CMBS Loan Defaults

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Commercial mortgage-backed securities have typically experienced low default rates. Beginning in 1999, however, the default trend is on the rise. Should we expect even higher default rates ahead? Or is the current recession the main catalyst?

We examine several empirical models that allow for CMBS loan seasoning and recession. Loan seasoning is found to produce a permanent increase in default rates, but the recession bump in defaults is temporary. Different views of the relative importance of seasoning and recession imply optimistic and pessimistic views of the future.

The most optimistic model projects a 2002 default rate in core CMBS loans (excluding hotels and health care) of 0.71%, up from 0.69% in 2001 and 0.33% in 2000. Assuming the recession is behind us in 2003, the optimistic model projects a drop in the default rate to 0.38%. The most pessimistic model projects a higher 2002 default rate of 0.79% and then a decline to 0.49% in 2003. With any kind of recovery in 2003, that is, the next big move in CMBS default rates should be down.

Our empirical models imply a credit quality for CMBS core loans no worse than BBB corporate bonds. This suggests that CMBS bonds are about a full notch better in credit quality than corporate bonds.

I. TREND VERSUS CYCLE

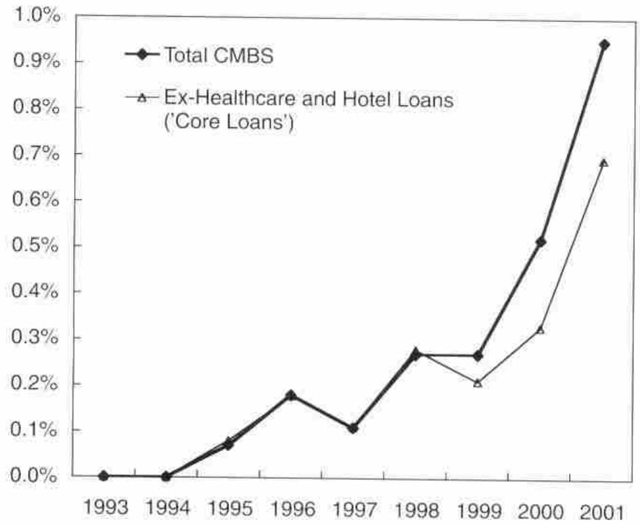
The Fitch CMBS loan default studies, beginning in 1999, have consistently documented very low default rates in these loans. Yet the annual default rate has been rising steadily (*see Exhibit 1*).

Is this a trend that should be extrapolated forward, with much higher default rates expected in the next several years? Or is the 2001-2002 recession the primary culprit in the higher 2001 defaults, implying that future non-recession default rates will be lower?

Clearly, the recession has temporarily raised CMBS loan default rates. A second explanation for higher default rates is the seasoning of CMBS loans, examined in Corcoran and Iwai [2001]. There we conclude that CMBS "toddler loans," those less than two years old, exhibit default rates that are only 40% of "adult loan" default rates. In the early stages of the CMBS market, when most loans were still toddlers, default rates were well below steady-state levels. As the average life of these loans extended, however, default rates rose permanently.

A third set of possible influences on default rates is a combination of initial underwriting and subsequent property performance that may differ for different vintages.

EXHIBIT 1
CMBS Loan Default Rates



Source: Fitch, JPMorgan.

EXHIBIT 2
CMBS Issuance by Vintage Year (number of new loans)

Vintage Year	New Issuance			
	Total	Hotel	Health Care	Core
2001	3,778	130	21	3,627
2000	3,708	187	55	3,466
1999	6,036	363	117	5,556
1998	6,318	498	155	5,665
1997	4,370	375	161	3,834
1996	2,424	223	89	2,112
1995	1,083	72	70	941
1994	241	8	42	191
1993	158	-	41	117
Total	**28,116**	**1,856**	**751**	**25,509**

Source: Fitch, JPMorgan.

We explore several models to assess the relative importance of seasoning and recession impacts on defaults. We focus on core CMBS loans, excluding the smaller and more volatile hotel and health care loan categories, where more complicated modeling is required.

II. MODEL A: SIMPLE SEASONING MODEL FOR CORE CMBS LOANS

In on our work with Fitch data prior to 2001, we determined that loan default rates for "toddler" loans, those with weighted-average lives (WAL) of less than two years, were only about 40% those of adult, fully seasoned loans, with WAL of longer than two years. We start with Model A, in which the adult default rate is 0.46% per year, and the toddler default rate is $0.40 \times 0.46 = 0.184\%$.

The last column in Exhibit 2 shows the number of Fitch-rated core loans by new issuance year. Multiplying new issuance levels by the assumed default rates produces predicted defaults in different years, as shown in Exhibit 3. The example in Exhibit 4 shows the calculation of 1998 vintage defaults in years 1998, 1999, and 2000.

Adding up column totals in Exhibit 3, we get the predicted number of defaults in each year (including all new issuance years or vintages). This predicted total can then be compared with the actual Fitch totals.

Model A does a decent job of explaining total defaults over 1995-2000. Not surprisingly, it underpredicts defaults substantially in the recession year 2001.

Suppose we use the model error in year 2001 to estimate proportionately higher recession period default probabilities that just fit the actual 2001 data point. Obviously, this cannot be done with statistical confidence, since the recession applies solely to the single 2001 data point. When we lack data, however, this might be defended as a reasonable procedure.

In this case, the revised model (with higher 2001 default probabilities) produces the pattern of predicted defaults shown in Exhibit 5. The column totals represent total defaults by calendar year (across vintages), and the row totals in the summary section measure total defaults by new issuance year. The Fitch 2002 default study provides the default totals by vintage year. Fitch also provided to us the vintage pattern for core loans (not published), which includes all loans except for hotels and health care.

Model A (with recession impacts added) predicts too many defaults in both the 1999 and 1998 issuance years but too few defaults in the years 1997 and 1996. Predicted defaults are also somewhat high in the 1993-1995 vintage years, when property markets were at the bottom and subsequently rebounded sharply.

Two possible explanations come to mind. First, perhaps loan underwriting was unusually weak in 1996

EXHIBIT 3

Core Loan Default Model A Without Recession

Default Assumptions:			
Non-Recession Scenario		*WAL*	*Weight*
Toddler Default Rate	0.184%	*2 years or less*	*0.43 ×*
Adult Default Rate	0.460%	*3 years or more*	*1.03 ×*

(number of defaulted loans) — Year of Default

Vintage Year	1995	1996	1997	1998	1999	2000	2001
2001							3
2000						3	6
1999					5	10	25
1998				5	10	26	26
1997			4	7	18	18	17
1996		2	4	10	10	10	10
1995	1	2	4	4	4	4	4
1994	0	1	1	1	1	1	1
1993	1	1	1	1	1	1	1
Estimated Core Total	2	5	13	28	48	72	94
Actual Core Total	1	6	8	36	39	72	177
Error	-1	1	-5	8	-9	0	83

Source: Fitch, JPMorgan.

EXHIBIT 4

Sample Calculation—1998 Vintage Year Defaults

1998 Defaults* = Toddler Default Rate / 2 × 1998 New Core Loans
= (0.184% / 2 × 5,665) = 5

1999 Defaults = Toddler Default Rate × 1998 New Core Loans × (1 - Toddler Default Rate / 2)
= (0.184% × 5,665) × (1 - 0.184% / 2) = 10

2000 Defaults = Adult Default Rate × 1998 New Core Loans × (1 - Toddler Default Rate / 2) × (1 - Toddler Default Rate)
= 0.460% × 5,665 × (1 - 0.184% / 2) × (1 - 0.184%) = 26

**In calculating first-year defaults, note that the average of 1998 loans at the end of 1998 is only six months. Thus, we apply the "toddler" default rate for only a half year.*

Source: JPMorgan.

EXHIBIT 5

Core Loan Default Model A With Recession

Default Assumptions:					
Non-Recession Scenario		Recession Scenario		*WAL*	*Weight*
Toddler Default Rate	0.184%	Toddler Default Rate	0.348%	*2 years or less*	*0.4×*
Adult Default Rate	0.460%	Adult Default Rate	0.869%	*3 years or more*	*1.0×*

(number of defaulted loans) — Year of Default / Summary

Vintage Year	1995	1996	1997	1998	1999	2000	2001	*Estimated Core Total*	*Actual Core Total*	*Error*	*Squared Error*	*Sum of Squared Error*
2001							6	*6*	*4*	*-2*	*6*	
2000						3	12	*15*	*26*	*11*	*114*	
1999					5	10	48	*63*	*62*	*-2*	*3*	
1998				5	10	26	49	*90*	*75*	*-15*	*237*	
1997			4	7	18	18	33	*79*	*87*	*8*	*69*	
1996		2	4	10	10	10	18	*53*	*58*	*5*	*27*	
1995	1	2	4	4	4	4	8	*28*	*21*	*-7*	*45*	
1994	0	1	1	1	1	1	2	*6*	*5*	*-1*	*2*	
1993	1	1	1	1	1	1	1	*4*	*1*	*-3*	*10*	
Estimated Core Total	2	5	13	28	48	72	177	*345*	*339*	*-6*		*513*
Actual Core Total	1	6	8	36	39	72	177	*339*	*339*	*0*		
Error	-1	1	-5	8	-9	0	0	*-6*	*0*	*6*		
Squared Error	1	1	26	70	89	0	0					
Sum of Squared Error								*186*				

Source: Fitch, JPMorgan.

and 1997 and unusually strong in 1998 and 1999. If this is the case, the vintage-specific errors might roughly wash out in a larger portfolio, and Model A (with adjustment for recession) might work reasonably well as a forecasting tool.

A second possible explanation is that our seasoning pattern, estimated from the pre-2001 data, is too simple. Perhaps 1998 and 1999 loans in 2001 should be viewed as "adolescent" loans instead of adult loans, with default rates below the full adult level but still somewhat above the toddler rate. Moreover, perhaps the higher-than-predicted 1996 and 1997 vintage defaults reflect additional seasoning not accounted for in Model A.

In effect, this argument implies that Model A may have applied too much seasoning to the 1998-1999 loans and not enough seasoning to the 1996-1997 loans.

III. MODELS B AND C: MORE COMPLICATED SEASONING PATTERNS

Exhibit 6 shows results with a more complicated seasoning pattern where we set defaults at a toddler level, equal to 40% of the benchmark adult rate, for the first two years. The default rate subsequently rises to an adolescent rate (67% of the adult level) for the next two years, the full adult benchmark rate for the year after that, and a "senior citizen" rate equal to 133% of the benchmark adult level thereafter.

Exhibit 6 shows that by making allowance for higher 2001 recession defaults, a model with a more complicated seasoning pattern can explain the pattern of calendar-year defaults (the column totals) and do somewhat better in explaining the vintage totals by year of issuance (the row totals). That Model B is better able to explain the vintage year totals is evident in a comparison of the sums of squared errors in Exhibits 5 and 6. The two models show similar results in explaining the calendar-year defaults, as measured by the sums of squared errors.

Looking more closely, we see that Model B's better fit of the vintage year totals comes mainly in the 1998-2001 vintages. Model B actually is worse than Model A in explaining the 1993-1995 vintage defaults, where the tendency to overpredict defaults is amplified. Here we are applying the higher "senior citizen" default rate to the 1993-1995 vintages in explaining 2000 and 2001 defaults.

A better model might be obtained by dropping the elevated senior citizen default rate, as shown in Model C in Exhibit 7. In fact, this modification improves the vintage explanation substantially, as shown in the drop in the sum of squares.

EXHIBIT 6

Core Loan Default Model B With Recession

Default Assumptions:					
Non-Recession Scenario		**Recession Scenario**		*WAL*	*Weight*
Toddler Default Rate	0.221%	Toddler Default Rate	0.399%	*2 years or less*	*0.4×*
Adolescent Default Rate	0.370%	Adolescent Default Rate	0.668%	*3 to 4 years*	*0.67×*
Adult Default Rate	0.552%	Adult Default Rate	0.997%	*5 years*	*1.0×*
Senior Default Rate	0.734%	Senior Default Rate	1.326%	*6 years or more*	*1.33×*

(number of defaulted loans)

Vintage Year	1995	1996	1997	1998	1999	2000	2001	*Estimated Core Total*	*Actual Core Total*	*Error*	*Squared Error*	*Sum of Squared Error*
	Year of Default							**Summary**				
2001							7	*7*	*4*	*-3*	*11*	
2000						4	14	*18*	*26*	*8*	*69*	
1999					6	12	37	*56*	*62*	*6*	*42*	
1998				6	12	21	38	*77*	*75*	*-2*	*4*	
1997			4	8	14	14	38	*79*	*87*	*8*	*67*	
1996		2	5	8	8	12	28	*62*	*58*	*-4*	*13*	
1995	1	2	3	3	5	7	12	*34*	*21*	*-13*	*172*	
1994	0	1	1	1	1	1	2	*8*	*5*	*-3*	*10*	
1993	0	0	1	1	1	1	1	*6*	*1*	*-5*	*20*	
Estimated Core Total	2	6	14	28	48	72	177	*346*	*339*	*-7*		*408*
Actual Core Total	1	6	8	36	39	72	177	*339*	*339*	*0*		
Error	-1	0	-6	8	-9	0	0	*-7*	*0*	*7*		
Squared Error	1	0	32	67	79	0	0					
Sum of Squared Error								*179*				

Source: Fitch, JPMorgan.

EXHIBIT 7

Core Loan Default Model C With Recession

Default Assumptions:					
Non-Recession Scenario		**Recession Scenario**		*WAL*	*Weight*
Toddler Default Rate	0.221%	Toddler Default Rate	0.425%	*2 years or less*	*0.4×*
Adolescent Default Rate	0.370%	Adolescent Default Rate	0.712%	*3 to 4 years*	*0.67×*
Adult Default Rate	0.552%	Adult Default Rate	1.062%	*5 years or more*	*1.0×*

(number of defaulted loans)

		Year of Default							Summary				
		1995	1996	1997	1998	1999	2000	2001	*Estimated Core Total*	*Actual Core Total*	*Error*	*Squared Error*	*Sum of Squared Error*
Vintage Year	2001							8	*8*	*4*	*-4*	*14*	
	2000						4	15	*19*	*26*	*7*	*55*	
	1999					6	12	39	*58*	*62*	*4*	*17*	
	1998				6	12	21	40	*80*	*75*	*-5*	*21*	
	1997			4	8	14	14	40	*81*	*87*	*6*	*33*	
	1996		2	5	8	8	12	22	*56*	*58*	*2*	*4*	
	1995	1	2	3	3	5	5	10	*30*	*21*	*-9*	*81*	
	1994	0	1	1	1	1	1	2	*7*	*5*	*-2*	*4*	
	1993	0	0	1	1	1	1	1	*5*	*1*	*-4*	*13*	
	Estimated Core Total	2	6	14	28	47	69	177	*343*	*339*	*-4*		*241*
	Actual Core Total	1	6	8	36	39	72	177	*339*	*339*	*0*		
	Error	-1	0	-6	8	-8	3	0	*-4*	*0*	*4*		
	Squared Error	1	0	32	70	69	7	0					
	Sum of Squared Error								*180*				

Source: Fitch, JPMorgan.

IV. MARGINAL DEFAULT PROBABILITIES

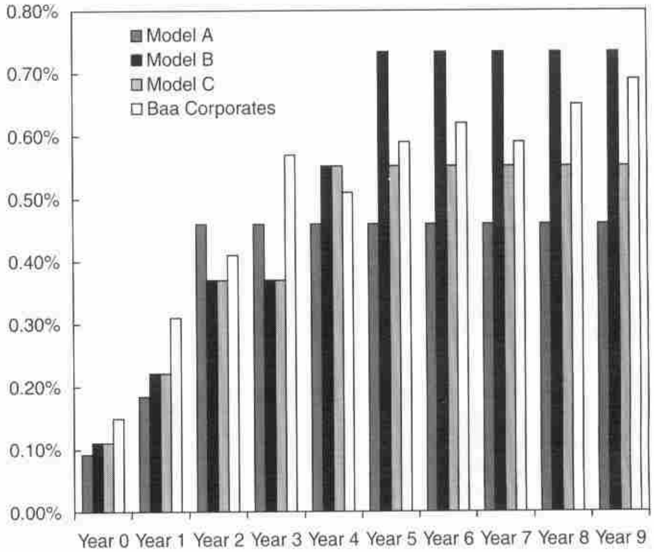
Loan seasoning in the three CMBS models makes the so-called marginal default probabilities rise as loans age. The increase is the sharpest in Model B. The rating agencies have consistently found that rising marginal default probabilities are a characteristic of investment-grade bonds. Corporate bonds originally rated below-investment-grade, however, typically feature default probabilities that peak in the bonds' early years and then fall as the bonds season further.

The seasoning characteristics estimated from the CMBS models are consistent with the view that the quality of CMBS core loans, measured by expected loss, is between A-rated and BBB-rated corporate bonds (see Corcoran and Iwai [2002b]).

Exhibit 8 graphs the marginal default probabilities in the three CMBS models with those compiled by Moody's for Baa corporate bonds (1972-2000) (see Hamilton, Cantor, and Ou [2002]). After rising in the first three or four years, the corporate default curve flattens out into a tight range between 0.55% and 0.70% per year. While recession-specific default probabilities will obviously be higher, we would expect a similar evolution of CMBS default probabilities as the market matures.

EXHIBIT 8

Core Loan versus Baa Corporate Defaults



Source: JPMorgan, Moody's.

It should be noted that the corporate curve gives little weight to issuance in the years 1995-2002, when defaults will certainly be higher than average. This emphasizes the importance of the market environment in setting underwriting standards that will subsequently deliver investment-grade credit performance (see Corcoran and Iwai [2002a] for further discussion).

The 2002 Fitch default study speculates that marginal default probabilities might decline beyond the sixth year and then possibly increase at balloon maturity dates (see Stafford, Cain, and Metz [2002, p. 4]). A model along this line is shown in Exhibit 9 as Model D.

Model D is similar to Model C, but it allows a drop in default probabilities beyond year six. Since balloon date defaults are still several years away from being an important issue, Model D makes no additional allowance for defaults at the balloon dates. Model D achieves some modest improvement in fit, primarily by further reducing the tendency to overpredict defaults from the early 1993-1995 vintages.

Yet, despite the improved fit, we are somewhat skeptical about a generalized drop in default probabilities after year six. We favor the vintage-specific idea that a combination of tough early loan underwriting and recovering property markets explains the low defaults from 1993-1995 issuance years.

V. FORECASTING 2002-2003

With the limited data set provided in the Fitch study, we certainly have not proved any of these models, partly because we have been more concerned with fitting models than proving them. As Sherlock Holmes well understood, one can use limited data clues either to form hypotheses (fit models) or to test them—but not both.

What we have done is form several hypotheses, or models, that are reasonable and roughly consistent with the clues so far. That is an advantage because many ideas or models are simply inconsistent with the data. Moreover, this advantage may be more powerful in our case than in murder mysteries.

In Holmes's cases, there is only one right answer to the murder mystery. All other answers are terribly wrong.

In our case, it may be that the models considered are not so different, since they all allow for seasoning and recession impacts. If this is so, it suggests there are many other possible views or models that are either more pessimistic or more optimistic than any of our models, which should be rejected because they are inconsistent with the evidence. In CMBS and real estate circles, most of the more recent views appear to fall on the pessimistic side.

EXHIBIT 9
Core Loan Default Model D With Recession

Default Assumptions:					
Non-Recession Scenario		**Recession Scenario**		*WAL*	*Weight*
Toddler Default Rate	0.221%	Toddler Default Rate	0.434%	*2 years or less*	*0.4×*
Adolescent Default Rate	0.370%	Adolescent Default Rate	0.727%	*3 to 4 years*	*0.67×*
Adult Default Rate	0.552%	Adult Default Rate	1.086%	*5 to 6 years*	*1.0×*
Senior Default Rate	0.370%	Senior Default Rate	0.727%	*7 years or more*	*0.67×*

(number of defaulted loans)	Year of Default							Summary				
Vintage Year	1995	1996	1997	1998	1999	2000	2001	*Estimated Core Total*	*Actual Core Total*	*Error*	*Squared Error*	*Sum of Squared Error*
2001							8	*8*	*4*	*-4*	*16*	
2000						4	15	*19*	*26*	*7*	*50*	
1999					6	12	40	*59*	*62*	*3*	*10*	
1998				6	12	21	41	*81*	*75*	*-5*	*30*	
1997			4	8	14	14	41	*82*	*87*	*5*	*23*	
1996		2	5	8	8	12	23	*57*	*58*	*1*	*2*	
1995	1	2	3	3	5	5	7	*27*	*21*	*-6*	*35*	
1994	0	1	1	1	1	1	1	*6*	*5*	*-1*	*1*	
1993	0	0	1	1	0	0	1	*4*	*1*	*-3*	*8*	
Estimated Core Total	2	6	14	28	47	69	177	*341*	*339*	*-3*		*175*
Actual Core Total	1	6	8	36	39	72	177	*339*	*339*	*0*		
Error	-1	0	-6	8	-8	3	0	*-4*	*0*	*4*		
Squared Error	1	0	32	70	69	7	0					
Sum of Squared Error								*180*				

Source: Fitch, JPMorgan.

EXHIBIT 10
Core Loan Default Projections*

	2000	2001	2002F	2003F
Model A	0.33%	0.69%	0.71%	0.38%
Model B	0.33%	0.69%	0.79%	0.49%
Model C	0.33%	0.69%	0.76%	0.42%
Model D	0.33%	0.69%	0.72%	0.39%

**Assuming a recession scenario in 2002 and no recession in 2003.*
Source: JPMorgan.

In Models A and C, seasoning effects are less substantial and occur more quickly. The recession-related impacts, though, are quite similar in all the models. Since seasoning produces a permanent increase in the default rate, in contrast to a temporary recession increase, Models A and C have a more optimistic story looking past the recession.

In Model B, seasoning impacts are greater and take longer to materialize. Thus, Model B embodies a higher default rate beyond the recession.

Suppose an investor who owns CMBS backed by the Fitch portfolio (or similar securities) intends to add new-issue CMBS backed by Fitch loans in 2002 and 2003. We assume new-issue loans in 2002-2003 are the same as 2001. What do the models have to say about the future default rates for this portfolio?

We assume that 1) the recession has continued in full measure in 2002, when we employ the higher recession-related default rates, and that 2) it vanishes completely in 2003, when we go back to the lower pre-recession default rates. Obviously, if the recession drags on into 2003, defaults would be higher. But the 2003 projections, without recession, are interesting because they show the tendency toward higher defaults from seasoning alone.

The results are shown in Exhibit 10. In Model B, the most pessimistic model, the year-end 2002 default rate is projected to be 0.79%, up from 0.69% in 2001 and 0.33% in 2000. In 2003, with the recession assumed to be over, the Model B default rate is projected to drop to 0.49%, a level some 16 basis points higher than the pre-recession default rate of 0.33% in year 2000. The increase reflects additional seasoning that has occurred in the intervening period.

In Model A, the most optimistic model, the 2002 forecast default rate rises only slightly to 0.71% (8 bp lower than Model A) and drops to 0.38% in 2003 (11 bp lower than Model A). Results for Model D, where marginal default probabilities decline after year six, are virtually identical to the optimistic Model A.

The point is that pessimistic results beyond the current recession occur in models such as Model B, where rising default probabilities point to an increase in defaults as the portfolio ages.

VI. CONCLUSION: LIMITS TO CMBS PESSIMISM

What do these results mean for the pattern of defaults and losses that should be anticipated by the CMBS investor? Exhibit 11 lays out the seasoning pattern of default probabilities implied by the different models.

In each case, the first column shows benchmark default probabilities without a recession shock. In the second column, we assume a recession shock bumps the default rate upward for three years. (Note this is a longer recession shock than we use in our projections above, where we elevate recession default probabilities only in 2001 and 2002.)

In the core loan loss panel, assuming an average loss severity of 27%, the expected ten-year cumulative loss ranges from 1.07% to 1.87%, depending on which model is used and whether the three-year recession shock actually occurs. This range of expected losses compares to ten-year cumulative default rates in BBB/Baa corporate bonds of about 5.0% and losses of about 3.0% estimated from the years 1980-2000 (see Hamilton, Cantor, and Ou [2002]).

In other words, the results suggest that core CMBS loans are better than equivalent in credit quality to BBB corporate bonds. Considering that new-issue BBB CMBS conduit paper has 8% to 9% credit enhancement, this further implies that BBB CMBS should probably be compared to corporates with A ratings or higher.

In the modern CMBS market, widespread investor pessimism has been emotionally easy to maintain but intellectually tough to defend. Emotionally easy, because investors remember the overbuilding boom of the 1980s and the numerous loan defaults of the early 1990s. Intellectually tough, because the modern CMBS market has had so few loan defaults.

In a sense, our Model B, with its slowly evolving seasoning, can be thought of as representing a kind of pessimists' last stand, because it depicts an intellectually respectable pessimism that is consistent with the Fitch default data.

How pessimistic does that allow an intellectually respectable pessimist to be? The answer is not very.

EXHIBIT 11

Core Loan Default Scenarios and Losses

Core Loan Default Scenarios

	Model A		Model B		Model C	
	No Recession	3-yr Recession Shock	No Recession	3-yr Recession Shock	No Recession	3-yr Recession Shock
Year 0	0.092%	0.092%	0.111%	0.111%	0.111%	0.111%
Year 1	0.184%	0.184%	0.221%	0.221%	0.221%	0.221%
Year 2	0.460%	0.460%	0.370%	0.370%	0.370%	0.370%
Year 3	0.460%	0.460%	0.370%	0.370%	0.370%	0.370%
Year 4	0.460%	0.869%	0.552%	0.997%	0.552%	1.062%
Year 5	0.460%	0.869%	0.734%	1.326%	0.552%	1.062%
Year 6	0.460%	0.869%	0.734%	1.326%	0.552%	1.062%
Year 7	0.460%	0.460%	0.734%	0.734%	0.552%	0.552%
Year 8	0.460%	0.460%	0.734%	0.734%	0.552%	0.552%
Year 9	0.460%	0.460%	0.734%	0.734%	0.552%	0.552%
Cumulative Defaults	3.956%	5.183%	5.294%	6.923%	4.384%	5.914%

Core Loan Loss Scenarios

	Model A		Model B		Model C	
	No Recession	3-yr Recession Shock	No Recession	3-yr Recession Shock	No Recession	3-yr Recession Shock
Year 0	0.025%	0.025%	0.030%	0.030%	0.030%	0.030%
Year 1	0.050%	0.050%	0.060%	0.060%	0.060%	0.060%
Year 2	0.124%	0.124%	0.100%	0.100%	0.100%	0.100%
Year 3	0.124%	0.124%	0.100%	0.100%	0.100%	0.100%
Year 4	0.124%	0.235%	0.149%	0.269%	0.149%	0.287%
Year 5	0.124%	0.235%	0.198%	0.358%	0.149%	0.287%
Year 6	0.124%	0.235%	0.198%	0.358%	0.149%	0.287%
Year 7	0.124%	0.124%	0.198%	0.198%	0.149%	0.149%
Year 8	0.124%	0.124%	0.198%	0.198%	0.149%	0.149%
Year 9	0.124%	0.124%	0.198%	0.198%	0.149%	0.149%
Cumulative Losses	1.068%	1.399%	1.429%	1.869%	1.184%	1.597%

Source: JPMorgan.

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