



**AgEcon** SEARCH  
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

*The World's Largest Open Access Agricultural & Applied Economics Digital Library*

**This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.**

**Help ensure our sustainability.**

Give to AgEcon Search

AgEcon Search  
<http://ageconsearch.umn.edu>  
[aesearch@umn.edu](mailto:aesearch@umn.edu)

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

**The Cost of Defaulted Loans**

**Christian Boessen and Allen Featherstone**

**Proceedings of  
Regional Research Committee NC-161**

**FINANCING AGRICULTURE IN A CHANGING  
ENVIRONMENT: MACRO, MARKET,  
POLICY AND MANAGEMENT ISSUES**

**St. Louis Farm Credit Bank  
St. Louis, Missouri  
September 23-24  
1991**

Department of Agricultural Economics  
Kansas State University  
Manhattan, KS 66506  
February 1992

*Copyright 1991 by author. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.*

**THE COST OF DEFAULT -  
THE INVESTMENT RETURNS FROM DEFAULTING AGRICULTURAL  
MORTGAGES BECOMING ACQUIRED PROPERTIES**

**Christian R. Boessen and Allen M. Featherstone**

Equitable Agri-Business Inc. (EAB) is a subsidiary of Equitable Real Estate Investment Management and The Equitable Life Assurance Society of the United States. EAB was formed in 1984 from the Farm Mortgage Department of The Equitable which had been originating and managing agricultural mortgage investments since 1912. EAB manages a portfolio of agricultural mortgages exceeding \$2.0 billion with annual new loan originations approaching \$350 million in recent years. Currently, EAB manages mortgage investments in all ten USDA Agricultural Regions.

As current trends change the face of agricultural finance, the opportunity exists to attract non-traditional sources of investment capital. In addition to continued agricultural investment management for The Equitable, the formation of EAB has facilitated the development of third party agricultural investment clients. Currently EAB is originating and/or servicing agricultural mortgage investments for other institutions. Increasing this third party business requires the comparison of the agricultural mortgage to other investment products. These third party non-traditional sources of capital include pension funds, smaller insurance companies and the public market through mutual funds or some other form of securitization. In all likelihood, direct investment in agricultural mortgages is a completely new asset class for many of these investors.

There is no shortage of investment alternatives for institutions or other investors. The myriad of investment products and alternatives have a broad spectrum of risk/return and historical performance information available to investors. For agriculture mortgages to warrant serious consideration as an investment, substantial performance information must be available to enable investors to make comparisons to other fixed income alternatives. EAB has initiated a project to assemble the data needed to develop agricultural mortgage performance information. Included in this project is a comprehensive study of the investment performance of the problem asset component (acquired property) of the portfolio. This report presents some preliminary results of the ongoing study of EAB acquired property experience.

**Background**

During the thirty year period prior to 1980, the weighted average acquired property owned as percentage of EAB's total portfolio averaged less than .03% with a high in 1976 of .15%. In 17 of these 30 years, acquired property owned as a percentage of the total portfolio was zero. However, from 1980 through 1990, EAB acquired over 600 agricultural properties in the wake of an economic adjustment that became known as the "Farm Crisis of the 80's." As a result, acquired property as a percent of the total portfolio peaked in 1987 at 6.3%. As

of January 1991, 419 of these properties had been completely sold. The performance of these 419 properties is the focus of the default study to date.

Determining the cost of default in terms of lost yield required the reconstruction of historical cash flows for each acquired property. The historical cash flows covered the period from the date of loan closing to the date of the final sale of the acquired property. An internal rate of return on this origination to disposition total cash flow could then be compared to the contractual yield of the original mortgage (effective rate) over the same period. The difference between the actual total IRR of the loan from origination through the sale of acquired property and effective rate represents the impact of default on the investment yield.

Of the 419 properties, 375 cash flows could be reconstructed with a reasonable effort and acceptable accuracy. Cash-flow amounts and dates were recorded as well as information about the terms of the loan, location, and the primary security. This represents a very extensive sample approaching 90% of all properties acquired and sold since 1980 (as of 1/91). It is anticipated that in 1991 approximately 75 additional complete acquired property sales will be finalized and added to the data.

## Results

Tables 1 through 7 present results of the analysis of the acquired property database of properties sold as of January 1991. Table 1 presents the basic performance and default statistics for the acquired properties in total and by USDA Region. The statistics are weighted by the original principal of the defaulted loan. Thus, performance of an individual property influences the results only in proportion to original loan size.

The average effective rate reflects the coupon of the mortgage adjusted for the terms of the note (semi-annual, monthly etc.). This rate represents the rate of return the investor would have realized had the loan performed as agreed for a length of time equivalent to the holding period (loan origination to acquired property sale). For an adjustable rate loan, a cash flow was constructed as if the loan had performed during the entire holding period to reflect any rate adjustments that would have occurred. The IRR of this cash flow was considered the effective rate on the adjustable loan.

The total cash flow IRR is the internal rate of return for the loan from loan closing to the date of the final sale of the acquired property. The cash flow consists of a monthly stream reflecting scheduled interest and principal payments as well as all changes to the loan before default such as additional payments applied to principal or rate changes. Also reflected in this cash flow are income and expenses associated with acquiring, operating, and selling the property. The default cost is the difference between the effective rate and the total cash flow IRR. The default IRR is the internal rate of return on the acquired property from the date of the last regularly scheduled interest payment received to the date of the complete sale of the property. For computational purposes, the principal balance at default is used as the initial cash flow in the default period stream.

As can be seen in Table 1, the original weighted average effective rate for all the loans that became acquired properties was 10.97%. Because default occurred during the holding period, this rate was not realized. However, the investments that became acquired properties achieved a 6.26% weighted average internal rate of return from loan origination to final sale of the acquired property, as indicated by the total cash flow IRR. The average default cost in terms of lost yield on these investments was thus 4.71%. The default IRR indicates how well the investments performed after default. The 2.59% IRR during the default period indicates that on average the entire default principal was recovered plus a very small but positive return. The default period returns are primarily a function of farm property operations and the net impact of gains and losses on land sales.

Figures 1 and 2 illustrate the range in the distribution for the total cash flow IRR and the default IRR, respectively. The total cash flow IRR ranges from -49.7% to 28.4% (Figure 1). Twenty six loans had a total cash flow IRR of less than zero, which indicates that not all principal was recovered on these loans. Sixty seven loans had a total cash flow IRR of greater than 10%. The median total cash flow IRR was 7.4%. The default IRR ranges from -53.8% to 82.1% (Figure 2). One hundred eight loans had a negative default IRR. Fifty nine loans had a default IRR of greater than 10%. The median default IRR was 2.9%.

Table 1 also presents the same statistics weighted by original balance and grouped by USDA Region. By a substantial margin, the greatest number of properties were acquired in the Corn Belt. The default cost in the Corn Belt of 2.8% was considerably lower than the national average which is likely a reflection of the regional recovery relative to other parts of the country. The worst performing properties on average were in the Southern Plains. Typically, there was a negative return from acquisition to sale on acquired properties in this region.

Table 2 reports weighted performance and default statistics by security type. The security type for this classification was the original security type description as taken from the loan origination documents. It appears that the performance statistics by security type approach the aggregate performance statistics from Table 1 as the number of acquired properties in a type category increase. The performance of properties by security type also reflects the regional differences of Table 1. Feed Grain loans predominately from the Corn Belt did well while the poor performance of the Food Grain loans again reflects conditions in the Southern Plains.

The presentation in Tables 3 and 4 uses the same performance measures as in the previous tables. In Table 3 the data is sorted by the year of loan origination and chronicles the rise of interest rates on agricultural loans. It is somewhat surprising that the effective rate on the loan is not reflected more in the Total Cash Flow IRR. At first glance, the effective rate does not appear to be a good predictor of total return by itself. Total Cash Flow IRR tended to be lower on higher rate loan years. Clearly there are a number of variables at work in this relationship. These will be examined in more detail later in the manuscript.

Table 4 presents the data by year of loan default. Typically, there was a 1.5 to 2 year period from default to when EAB acquired title to properties. Thus for the loans defaulting in and after 1984, the properties would have been acquired when the land market and rents were bottoming out or rebounding. This could explain some of the substantial improvement in Total Cash Flow IRR for loans defaulting after 1984.

Table 5 is an origination year by default year frequency distribution for the acquired properties. Of the acquired properties completely sold as of January 1991, 287, or 77% were from loans originated from 1977 through 1980. Eighty-one percent of the loans defaulted during the four year period 1983 through 1986. While not surprising, the intersection of these 4 rows and columns illustrates an interesting culmination of the "Farm Crisis of the 1980's". The four origination years were those just preceding the peak in farm asset values and the worst four default years began as net farm incomes hit bottom in 1983.

The acquired property portfolio was further summarized in Table 6. The means reported in Table 6 are not weighted by the original loan balance as they were in Tables 1 through 4. The un-weighted effective rate mean is lower than the weighted effective rate mean while the un-weighted total cash flow IRR and the default IRR are higher than the weight means. The default IRR has a coefficient of variation (329.0%) of nearly four times that of the total cash flow IRR (75.4%).

The average loan performed 5.5 years before for defaulting (Table 6). The standard deviation was 2.4 years. It took an average of 1.8 years from the time the loan defaulted until the title to the property legally changed hands. After the title was received, it took EAB an average of 2.3 years to complete the sale of the entire property.

The loan to value ratio was an average of 61.2% at loan origination (Table 6). At acquisition, the appraisal to default principal was 107.8%. The appraisal to default principal was much more variable than the original loan to value ratio. From origination until default, the average loan balance was reduced by nearly \$50,000. The rapid change of the origination loan to value ratio to the acquisition to default principal is an artifact of the rapid decline in land values.

On average, EAB paid \$12,456 in property tax expense before selling the property (Table 6). Some of this expense accrued before acquisition while some accrued during ownership. On average, EAB paid \$6,374 in legal expenses associated with the acquisition and sale of acquired properties on defaulted loans. Legal expenses are much more variable than property taxes in terms of the coefficient of variation. The mean property tax expense is roughly twice that of legal expenses while the standard deviations are nearly equal. Total acquisition and sales expenses as a percent of the default principal averaged 9.6%. Total acquisition and sales expenses include legal expense, property tax expense, selling expenses such as title and abstracting fees, and advertising and other acquisition expenses. Expenses associated with managing the property during ownership are not included in this figure. However, it would not be uncommon for these expenses to approach 20% given the

magnitude of the standard deviation. Finally, EAB provided partial or all financing on 50.1% of the properties sold.

Five regression models were estimated to understand some of the inter-relationships between variables. The first two regression models examine the inter-relationships between the total cash flow IRR and important variables which may affect the IRR (Table 7). As expected, the effective rate has a positive effect on the total cash flow IRR. Roughly fifty percent of the effective rate will be translated into the total cash flow IRR. The total cash flow IRR is not significantly affected by the original loan balance. Loans that had a longer length of performance had a higher total cash flow IRR. Each year of performance will roughly increase the total cash flow IRR by .84%. The length of time of the acquisition period does not have a statistically significant effect on the total cash flow IRR. The length of time it takes to sell a property is negatively (-.58%) related to the total cash flow IRR. The original loan to value ratio is negatively related to total cash flow IRR. If EAB provided partial or complete financing for the sale of property, the return on the total cash flow IRR was roughly 1% higher. This result seems to indicate that EAB was able to negotiate a higher selling price when providing financing than they otherwise might have.

The second model explaining total cash flow IRR was similar to the first except that the acquisition appraisal to default principal ratio was not included. This variable was dropped to examine the stability of other estimated parameters in model one. The results suggest that the other parameters are fairly stable.

The regression examining factors which affect the default IRR is also found in Table 7. As would be expected given the increased variability in this variable, the regression results were not as statistically significant. The effective rate and the original loan balance do not have a statistically significant effect on the default IRR. The remaining variables have the same directional effect on the default IRR as they did on the total cash flow IRR. The magnitude and the statistical significance of the effect is less.

The fourth regression examines variables which affect the number of years of loan performance (Table 7). Only variables that are known at loan origination were included in the regression. The effective rate and the original loan balance have significant negative effects on the number of years a loan will perform. The original loan to value ratio has a negative effect on the years of performance but the relationship is not statistically significant.

The final regression examines variables which affect the length of property ownership (Table 7). All included variables except the binary variable for EAB financed purchases are statistically significant. If EAB finances part of the purchase, the length of ownership tends to be lower but not from a statistical standpoint.

In summary, several things can be learned from the regressions. The effective interest rate, the years of performance, EAB financed acquired property purchases, and the acquisition appraisal to default principal ratio all are positively related to the total cash flow IRR. The length of property ownership and the original loan to value ratio are negatively related to the

total cash flow IRR. The original loan balance is not significantly related to the total cash flow IRR, although it is negatively related to years of loan performance. On the other hand, the original loan to value ratio is negatively related to the total cash flow IRR but not significantly related to years of performance. The relationship between the independent variables and the default IRR are the same as to the total cash flow IRR with one exception. The effective rate is not significantly related to the default IRR. One interesting point that needs to be examined in the future is the performance of the loans which EAB made in conjunction with selling acquired property. While EAB financing did not decrease the time of ownership, these loans had a significant positive affect on the internal rate of return. A final word of caution should be noted in using the regression results for other financial institutions. These regression are EAB specific and should not be applied to other financial institutions whose class of investments may be different or whose philosophy of the management of acquired properties was different than EAB's.

### Summary

Initial disaggregation of the data has yielded several interesting observations as well as measured some intuitive aspects of acquired properties portfolio management. The performance of acquired property has varied considerably geographically and by the primary farm enterprises underlying the mortgages. The majority of the loans which became acquired properties during the 1980's were originated in the four years 1977 through 1980. The majority of these loans defaulted in the four years 1983 through 1986. The internal rate of return for this sample of loans becoming acquired properties was 6.26%. With an average original effective rate on the loans of 10.97%, the average loss in yield through loss of contractual interest payments was 4.71%. The average number of years of loan performance was 5.5, the average length of time to acquire property after default was 1.8 years, and the average length of ownership was 2.3 years. Legal costs averaged \$6,374 per acquired property, while property taxes average \$12,546. Total sales and acquisition costs as a percentage of the default principal was 9.6%. However, the standard deviation was 8.6% indicating a wide variance in this average figure.

The focus of the ongoing research is updating the acquired property data as sales are completed and merging of the acquired property data with a total portfolio data set being assembled. An important area needing continued analysis is the performance of those loans which were made in conjunction with the sale of acquired property. A combined data set will enhance further research into the actual cost of default, the probability of default and thus estimates of future default premiums. This information will be useful to rating agencies and institutional investors in calculating the performance of agricultural mortgages compared to other types of investments they currently make.



Table 1. Weighted Average Performance and Default Statistics For  
Equitable Agri-Business Acquired Properties By USDA Regions

USDA Region	Num. <sup>1</sup>	Original Loan Bal.	Avg. Eff. Rate	Tot. Cash Flow IRR <sup>2</sup>	Default Cost <sup>3</sup>	Default IRR <sup>4</sup>
Total U.S.	375	133,593,700	10.97%	6.26%	4.71%	2.59%
Appalachia	30	16,961,500	10.83%	3.53%	7.30%	0.80%
Corn Belt	133	35,898,700	10.90%	8.10%	2.80%	5.29%
Delta States	23	10,056,400	10.86%	6.06%	4.80%	2.12%
Lake States	22	7,930,000	10.93%	6.52%	4.41%	3.01%
Mountain	22	8,290,000	10.94%	5.42%	5.51%	0.88%
Northeast	11	2,480,000	9.80%	4.86%	4.94%	2.45%
Northern Plains	79	24,978,100	10.70%	7.32%	3.38%	3.65%
Pacific	13	7,641,000	12.02%	1.53%	10.49%	-0.95%
Southeast	11	7,195,000	10.71%	5.13%	5.58%	2.16%
Southern Plains	31	12,163,000	11.79%	6.92%	4.88%	-1.33%

Table 2. Weighted Average Performance and Default Statistics For  
Equitable Agri-Business Acquired Properties By Farm Type

Farm Type	Num. <sup>1</sup>	Original Loan Bal.	Avg. Eff. Rate	Tot. Cash Flow IRR <sup>2</sup>	Default Cost <sup>3</sup>	Default IRR <sup>4</sup>
Agri-Business	2	360,000	9.66%	6.67%	2.99%	0.87%
Broilers	1	310,000	9.20%	10.52%	-1.32%	16.82%
Cattle and Calves	41	15,470,000	10.91%	7.05%	3.86%	3.79%
Cotton and Tobacco	22	9,103,500	11.17%	6.51%	4.66%	4.26%
Dairy	11	4,041,000	10.13%	6.74%	3.39%	4.05%
Feed Crops	159	53,377,900	11.17%	7.04%	4.13%	2.55%
Food Grains	35	13,909,100	10.53%	4.30%	6.24%	-2.06%
General Farm	84	29,079,200	10.77%	5.41%	5.36%	3.60%
Oil Seeds	10	5,263,000	12.14%	4.01%	8.14%	1.01%
Permanent Plantings	8	2,180,000	10.79%	7.39%	3.40%	2.47%
Timber	2	500,000	8.63%	8.53%	0.09%	6.62%

<sup>1</sup>Represents 90% of FRE's completely sold as of 1/1/91.

<sup>2</sup>Internal rate of return for the investment from loan origination to date the entire acquired property was sold.

<sup>3</sup>Yield loss in percent, the difference between the effective rate and the internal rate of return on the loan from origination to total disposition of the property.

<sup>4</sup>Internal rate of return from the last date that regularly scheduled interest was received to the date the FRE was completely sold.

Table 3. Weighted Average Performance and Default Statistics For Acquired Properties by Year of Origination

Orig. Year	Number	Avg. Eff. Loan Rate	Total Cash Flow IRR <sup>1</sup>	Default Cost <sup>2</sup>	Default IRR <sup>3</sup>
67	1	6.500%	7.749%	-1.249%	21.084%
72	1	8.243%	7.365%	0.878%	8.180%
73	2	8.192%	9.456%	-1.263%	13.322%
74	1	9.576%	5.836%	3.740%	2.957%
75	5	9.795%	9.449%	0.346%	1.833%
76	18	9.720%	8.194%	1.526%	9.992%
77	60	9.172%	7.597%	1.576%	5.511%
78	81	9.307%	6.650%	2.658%	3.153%
79	74	10.020%	5.946%	4.074%	1.062%
80	72	12.282%	6.499%	5.783%	0.413%
81	26	14.755%	3.977%	10.778%	-0.632%
83	18	13.484%	4.429%	9.055%	7.068%
84	11	14.155%	9.847%	4.308%	12.562%
85	5	13.251%	-8.181%	21.432%	-9.989%

Table 4. Weighted Average Performance and Default Statistics For Acquired Properties by Year of Default.

Default Year	Number	Avg. Eff. Loan Rate	Total Cash Flow IRR <sup>1</sup>	Default Cost <sup>2</sup>	Default IRR <sup>3</sup>
78	1	9.250%	0.192%	9.058%	-0.020%
79	1	9.576%	5.836%	3.740%	2.957%
80	9	9.941%	2.597%	7.345%	1.654%
81	6	10.745%	2.308%	8.436%	3.590%
82	28	11.562%	3.473%	8.089%	1.246%
83	36	10.723%	4.764%	5.959%	1.487%
84	62	10.935%	6.773%	4.163%	2.739%
85	115	11.077%	6.804%	4.273%	3.140%
86	91	10.779%	9.048%	1.731%	4.906%
87	21	11.584%	5.998%	5.587%	0.903%
88	4	9.543%	6.544%	2.999%	-17.095%
89	1	9.000%	9.411%	-0.411%	11.407%

<sup>1</sup>Internal rate of return for the investment from loan origination to date the entire acquired property was sold.

<sup>2</sup>Yield loss in percent, the difference between the effective rate and the internal rate of return on the loan from loan origination to date the entire acquired property was sold.

<sup>3</sup>Internal rate of return from the last date that regularly scheduled interest was received to the date the acquired property was completely sold.

Table 5. Frequency Distribution for Acquired Property Origination Year by Default Year

Orig. Year	Default Year															Total
	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	Total			
1967	.	.	.	.	.	.	.	.	1	.	.	.	.	1		
1972	.	.	.	.	.	.	1	.	.	.	.	.	.	1		
1973	.	.	1	.	.	.	.	.	1	.	.	.	.	2		
1974	.	1	.	.	.	.	.	.	.	.	.	.	.	1		
1975	.	.	1	.	.	2	1	.	.	1	.	.	.	5		
1976	.	.	.	1	1	2	5	5	4	.	.	.	.	18		
1977	1	.	3	1	5	5	11	22	9	2	.	.	1	60		
1978	.	.	2	2	5	9	11	24	23	4	4	1	.	81		
1979	.	.	.	1	4	9	15	20	19	3	2	.	.	74		
1980	.	.	1	.	9	7	10	18	20	6	1	.	.	72		
1981	.	.	.	1	4	2	3	12	3	1	.	.	.	26		
1982	.	.	.	.	.	.	.	.	.	.	.	.	.	0		
1983	.	.	.	.	.	.	4	9	3	2	.	.	.	18		
1984	.	.	.	.	.	.	1	4	6	.	.	.	.	11		
1985	.	.	.	.	.	.	.	1	2	2	.	.	.	5		
Total	1	1	9	6	28	36	62	115	91	21	4	4	1			

Table 6. Summary Statistics of 375 Defaulted Loans.

Variable	Arithmetic Mean	Standard Deviation
Original loan balance	\$356,250	\$351,466
Effective rate	10.8%	2.0%
Total cash flow IRR	6.9%	5.2%
Default IRR	3.1%	10.2%
Years of performance	5.5	2.4
Years to acquisition	1.8	1.1
Years of ownership	2.3	1.6
Original loan to value <sup>1</sup>	61.2%	9.8%
Acquisition appraisal to default principal <sup>2</sup>	107.8%	38.7%
Default principal	\$296,802	\$321,633
Property tax expenses	\$12,546	\$22,533
Legal expenses	\$6,374	\$21,516
Total acquisition and sales expenses	9.6%	8.6%
EAB financed purchases	50.1%	-

<sup>1</sup>Only 369 observations were available on this variable.

<sup>2</sup>Only 367 observations were available on this variable.

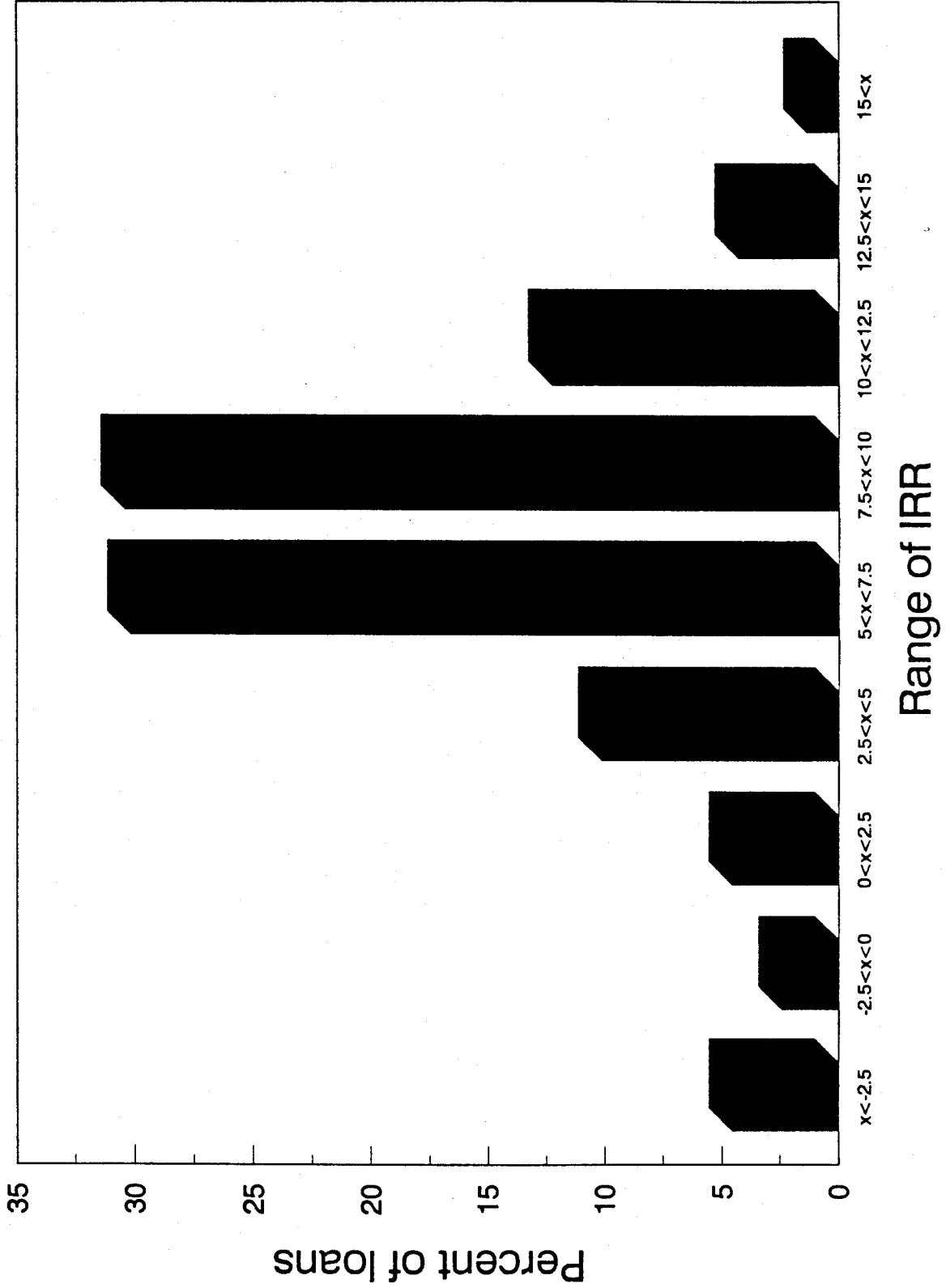
Table 7. Estimated Default Portfolio Regression Models.

Variable	Total Cashflow IRR		Default IRR	Years of Performance	Years of Ownership
	Model 1	Model 2			
Intercept	.90	3.04	.090	14.63**	2.12**
Effective rate	.48**	.45**	-.001	-.76**	-
Original loan balance (\$ thousands)	-.00	-.00	.000	-3.10**	.001**
Years of performance	.84**	.86**	.005*	-	-.20**
Years in acquisition	.05	.11	.007	-	-.38**
Years of ownership	-.58**	-.54**	-.006*	-	-
Original loan to value	-.08**	-.09**	-.002**	-.01	.02**
EAB financed purchases	1.02**	1.12**	.019**	-	-.13
Acquisition appraisal to default principal	.02**	-	.0005**	-	.004**
- - - - - Regression Statistics - - - - -					
Number of observations	361	361	361	361	361
R <sup>2</sup>	22.2%	21.0%	13.7	41.7%	19.1%
F-statistic	12.55**	13.39**	6.96**	84.99**	16.72**

\* - significant at 20% level

\*\* - significant at 5% level

**Figure 1. Distribution of Total Cashflow IRR**



**Figure 2. Distribution of Default IRR**

