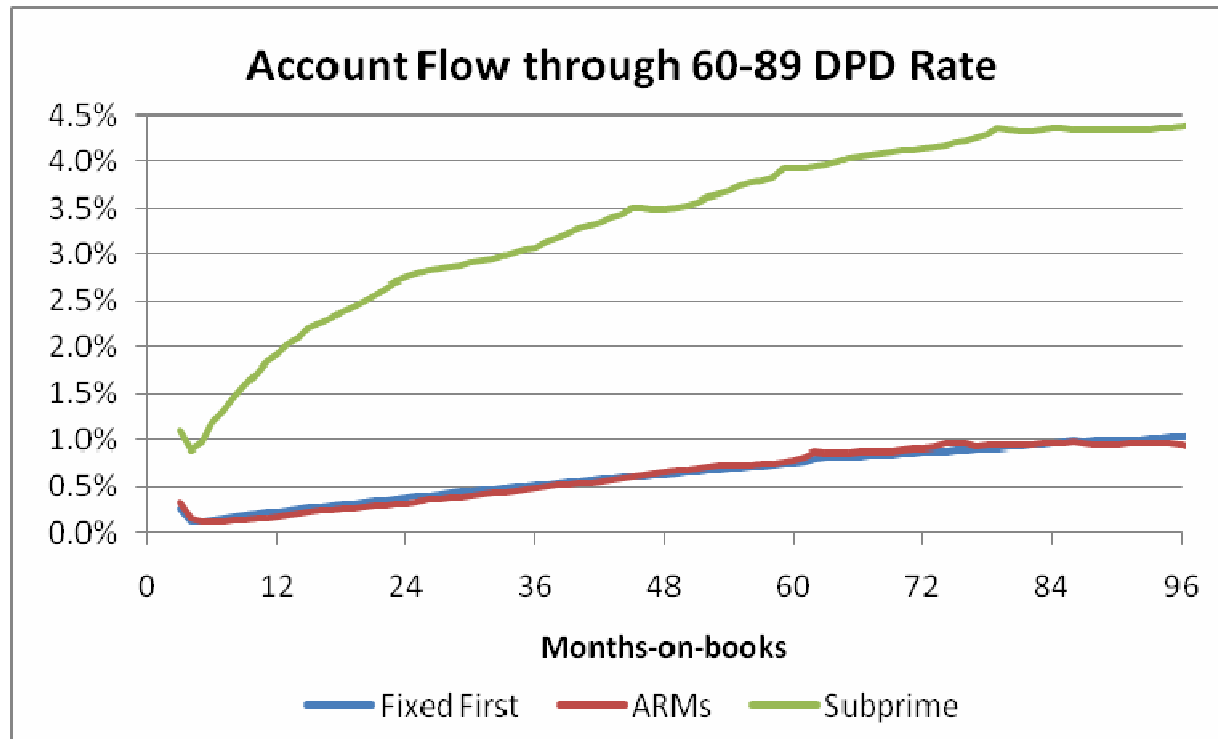
Cycles in Lending Volume



- After a boom, delinquency and foreclosure rates climb.
- To manage through the boom-bust cycle, lenders need to understand the causes.

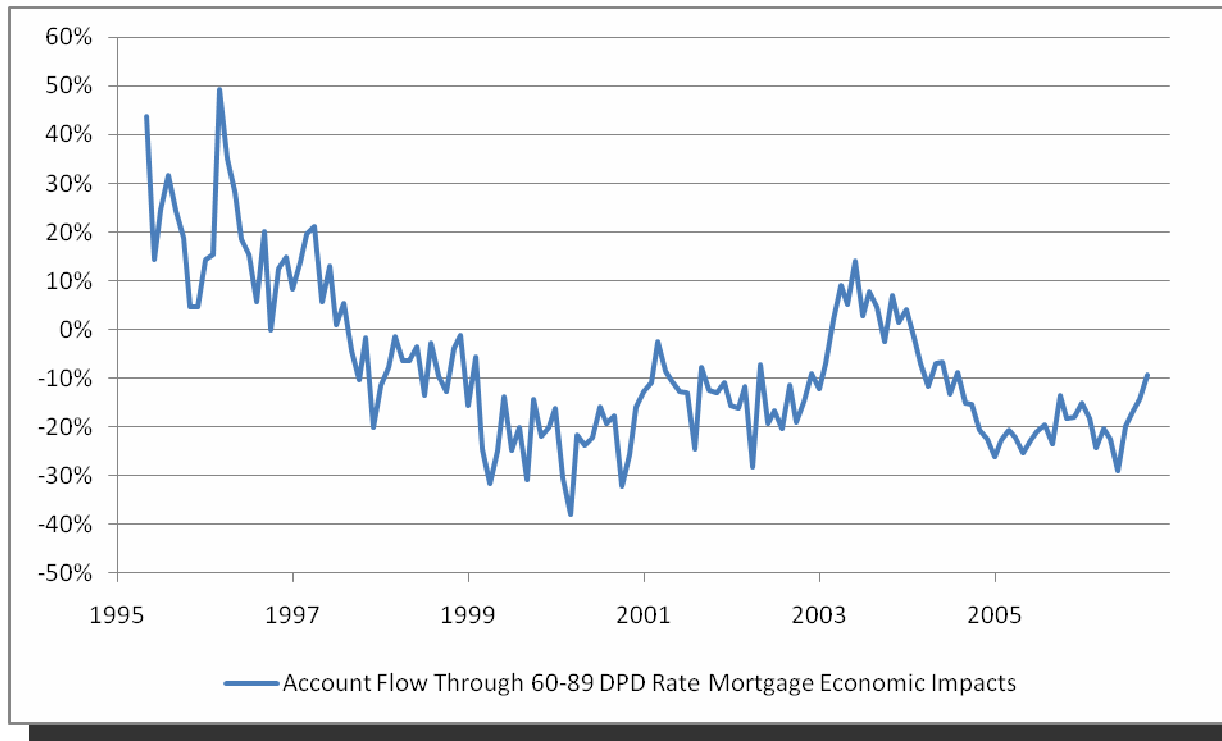
* Data provided by the Mortgage Bankers Assoc.

Delinquency Lifecycles



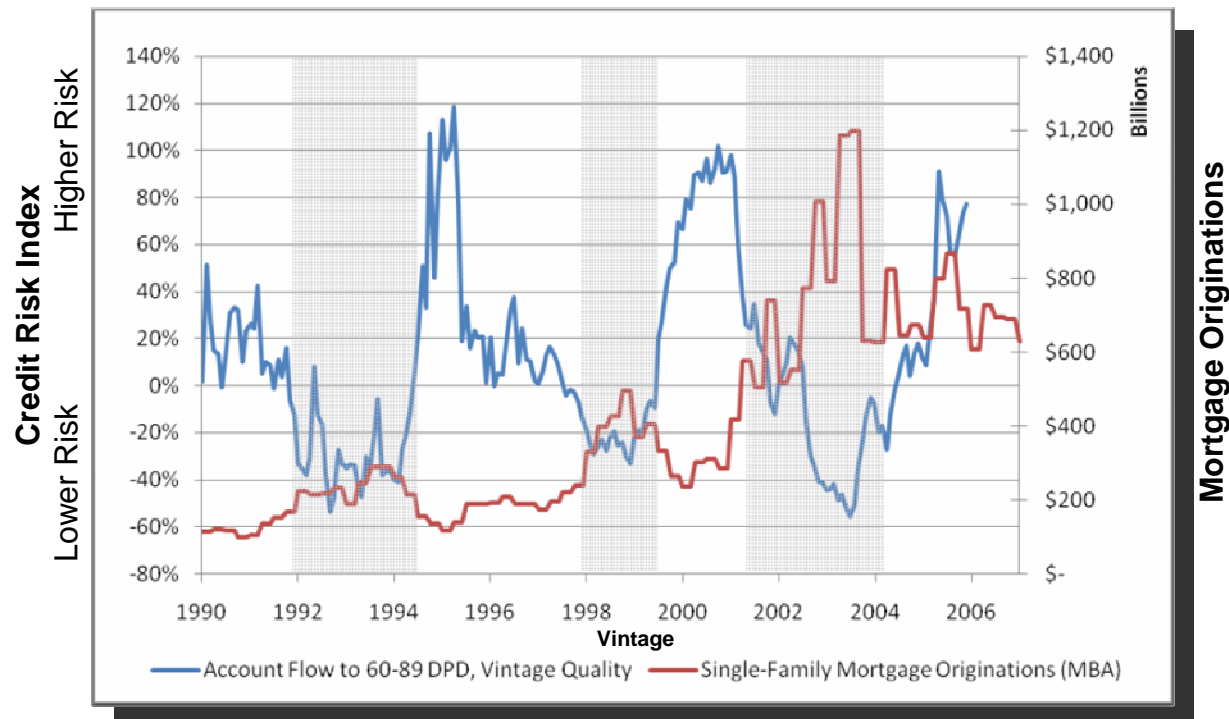
- New loans have lower-than-average delinquency.
- Loans hit peak delinquency several years after origination.

Delinquency Environment



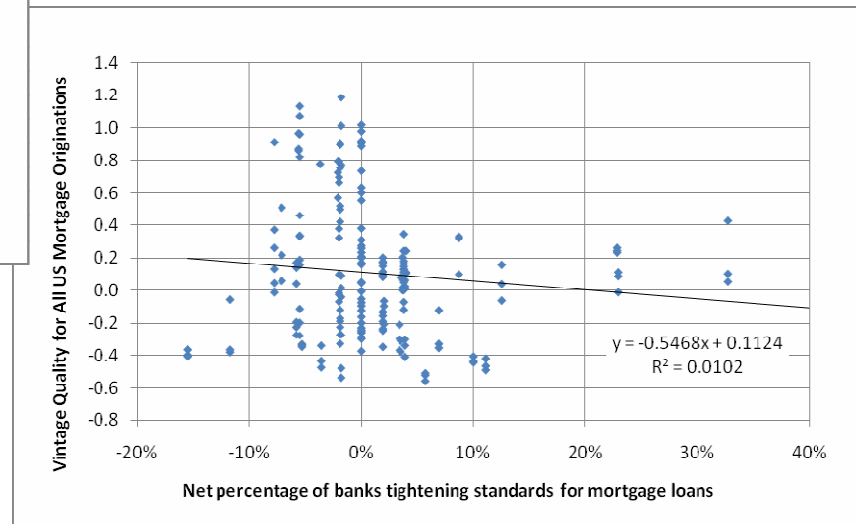
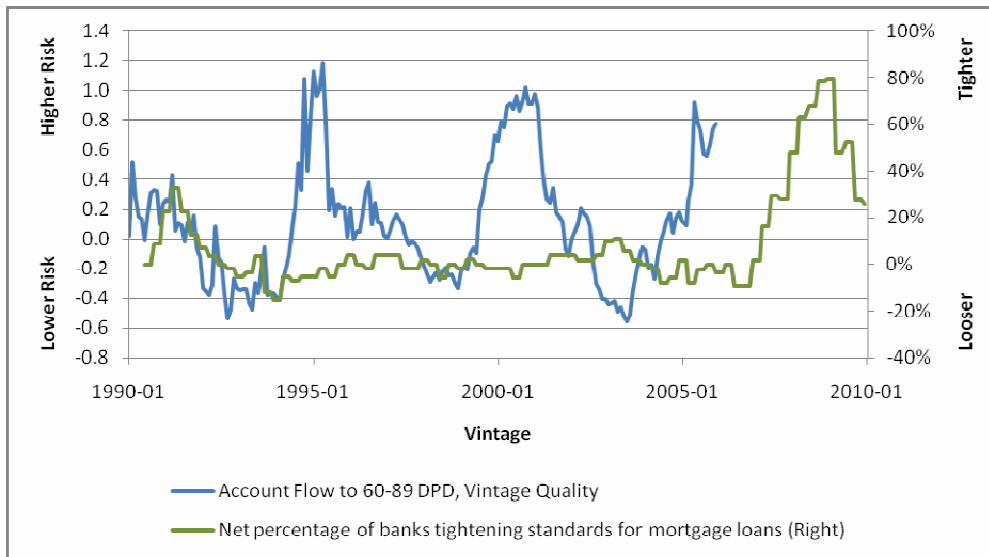
- The US Mortgage environment began to deteriorate in 2000 along with other consumer loan types.
- In 2001, a surge in home prices stopped the deterioration from the recession.
- By 2004, the overall economy was growing strongly, so US mortgage largely missed the last recession.

Credit Risk by Vintage



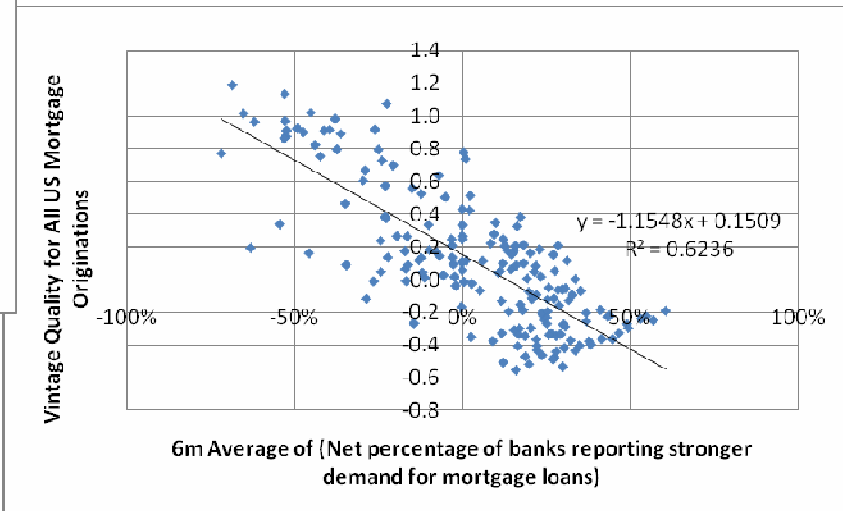
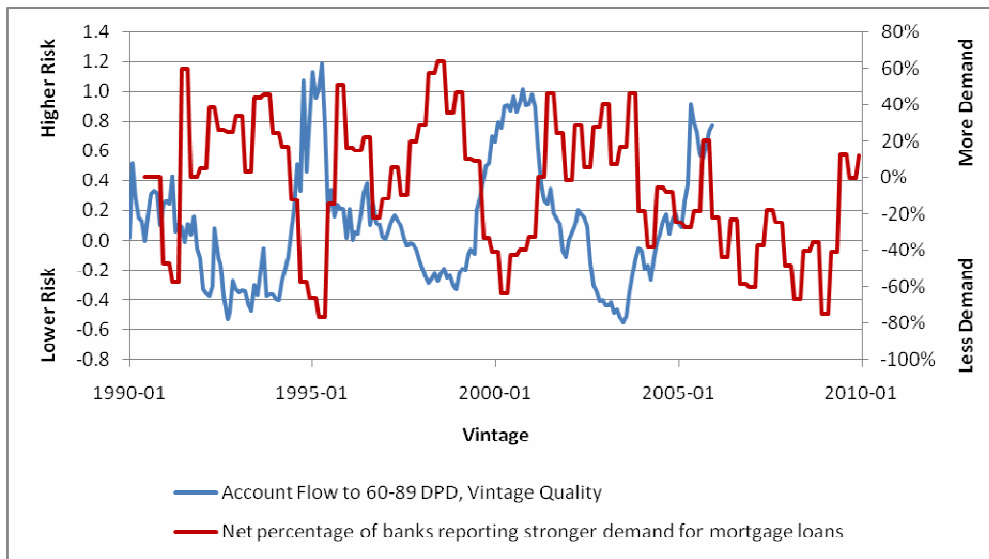
- The credit risk of originated mortgages shows three clear periods of deterioration since 1990.
- Every time a lending boom ends, loan quality deteriorates dramatically:
 - The available pool of high-quality consumers has been tapped over the previous couple years.
 - Marketing is trying to maintain high origination targets and moves to alternate channels, products, pricing, etc.

Senior Loan Officer Opinion Surveys



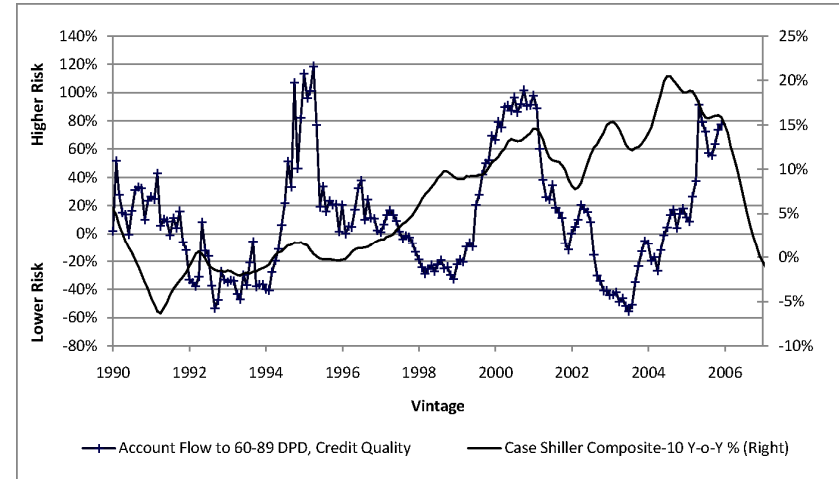
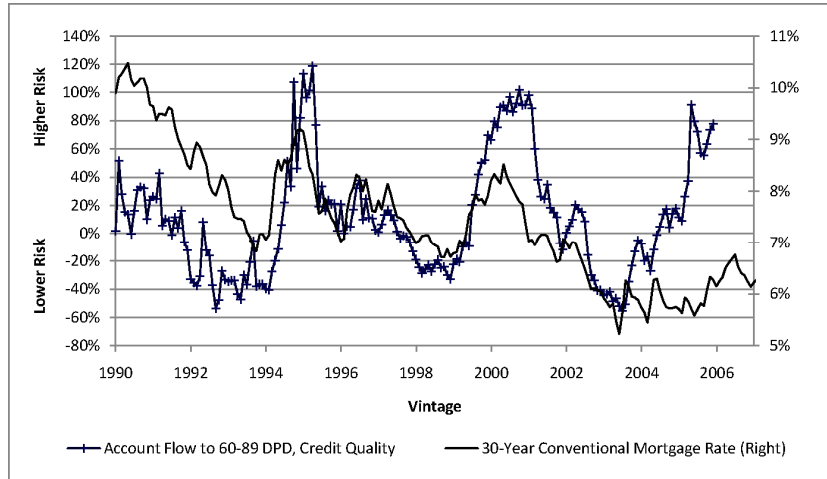
- The Senior Loan Officer Survey's measure of whether banks are tightening lending standards has no correlation to trends in the credit risk of loans originated.

Senior Loan Officer Opinion Surveys



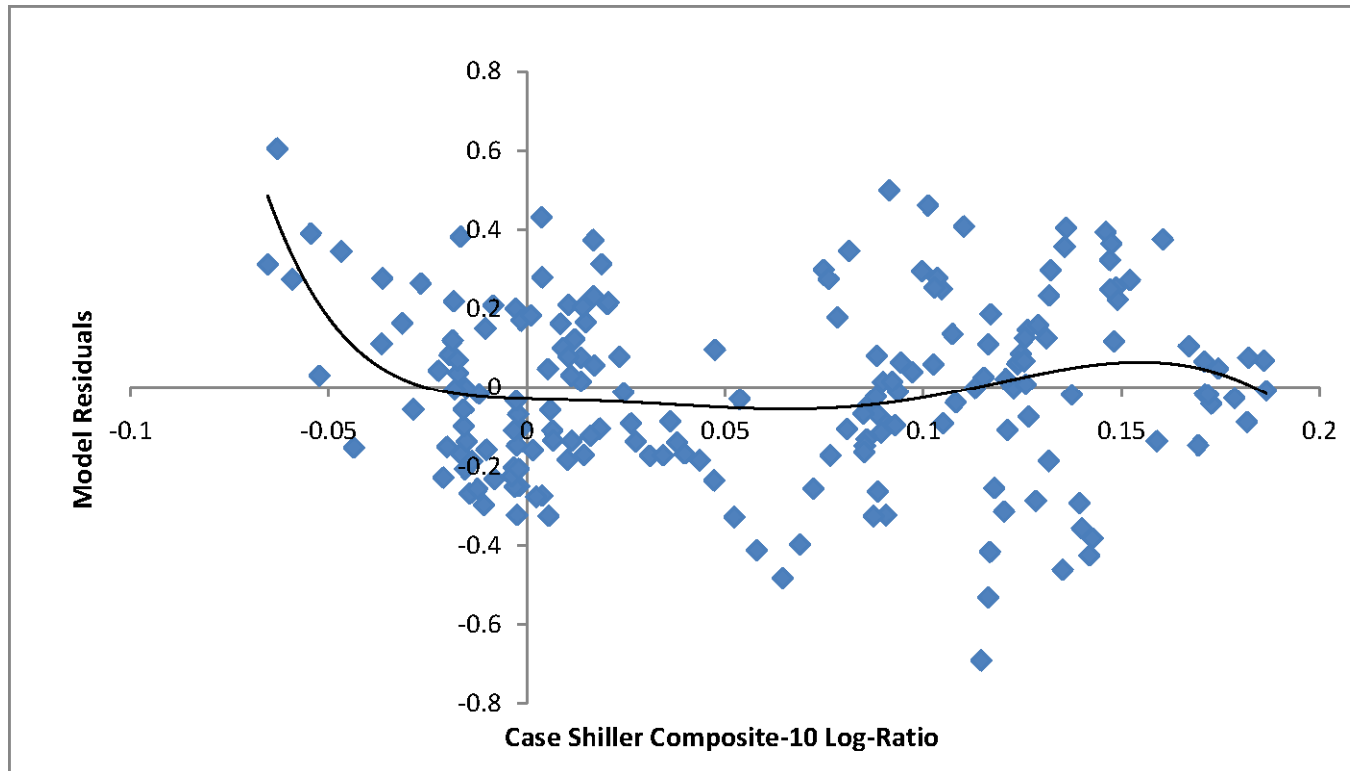
- The Senior Loan Officer Survey's measure of whether consumers want more debt correlates very well to the credit risk of the loans booked.
- When consumer demand is high, the loans originated are lower risk.
- When consumer demand is low, the loans originated are higher risk.

Interest Rate Correlations



- Good correlations would found to
 - The 2-yr change in the interest rate on a 30-yr mortgage
 - The year-over-year change in house prices.

House Price Residuals



- A simple linear model with HPI and Interest Rates shows that rising house prices correlate to higher credit risk loans being originated.
- A plot of the residuals vs. HPI shows that this is actually a nonlinear response. Falling house prices are also bad for credit risk on new originations.

Macroeconomic Adverse Selection Model

- Creating a model of credit risk using both mortgage interest rates and house prices provides a multiple $R^2 = 0.81$.
- This correlation is equivalent to relying solely on the Senior Loan Officer Opinion Survey, $R^2 = 0.80$.

	Coefficients	Std Err	t Stat	P-value	Lower 95%	Upper 95%
Intercept	0.1670	0.0292	5.80	2.7210^{-8}	0.112	0.2278
2-yr Diff in Interest Rate	33.90	1.83	18.55	2.4610^{-44}	30.30	37.51
HPI Log-Ratio, Declines	-5.99	1.51	-3.96	1.03910^{-4}	-8.97	-3.01
HPI Log-Ratio, Increases	0.418	0.292	1.43	0.1543	-0.158	0.994

US Mortgage Summary

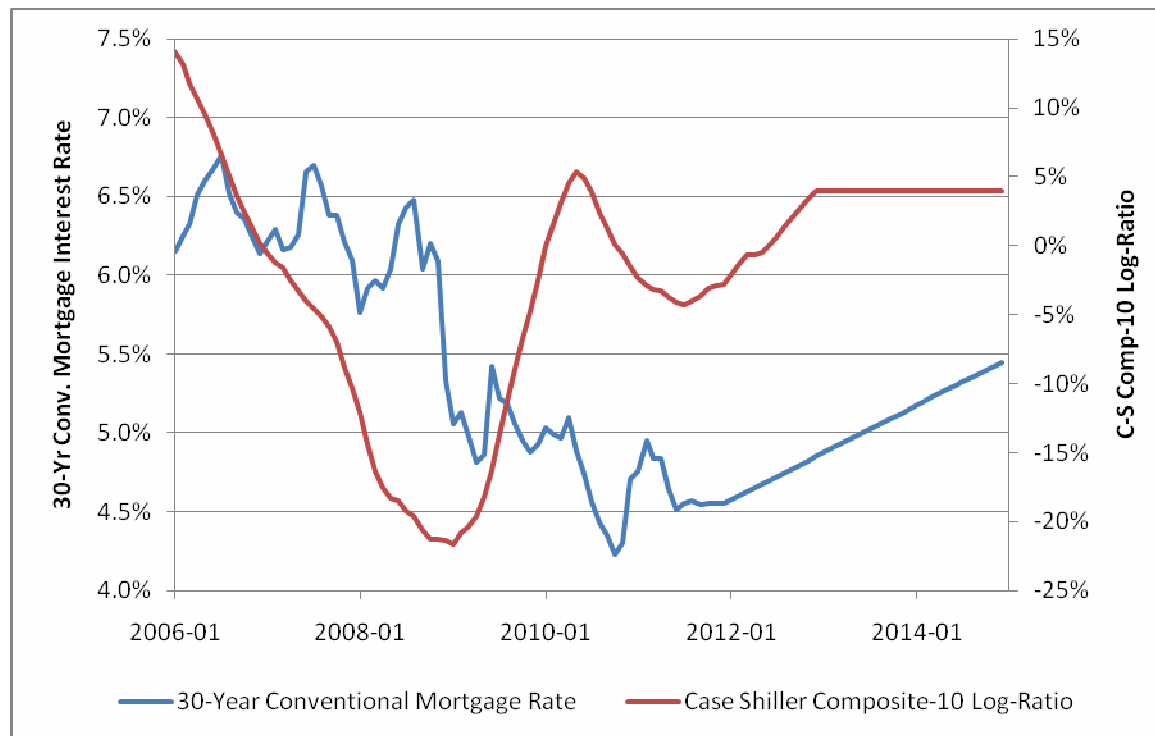
- Three major credit cycles have been observed since 1990.
- The variations in credit quality appear to be driven by shifts in consumer demand. At the worst points in the cycle, the low-risk consumers pull out of the market.
- Traditional credit scores do not see these shifts in consumer demand.
- Changing underwriting standards adjust which applicants one accepts, but this is a second-order effect to the shifts in applicant demand, i.e. **you cannot improve quality via underwriting if there are no good consumers interested.**

The Next Phase



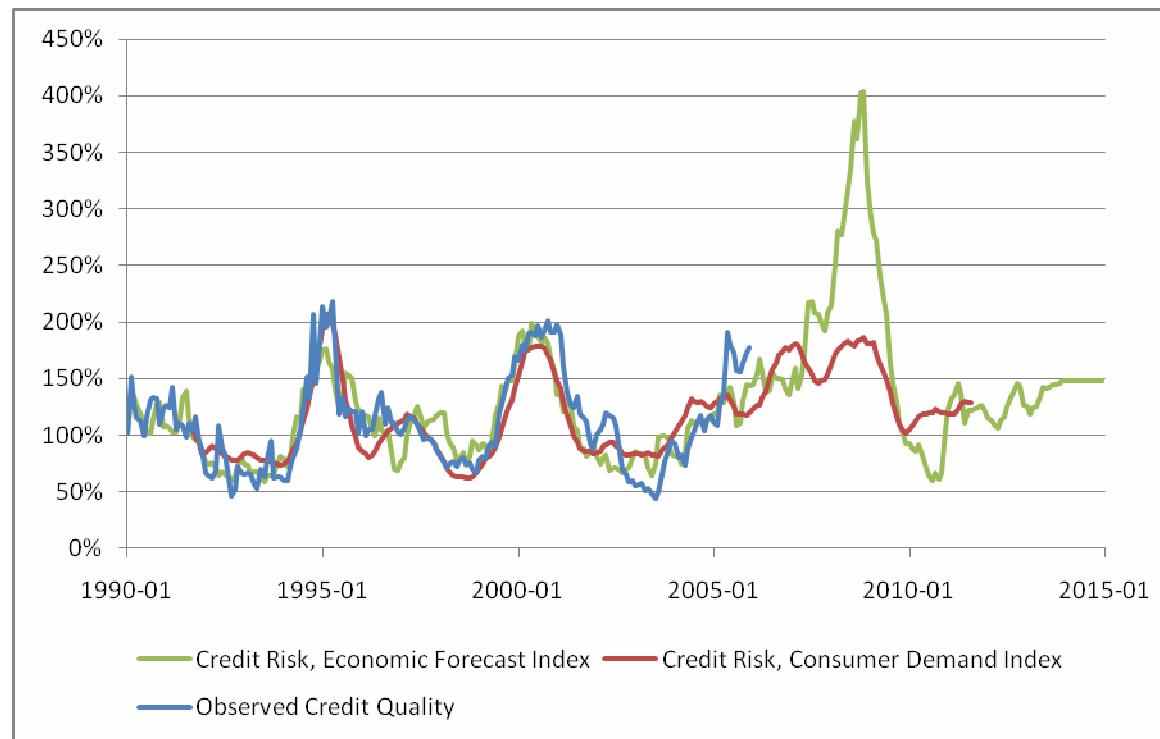
Baseline Economic Scenario

- Using the baseline from eForecasting, we have the following scenario.



Credit Risk Projections

- From recent Loan Officer Surveys and the baseline economic scenario, we have the following credit risk projections.



Lending Cycles

- Lenders are currently over-reserved relative to actual losses occurring.
- As economic conditions continue to improve slowly through 2012, lenders will book more loans.
- This next boomlet in originations will hit peak delinquency in 2015 – 2016.
- Credit risk in 2011 will be good, but deteriorating through 2014 to a little better than 2000-vintage credit risk.
- Poorer quality loans will hit peak losses in 2015-2016.
- As the US economy remains weakly growing, it will be susceptible to a recession around the same time frame.
- 2015-2016 will be a bad years because of what is booked in 2013-2014.

Further Information

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