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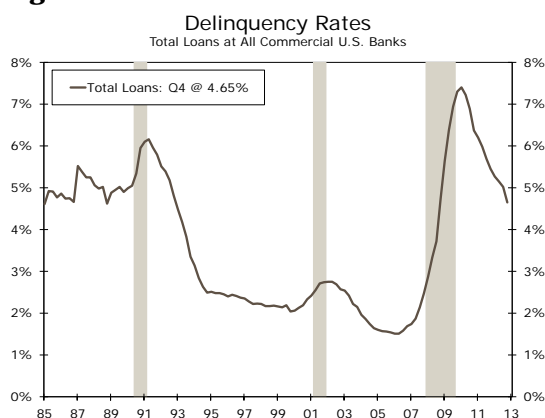
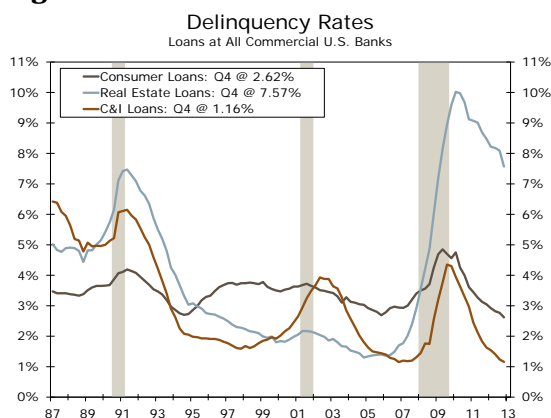
# Identifying Change: Did the Great Recession Alter Credit Benchmarks?

Despite the Federal Reserve's efforts to spur economic growth through extensive monetary policy, the current recovery has proceeded at a sluggish pace. Reviewing previous recoveries, the pattern of credit and lending has been an essential node in the transmission process of monetary policy. In this paper, we take a statistical approach to review the patterns of bank loan delinquencies, charge-offs and the loan-to-deposit ratio. We find that in some instances, the pattern of these credit benchmarks has been altered, explaining some of the weakness in monetary policy transmission.

***The pattern of credit has been an essential node in the transmission process of monetary policy.***

**Delinquency Rates: Identifying Change Post-Great Recession**

The ability to repay loans is influenced by the economic environment and therefore, as illustrated in Figure 1, loan delinquencies follow a predictable pattern over the business cycle. As would be expected, there is a sharp rise in delinquencies at commercial banks associated with the recessions of 1990-1991, 2000-2001 and 2008-2009. Yet, beyond the typical cyclical pattern, there is a question about the sharp rise in delinquencies through the Great Recession. Was the change in delinquency rates across loan types significantly different? To anticipate, the answer is yes.

**Figure 1****Figure 2****Source: Federal Reserve Board and Wells Fargo Securities, LLC**

Broken down by loan category, data begins in 1987. We split the data sample into two periods: first, the period from 1987 to 2007 and then the entire sample period of 1987 to 2012 to see if the Great Recession had a significant effect on credit patterns. We can test whether there is a behavioral difference between credit categories—such as the degree to which delinquencies rise due to a recession or whether loan delinquencies vary by category in their reaction timing to recessions—by running a regression of the delinquency rates of varying loan types.



***This would be a good time to evaluate our credit benchmarks in recognition of the difference in delinquency rates and perhaps adjust our credit criteria.***

Our analysis shows that there was no statistically significant difference in the trends between loan categories from 1987 to 2007.<sup>1</sup> However, outcomes differ dramatically when 2007-2012 is included in the sample period. The past recession was driven by an imbalance in real estate markets, the residential market in particular. Therefore, the pattern between real estate and other loan types has been significantly altered and suggests that credit in these sectors may now function differently. Real estate delinquencies are now statistically different from consumer and commercial and industrial (C&I) loan delinquencies.

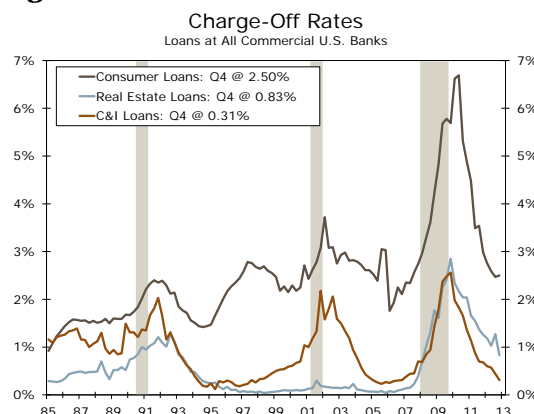
In addition, the relationship between C&I and consumer loan delinquencies has changed over time as C&I delinquency rates have tracked lower than consumer loans since the mid-2000s (Figure 2). This difference is statistically significant and would support the view that C&I portfolios are stronger at this stage of the business cycle.

For the credit officer as well as the investor, there is a new playing field here in credit—at least for the time being. This would be a good time to evaluate our credit benchmarks in recognition of the difference in delinquency rates and perhaps adjust our credit criteria.

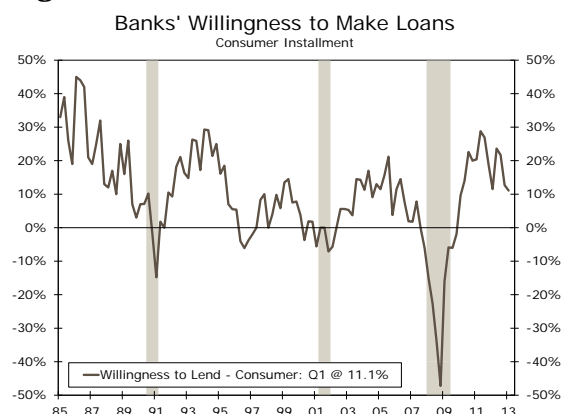
### **Patterns in Charge-off Rates: Identifying Differences in the Character of Trends**

Similarly, some patterns in charge-off rates have also changed. While charge-offs also exhibit a distinct cyclical pattern, charge-offs for consumer loans appear to also have a gentle upward slope over time (Figure 3). Are these patterns statistically significant and, if so, should we incorporate this information in our credit modeling? Yes, on both counts.<sup>2</sup>

**Figure 3**



**Figure 4**



**Source: Federal Reserve Board and Wells Fargo Securities, LLC**

The uptrend in consumer loan charge-offs through the past three business cycles is consistent with the impression that over the past 30 years, credit availability has improved for many households (Figure 4). However with that availability, credit quality appears to have declined, therefore leading to higher charge-offs—particularly for consumer loans.

### **Breakdown of the Monetary Policy Transmission Mechanism**

Recent years have brought forth a debate on the effectiveness of monetary policy. This debate focuses on the substantial increase in the Fed's balance sheet, the commensurate increase in excess bank reserves and yet only a modest rise in bank lending (Figure 5). Bank lending has indeed risen since the recession ended—up 11 percent at commercial banks since bottoming three years ago. Yet the extent of the rise compared to the rise in bank reserves appears modest. This reflects a greater degree of caution on the part of many banks, evidenced by still tight credit standards, as well as regulatory uncertainty with respect to future capital requirements. This is not unusual as this reflects the pattern of the money multiplier concept. This multiplier varies

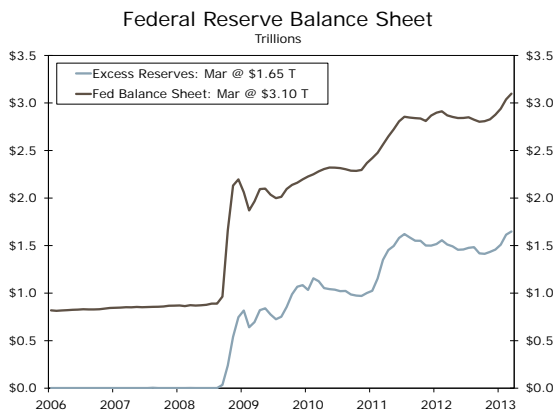
<sup>1</sup> See appendix for details on methodology and statistical results.

<sup>2</sup> Methodology and statistical results are also available in the appendix.

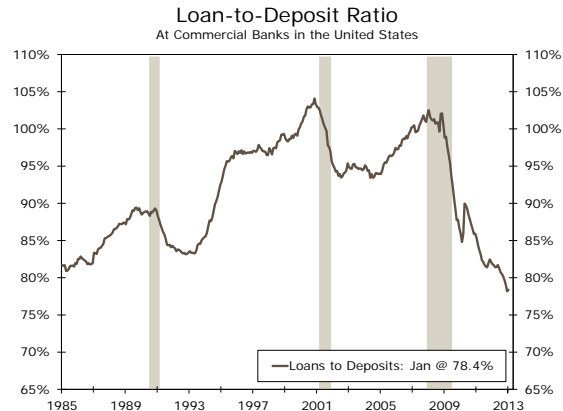
over the business cycle as lenders and borrowers alternate between periods of caution and exuberance.<sup>3</sup>

Figure 6 provides an illustration of the breakdown in the money multiplier process associated with the Great Recession of 2008-2009. Here the banking system witnessed a sharp drop in the ratio of loans to deposits, thereby reducing the money multiplier as banks are not turning over deposits into loans at a pace that was associated with the 1985-2007 period. Is this latest period a statistical break with the past?

**Figure 5**



**Figure 6**



**Source: Federal Reserve Board and Wells Fargo Securities, LLC**

It is clear from Figure 6 that the loan-to-deposit ratio in the current economic expansion is distinct from previous expansionary periods. Testing for a structural break confirms that this period is indeed different.<sup>4</sup> The loan-to-deposit ratio experienced a significant shift downward between the second and fourth quarter of 2009. This change has likely diminished the effectiveness of monetary policy since 2010 and would help explain the simultaneous existence of a very large Fed balance sheet, a large pool of bank excess reserves and yet only a modest increase in bank loans. Such is the price of uncertainty in a post-Great Recession economy.

***The decline in the loan-to-deposit ratio has likely diminished the effectiveness of monetary policy.***

<sup>3</sup> See N. Gregory Mankiw, *Macroeconomics*, Worth, Seventh Edition, 2010, pp. 551-553 and especially his discussion on the money multiplier experience during the 1930s.

<sup>4</sup> For results, see Table 4 in the appendix. For methodology, see the appendix of *When is This Time Different: Benchmarking the Housing Bust, Bear Stearns and Lehman Brothers*, February 4, 2013, available on our [website](#) or on request.

## Appendix

### Testing Loan Delinquencies Before and After the Great Recession

In the first example, we test to see whether there is a statistically significant difference in the delinquency trends of loans. That is, we use OLS regression analysis to see whether the difference between loan types is significantly different from zero. The null hypothesis is that the difference is zero, therefore there is no statistical difference between the delinquency trends of consumer and real estate loans. The alternative hypothesis is that they are statistically different from one another. The results are illustrated in Table 1. We test three different relationships, (1) the relationship between consumer and real estate loan delinquency rates, (2) commercial and industrial (C&I) and real estate loan delinquency rates and (3) C&I and consumer loan delinquency rates. One can see that all three of the relationships tested show no significant difference in the delinquency rates. The three t-values are less than 2, leading us to fail to reject the null hypothesis.

We can conclude that there is no statistically significant difference between the behavior of delinquency rates of consumer and real estate loans, of C&I and real estate loan delinquency rates, and C&I and consumer loan delinquency rates for the 1987-2007 period.

**Table 1**

Delinquency Trends 1987-2007			
Relationship	Mean Estimate	t-Value	Pr > t
Consumer - Real Estate	0.12	0.65	0.5186
C&I - Real Estate	-0.13	-1.24	0.2193
C&I - Consumer	-0.25	-1.53	0.1288

**Table 2**

Delinquency Trends 1987-2012			
Relationship	Mean Estimate	t-Value	Pr > t
Consumer - Real Estate	-0.71	-3.02	0.0032
C&I - Real Estate	-1.15	-4.93	<.0001
C&I - Consumer	-0.44	-3.13	0.0023

**Source:** Wells Fargo Securities, LLC

However, when including the Great Recession period in our analysis, the statistics show that the differences in delinquency patterns are statistically significant (Table 2). When we compare the delinquency rates for C&I loans and consumer loans, we find a mean estimate of -0.44. Due to the relationship's significance, we can interpret this mean estimate as the average difference in the delinquency rates of C&I and consumer loans. Therefore, on average C&I delinquency rates are 0.44 percentage points lower than consumer loans over the time period. The statistical difference in delinquencies for C&I loans and real estate loans is even larger, -1.15 percentage points, thereby suggesting an even bigger gap in credit quality. This gap is also consistent with the jump in real estate delinquencies relative to C&I loans, as would be expected from Figure 1. In a similar manner, the delinquency rate difference for consumer loans less residential loans is also negative and statistically different, thereby suggesting that real estate delinquency rates have also risen relative to consumer loans.

### Testing the Character of Trends in Charge-off Rates

Next, we examine the character of the time trend in charge-off rates; do charge-off rates follow a linear trend, or is it more specific to the business cycle? We test the trends of the charge-off rates for real estate, C&I and consumer loans, regressing time and time-squared on the charge-off rates. The results are presented in Table 3.

We first notice that residential real estate and C&I charge-off rates follow non-linear trends, while consumer loan charge-off rates follow a linear time trend. The mean estimates on residential real estate loan charge-offs suggest that real estate charge-offs have a non-linear time trend that can be characterized as convex and upward sloping (more U-shaped). The statistics support the cyclical pattern we observe in Figure 2. Here, it is important to note that the pattern is statistically significant so that our initial observation is confirmed by the analysis, adding to the need to incorporating this pattern in our credit analysis. Similarly, C&I loans have a non-linear, U-Shaped time trend which is statistically significant.

**Table 3**

Time Trends in Loan Charge-Off Rates				
	Mean Estimte	t-Value	P>t	Trend Type
Real Estate				Non-
intercept	1.15	8.09	0.001	linear/U- shaped
time	-0.04	-7.15	0.001	
time-square	0.00	8.46	0.001	
C&I				Non-
intercept	1.27	7.38	0.001	linear/U- shaped
time	-0.02	-2.93	0.004	
time-square	0.00	3.06	0.003	
Consumer				Linear
intercept	1.31	8.32	0.001	
time	0.02	9.51	0.001	

**Table 4**

<b>Structural Break in the Loan-to-Deposit Ratio</b>			
<b>Break Date</b>	<b>Break Type</b>	<b>Coefficient</b>	<b>Pr&gt; ChiSq</b>
Q2 2010	Level Shift	5.8486	<.0001
Q4 2008	Add. Outlier	1.756	<.0002
Q3 2009	Level Shift	-1.7427	0.0033
Q2 2009	Level Shift	-1.4849	0.0123
Q4 2009	Level Shift	-1.4729	0.0130

**Source: Wells Fargo Securities, LLC**

The consumer pattern of charge-offs is different. As suggested by our simple look at the graph, there appears to be a slight uptrend in the charge-off rates for consumer loans over the 1985-2012 period. Testing the time trend, it is indeed statistically significant. When we retest for the U-shape pattern the results are not statistically significant (not shown but available on request).

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