Cooperative Housing Projects In Difficulty: A Statistical Analysis

FINAL REPORT

Prepared For
Audit & Evaluation Services
Canada Mortgage & Housing Corporation

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Executive Summary

Background

The purpose of this report is to examine the factors that distinguish between coop projects in financial difficulty and those projects that are not in financial difficulty. A coop project is defined as a project that is in financial difficulty if the project cannot meet its expenses and obligations, i.e. revenues are less than costs. It is hypothesized that coop projects in difficulty would be distinguished from coop projects not in difficulty as a result of differences in four main areas, 1) condition of buildings, 2) quality of coop management, 3) quality of coop board, and 4) external factors.

Our analysis followed a multiple lines of inquiry approach including simple (univariate) probability analysis and logistic (multiple) regression analysis using survey data compiled in the Cooperative Housing Programs Evaluation, namely: the physical condition survey (150 observations), coop manager survey (238 observations), and coop board survey (237 observations).

Survey Data & Simple Probability Analysis

The coop manager survey (228 observations) provided insight into the financial difficulties facing coops. Table E1 shows the major reasons given by coop managers for the coop having financial difficulty. These survey data lend support to the hypothesis that coops are in financial difficulty as a result of a combination of management and external factors. The highest ranked reason given is unforeseen repairs (14.8%). Together with member arrears (12.4%) and catching up on deferred maintenance (11.4%), these management related factors account for 38.7% of all reasons. The second highest reason given is high vacancy rates due to housing market slumps (13.9%). This represents an external factor as does taxes (8.5%) and operating cost increases (7.5%). Building conditions rank low as a reason for financial difficulty (8.0%).

Table E1: Top Reasons for Coop's Being in Financial Difficulty

Reasons	# coops	%
Unforeseen repairs	30	14.9%
High vacancy rates due to housing market slump	28	13.9%
Member arrears	25	12.4%
Catching up on deferred maintenance	23	11.4%
Management problems	18	9.0%
High taxes	17	8.5%
Operating costs increases (including utility costs increases)	15	7.5%

Table E1: Top Reasons for Coop's Being in Financial Difficulty		
Reasons	**# coops**	*%*
Subsidy reductions (e.g. due to mortgage renewal or to subsidy "step out")	**15**	7.5%
Poor condition/design of acquired building(s)	**9**	4.5%
Poor condition/design of new building(s)	**7**	3.5%
Delays in receiving subsidies	**3**	1.5%
Other	**11**	5.5%
TOTAL	**201**	100.0%

Source: Survey of Project Managers, Cooperative Housing Programs Evaluation, CMHC, 2001.

It is interesting to discover what coop managers did to address their financial difficulty. The most common responses were to reduce operating expenses (16.4%) and to increase housing charges (15.1%). Only 8% reported seeking assistance from the Cooperative Housing Stabilization Fund.

Table E2: Actions Taken by Managers to Solve Financial Difficulty		
Actions	**# coops**	*%*
Reduced operating expenses	**37**	16.4%
Increased housing charges	**34**	15.1%
Applied for additional government assistance	**31**	13.8%
Deferred needed repairs	**30**	13.3%
Sought assistance from Cooperative Housing Stabilization Fund	**18**	8.0%
Developed marketing plan	**18**	8.0%
Sought assistance from CHF Canada or local cooperative federations	**18**	8.0%
One-time charge to residents	**7**	3.1%
Hired additional help	**4**	1.8%
Increased surcharges	**2**	0.9%
Other	**26**	11.6%
TOTAL	**225**	100.0%

Source: Survey of Project Managers, Cooperative Housing Programs Evaluation, CMHC, 2001.

Simple probability analysis of a coop project being in financial difficulty showed that projects in difficulty have some distinguishing attributes with respect to management and building conditions. However, the major finding was that, for most board characteristics, management attributes and building conditions, coops in financial difficulty are similar to coops not in financial difficulty.

Regression Analysis

The logistic regression provides acceptable but not stellar results as judged by the McFadden R-squared (29.6%). (See Table 17 in the Report) However, a more intuitive understanding of the goodness of fit is in the sample prediction evaluation. We set the cut-off at .4, i.e. if the probability score is greater than .4 then we predict the project will be in financial difficulty. Under this criteria we correctly classify 70% of the coop projects in financial difficulty when in fact they are in financial difficulty and 83% of the coop projects not in financial difficulty when in fact they are not in financial difficulty. (See Table 18 in the Report)

The logistic regression is statistically significant at the 5% level for all variables. Interpretation of the contribution of each variable to increasing the probability of financial difficulty is cumbersome under the logistic regression format. We can get a more complete understanding of the interpretation of the logistic regression by referring to Table E3 which shows the average values for each of the explanatory variables and the impact of increasing this value by 10% for the continuous variables and from 0 to 1 for the dummy variables. The interpretation is as follows:

- The average value for the ratio of mortgage costs to annual rent revenue is .9263. If we increase this by 10%, the incremental increase in the probability that the coop portfolio with these attributes will be a project in financial difficulty is 3.21% over the base case.

- The average value for reserves per unit is 1850.5. If we increase this by 10%, the incremental increase in the probability that the coop portfolio with these attributes will be a project in financial difficulty is 1.32% over the base case.

- 61.6% of the projects had an age between fourteen (14) and twenty-three years(23). If we increase the portfolio of projects by 10% with this attribute, the incremental increase in the portfolio with projects in financial difficulty will increase by 1.38% over the base case.

- 48.5% of the project's cause of repair is poor construction or design. If we increase the portfolio of projects by 10% with this attribute, the incremntal increase in the portfolio with projects in financial difficulty will increase by 2.48% over the base case.

- 33.3% of the projects had a board that did not have a financial subcommittee. If we increase the portfolio of projects by 10% with this attribute, the incremental increase in the portfolio with projects in financial difficulty will increase by 3.4% over the base case.

Table E.5: Incremental Contribution of Explanatory Variables Project in Financial Difficulty

Variable	Mean (Base Case)	Incremental Increase	Increase in Probability of Being in Financial Difficulty
Ratio annual mortgage and interest payment to annual rent.	.9263	0.09	3.21%
Reserves per unit	1850.5	185	1.32%
Coop project age, if age 14 to 23, Ser DDD7 = 1	.6162	0.6778	1.38%
Cause of repair is poor construction or design	.4848	0.5333	2.48%
Board does not have financial subcommittee, Ser D151 = 1	.3333	0.3666	3.4%

Note 1: All variables are postulated to increase the base case by 10%.
Source: Computed by Canmac Economics Ltd.

Conclusions

This analysis of coop projects in financial difficulty has provided some interesting insights into the causes of financial difficulty for coop projects. There were no overpowering attributes that distinguished coop projects in financial difficulty versus those not in financial difficulty. Standard regression analysis confirmed that we could obtain high levels of fit for predicting costs and revenues. These equations showed annual mortgage and interest costs as the most important determinant of operation costs and that operation costs plus market constraints determined rent levels. Hence the evidence suggests that external factors determine in large measure the revenue and costs of the coop.

A logistic regression provided a more in depth analysis as to the factors that distinguish coops in financial difficulty versus those not. This analysis showed that fixed costs (mortgage payment to rent) outside the control of management have the most significant explanatory power. We also

found modest evidence that building conditions (poor construction/design) and coop management (board without financial subcommittee) matter in distinguishing between coop projects in financial difficulty versus those not. The project age which served as a proxy for program type also impacted on the final results. These results should be viewed with caution given the small sample size.

1.1- Background

An overall evaluation of the efficiency and effectiveness of cooperative housing programs was conducted by CMHC's Audit and Evaluation Services Division. This report addresses one component of the evaluation, namely, a consideration of the extent to which cooperative housing projects experience financial difficulties and the causes of such difficulties.

In this report, the characteristics of projects which are in financial difficulty are compared with the characteristics of projects which are not in financial difficulty in order to identify those characteristics which are strongly correlated with projects in financial difficulty. In addition, the characteristics which are strongly correlated to projects being in difficulty are separated into those over which the project has some control and those over which the project has no control. In doing so, potential areas for intervention can be identified.

1.2 Methodology Overview

Our approach to determining the factors that account for cooperative projects in financial difficulty involves exploratory analysis of survey data and logistic regression analysis. Data from three surveys was used in our analysis: 1) A Board Member survey, 2) Coop Managers survey and 3) A Coop Conditions survey. Coded data received was in many cases re-coded to a numeric code to facilitate regression analysis.

It is hypothesized that coop projects in difficulty would be distinguished from coop projects not in difficulty as a result of differences in four main areas, 1) condition of buildings, 2) quality of coop management, 3) quality of coop board, and 4) external, non-controllable factors. Our analysis of the distinguishing factors between projects in difficulty and projects not in difficulty followed a multiple lines of inquiry approach that included exploratory probability analysis, direct surveying and logistic regression analysis. Our study examined these using as a database surveys on coop physical conditions (150 observations), coop management (238 observations), and coop board activity (237 observations). The surveys were analyzed to separate out the key attributes that correlated strongly with projects in financial difficulty. Appendices provide the complete analysis by survey question.

Once the exploratory analysis was completed, the next stage involved measuring the strength of the relationship. This involved a set of logistic regressions. A logistic regression analysis was conducted to determine both the magnitude of the relationship between project characteristics and financial difficulties and whether the relationship is statistically different from zero or not (students "t" test). In the logistic regression, the dependent variable is 1 if the project is in financial difficulty and 0 if the project is not in financial difficulty. Operationally, financial difficulty will be defined as either being in a work out situation (hard core) or being on the list of projects in financial difficulty complied by CMHC's Assisted Housing Division (soft core).

1.3 Direct Survey Responses to Reasons for Financial Difficulties

A subset of survey questions in the coop management survey asked respondents if their project had ever been in financial difficulty, the reasons and the manner in which they responded.

The coop manager survey (228 observations) provided insight into the financial difficulties facing coops. For those surveyed that stated they experienced financial difficulty, Table 1 shows the top three (3) reasons why the coop had been in financial difficulty. These three (3) reasons account for 41.2% of the total reasons given. The direct survey analysis lends support to the hypothesis that coops are in financial difficulty as a result of several factors (condition of buildings, quality of management/board, external factors). From the direct surveys it appears that a combination of management and external factors account for the major reasons explaining coop financial difficulty. The reasons, unforeseen repairs, member arrears, catching up on deferred maintenance account for 38.7% of all reasons. These factors directly impact on revenues and costs and the causal factors explaining their existence likely has much to do with the quality of management in selecting tenants and general operations abilities. Of course, simple bad luck can also explain much as would external factors. The second highest reason given is high vacancy rates due to housing market slumps (13.9%). This of course represents an external factor as does taxes (8.5%) and operating cost increases (7.5%). Building conditions rank low as a reason for financial difficulty (8.0%).

Table 1: Top Reasons for Coop's Being in Financial Difficulty

	Count	*% of Total*
Unforeseen repairs	**30**	14.9%
High vacancy rates due to housing market slump	**28**	13.9%
Member arrears	**25**	12.4%
Catching up on deferred maintenance	**23**	11.4%
Management problems	**18**	9.0%
High taxes	**17**	8.5%
Operating costs increases (including utility costs increases)	**15**	7.5%
Subsidy reductions (e.g. due to mortgage renewal or to subsidy "step out")	**15**	7.5%
Other	**11**	5.5%
Poor condition/design of acquired building(s)	**9**	4.5%

Table 1: Top Reasons for Coop's Being in Financial Difficulty		
	Count	*% of Total*
Poor condition/design of new building(s)	7	3.5%
Delays in receiving subsidies	3	1.5%
TOTAL	201	100.0%

It is interesting to discover what coop managers did to solve their financial difficulty. Table 2 shows the percent allocation of the actions taken by managers. As shown in Table 2, the major response was to reduce operating expenses. This represented 16.4% of the total responses to this survey question.

Table 2: Actions Taken by Managers to Solve Financial Difficulty		
Action	*Count*	*% of Total*
Reduced operating expenses	37	16.4%
Increased housing charges	34	15.1%
Applied for additional government assistance	31	13.8%
Deferred needed repairs	30	13.3%
Other	26	11.6%
Sought assistance from Cooperative Housing Stabilization Fund	18	8.0%
Developed marketing plan	18	8.0%
Sought assistance from CHF Canada or local cooperative federations	18	8.0%
One-time charge to residents	7	3.1%
Hired additional help	4	1.8%
Increased surcharges	2	0.9%
TOTAL	225	100.0%

1.4 Exploratory Analysis

The purpose of the exploratory analysis is to develop an overall understanding of the key differences between co-op projects in financial difficulty and coop projects not in financial difficulty and to use these differences as explanatory variables for the logistic regressions of the next section. We present our major findings by each of the survey types (condition, member, and board). The appendices provide a detailed analysis. The exploratory analysis consists of descriptive statistics and crosstabs. Many of the explanatory variables are category variables. Under these circumstances, the crosstabs may be viewed as simple conditional probability tables.

Conditions Survey

The conditions survey provides a set of measures on the structural conditions of the coop project. As shown in Volume II, the conditions survey consists of a set of five (5) variables that describe the condition of the buildings, one variable that describes the financial status of the project and several variables to describe the type of coop program the project was financed under. The conditions survey had a total of 180 observations.

As noted above, the crosstabs of a given condition variable against the financial status of the coop project can be viewed as a simple probability table. Table 3 shows the crosstabs of the condition - cause of repair (1= normal use; 2 = poor construction, 3 = poor design, 4 = no repair, 5 = abuse) against the financial status (1 = project in financial difficulty, 0 = project no in financial difficulty). As can be seen from Table 3, there are 45 projects (25% of sample) that are in financial difficulty and 135 (75% of sample) that are not in financial difficulty, i.e. overall there is a .25 probability of being in financial difficulty. Now, given that the project has a normal use cause of repair, Table 3 shows that there is a .16 probability that the project is in financial difficulty, given that the coop project had a cause of repair = 2, poor construction, there is a .33 probability that the project is in financial difficulty. Hence condition 2 has a higher probability than the overall sample which makes it a candidate for inclusion as an explanatory variable in the logistic regressions.

An examination of the conditions survey variables using the approach described above, leads to the conclusion that coop projects in financial difficulty have the following conditions characteristics:

- They are more likely to have a cause of repair due to poor construction or poor design.
- They are less likely to belong to a neighborhood that is improving.
- They are more likely to be adjacent to a residential neighborhood.
- They are more likely to belong to a type 11 project.

Table 3: Cross Tabs of Condition/Case

Tabluation of SER03 and SER07
Date: 04/27/02 Time 09:12
Sample: 1 180
Included observations: 180

Tabulation Summary

Variable	*Categories*		
SER03	5		
SER07	2		
Product of Categories	10		
Measures of Association	Value		
Phi Coefficient	0.238174		
Cramer's V	0.238174		
Contingency Coefficient	0.231693		
Test Statistics	df	Value	Prob
Pearson X2	4	10.21081	0.037
Likelihood Ratio G2	4	10.348229999999999	0.035

Note: Expected value is less than 5 in 20.00% of cells (2 of 10).

Count; % Row; % Col	SER 07 0	1	Total
1	62	12	74
	83.780000000000001	16.219999999999999	100
	45.93	26.670000000000002	41.109999999999999
2	33	15	48
	68.75	31.25	100
	24.440000000000001	33.329999999999998	26.670000000000002

Table 3: Cross Tabs of Condition/Case

Tabluation of SER03 and SER07
Date: 04/27/02 Time 09:12
Sample: 1 180
Included observations: 180

Tabulation Summary

Variable	*Categories*		
3	22	15	37
	59.460000000000001	40.539999999999999	100
SER03	16.300000000000001	33.329999999999998	20.559999999999999
4	17	3	20
	85	15	100
	12.59	6.67	11.109999999999999
5	1	0	1
	100	0	100
	0.74	0	0.56
Total	135	45	180
	75	25	100
	100	100	100

Manager's Survey

The coop management survey is comprised of 268 observations and 154 data items per survey. The major distinguishing attributes that differentiate projects in financial difficulty and projects not in financial difficulty are as follows:

- Managers of coop projects in difficulty have fewer years of experience than managers of coop projects not in financial difficulty.
  - 10.89 years versus 11.36 years as a project manager.
  - 5.7 years versus 7.7 years managing this coop.

- Co-op projects in financial difficulty have higher rates of arrears than projects not in financial difficulty (8.8% versus 6.6%).

- There is a higher incidence of projects in difficulty in PEI, New Brunswick, Manitoba and Saskatchewan than in the other provinces (43.2% of projects are in difficulty in these provinces versus 25% for the total population).

- Projects in financial difficulty have more paid staff than projects not in financial difficulty (1.27 versus 1.06 for projects not in difficulty.)

- Projects in financial difficulty are more likely to have vacant units than projects not in financial difficulty (40% of projects in financial difficulty have vacancies while 24% of all projects have vacancies).

Board Member's Survey

The coop board member survey is comprised of 267 observations and 158 data items per survey. Overall, 26.2% of the sample consists of coop projects that are in financial difficulty. The major differences we have found are as follows:

- Board members of coop projects in financial difficulty are more likely to have less than 2 years board experience than board members of projects not in difficulty. All board members in 41.18% of projects in difficulty have less than two years experience compared to 25.7% of projects not in difficulty having all board members with less than 2 years experience

- Board members of coop projects in financial difficulty are more likely not to monitor their project's activities than board members of projects not in financial difficulty.

  - Monitor revenues and expenses, 71.4% versus 25.0%
  - Monitor financial statements 80.0% verses 25.0%
  - Compare budget to actual 70.0% versus 25.0%
  - Review tax assessments 33.3% versus 25.0%
  - Review Insurance 38.5% versus 25.0%
  - Review obligations to CMHC, etc. 37.5% versus 24.0%

- Coop projects in financial difficulty are more likely to not have board committees than projects not in financial difficulty.
  - Finance 41.0% versus 25.9%
  - Social and Recreation 33.0% versus 25.7%
  - Member Selection 34.4% verses 25.8%
  - Maintenance 38.3% versus 26.0%

- Coop projects in financial difficulty have fewer members than coop projects not in financial difficulty (40.9 households vs 48.0 households).

- Coop projects in financial difficulty have fewer active members than coop projects not in financial difficulty.
  - 20.4 versus 28.4 for general meeting attendance
  - 17.2 versus 29.8 for other volunteer work

1.5 Regression Analysis

The logistic regression analysis takes the exploratory analysis of the previous section and tests for a more statistically rigorous model that combines the individual probability assessments and tests their overall joint effects. Interpretation of logistic regressions is best understood as a two step procedure. The overall objective is to predict the level of coop projects in difficulty by adding those explanatory variables to the equation that explain the probability that a given coop project will be in financial difficulty. The starting point is to predict the probability of coop projects in financial difficulty (CPIFD) as a constant:

1) Probability (CPIFD=1) = Constant

In this case, the constant will equal the sample proportion, i.e. proportion of CPIFD of the total sample. For our various surveys, this number is about .25. Now, the second stage of the analysis begins with adding the explanatory variables that improve on this basic prediction.

In what follows, we will first present the final logistic regressions for each survey separately. This step isolates the best regression exclusive of the explanatory variables from other survey information and hence suffers from specification error. However, given the difference in sample sizes across various surveys it is instructive to first review our findings on a survey by survey basis. In the final section we present our global logistic regression that results from the combined survey data.

Conditions Survey

Table 4 presents our final estimated logistic regression for explaining the probability that a coop project is in financial difficulty. Logistic regressions are presented in a ln (P/1-P) format, i.e. the log of the odds ratio - the probability of the event to the probability of not the event. Hence the interpretation of coefficients is that a one (1) unit change in the explanatory variable increases the odds ratio by the value of the coefficient.

Table 4 shows a statistically relevant fit but not a particularly large explanatory power (McFadden R-squared equals .17). However, each of the explanatory variables are statistically significant. The variables are defined as follows:

Ser03D2 = Cause of repair = 2, Poor Construction
Ser03D3 = Cause of Repair = 3, Poor Design
Ser06D1 = Adjacent land use = 1, residential
Ser9D1 = Coop program = ILM (1986-1991)

Table 4: Logistic regression
Conditions Survey

Dependent Variable: SER07
Method: ML - Binary Logit
Date: 06/01/02 Time: 09:20
Sample: 1 180
Included observations: 180
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Variable	*Coefficient*	*Std.* Error	z-Statistic	Prob.
Constant	-3.112885	0.565254	-5.507054	0.0000
SER03D2	0.956842	0.458938	2.084905	0.0371
SER03D3	1.475714	0.483155	3.054329	0.0023
SER06D1	1.026343	0.499706	2.053893	0.0400
SER08D6	1.838546	0.41741	4.404652	0.0000
Mean dependent var	0.25	S. D. dependent var		0.434221
S.E. of regression	0.396466	Akaike info criterion		0.990474
Sum squared resid	27.50742	Schwarz criterion		1.079168
Log likelihood	-84.14269000000000002	Hannan-Quinn criter.		1.026436
Restr. log likelihood	-101.22029999999999	Avg. log likelihood		-0.467459
LR statistic (4 df)	34.155279999999998	McFadden R-squared		0.168717
Probability(LR stat)	0.000000692			
Obs with Dep=0	135	Total obs		180

Table 4: Logistic regression
Conditions Survey

Dependent Variable: SER07
Method: ML - Binary Logit
Date: 06/01/02 Time: 09:20
Sample: 1 180
Included observations: 180
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Obs with Dep=1	**45**			

Manager's Survey

The final logistic regression for the Manager's survey is presented in Table 5. The regression's explanatory variables are also significant as shown in the probability estimates for the Z-statistic. Overall, the total explanatory variables for the equation is modest as judged by McFadden R- squared of 11.4%.

The definition of the explanatory variables are as follows:

SerA3D1 = dummy variable for households in arrears as ratio of total households.
Value = 1 if greater than average
Value = 0 if less than average

Ser81D1 = dummy variable 1 = vacancies, 0 = no vacancies

Ser02D1 = dummy variable = 1 if province is (P.E.I., NB, Man., Sask.) = 0 otherwise

SerA3D1·Ser148 = arrears dummy variable · program type
dummy variable (= 1 if type 56.1 (1978-1985), 0 = otherwise).

Table 5: Logistic regression
Manager's Survey

Dependent Variable: SER146
Method: ML - Binary Logit
Date: 04/27/02 Time: 15:12
Sample: 1 268
included observations: 228
Excluded observations: 40
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

Variable	*Coefficient*	*Std.* Error	z-Statistic	Prob.
C	-1.547218	0.227577	-6.798667	0.0000
SERA3D1	1.887841	0.471647	4.00266	0.0001
SER81 D1	0.977986	0.415636	2.352986	0.0186
SER02131	1.104571	0.421067	2.623267	0.0087
SERA3D1* SER148	-1.655593	0.558823	-2.962645	0.0031
Mean dependent var	0.289474	S.D. dependent var		0.454516
S.E. of regression	0.424434	Akaike info criterion		1.110628
Sum squared resid	40.172150000000002	Schwarz criterion		1.185833
Log likelihood	-121.6116	Hannan-Quinn criter.		1.140971
Restr. log likelihood	-137.18299999999999	Avg. log likelihood		-0.533384
LR statistic (4 df)	31.142810000000001	McFadden R-squared		0.113508
Probability(LR stat)	0.00000286			

Table 5: Logistic regression
Manager's Survey

Dependent Variable: SER146
Method: ML - Binary Logit
Date: 04/27/02 Time: 15:12
Sample: 1 268
included observations: 228
Excluded observations: 40
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

Obs with Dep=0	**162**	**Total obs**		**228**
Obs with Dep=1	**66**			

Board Survey

The logistic regression with dependent variable probability of coop projects in financial difficulty = 1 for the board survey is presented in Table 6. Each variable is statistically significant at the 5% level as shown in the Z-statistic probability estimates. No McFadden correlation statistic is presented due to the absence of the constant term which proved not to be statistically relevant. The definition of the explanatory variables are as follows:

SerD102 = dummy variable, 1 = if province = P.E.I., NB, Man., or Sask., 0 = otherwise
SerD131 = dummy variable, 1 if coop has a maintenance plan, 0 = otherwise.
SerD142 = 1 if coop never compares budget to actuals, 0 = otherwise
SerD156 = 1 if coop does not have a finance committee, 0 = otherwise
Ser152 - 1 if coop project is type 56.1 (1978-1985), 0 = otherwise

Table 6: Logistic regression
Board Survey

Dependent Variable: SER150
Method: ML - Binary Logit
Date: 04130/02 Time: 16:24
Sample(adjusted): 1 262
Included observations: 228
Excluded observations: 34 after adjusting endpoints
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

Variable	*Coefficient*	*Std.* Error	z-Statistic	Prob.
SERD102	1.338375	0.635419	2.106288	0.0352
SERD131	-1.00426	0.246067	-4.081246	0
SERD142	1.613079	0.780652	2.066322	0.0388
SERD156	1.242359	0.320728	3.87356	0.0001
SER152	-0.866936	0.251202	-3.451153	0.0006
Mean dependent var	0.307018	S.D. dependent var		0.462272
S.E. of regression	0.431945	Akaike info criterion		1.131218
Sum squared resid	41.6064799999999 98	Schwarz criterion		1.206423
Log likelihood	-123.9589	Hannan-Quinn criter.		1.161561
Avg. log likelihood	-0.543679			
Obs with Dep =0	158	Total obs		228
Obs with Dep=1 70				

1.6 Global Regression

The final stage in our analysis of the factors that account for coop projects in financial difficulty is a logistic regression analysis on a database that includes all variables from the CMHC data, conditions survey, management survey and board survey. When we combine all data sources we have a linked database of 149 observations. We use this database as the source for our model development.

The development of an appropriate model to explain the probability that a coop project is in financial difficulty begins with documenting in a qualitative way the reasons for a coop being in financial difficulty. We have two major sources for this information, 1) a survey of coop managers, and 2) discussions with CMHC officials. In what follows, we outline these reasons and present an exploratory analysis. This is followed by specification and testing of the model.

The major reason given by coop managers for a coop being in financial difficulty is unforeseen repairs. This reason accounted for 14.9% of the top three reasons given by survey respondents. We have no direct measure of this variable but we have a close proxy - actual repair expenditures by coop projects for their most recent fiscal year. An exploratory analysis of this variable is provided in Table 7. We find that the average expenditures per unit for projects in difficulty exceeds projects not in difficulty by $211 on average. The difference while in the expected direction is not statistically significant.

The second highest reason expressed by project managers for coop projects in difficulty is high vacancy rates due to market slumps. We have two measures of vacancy rates in our database. Vacancy rate 1 is the actual vacancy rate for the project at the time of the survey. Vacancy rate 2 is the general vacancy rate for the area that the project is in for the census year 1996. Table 8 and 9 present our exploratory analysis.

TABLE 7

Test for Equality of Means of SERD262
Categorized by values of SER233
Date: 08/30/02 Time: 15:51
Sample: 1 149
Included observations: 149

Method	*df*	*Value*	*Probability*
t-test	144	0.320372	0.7492
Anova F-statistic	(1, 144)	0.102638	0.7492

Analysis of Variance

Source of Variation	*df*	*Sum of Sq.*	*Mean Sq.*
Between	1	1245517.	1245517.
Within	144	1.75E+09	12135002
Total	145	1.75E+09	12059902

Category Statistics

SER233	*Count*	*Mean*	*Std. Dev.*	*Std. Err. of Mean*
0	108	2366.537	3093.577	297.6796
1	38	2577.035	4421.773	717.3063
All	146	2421.324	3472.737	287.4058

Note: Ser D262 = Repair Expenditures/Unit

TABLE 8

Test for Equality of Means of SERD264
Categorized by values of SER233
Date: 08/30/02 Time: 16:23
Sample: 1 149
Included observations: 149

Method	*df*	*Value*	*Probability*
t-test	144	0.051101	0.9593
Anova F-statistic	(1, 144)	0.002611	0.9593

Analysis of Variance

Source of Variation	*df*	*Sum of Sq.*	*Mean Sq.*
Between	1	4.44E-07	4.44E-07
Within	144	0.024493	0.000170
Total	145	0.024493	0.000169

Category Statistics

SER233	*Count*	*Mean*	*Std. Dev.*	*Std. Err. of Mean*
0	108	0.003907	0.013653	0.001314
1	38	0.004033	0.011086	0.001798
All	146	0.003940	0.012997	0.001076

Note D264= Vacancy Rate 1 - project actual vacancy rate

Table 9

Test for Equality of Means of SER247
Categorized by values of SER233
Date: 08/30/02 Time: 16:34
Sample: 1 149
Included observations: 149

Method	*df*	*Value*	*Probability*
t-test	97	1.005639	0.3171
Anova F-statistic	(1, 97)	1.011309	0.3171

Analysis of Variance

Source of Variation	*df*	*Sum of Sq.*	*Mean Sq.*
Between	1	11.64812	11.64812
Within	97	1117.232	11.51786
Total	98	1128.880	11.51919

Category Statistics

SER233	*Count*	*Mean*	*Std. Dev.*	*Std. Err. of Mean*
0	74	4.886486	3.303022	0.383968
1	25	5.676000	3.656077	0.731215
All	99	5.085859	3.393993	0.341109

Note: Ser D247 = Area Vacancy Rate

Actual vacancy rates for the projects in our sample are very low and not statistically significantly different. The overall vacancy rate is .04%, those projects that are in financial difficulty have a vacancy rate of .04%, those that aren't have a vacancy rate of .039%. The vacancy rate of the project's area show still not statistically significant results but stronger differences then the vacancy rate 1 measure. Vacancy rate 2 records an average vacancy rate of 5.7% for projects in financial difficulty compared to 4.9% for projects not in difficulty.

The third major reason given by coop managers is member arrears. Data was collected on the percentage of coop members that have been in arrears for at least 3 months. The exploratory statistical analysis is provided in Table 10. The sample shows that projects in financial difficulty have a high membership arrears ratio (5.9%) versus projects not in arrears (4.4%) although the difference is not statistically significant.

Table 10

Test for Equality of Means of SERD280
Categorized by values of SER233
Date: 08/31/02 Time: 11:11
Sample: 1 149
Included observations: 149

Method	*df*	*Value*	*Probability*
t-test	144	0.895518	0.3720
Anova F-statistic	(1,144)	0.801953	0.3720

Analysis of Variance

Source of Variation	*df*	*Sum of Sq.*	*Mean Sq.*
Between	1	0.006629	0.006629
Within	144	1.190391	0.008267
Total	145	1.197020	0.008255

Category Statistics

SER233	*Count*	*Mean*	*Std. Dev.*	*Std. Err. of Mean*
0	108	0.043653	0.093811	0.009027
1	38	0.059010	0.081993	0.013301
All	146	0.047650	0.090859	0.007520

Note: Ser D280 = proportion of membership that have been in arrears for at least three (3) months.

The fourth reason given by coop managers is catching up on deferred payments. Our measure for this variable is reserve ratios. We would expect projects in difficulty to have lower reserve ratios. Table 11 shows reserve ratios per unit. We find that reserve ratios for projects in financial difficulty to be statistically significantly less than other projects - $1132/units versus $2209 per unit.

In addition to the above variables, coop managers and other stakeholders suggest a variety of general reasons for coop projects in financial difficulty. These include management quality, board experience, external market environment and local conditions. We have tested these reasons using proxies available from the database.

Table 11

Test for Equality of Means of SERD261
Categorized by values of SER233
Date: 08/31/02 Time: 11:27
Sample: 1 149
Included observations: 149

Method	*df*	*Value*	*Probability*
t-test	102	2.847334	0.0053
Anova F-statistic	(1, 102)	8.107313	0.0053

Analysis of Variance

Source of Variation	*df*	*Sum of Sq.*	*Mean Sq.*
Between	1	25274585	25274585
Within	102	3.18E+08	3117505.
Total	103	3.43E+08	3332622.

Category Statistics

SER233	*Count*	*Mean*	*Std. Dev.*	*Std. Err. of Mean*
0	73	2209.943	1871.157	219.0023
1	31	1132.197	1482.083	266.1900
All	104	1888.692	1825.547	179.0096

Note: Ser D261 = Reserve fund/unit

One of the major hypothesis is that market conditions impact on the overall financial health of the coop by acting as a ceiling on the amount that a coop can charge for rent. Coops first determine their annual costs and set proposed rents to cover costs. If these rents are above market rents then proposed rents must be lowered. This can affect the overall viability of the coop.

We examined the market rent constraint issue by comparing the average rent for a coop with the average rent paid for a two bedroom apartment (1996) in the coop project's urban area. Table 12 provides our results. Projects in financial difficulty has an average ratio of .71 of coop average rents to area average two bedroom rents; projects not in financial difficulty had an average ratio of .69. The difference is not statistically significant.

To further explore the significance of the market rent constraint on coops we specified a revenue/unit forecast equation. Table 13 shows our revenue forecast equation. The overall R-squared is 78% and the right hand side variables are highly significant. As expected, average operating costs per unit (Ser506/SerD260) plays a major role in explaining costs with 44% of the rents explained by costs. The next largest variable is our market constraint variable. The market constraint variable measure the market rent ceilings for those projects that are constrained by the market. The measure we use is the average rent for a two bedroom apartment times one if the ratio of coop project rent to market rent is greater that .95 and zero otherwise. The average two bedroom unit is $500 per month which implies some $1500/unit is accounted for by this variable. The remaining explanatory variables are area vacancy rate and project age. A priori, the project age would have expected to represent a quality proxy.

In conclusion, the regression results confirm that the external market conditions have a strong impact on rent levels but are not a significant factor explaining the difference between projects in difficulty versus those that are not.

Table 12

Test for Equality of Means of SERFFI = Ratio of Annual Rents to Market Rents
Categorized by values of SER233
Date: 09/10/02 Time: 16:50
Sample: 1 149
Included observations: 149

Method	**df**	**Value**	**Probability**
t-test	78	0.343097	0.7324
Anova F-statistic	(1, 78)	0.117715	0.7324

Analysis of Variance

Source of Variation	*df*	*Sum of Sq.*	*Mean Sq.*
Between	1	0.006671	0.006671
Within	78	4.419981	0.056666
Total	79	4.426651	0.056034

Category Statistics

SER233	**Count**	**Mean**	**Std. Dev.**	**Std. Err. of Mean**
0	54	0.691811	0.205152	0.027918
1	26	0.711307	0.295930	0.058037
All	80	0.698147	0.236714	0.026465

Table 13

Dependent Variable: SER507/SERD260
Method: Least Squares
Date: 09/12/02 Time: 16:09
Sample: 1 149
Included observations: 69
Excluded observations: 80

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
SER506/SERD260	0.436334	0.025389	17.18615	0.0000
SER248*SERFF1 D	2.418467	0.500500	4.832105	0.0000
SER513	127.7432	12.46334	10.24951	0.0000
SER247	-190.9045	32.35146	-5.900954	0.0000

R-squared	0.789338	Mean dependent var	5305.074
Adjusted R-squared	0.779615	S.D. dependent var	1844.199
S.E. of regression	865.7620	Akaike info criterion	16.42132
Sum squared resid	48720352	Schwarz criterion	16.55083
Log likelihood	-562.5355	Durbin-Watson stat	1.761222

Ser 506/SerD260 = Average Operating Costs/Unit
Ser 248 * Ser FF1D = Rent for 2 bedroom times dummy variable = 1 if coop rent to 2 bedroom rent >.95
Ser 513 = Age
Ser 247 = Area vacancy rate

The second major category that is postulated to explain why some coop projects are in financial difficulty and other are not is the efficiency of operations. Table 14 shows the average costs per unit for coop projects in difficulty. As shown in Table 14, there is no statistically significant difference between coop projects in difficulty versus those not in difficulty. To better appreciate the role of cost inefficiency in project financial difficulty we developed an inefficiency indicator. We first subtracted mortgage annual costs from total operating costs since mortgage costs are essentially beyond the control of management. We then computed the ratio of non-mortgage operating cost for each project to the average cost of all projects. Projects with costs above average represent inefficient use. Table 15 provides our results. based on our inefficiency measure, projects not in difficulty are on average less inefficient than projects in financial difficulty thought not in a statistically significant sense. Hence cost of inefficiency does not appear to be a significant factor in determining the difference between projects in financial difficulty versus those not in financial difficulty.

We conclude our discussion on cost by providing an operating cost/unit forecast equation. Table16 shows that costs can be largely explained by two factors - mortgage costs and age. The overall R-squared is 79%. The results further enforce our view that operational costs are in large a measure determined by factors outside the control of coop management.

Table 14

Test for Equality of Means of SERFF3 = Ser 506/Ser D200 = Cost/Unit
Categorized by values of SER233
Date: 09/12/02 Time: 13:16
Sample: 1 149
Included observations: 149

Method	*df*	*Value*	*Probability*
t-test	100	0.099543	0.9209
Anova F-statistic	(1, 100)	0.009909	0.9209

Analysis of Variance

Source of Variation	*df*	*Sum of Sq.*	*Mean Sq.*
Between	1	290606.9	290606.9
Within	100	2.93E+09	29328106
Total	101	2.93E+09	29040606

Category Statistics

SER233	*Count*	*Mean*	*Std. Dev.*	*Std. Err. of Mean*
0	71	8471.390	6021.878	714.6654
1	31	8587.440	3625._831	651.2185
All	102	8506.660	5388.934	533.5839

Table 15

Test for Equality of Means of SERFF11
Categorized by values of SER233
Date: 09/13/02 Time: 10:55
Sample: 1 1491E SERFFI1>0
Included observations: 34

Method	*df*	*Value*	*Probability*
t-test	32	0.862051	0.3951
Anova F-statistic	(1, 32)	0.743132	0.3951

Analysis of Variance

Source of Variation	*df*	*Sum of Sq.*	*Mean Sq.*
Between	1	1.151423	1.151423
Within	32	49.58143	1.549420
Total	33	50.73285	1.537359

Category Statistics

SER233Count	*Mean*	*Std. Dev,*	*of Mean*	*Std. Err.*
0	24	1.209651	1.299031	0.265164
1	10	0.805772	1.093889	0.345918
All	34	1.090863	1.239903	0.212642

Measure of coop inefficiency - ratio of coop oper - mortgage cost to average - positive values only. Shows projects in difficulty are more efficient.

Table 16

Dependent Variable: SER506/SERD260
Method: Least Squares
Date: 09/16/02 Time: 15:24
Sample: 1 149
Included observations: 101
Excluded observations: 48

Variable	*Coefficient*	*Std. Error*	*t-Statistic*	*Prob.*
SER505/SERD260	1.322025	0.047870	27.61676	0.0000
SER513	107.3576	13.01255	8.250311	0.0000

R-squared	0.793267	Mean dependent var	8067.754
Adjusted R-squared	0.791178	S. D. dependent var	3079.837
S.E. of regression	1407.393	Akaike info criterion	17.35647
Sum squared resid	1.96E+08	Schwarz criterion	17.40825
Log likelihood	-874.5017	Durbin-Watson stat	1.448031

Global Regression Results

Table 17 provides our global logistic regression results. The logistic regression provides acceptable but not stellar results as judged by the McFadden R-squared (29.6%). However a more intuitive understanding of the goodness of fit is in the sample prediction evaluation. We set the cut-off at .4, i.e. if the probability score is greater than .4 then we predict the project will be in financial difficulty. As shown in Table 18, under this criteria we correctly classify 70% of the coop projects in financial difficulty when in fact they are in financial difficulty and 83% of the coop projects not in financial difficulty when in fact they are not in financial difficulty. Appendix A shows the actual and predicted values for each case.

Table 17

Dependent Variable: SER233
Method: ML - Binary Logit
Date: 09/17102 Time: 09:56
Sample(adjusted): 1 148
Included observations: 99
Excluded observations: 49 after adjusting endpoints
Convergence achieved after 7 iterations
Covariance matrix computed using second derivatives

Variable	*Coefficient*	*Std. Error*	*z-Statistic*	*Prob.*
SER505/SER507	2.021854	0.794392	2.545158	0.0109
SERD261	-0.000429	0.000188	-2.283847	0.0224
SERDDD7	1.346419	0.647326	2.079971	0.0375
Constant	-4.419766	1.268742	-3.483582	0.0005
SERD229	1.308708	0.562177	2.327928	0.0199
SERD151	1.546886	0.557701	2.773683	0.0055

Mean dependent var	0.303030	S. D. dependent var	0.461907
S.E. of regression	0.386547	Akaike info criterion	0.985197
Sum squared resid	13.89595	Schwarz criterion	1.142477
Log likelihood	-42.76726	Hannan-Quinn criter.	1.048833
Restr. log likelihood	-60.72759	Avg. log likelihood	-0.431993
LR statistic (5 df)	35.92066	McFadden R-squared	0.295752
Probability(LR stat)	9.85E-07		

Obs with Dep=0 69 Total obs 99
Obs with Dep=1 30

Ser 233 = Coop project in financial difficulty = 1
Ser 505/Ser 507 = ratio annual mortgage and interest payment to annual rent
Ser D261 = Reserves per unit
Ser DDD7 = Coop project age, if age 14 to 23, Ser DDD7 = 1
Ser D229 = Cause of repair is poor construction or design
Ser D151 = Board does not have financial subcommittee, Ser D151 = 1

The logistic regression is statistically significant at the 5% level for all variables. Interpretation of the contribution of each variable to increasing the probability of financial difficulty is cumbersome under the logistic regression format. We can get a more complete understanding of the interpretation of the logistic regression by referring to Table 19. Table 19 shows the average values for each of the explanatory variables and the impact of increasing this value by 10% for the continuous variables and from 0 to 1 for the dummy variables. The interpretation is as follows:

The average value for the ratio of mortgage costs to annual rent revenue is .9263. Ff we increase this by 10%, the incremental increase in the probability that the coop with these attributes will be a project in financial difficulty is 3.21% over the base case.

The average value for reserves per unit is 1850.5. If we increase this by 10%, the incremental increase in the probability that the coop with these attributes will be a project in financial difficulty is 1.32% over the base case.

61.6% of the projects had an age between fourteen (14) and twenty-three (23). If we increase the portfolio of projects by 10% with this attribute, the incremental increase in the portfolio with projects in financial difficulty will increase 1.38% over the base case.

48.5% of the project's cause of repair is poor construction or design. If we increase the portfolio of projects by 10% with this attribute, the incremental increase in the portfolio with projects in financial difficulty will increase by 2.48% over the base case.

33.3% of the projects had a board that did not have a financial subcommittee. If we increase the portfolio of projects by 10% with this attribute, the incremental increase in the portfolio with projects in financial difficulty will increase by 3.4% over the base base.

Table 18

Dependent Variable: SER233
Method: ML - Binary Logit
Date: 09/17/02 Time: 09:56
Sample(adjusted): 1 148
Included observations: 99
Excluded observations: 49 after adjusting endpoints
Prediction Evaluation (success cutoff C = 0.4)

			Estimated Equation			***Constant Probability***		
			Dep=0	***Dep=1***	***Total***	***Dep=0***	***Dep=1***	***Total***
	57	9	66	69	30	99		
P(Dep=1)>C	12	21	33	0	0	0		
Total	69	30	99	69	30	99		
Correct	57	21	78	69	0	69		
Correct	82.61	70.00	78.79	100.00	0.00	69.70		
Incorrect	17.39	30.00	21.21	0.00	100.00	30.30		
Total Gain	-17.39	70.00	9.09					
Percent Gain"	NA	70.00	30.00					

			Estimated Equation			***Constant Probability***		
			Dep=0	***Dep=1***	***Total***	***Dep=0***	***Dep=1***	***Total***
E(# of Dep=0)	55.08	13.92	69.00	48.09	20.91	69.00		
E(# of Dep=1)	13.92	16.08	30.00	20.91	9.09	30.00		
Total	69.00	30.00	99.00	69.00	30.00	99.00		
Correct	55.08	16.08	71.16	48.09	9.09	57.18		
Correct	79.83	53.60	71.88	69.70	30.30	57.76		
Incorrect	20.17	46.40	28.12	30.30	69.70	42.24		
Total Gain*	10.13	23.30	14.12					
Percent Gain**	33.43	33.43	33.43					

Change in "% Correct" from default (constant probability) specification
"Percent of incorrect (default) prediction corrected by equation

Table 19: Incremental Contribution of Explanatory Variables Project in Financial Difficulty

Variable	Mean	Incremental Increase	Increase in Probability of Being in Financial Difficulty
Ratio annual mortgage and interest payment to annual rent.	.9263	0.09	3.21%
Reserves per unit	1850.5	185	1.32%
Coop project age, if age 14 to 23, Ser DDD7 = 1	.6162	.6778	1.38%
Cause of repair is poor construction or design	.4848	.5333	2.48%
Board does not have financial subcommittee, Ser D151 = 1	.3333	.3666	3.4%

Note 1: All variables are postulated to increase the base case by 10%.
Source: Computed by Canmac Economics Ltd.

1.7 Conclusions

Our analysis of coop projects in financial difficulty has provided some interesting insights into the causes of financial difficulty for coop projects. Our exploratory analysis showed that there were no overpowering attributes that distinguished coop projects in financial difficulty versus those not in financial difficulty. Standard regression analysis confirmed that we could obtain high levels of fit for predicting costs and revenues. These equations showed that annual mortgage and interest costs as the most important determinant of operation costs and that operation costs plus market constraints determined rent levels. Hence the evidence suggests that factors outside the control of management determine in large measure the revenue and costs of the coop.

A logistic regression provides a more in depth analysis as to the factors that distinguish coops in financial difficulty versus those not. This analysis differs from the standard regression analysis. For example, in the standard regression approach we found that a market rent constraint had a significant impact on rent levels. In the logistic regression, we did not find that this variable had significant explanatory power in distinguishing projects in financial difficulty versus those not i.e., the variable is important to both types of coop. Our logistic regression showed that fixed costs (mortgage payment to rent) outside the control of management have the most significant explanatory power (7.1%). We also found modest evidence that building conditions (poor construction/design) and coop management (board without financial subcommittee) matter in distinguishing between coop projects in financial difficulty versus those not. The project age which served as a proxy for program type also impacted on the final results.

Our analysis of coop projects distinguished by those in financial difficulty and those not in financial difficulty has tentatively found that 1) coop conditions, 2) management practices, and 3) board operations have an impact on the financial success of coop projects. However, it is difficult to be definitive on the exact causal relationship due to 1) specification error, 2) multicollinearity, and 3) small sample size.

Specification error potential is high in the context of logistic regressions. We have seen that at the exploratory level, many variables are candidates for the final regression that did not end up in the final regression. The qualitative nature of the variables when combined together in a regression did not provide sufficient discriminatory power to be included. Therefore final variables selected should be viewed as indicator variables of the major factors (conditions, management, board operation) rather than specific causes.

Multicollinearity is essentially a sample size issue - the sample is not large enough to provide sufficient data variability. Our tests of multicollinearity (primarily simple correlations analysis) show that collinearity is not a problem in the final regression but could have been the reason for exclusion of variables before the final regression was selected.

Our basic hypothesis is to derive explanatory variables that predict the probability of failure. Now the overall probability of failure is approximately 25% in the samples. The implication of this low level of observation is that sample size can be a significant issue. This is particularly true if the explanatory variables are dummy variables and the nature of the problem, as in our case, is such that extreme values (e.g. high arrears, vacancies) are needed to turn a financially positive situation into a negative one.

Our results should be viewed with caution. The overall impression is that coop projects do not differ much from one another in their attributes whether they are in financial difficulty or not. This may in fact be true or alternatively the sample is too small to derive meaningful results. The goal of this study has been to examine the factors that distinguish coop projects in financial difficulty with those that are not. Future research could examine a related goal - what determines the difference between coop projects with strong financial viability versus projects in financial difficulty. It is answers to this question that can assist poorly performing coops to improve their financial viability.

APPENDIX A GLOBAL REGRESSION WITHIN SAMPLE FITS

Canmac Economics Ltd.
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obs	Actual	Fitted	Residual	Residual Plot
72	0.00000	0.39050	-0.39050	
73	1.00000	0.60398	0.39602	
74	0.00000	0.33608	-0.33608	
76	0.00000	0.22121	-0.22121	
78	0.00000	0.59762	-0.59762	
80	0.00000	0.05111	-0.05111	
82	1.00000	0.75555	0.24445	
83	0.00000	0.04926	-0.04926	
85	0.00000	0.08482	-0.08482	
90	0.00000	0.07422	-0.07422	
91	0.00000	0.11375	-0.11375	
92	1.00000	0.39538	0.60462	
93	1.00000	0.47562	0.52438	
95	1.00000	0.35395	0.64605	
96	1.00000	0.42076	0.57924	
97	0.00000	0.24367	-0.24367	
98	1.00000	0.30865	0.69135	
99	0.00000	0.14181	-0.14181	
100	1.00000	0.10151	0.89849	
101	0.00000	0.63993	-0.63993	
104	1.00000	0.68464	0.31536	
105	1.00000	0.87816	0.12184	
112	0.00000	0.43221	-0.43221	
113	0.00000	0.02518	-0.02518	
114	0.00000	0.20504	-0.20504	
117	0.00000	0.01767	-0.01767	
120	1.00000	0.43526	0.56474	
121	1.00000	0.63381	0.36619	
122	0.00000	0.12943	-0.12943	
123	1.00000	0.57044	0.42956	
124	1.00000	0.86078	0.13922	
125	1.00000	0.49987	0.50013	
126	1.00000	0.25456	0.74544	
128	0.00000	0.69618	-0.69618	
131	0.00000	0.00410	-0.00410	
132	1.00000	0.06346	0.93654	
137	0.00000	0.03995	-0.03995	
138	1.00000	0.85206	0.14794	
139	0.00000	0.19801	-0.19801	
143	0.00000	0.11922	-0.11922	
144	0.00000	0.45714	-0.45714	
145	1.00000	0.76094	0.23906	
146	0.00000	0.10787	-0.10787	
147	0.00000	0.05843	-0.05843	
148	0.00000	0.65432	-0.65432	

APPENDIX B

SENSITIVITY ANALYSIS

SAMPLE SIZE VARIATION

We tested the sensitivity of our results to sample size variation by comparing the full sample results to a reduction in sample size by 50%. The results as shown in Table B1 show that to a first approximation the coefficients remain stable but there is significant change. In particular, the mortgage cost to rent variable's coefficient is reduced and becomes statistically insignificant as does the reserves/unit variable. The McFadden R-squared increases to 38%.

Table B1

Dependent Variable: SER233
Method: ML - Binary Logit
Date: 09/25/02 Time: 14:37
Sample(adjusted): 1 148
Included observations: 99
Excluded observations: 49 after adjusting endpoints
Convergence achieved after 7 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.419766	1.268742	-3.483582	0.0005
SER505ISER507	2.021854	0.794392	2.545158	0.0109
SERD261	-0.000429	0.000188	-2.283847	0.0224
SERDDD7	1.346419	0.647326	2.079971	0.0375
SERD229	1.308708	0.562177	2.327928	0.0199
SERD151	1.546886	0.557701	2.773683	0.0055

Mean dependent var	0.303030	S. D. dependent var	0.461907
S.E. of regression	0.386547	Akaike info criterion	0.985197
Sum squared resid	13.89595	Schwarz criterion	1.142477
Log likelihood	-42.76726	Hannan-Quinn criter.	1.048833
Restr. log likelihood	-60.72759	Avg. log likelihood	-0.431993
LR statistic (5 df)	35.92066	McFadden R-squared	0.295752
Probability(LR stat)	9.85E-07		

Obs with Dep=0	69	Total obs	99
Obs with Dep=1	30		

Table B2

Dependent Variable: SER233
Method: ML - Binary Logit
Date: 09/25/02 Time: 14:46
Sample(adjusted): 1 74
Included observations: 57
Excluded observations: 17 after adjusting endpoints
Convergence achieved after 8 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-6.364727	2.199548	-2.893653	0.0038
SER505/SER507	1.601194	1.535544	1.042754	0.2971
SERD261	-0.000401	0.000286	-1.403293	0.1605
SERDDD7	2.078513	1.350721	1.538817	0.1238
SERD229	2.839066	1.208218	2.349797	0.0188
SERD151	1.495515	0.936599	1.596750	0.1103

Mean dependent var	0.210526	S. D. dependent var	0.411306
S.E. of regression	0.326143	Akaike info criterion	0.851795
Sum squared resid	5.424824	Schwarz criterion	1.066854
Log likelihood	-18.27617	Hannan-Quinn criter.	0.935374
Restr. log likelihood	-29.33523	Avg. log likelihood	-0.320635
LR statistic (5 df)	22.11812	McFadden R-squared	0.376989
Probability(LR stat)	0.000497		

Obs with Dep=0	45	Total obs	57
Obs with Dep=1	12		

APPENDIX C

SENSITIVITY ANALYSIS

ALTERNATIVE VARIABLES

To more fully appreciate the relevance of our final selection of variables we completed an estimated a set of regressions with additional variables as follows:

Ser08 =	Manager years of Experience
Ser238 =	Program Type ILM
SerD262=	Repair Expenditures/Unit

As shown in Tables C1, C2, C3, and C4, the selected variables proved to be insignificant in the final analysis.

Table C1

Dependent Variable: SER233
Method: ML - Binary Logit
Date: 09/25/02 Time: 15:06
Sample(adjusted): 1 148
Included observations: 99
Excluded observations: 49 after adjusting endpoints
Convergence achieved after 7 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.638195	1.349384	-3.437268	0.0006
SER505/SER507	1.535978	0.867964	1.769634	0.0768
SERD261	-0.000458	0.000195	-2.354568	0.0185
SERDDD7	1.811175	0.752032	2.408377	0.0160
SERD229	1.441878	0.586140	2.459955	0.0139
SERD151	1.434207	0.570933	2.512041	0.0120
SER238	1.057775	0.745379	1.419111	0.1559

Mean dependent var	0.303030	S. D. dependent var	0.461907
S.E. of regression	0.383730	Akaike info criterion	0.984360
Sum squared resid	13.54688	Schwarz criterion	1.167854
Log likelihood	-41.72584	Hannan-Quinn criter.	1.058602
Restr. log likelihood	-60.72759	Avg. log likelihood	-0.421473
LR statistic (6 df)	38.00352	McFadden R-squared	0.312902
Probability(LR stat)	1.12E-06		

Obs with Dep=0	69	Total obs	99
Obs with Dep=1	30		

Table C2

Dependent Variable: SER233
Method: ML - Binary Logit
Date: 09/25/02 Time: 15:06
Sample(adjusted): 1 148
Included observations: 60
Excluded observations: 88 after adjusting endpoints
Convergence achieved after 7 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.463024	1.806743	-2.470205	0.0135
SER505/SER507	2.643331	1.225438	2.157050	0.0310
SERD261	-0.000509	0.000256	-1.985416	0.0471
SERDDD7	1.358939	0.851792	1.595389	0.1106
SERD229	1.896807	0.801046	2.367912	0.0179
SERD151	1.859069	0.747171	2.488145	0.0128
SER08	-0.059936	0.054544	-1.098841	0.2718

Mean dependent var	0.350000	S. D. dependent var	0.480995
S.E. of regression	0.385083	Akaike info criterion	1.051154
Sum squared resid	7.859297	Schwarz criterion	1.295494
Log likelihood	-24.53462	Hannan-Quinn criter.	1.146729
Restr. log likelihood	-38.84680	Avg. log likelihood	-0.408910
LR statistic (6 df)	28.62435	McFadden R-squared	0.368426
Probability(LR stat)	7.16E-05		
Obs with Dep=0	39	Total obs 60	
Obs with Dep=1	21		

Table C3

Dependent Variable: SER233
Method: ML - Binary Logit
Date: 09/25/02 Time: 15:05
Sample(adjusted): 1 148
Included observations: 99
Excluded observations: 49 after adjusting endpoints
Convergence achieved after 9 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-4.405418	1.275481	-3.453925	0.0006
SER505/SER507	2.016813	0.795703	2.534630	0.0113
SERD261	-0.000430	0.000188	-2.283076	0.0224
SERDDD7	1.355134	0.651727	2.079296	0.0376
	1.321791	0.573099	2.306392	0.021
SERD151	1.547023	0.557981	2.772536	0.0056
SERD262	-8.30E-06	6.88E-05	-0.120601	0.9040

Mean dependent var	0.303030	S. D. dependent var	0.461907
S.E. of regression	0.388486	Akaike info criterion	1.005253
Sum squared resid	13.88477	Schwarz criterion	1.188746
Log likelihood	-42.76001	Hannan-Quinn criter.	1.079494
Restr. tog likelihood	-60.72759	Avg. log likelihood	-0.431919
LR statistic (6 df)	35.93516	McFadden R-squared	0.295872
Probability(LR stat)	2.84E-06		

Obs with Dep=0 69	Total obs	99
Obs with Dep=1 30		

Table C4

e: 09/25/02 Time:
14:58 Sample: 1 149

	SER233	SER505/SER5	SERD261	SERDDD7	SERD229	SERD151
Mean	0.303030	0.926334	1850.527	0.616162	0.484848	0.333333
Median	0.000000	0.937369	1687.319	1.000000	0.000000	0.000000
Maximum	1.000000	1.993580	8057.302	1.000000	1.000000	1.000000
Minimum	0.000000	0.250281	0.000000	0.000000	0.000000	0.000000
Std. Dev.	0.461907	0.390309	1817.662	0.488794	0.502314	0.473804
Skewness	0.857195	0.440790	1.092430	-0.477717	0.060634	0.707107
Kurtosis	1.734783	2.931917	4.139204	1.228214	1.003676	1.500000
Jarque-Bera	18.72711	3.224996	25.04451	16.71484	16.50006	17.53125
Probability	0.000086	0.199389	0.000004	0.000235	0.000261	0.000156
Observations	99	99	99	99	99	99