ESTIMATION OF A MODEL FOR FORECASTING SBLA DEFAULTS: FINAL REPORT

SUBMITTED BY A. RIDING

APRIL 25 1997

SUMMARY

This study sought to estimate the parameters of default forecasting models that simultaneously take explicit account of two groups of variables: firm-specific attributes of the borrower and variables that describe regional economic conditions. The objective is to estimate the parameters and accuracy of statistical models for forecasting default losses on the SBLA loan portfolio. In attempting this task, the nature of the history and process of defaults on SBLA loans was clarified.

The tasks were based on assembly of a database that comprised variables that describe both borrower attributes (such as age of firm, industry sector, etc.), loan characteristics (amount borrowed, use of proceeds, etc.) and regional economic conditions (unemployment rate, etc.). The specific properties of this database were described in an initial report. The initial report is included as Appendix A to this final report.

A second report built on the first by noting several findings from the data, findings that included:

- cumulative default rates for each of the annual cohorts of SBLA loans since 1988, broken down by geographic region. The default rates were found to exhibit substantial variation by region as well as a cyclical component.
- Initial findings suggested that variables often associated with loan defaults included uses of funds, age and size of firm, the size of the loan, bank-specific indicators, and economic variables. Estimates of the relative importance were provided for each of the four major geographic regions and for each of the nine cohorts of SBLA loans since 1988.

This third report extends these earlier findings in several ways.

- First, this report documents refinements to the initial set of statistical models of the SBLA default process.[1] These refinements take account of collinearity and the effects of suppression of non-significant variables that had been retained in the initial estimation steps noted in the second report. Revised findings confirm the significance of:
  - age of firm;
  - amount of loan;
  - use of loan proceeds (loans applied to leasehold improvements were found to be more likely to default than loans used for other purposes). However, some evidence was advanced that loans used to finance changes of ownership, in some settings, also default with unusually-high frequency.

[1] To fully characterize the models of default rate determination, Cox Regression with time-varying parameters was employed as well as Cox Regression without time-varying parameters.

    - Lender-specific effects were also confirmed, particularly for loans advanced within Quebec.
    - Cyclical measures such as unemployment rate were also found to be important. However, the shortage of annual observations available for such variables reduced the precision with which their effects could be reported.
- Policy implications of these findings are developed.
    - Larger loans were found to default with greater frequency than smaller loans. Most SBLA loans are small: of the order of $30,000 to $50,000. However, the effect of larger loans moves the "average" loan size to approximately $65,000. The decision to increase the lending ceiling to $250,000 might usefully be revisited.
    - Loans to young firms default more frequently. However, the purpose of the SBLA is specifically to facilitate capital formation for such firms. Higher defaults on smaller firms could be offset to some extent by reducing the loan ceiling and thereby mitigating the higher frequencies of default on larger loans.
- The differences in default experience between loans made in Quebec and those made in the rest of Canada are further elaborated. It is seen that:
    - the effects of defaults in Quebec dominate the national experience;
    - while the level of defaults on Quebec SBLA loans remains significantly higher than those in the other regions, the rate of defaults in Quebec appears to be decreasing.
    - The historical tendency of the Banque Nationale as a lender with anomalously-high default rates seems to be waning. In recent years, default rates on Banque Nationale loans are becoming more in line with those of other lenders in the province.

Nonetheless, default levels on Quebec SBLA loans remain, in general, higher than those in the rest of Canada and are greater than lenders would tolerate on their non-guaranteed loans.

- Several approaches to forecasting default rates are provided. These include:
    - straight extrapolation of historical default experiences;
    - forecasts based on the results of statistical procedures that model variables found to be associated with levels of default. Because the role of cyclical measures could not be determined with sufficient precision, heuristic methods of allowing for their effects are necessary.
    - Both approaches employ firm-specific variables and are based on statistical analysis of survival functions.
- The forecasting techniques are compared and used to 'forecast' the levels of defaults in samples of loans not used to estimate the models.
    - It was found that current levels of claims far exceed those that were estimated by any method. Moreover, the current level of claims was found to be consistent with defaults rates that are at least 50 percent greater than historical rates.
- Finally, this report extends further the breakdowns of defaults across a variety of dimensions, including lender, region, and lending cohort.
- The relationships between timing of defaults and subsequent claims is examined. It is found that approximately one-third of defaults result in claims within the same fiscal year as the defaults; 38 percent of defaults led to claims in the next fiscal year; and, 25 percent of defaults led to claims in the third year.
- Claims are being made within one year of the lending date with increasing frequency. Between 1990 and the first calendar quarter of 1995, the average rate with which claims were made during the first 12 months was).19% of loans. Since April of 1995, the rate with which claims were submitted within the first twelve months has more than doubled, to 0.46% of loans.
    - The earlier level of claims activity, coupled with the higher rates of default are outcomes consistent with adverse selection. The concept of adverse selection predicts that higher costs of loan guarantees (for example, since April 1995, annual fees have been added to the price of the SBLA guarantee) will result in a lower-quality loan portfolio.

The sections that follow report the results of these analyses and provide directions about how to employ the findings to forecast default rates..

DEFAULT RATES: CYCLICAL AND GEOGRAPHIC ASPECTS

Initial analyses of the data revealed strong regional variations in default rates. Four major geographic regions were considered:

- Atlantic Canada, comprising the provinces of Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick;
- the Province of Quebec;
- the Province of Ontario;
- the Western Provinces of Manitoba, Saskatchewan, Alberta, British Columbia, and the Yukon and Northwest Territories.

In particular, default rates were found to be significantly greater for SBLA loans advanced in Quebec. Table 1 presents the default rates for one year following the loans and the cumulated default/hazard rates for the longest term after the loans had been made.[2] These default rates are presented by cohort according to the calendar year in which they were made. Charts 1 and 2 report these one-year and long-term default rate results, respectively, in graphical form.

TABLE 1: DEFAULT RATES BY COHORT AND REGION (REVISED)

	ATLANTIC		QUEBEC		ONTARIO		WEST	
Cohort	1-year	Long-Term	1-year	Long-Term	1-year	Long-Term	1-year	Long-Term
1988	0.19%	0.46%	0.46%	1.79%	0.11%	0.65%	0.13%	0.40%
1989	1.03%	3.60%	0.75%	1.58%	0.19%	0.74%	0.24%	0.46%
1990	1.05%	3.60%	2.30%	6.59%	0.88%	4.84%	0.66%	2.15%
1991	0.60%	1.20%	2.11%	7.31%	0.84%	3.81%	0.83%	1.96%
1992	0.28%	0.71%	3.23%	7.01%	0.74%	3.95%	0.21%	0.70%
1993	0.71%	1.72%	3.20%	7.75%	0.91%	2.58%	0.54%	1.69%
1994	0.49%	0.85%	3.10%	5.35%	0.97%	1.79%	0.96%	1.70%
1/95 to 4/95	0.24%	0.42%	2.19%	2.97%	0.54%	0.63%	0.65%	0.78%
Since 4/95	0.08%	0.12%	1.35%	1.58%	0.45%	0.63%	0.29%	0.40%

[2] The terms “hazard rate” and “default rate” are generally used interchangeably in this report although they do differ. Default rates usually relate the fraction of loans in a given cohort that have defaulted over a specified time period. Technically, a hazard rate is defined as the fraction of loans that had defaulted during a given time period expressed as a fraction of the loans that had not defaulted as at the beginning of the particular time period (as opposed to the number of loans at the birth of the cohort). Hence, during the first few years, hazard and default rates are virtually indistinguishable although for higher levels of default, the two measures may differ slightly several years after the birth of the cohort.

Chart 1: One-Year Default Rates by Region

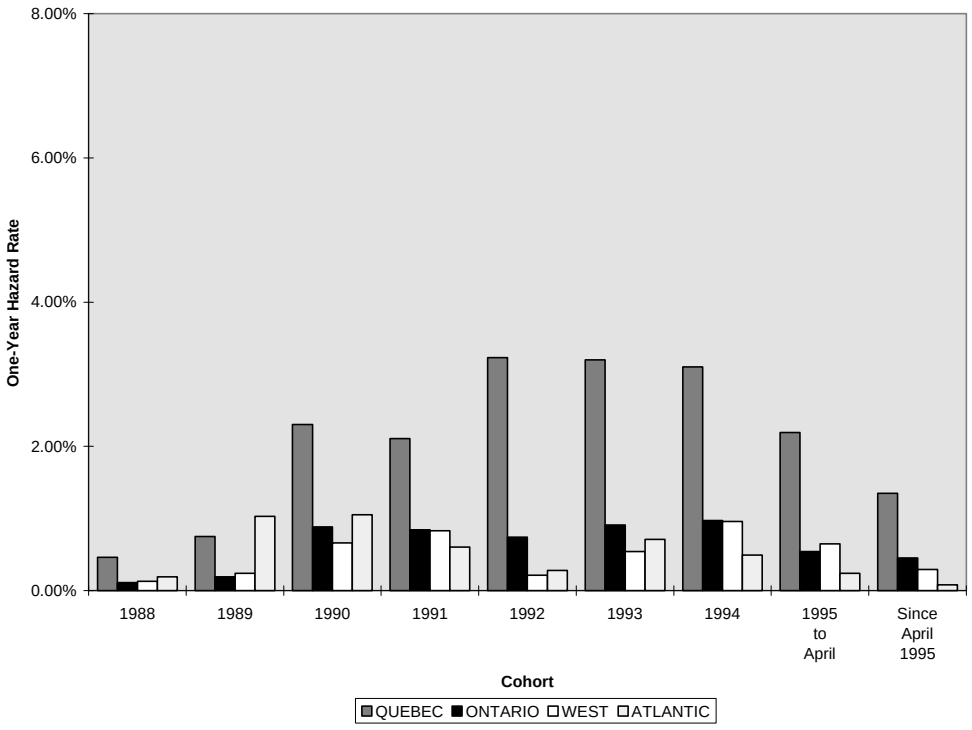
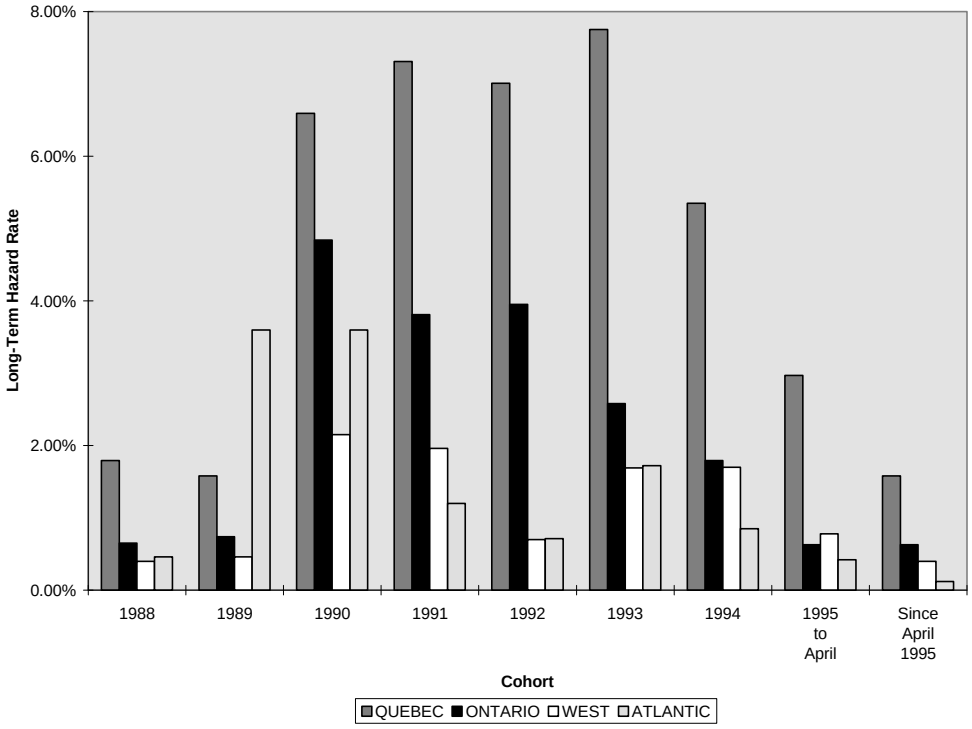


Chart 2: Long-Term Default Rates by Region



These charts and tables indicate the nature of the regional disparity in hazard/default rates. An additional demonstration of these disparities is given by the cumulative hazard (default) rates over the terms of loans. Appendix B provides charts of the cumulative hazard functions for each region and cohort (cumulated hazards against the number of years after the loan had been granted).

Long term default rates on SBLA loans made by Quebec lenders were from two to four times as high as on loans made in other regions. Of even more import, the proportion of Quebec loans in default within one year of the lending date has remained at least 300% higher than short-term default rates exhibited in any of the other regions.

These variations are important, for both statistical and policy-related reasons. Statistically, because of the strong variations across regions and across loan cohort, it did not make sense to estimate a single system-wide default forecasting model. Accordingly, separate estimation procedures were conducted for each year and each region, a total of 36 separate regressions.

Relatively high levels of default on *long term* loans can reflect a variety of factors. Among these factors might be a relatively more depressed economic setting, socio-political unrest, business uncertainty, etc. Defaults that occur within *short* times after loans have been made, however, are more a reflection of lending decisions that may not, in hindsight and perhaps foresight, have been well-advised.

From a policy perspective, the variation across regions prompts important questions. In particular, the relatively high default rates characteristic of SBLA loans made in Quebec bears further investigation. Appendix C presents an analysis of variations of short-term default rates across the lenders that are most active in Quebec. From these data, it is clear that the high default rates in Quebec reflect to a large extent loans advanced by the Banque Nationale that defaulted both with relatively high frequency and unusually early in their terms. The good news is that default rates for all Quebec banks, including those of the Banque Nationale, appear to be converging to lower levels since 1994.

Appendix D extends these results by comparing the Quebec default data with corresponding data for the other major geographic regions. The findings confirm that the Quebec situation, in particular the lending decisions made by the Banque Nationale during the early 1990's, are unusual in the national context. However, even though the frequency of defaults on Quebec SBLA loans seems to be decreasing, the incidence of one-year defaults remains substantially greater in Quebec than in other regions. This is a reflection on all Quebec lenders.

These findings are further extended in Appendix E. Appendices C and D are based on default activity measured by the *frequencies* with which borrowers defaulted. Appendix E reports default results in terms of dollar values. The conclusion remains that there has historically been considerable variation among Quebec lenders with respect to default rates. The Banque Nationale has accounted for a disproportionately greater share of defaults and claims than is commensurate with their share of SBLA lending. More recently, however, the Banque Nationale has exhibited one-year default rates that are proportional to their share of lending within the province.

In spite of these considerable improvements, the frequency with which SBLA loans made in the Province of Quebec default within a short period of lending remains

problematic. In addition, since the amendments to the SBLA regime that allowed loans to finance changes in ownership, early evidence suggests that, in Quebec, loans for this purpose exhibit unusually high one-year default rates.

Default Rates

Before considering models for prediction of default rates, it is useful to explore further the patterns and nature of defaults on SBLA loans. In particular, it will be necessary to use information about how default rates and claims vary over the term of the loans. In previous work, Goss Gilroy and Associates (1994) found that very few SBLA loans defaulted during the initial year of the loan, that most SBLA loans defaulted during the second to fourth years of maturity. This finding is no longer seems to apply. Table 2 provides a breakdown, by region, of one-year hazard rates for each year for the first five years of "average" SBLA loan cohorts. Chart 3 illustrates the chronology of defaults graphically, by plotting the across-cohort average hazard rates against age of the loans in the cohort. Chart 4 extends this analysis by presenting the *proportion* of loan defaults that occur within each of the five years analyzed.

Several observations stand out clearly.

- First, as noted previously, the hazard rate for the first year of loans in Quebec is much higher than the corresponding rate for the other regions (Table 2 and Chart 3).
- Second, Chart 4 indicates that 18 to 30 percent of defaults occur during the initial year of the loan. Between 60 to 70 percent of defaults have by the end of the second year.
- Third, loans made in the province of Quebec tend to default earlier than loans in the rest of Canada.
- Finally, hazard rates are higher in Quebec for each year of lending. These findings are consistent with the results presented in Appendices C through E regarding one-year hazard rates.

The cumulative effect of these hazard rates is shown in Chart 5.

Table 2: One-Year Hazard Rates

	Quebec	East	Ontario	West	Mean	Standard Deviation
Cohort	**Initial Year of Loans**					
1988	0.220%	0.140%	0.040%	0.065%	0.082%	0.052%
1989	0.600%	0.800%	0.120%	0.100%	0.340%	0.398%
1990	1.520%	0.800%	0.750%	0.440%	0.663%	0.195%
1991	1.050%	0.040%	0.310%	0.430%	0.260%	0.200%
1992	2.320%	0.000%	0.560%	0.160%	0.240%	0.288%
1993	2.200%	0.430%	0.620%	0.300%	0.450%	0.161%
1994	2.170%	0.280%	0.690%	0.550%	0.507%	0.208%
1995	1.610%	0.100%	0.450%	0.460%	0.337%	0.205%
1995A	1.120%	0.080%	0.450%	0.290%	0.273%	0.186%
Mean	1.423%	0.297%	0.443%	0.311%	0.618%	
Std. Dev.	0.780%	0.324%	0.263%	0.184%		0.627%
Cohort	**Second Year of Loans**					
1988	0.790%	0.150%	0.120%	0.140%	0.137%	0.015%
1989	0.615%	1.100%	0.160%	0.140%	0.467%	0.549%
1990	1.820%	1.150%	1.760%	0.850%	1.253%	0.464%
1991	3.090%	0.020%	1.340%	0.530%	0.630%	0.666%
1992	2.000%	0.000%	1.650%	0.200%	0.617%	0.900%
1993	3.250%	0.660%	1.250%	0.820%	0.910%	0.305%
1994	2.130%	0.340%	0.730%	0.660%	0.577%	0.208%
Mean	1.956%	0.489%	1.001%	0.477%	0.981%	
Std. Dev.	1.014%	0.489%	0.675%	0.315%		0.883%
Cohort	**Third Year of Loans**					
1988	0.420%	0.075%	0.310%	0.110%	0.165%	0.127%
1989	0.135%	0.870%	0.270%	0.030%	0.390%	0.433%
1990	1.520%	0.900%	1.190%	0.300%	0.797%	0.454%
1991	1.250%	0.030%	0.880%	0.390%	0.433%	0.427%
1992	1.360%	0.000%	1.160%	0.230%	0.463%	0.614%
1993	1.180%	0.335%	0.420%	0.330%	0.362%	0.051%
Mean	0.978%	0.368%	0.705%	0.232%	0.571%	
Std. Dev.	0.562%	0.418%	0.424%	0.138%		0.488%
Cohort	**Fourth Year of Loans**					
1988	0.060%	0.020%	0.050%	0.020%	0.030%	0.017%
1989	0.040%	0.450%	0.040%	0.050%	0.180%	0.234%
1990	0.440%	0.390%	0.450%	0.210%	0.350%	0.125%
1991	0.650%	0.010%	0.470%	0.180%	0.220%	0.233%
1992	0.395%	0.000%	0.380%	0.000%	0.127%	0.219%
Mean	0.317%	0.174%	0.278%	0.092%	0.215%	
Std. Dev.	0.262%	0.226%	0.215%	0.096%		0.212%
Cohort	**Fifth Year of Loans**					
1988	0.030%	0.020%	0.040%	0.000%	0.020%	0.020%
1989	0.030%	0.100%	0.000%	0.000%	0.033%	0.058%
1990	0.440%	0.080%	0.330%	0.090%	0.167%	0.142%
1991	0.000%	0.000%	0.280%	0.030%	0.103%	0.154%
Mean	0.125%	0.050%	0.163%	0.030%	0.092%	
St Dev	0.210%	0.048%	0.167%	0.042%		0.135%

Chart 3: Aggregated Hazard Rates in Each Year of Loan

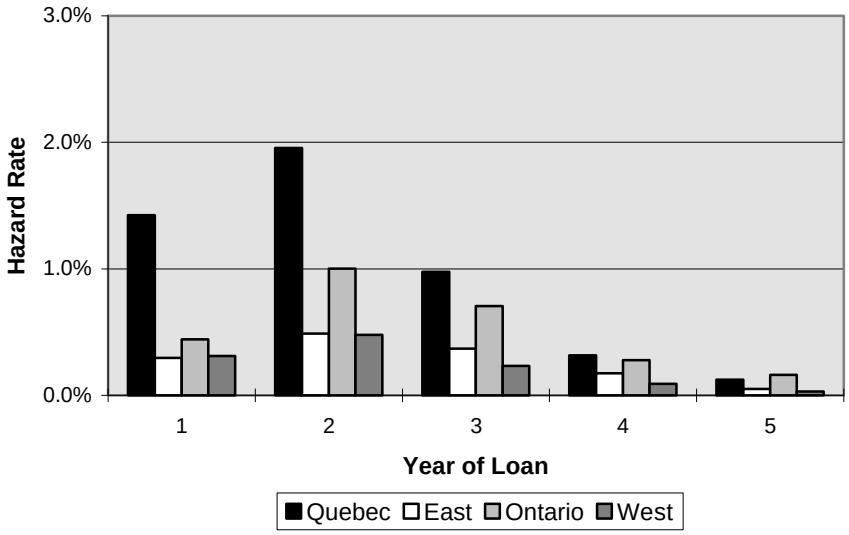


Chart 4: Chronology of Defaults:
Proportion of One-Year Hazards by Year of Lending

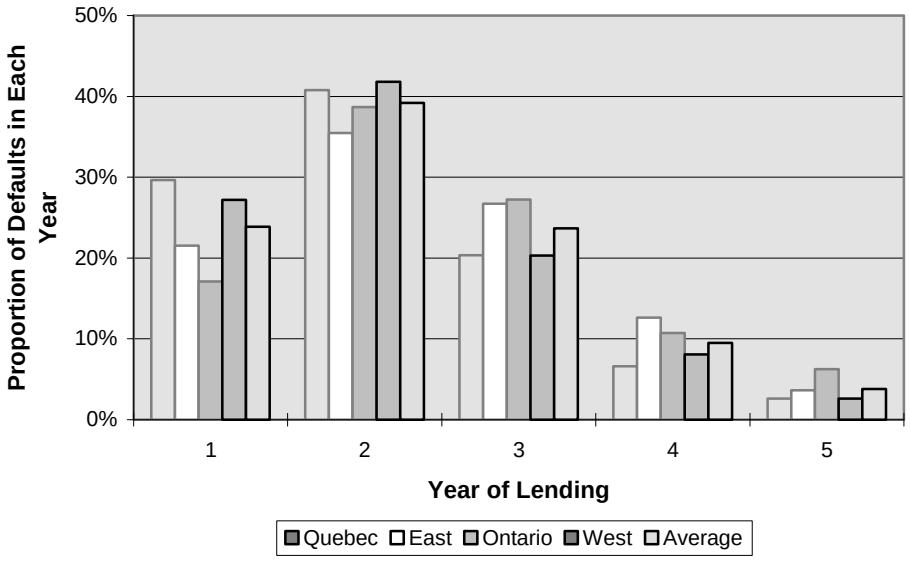
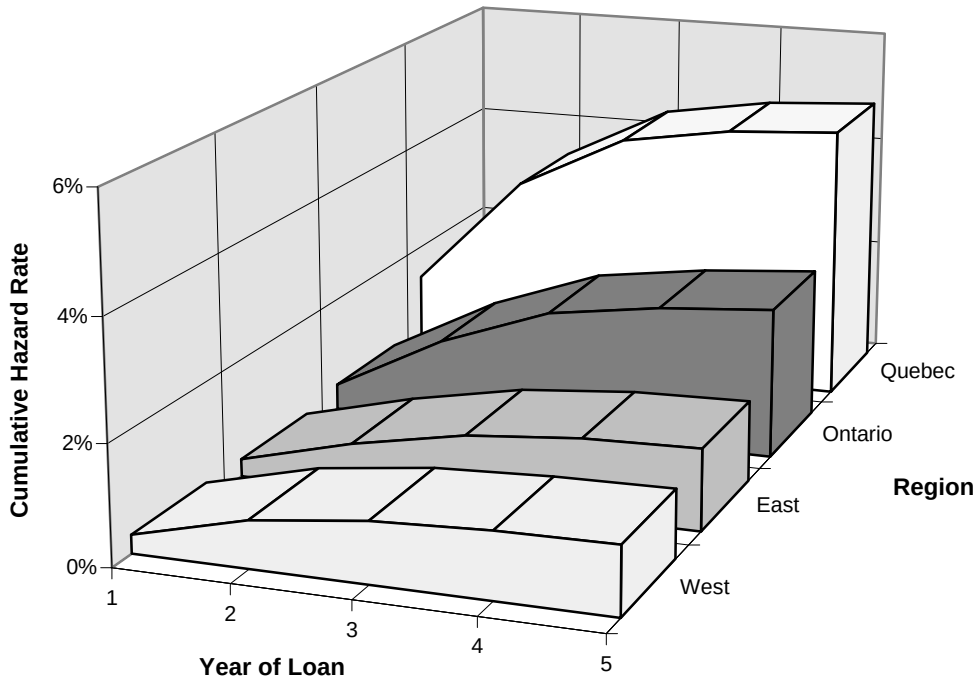


Chart 5: Cumulative Hazard Rates by Region and Loan Year



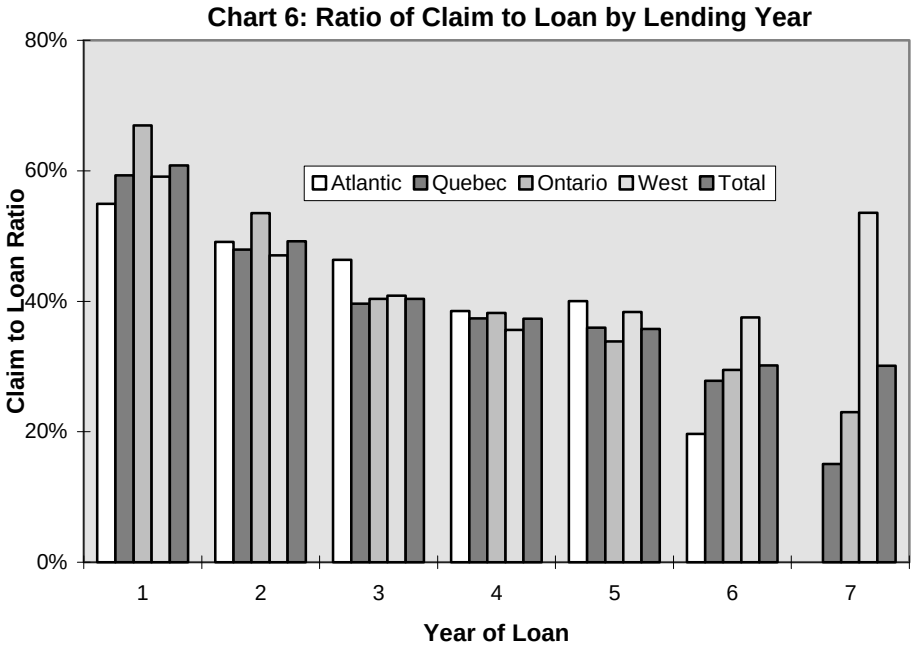
This section has documented, in some detail, the frequencies with which SBLA loans default over time and by region. It is evident that there is considerable variation both over time and across region.

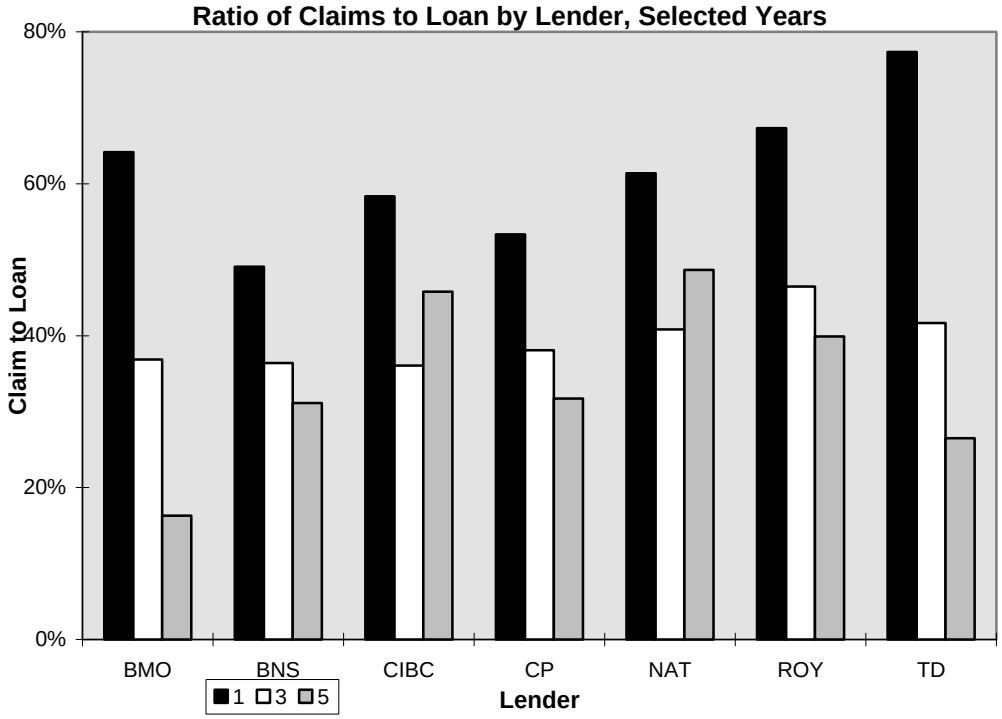
Claims on SBLA Loans

The rate at which loans default, however, is only one aspect of the analysis. A second is the dollar value of the claims that result. Table 3 reports the average size of claims expressed per dollar of the original amount of funds loaned ["claim ratio" henceforth]. Earlier work (Riding, 1996) has documented average loan sizes so that the amount of claims can be computed knowing the frequency of claim (previous section), the claim ratio (Table 3), and the loan size. Charts 6 and 7 present some salient aspects of these data in graphical format.

Table 3: Ratios of Value of Claims to Loan Principal

Year After Loan		1	2	3	4	5	6	7
Atlantic	BMO	45.85%	41.22%	34.58%	37.52%			
	BNS	47.07%	45.91%	55.32%	42.59%	38.27%		
	CIBC	66.82%	62.24%	14.95%	41.38%	68.85%		
	CP			16.48%				
	NAT	59.58%	41.41%	32.16%			40.24%	
	ROY	67.76%	51.45%	50.78%	39.15%	27.40%	9.40%	
	TD	55.58%	52.46%	31.02%	6.65%			
	Total	54.91%	49.09%	46.34%	38.52%	40.04%	19.68%	
Ontario	BMO	66.91%	55.04%	35.75%	38.42%	5.42%	0.00%	
	BNS	49.39%	40.57%	27.17%	45.22%	35.97%	0.00%	
	CIBC	58.62%	51.49%	39.55%	36.47%	37.42%	32.07%	26.39%
	CP	24.76%	32.66%					
	NAT	50.67%	34.08%	48.14%				
	ROY	70.04%	56.37%	44.15%	45.45%	36.09%	34.49%	21.29%
	TD	78.68%	59.50%	42.24%	24.20%	27.98%	32.88%	
	Total	66.95%	53.49%	40.39%	38.23%	33.83%	29.47%	22.99%
Quebec	BMO	60.86%	40.27%	34.71%	70.84%	31.25%	22.79%	6.65%
	BNS	54.79%	49.00%	34.14%	39.27%	2.40%		
	CIBC	54.30%	45.87%	41.25%	44.58%			
	CP	53.48%	47.44%	38.33%	38.12%	31.73%	31.08%	13.30%
	NAT	61.72%	47.47%	41.01%	39.08%	48.68%	54.41%	15.19%
	ROY	68.52%	51.73%	44.94%	28.94%	46.60%	18.71%	
	TD	87.74%	59.09%	38.97%	38.23%	19.48%	29.78%	24.36%
	Total	59.32%	47.92%	39.64%	37.39%	35.98%	27.80%	15.05%
West	BMO	70.29%	46.64%	43.50%	24.87%	8.21%	45.89%	41.26%
	BNS	48.35%	26.85%	23.48%	27.80%		115.48%	
	CIBC	59.96%	48.15%	27.77%	43.25%	67.72%	26.98%	36.95%
	ROY	61.02%	62.64%	52.97%	41.89%	41.33%	27.89%	58.35%
	TD	62.00%	57.43%	44.61%	35.05%	34.55%	20.31%	
	Total	59.10%	47.04%	40.88%	35.63%	38.38%	37.51%	53.54%
Totals	BMO	64.16%	47.41%	36.87%	38.45%	16.31%	22.85%	23.96%
	BNS	49.07%	38.98%	36.39%	41.55%	31.14%	57.74%	
	CIBC	58.37%	50.52%	36.04%	39.83%	45.79%	29.52%	31.67%
	CP	53.33%	47.39%	38.07%	38.12%	31.73%	31.08%	13.30%
	NAT	61.40%	47.13%	40.82%	39.08%	48.68%	47.32%	15.19%
	ROY	67.31%	55.67%	46.45%	39.31%	39.90%	27.24%	49.08%
	TD	77.34%	58.72%	41.68%	30.19%	26.49%	30.14%	24.36%
	TOTAL	60.80%	49.20%	40.35%	37.32%	35.78%	30.17%	30.13%





While there is considerable variability in claim ratio data, some general observations do emerge.

- First, from inspection of these data, it is clear that the claim ratio decreases over the term of the loans (Chart 6).
- Less apparent, it also seems that certain lenders have better records than others on this dimension of the default issue. In general, for example, the Bank of Nova Scotia - in spite of considerable SBLA-based lending activity during 1993 and 1994 - have maintained a particularly low ratio of claim ratio.

There are a variety of possible explanations for these observations. However, it is beyond the scope of this report to speculate about potential explanations or to try to resolve this question. and we therefore proceed to a discussion of statistical modeling of loan defaults.

STATISTICAL MODELS OF DEFAULT RATES

The findings of the previous sections and those presented in the appendices bear important implications for statistical estimation of default rate forecasts. They suggest that while the default-generating process includes both geographic and cyclical components, the process is unstable over time, with, for example, the impact of lender changing over the loan period. Moreover, the national default experience is clearly dominated by what happens in the Province of Quebec,[3] a region in which the pattern of defaults is itself unstable. This instability must be considered in application of the forecasting models.

Methodology

Cox Regression

In recent years, sociologists have developed formal models for parametric and non-parametric analysis of event histories (Tuma, 1982, and others). An event history includes data on the number, timing, and sequence of *"events"* occurring to individual cases. In the context of SBLA lending, an individual case is a loan and the sequence of events proceeds from the *event* of granting of the loan to either the eventual retirement of the loan or to the event of default on the loan. Normal retirement is precluded by the *event* of failure, leading to default and a claim on the guarantor.

The time period between two events, events such as granting a loan and default, almost certainly depends on a variety of factors, factors that arguably comprise both the attributes of the borrowing firm and the economic environment in which the firm operates. Application of basic statistical analyses to examine linkages between the time between events and potential causal factors is not appropriate because of two complications with such data.

1. The first complication is that the event of interest may not occur for all cases during the period in which they are observed. For example, at any point in time the analysts can observe loans that have defaulted.

[3] Between 1988 and 1995 SBLA loans made within the Province of Quebec accounted for less than 30% of the total number of loans advanced nationally; yet, more than 50 percent of all defaults were on loans made in Quebec.

The loans that have not defaulted at that time may yet default in the future or they may be retired in an orderly fashion. During the first year of a cohort of loans (or two years, or three years, … etc.) only a minority will experience the event of default. Cases for which default does not occur during the observation period are called *censored* cases.

2. The second complication is that the period of observation may not be the same for all cases. Loans are granted on different dates and not all loans will default. Some cases are simply lost to follow-up.

These complications eliminate the possibility of simpler, more direct, analyses. To investigate these situations, a special category of statistical techniques, known collectively as "survival analysis" has been developed recently. These techniques, while seldom applied in a financial context, have been applied successfully in a wide range of situations from various sciences, such as:

- modeling the duration of marriages (sociology);
- investigating the effect of medical treatments on survival / mortality rates (medicine);
- analyzing factors related to the retention of employees (management); and,
- examining persistence of brand loyalty in market research (marketing).

In several respects, the Cox regression model is similar to ordinary regression models. Like ordinary regression models, Cox regression has one dependent variable and independent variables (such as age of borrower firm, industry sector of firm, etc.). As with ordinary least squares regression, standard statistical methods are employed to estimate the coefficients of the independent variables in the models and the coefficient estimates measure the importance of the variable to which it relates. In Cox regressions the dependent variable is the proportion of cases that have survived at a particular point in time. This dependent variable is known as the *cumulative survival function,* $\boldsymbol{S_t}$. According to the Cox model, the proportion of cases that survive to time $\boldsymbol{t}$ depends on two functions:

- a reference value known as the *baseline survival function,* $\boldsymbol{S_0\{t\}}$. The baseline survival function depends only on time alone. In the SBLA context, the baseline survival function is a reference value that is increased or decreased according to the values of other variables in the model. The baseline survival function acts somewhat like the constant term in a multiple regression model. Both are values of the dependent variable that are modified according to the values of the explanatory variables in the rest of the model.
- The second function is an expression that comprises the $\boldsymbol{i}$ explanatory variables in the analysis. The explanatory variables can be combinations of borrower attributes and measures of regional economic conditions.

Suppose the ***i*** explanatory variables are denoted by the vector ***{X$_i$ }*** (for example, age of borrower might be ***X$_1$,*** amount of loan as ***X$_2$,*** etc.), then the Cox regression model may be expressed as follows:

$$\log [S_i] = \log [S_0\{t\}] \cdot p$$

where $p = e^{\{S b X\}}$.

The cumulative survival function is defined for a given time according to the values of time and the explanatory variables in the model. The Cox regression procedure uses historical data on cases to estimate the values of the coefficients, ***{b$_i$}.*** These coefficients connote the weights (or the relative importance) of each of the explanatory variables, ***{X$_i$}***.

From knowledge of the survival function, its counterpart, *the hazard function* ***h$_t$,*** can be calculated. The cumulative hazard function expresses, for a given time, the likelihood that a case will experience the default given that is has not defaulted to that time. Intuitively, the hazard function may be considered a default rate per unit of time. Because the hazard function can be derived from the survival function, the Cox regression may be written in terms of the hazard function. As with the survival function, the hazard function has two components:

- a reference baseline hazard function ***h$_0${t},*** that depends only on time; and,
- a function of the set of explanatory variables ***{X$_i$ }*** weighted by the coefficients ***{b$_i$}*** estimated by the Cox procedure.

The form of the Cox model in terms of the hazard function is:

$$h_t = h_0\{t\} e^{S bX}$$

Once the ***{b$_i$}*** have been ascertained, application of the model for a known set of ***{X$_i$}*** is straightforward.

Data

The initial report for this project itemized variables that were employed as potential explanatory variables in the Cox regression estimations of the hazard rates. The sample data were used to estimate the ***{b$_i$ }*** parameters of Cox regressions for each of the loan cohorts and by region. The default rate data used to estimate the Cox regression models is summarized in Table 4.

The full SBLA database was split as follows:

1. by the four major geographic regions;
2. within regions, 60% of the sample, chosen randomly, were used to estimate the models of default rate determination and the remaining 40 percent were used as a holdout sample to test the accuracy of the models.

Table 4: Basis of Cox Regression Estimations
(Number of Defaults by Region and Loan Cohort for Sample Data)

	Atlantic		Quebec		Ontario		West	
	Defaults	Non Defaults	Defaults	Non Defaults	Defaults	Non Defaults	Defaults	Non Defaults
1988	11	1050	26	990	23	1955	16	3403
1989	9	696	14	778	16	1500	18	2762
1990	23	531	61	608	63	902	58	2168
1991	19	483	63	697	38	629	63	2073
1992	5	502	74	801	31	665	34	2411
1993	22	1037			53	1110	39	1727
1994	59	1956			78	1889		
1995 to April	11	609	38	787	16	623	13	996
Since April 1995	16	1836	37	2666	15	1762	18	2853

Findings

Following preliminary estimations of the Cox model for each annual cohort of loans and for each of the geographic regions, four subsets of variables were found to be statistically significant on a regular basis. These categories of variables were:

- variables that denoted the **usage** of the borrowed funds. Funds borrowed to purchase equipment and to finance leasehold improvements were found to be significant with varying frequencies.
- Significant variables consistently included the following attributes of the borrower firm:
    - **age** of firm;
    - **size of loan** (possibly acting as a proxy for size of business); and,
- Variables indicating the **identity of the lender** were found to be significantly related to hazard rates in particular combinations of region and loan cohort.
- **Economic variables**, particularly the regional unemployment rate, were found to be important; however, with only eight years of default and unemployment data (1988 through 1995), estimation of the impact of cyclical measures could not be made with sufficient precision to warrant their use, except as in a heuristic manner to be described.

Previous reports presented initial findings based on the estimations of the Cox regressions. The initial findings showed that it was worthwhile to proceed with this avenue of research. They also indicated that the lack of sufficient years of data mitigated against inclusion of the time-varying measures of economic activity with confidence. Based on the initial findings, further detailed analysis of the 36 regression models was undertaken. Insignificant variables were progressively deleted and

instances of potential collinearity were identified and addressed. The coefficient estimates found to be statistically significant are summarized in Tables 5 through 8.

The final sets of coefficient estimates are reported in Tables 5 to 8 for each of the various combinations of nine loan cohorts and four geographic regions.

Interpretation of Coefficient Estimates

Coefficient estimates that are greater than zero (i.e., positive values) indicate that increases in the value of the associated variable increases the likelihood of default. For example, the coefficient estimate of the amount of the loan usually enters the estimations with a positive value; hence, larger loans are more likely to default than smaller ones. Coefficients with negative signs indicate that increases in the value of the variable *decreases* the likelihood of default. For example, the coefficient of the age of the firm is frequently negative. Hence, younger firms are more likely to default.

Variable that take on dichotomous values include bank identifiers (for example, the variable BNS is set equal to 1 if the lender is the Bank of Nova Scotia and 0 otherwise). Again, positive coefficient estimates indicate that such lenders make loans that are more likely to default than other lenders.

From inspection of Tables 5 through 8, several observations stand out:

- the age of the borrower firm is consistently and negatively related to default likelihoods. Younger firms are more likely to default, especially during the earlier years of the loan than are more established firms. However, the articulated objective of the SBLA program is to help facilitate financing for small firms.
- the size of the loan is positively correlated with default rates: larger loans tend to default more frequently than smaller ones. This finding prompts review of the loan limits. The majority of SBLA loans are for less than $60,000. If larger loans are indeed more prone to default, given the objective of the program it may not be defensible to retain the higher loan limit.
- The findings confirm the analyses conducted in Appendices C through E. From 1988 through 1993, hazard rates for loans advanced by the Banque Nationale are generally greater than for other lenders. The findings also show that loans made by Caisses Populaires also tend to default more often, especially for years between 1988 and 1933. Subsequent to 1993, neither of these lenders entered default rate determination. Conversely, the Toronto-Dominion bank consistently achieved lower-than-usual default rates within the Province of Quebec.
- In Ontario, the Bank of Nova Scotia and the CIBC were also found to achieve lower default rates than other lenders, especially for the post-1993 years.
- Loans made to finance leasehold improvements are also consistently more likely to default than loans for most other purposes. In some instances, loans to finance equipment purchase also exhibited higher-than-usual default rates.

However, loans used for leasehold improvements were 1.5 to 3 times more likely to default than loans for other purposes.

Table 5: Forecasting Model Coefficient Estimates, *East* Region

	Hazard Rates (%)		Coefficient Estimates			
Cohort	1-year	Long-Term	Amount	Age	Leasehold	Other
1988	0.19	0.46		-0.171		equip: -1.175
1989	1.03	3.60	2.674			BNS: -1.536
1990	1.05	3.60		-0.071		
1991	0.60	0.12	1.552	-0.551		BNAT: 1.739
1992	0.28	0.71	2.541			
1993	0.71	1.72		-0.100	0.936	
1994	0.49	0.85		-0.243	1.009	equip: 0.737
						BNS: -1.029
Jan.-Mar.1995	0.24	0.42		-0.272		
Since Apr. 1995	0.08	0.12		-0.119		BNS: -1.257

Table 6: Forecasting Model Coefficient Estimates, *Quebec* Region

	Hazard Rates (%)		Coefficient Estimates			
Cohort	1-year	Long-Term	Amount	Age	Leasehold	Other
1988	0.46	1.79	2.043		0.579	CP: 0.544
						NAT: 0.679
1989	0.75	1.58	2.008	-0.054	-0.663	CP: 0.536
						NAT: 1.067
1990	2.30	6.59	1.171	-0.063	0.347	CIBC: -1.274
						NAT: 0.444
1991	2.11	7.31	1.006	-0.082	0.406	CP: 0.305
1992	3.23	7.01	0.596	-0.058	0.348	CIBC: 0.908
						CP: 0.597
1993	3.20	7.75	0.245	-0.067	0.723	CIBC: -0.624
						NAT: 0.144
						TD: -0.580
						equip: 0.865
1994	3.10	5.35	0.135	-0.126	0.676	equip: 0.966
						NAT: 0.233
						TD: -0.582
						BNS: -0.580
Jan.-Mar.1995	2.19	2.97		-0.173		equip: 0.642
						TD: 0.909
Since Apr. 1995	1.35	1.58	-0.287	-0.096	0.509	equip: 0.598
						TD: -1.265

Table 7: Forecasting Model Coefficient Estimates: *Ontario* Region

	Hazard Rates		Coefficient Estimates				
Cohort	1-year	Long-Term	Amount	Age	Leasehold	Other	
1988	0.11	0.65	1.951			BNS:	-1.779
						CIBC:	-1.666
1989	0.19	0.74	2.909				
1990	0.88	4.84	1.611	-0.070			
1991	0.84	3.81		-0.193		NAT:	1.254
1992	0.74	3.95		-0.119	0.587		
1993	0.91	2.58	0.281	-0.136	0.866	CIBC:	-0.611
						TD:	-0.404
						BNS:	-0.419
						equip:	0.646
1994	0.97	1.79		-0.195	0.589	CIBC:	-0.774
						BNS:	-0.655
						equip:	0.649
Jan.-Mar.1995	0.54	0.63		-0.179	0.857	BNS:	-0.679
						TD:	0.573
						equip:	1.359
Since Apr. 1995	0.45	0.63		-0.141		BNS:	-2.437

Table 8: Forecasting Model Coefficient Estimates: *West* Region

	Hazard Rates		Coefficient Estimates				
Cohort	1-year	Long-Term	Amount	Age	Leasehold	Other	
1988	0.13	0.40	1.872				
1989	0.24	0.46	1.790			equip:	-1.426
1990	0.66	2.15		-0.089	0.901		
1991	0.83	1.96	1.648	-0.126			
1992	0.21	0.70	1.757	-0.146		equip:	1.649
						BMO:	-1.214
1993	0.54	1.69		-0.119	1.203	equip:	1.250
						BMO:	-0.762
						CIBC:	-0.654
						BNS:	-0.662
						TD:	-0.426
1994	0.96	1.70		-0.144	0.879	equip:	0.933
Jan.-Mar.1995	0.65	0.78		-0.123	1.755	equip:	1.021
						TD:	-0.426
Since Apr. 1995	0.29	0.40	-1.050	-0.133	0.755	CIBC:	0.779

Measures of economic activity were also found to be important. There is a definite cyclical pattern to the defaults. Unemployment rate was found to enter estimations significantly; however, when they did so, they introduced linear dependence to the system and made any estimations untenable. Based on the partial results, cyclical economic factors could make material differences in default rates. The lack of sufficient annual measurement periods made it impossible to estimate precisely the effects of unemployment rate.

These findings set the stage for the next steps in derivation of forecasting default rates. The findings reported above indicate that the process that determines default rates is consistent over most geographic regions; however, the stability of the default process over time is in question, at least for the Province of Quebec.

Straight Extrapolation Approach

This method rests on using historical default rates as the guide to future default experience. The forecasting calculation recognizes that defaults recorded in a particular year result from loans made in that year and in each of the preceding years. Extrapolation of historical patterns uses historical default patterns applied to existing loans to estimate future defaults.

Table 9 shows the historical patterns, by region, of average default frequencies for the lending year (0) and each of the five following years. To illustrate forecasting from these data, these patterns will be applied to loans made from 1991 through 1996 to 'forecast' defaults in 1996.

Table 9: One-Year Default Rates

	Years After Loan						
Region	0	1	2	3	4	5	Total
East	0.327%	1.064%	0.498%	0.407%	0.115%	0.047%	2.458%
Quebec	1.049%	2.794%	1.642%	0.722%	0.200%	0.169%	6.576%
Ontario	0.463%	1.439%	1.298%	0.642%	0.373%	0.128%	4.343%
West	0.299%	0.803%	0.460%	0.232%	0.083%	0.060%	1.937%
Average	0.535%	1.525%	0.974%	0.501%	0.193%	0.101%	3.828%

Table 10 lists the number of loans made in each region for this period in the 40% holdout samples of the SBLA database.

Table 10: Lending Frequencies 1991-1996 in Holdout Samples

	Year					
	1996	1995	1994	1993	1992	1991
East	965	1603	2217	1163	343	352
Quebec	4338	6320	7428	4804	1819	1380
Ontario	3513	5975	6943	3056	797	726
West	3170	5094	6505	3827	1621	1469

For example, 1.298% of loans made in Quebec default two years subsequent to the loan. Therefore, 1.298% of the 7,428 loans made in Quebec in 1994 can be expected to default in 1996. Carrying out this calculation across the various regions yields the estimated defaults listed in Table 11.

Table 11: Estimation of 1996 Defaults

	Estimated Defaults from Loans Advanced in Year:						
	1996	1995	1994	1993	1992	1991	Totals
East	3.2	17.1	11.0	4.7	0.4	0.2	36.6
Quebec	45.5	176.6	122.0	34.7	3.6	2.3	384.7
Ontario	16.3	86.0	90.1	19.6	3.0	0.9	215.9
West	9.5	40.9	29.9	8.9	1.4	0.9	91.5
Totals	74.4	320.5	253.1	67.9	8.3	4.3	728.7
Average Loan	64167	66760	61823	56313	37849	37668	
Average Claim	38545	32972	25848	21087	14026	10780	
Value of Claims	2,867.7	10,567.8	6,542.2	1,431.8	116.4	46.4	21,572.3

Table 11 estimates that 729 defaults would be recorded in the holdout sample for a value of $21.572 million. Since the holdout sample represents about 40 percent of the loans (and, therefore, 40 percent of defaults), this method estimates 1,821 claims for a total of $53.93 million in 1996.

Forecasting Using Cox Regressions

SUMMARY

Work continues on this study. While not as far advanced as had been anticipated by this stage, the large geographic variations in default rates have necessitated considerably more analyses than had been expected. In addition, extensive analysis was required to ascertain that the level of claims recorded prior to 1989 was negligible in terms of the volume of lending. This finding has prompted modifications to the analysis and has involved consultations with the designers of the SPSS statistical analysis software. Technical problems have been addressed and estimation of the accuracy of the forecasting models is underway.

APPENDIX A: ATTRIBUTES OF THE DEFAULT FORECASTING DATABASE

Firm-Specific Attributes of the Borrower.

The analysis will evaluate the importance of attributes of the borrower as reported from loan registration data. The SBLA administration has provided data from lending periods 7 through 12 with the following information.

Legal Status of Borrower. These data are available mainly from the 1988 lending year through 1997. For these periods, indications of the legal status of the borrowers appears to be reliable.

Franchise Status. Reflecting the change in legislation, data on franchises is available only for lending period 12. Accordingly, it is not particularly helpful at this stage.

Industrial Sector. Breakdowns of industrial sector appear to be available only for period 12. This was somewhat surprising in that industrial sector was available for earlier lending periods.

Region. Data on region (Atlantic Canada, Quebec, Ontario, and Western Canada and the North) are available and appear to be reliable for all lending periods.

Lender Category. Data on lender category (Banks, Foreign Banks, etc.) are available for all lending periods. Lending periods 10 through 12 include a wider array of lender categories than did previous lending periods.

Claims. The status variable that indicated a claim had been received appear to be reliable only for lending periods 10 through 12. (For lending periods 7 through 9, this indicator suggests that only 43 claims had been received out of 141,352 loans, none of which represented loans made during lending period 7. Table A-1 details defaults, according to the claim status indicator, for each lending period and according to the years in which defaults were recorded.

Age of Firm. This variable does not appear to have been maintained prior to 1987. Subsequently, it appears to be reliable.

Number of Employees. A potentially important variable, data on this attribute indicates the size of the borrower. However, until the 1988 lending year, this variable was not captured consistently in the database.

Annual Revenues. An alternative measure of firm size, this data is only available for lending period 12.

Term of Loan. Term of loan is only available for period 12.

Amount Borrowed. Data on the amount of the loan appears to be reliable for all lending periods. While not ideal, this variable may correlate with firm size.

In addition, data on intended use(s) of loan proceeds and amounts requested and paid in the event of default are incorporated into the database.. Additional variables include the date the loan was made, the data of loan registration, and the date of default, in any.

Table A-1: Claims Recorded: SBLA Database

	Atlantic	*Quebec*	*Ontario*	*West*	*Total*
Lending Period					
7					**0**
8		3	1		**4**
9	2	15	3	16	**36**
10	49	344	137	115	**645**
11	82	1078	405	258	**1823**
12	254	2979	1328	784	**5345**
Totals	387	4419	1874	1173	**7853**
Year of Default					
1984		1			**1**
1985					
1986	1	5		1	**7**
1987		6		6	**12**
1988	2	28	6	11	**47**
1989	18	110	28	53	**209**
1990	20	163	56	48	**287**
1991	28	173	89	67	**357**
1992	23	319	106	81	**529**
1993	25	445	134	58	**662**
1994	71	971	363	239	**1644**
1995	136	1580	785	452	**2953**
1996	62	617	307	156	**1142**
Totals	385	4417	1874	1172	**7848**

Economic Conditions at Default.

Default rates of the portfolios of bank loans to businesses and individuals arguably vary according to economic conditions. It is reasonable to expect, therefore, that losses on the portfolio of SBLA loans are also sensitive to changes in the firm's economic environment. Therefore, the forecasting models will incorporate measures of the economic conditions that provide a context for the firm's ability to repay, or default on, the loan.

The choice of economic conditions is governed by three primary criteria:

1. they should be good descriptions of economic conditions;
2. economic variables must be among those that are forecasted by government and industry on a regular basis. This is because forecasted

variables will be needed to forecast default rates once a forecasting model is established.

3. The data must be available and forecasted on a regional basis.

Accordingly, three standard measures of economic conditions were incorporated: unemployment rates, business bankruptcy rates, and housing starts. The charts that follows present their time series properties of these variables for each of the four economic regions to be used in this study.

Chart A-1

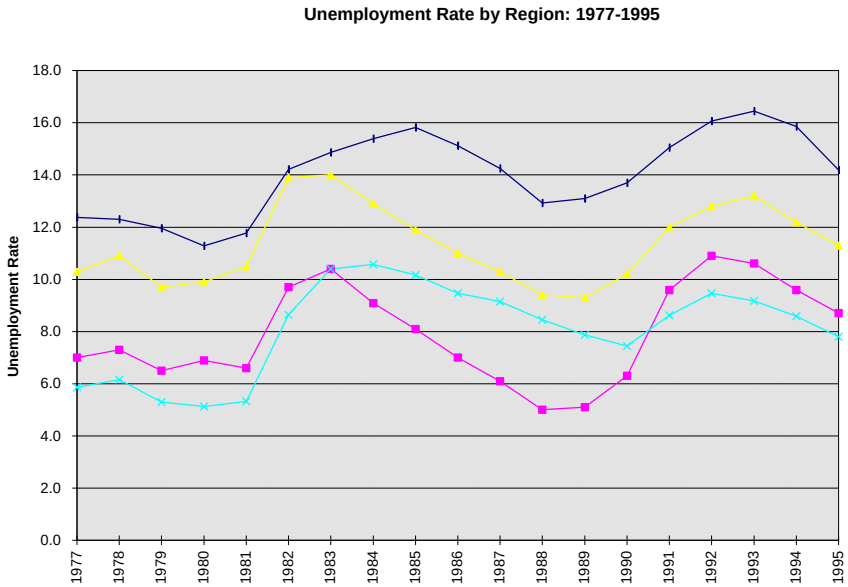


Chart A-2

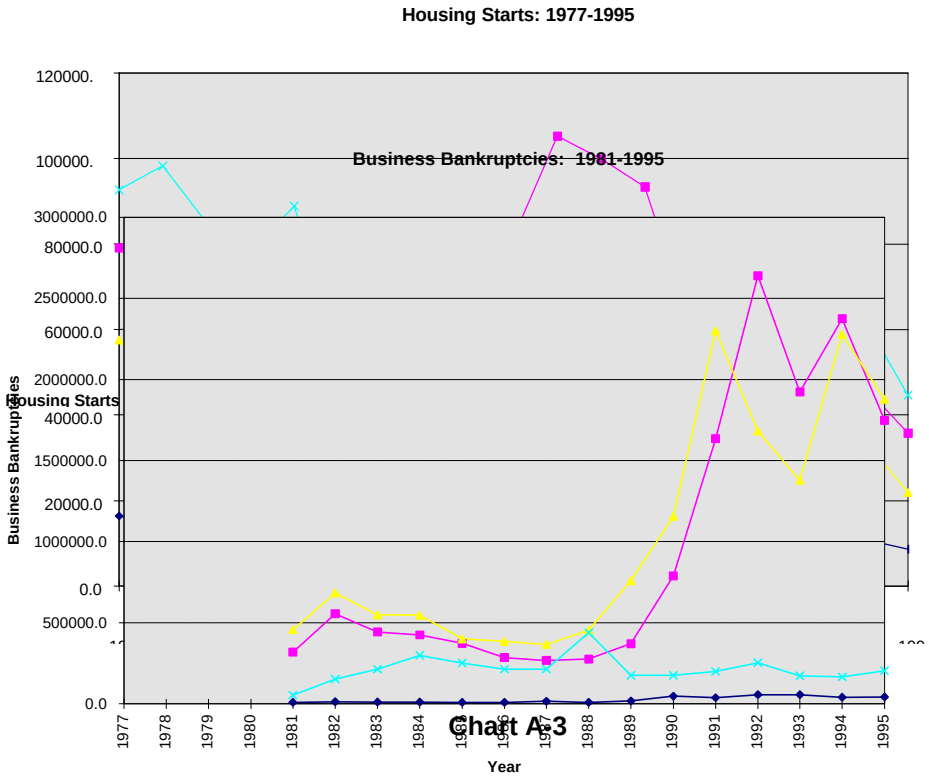
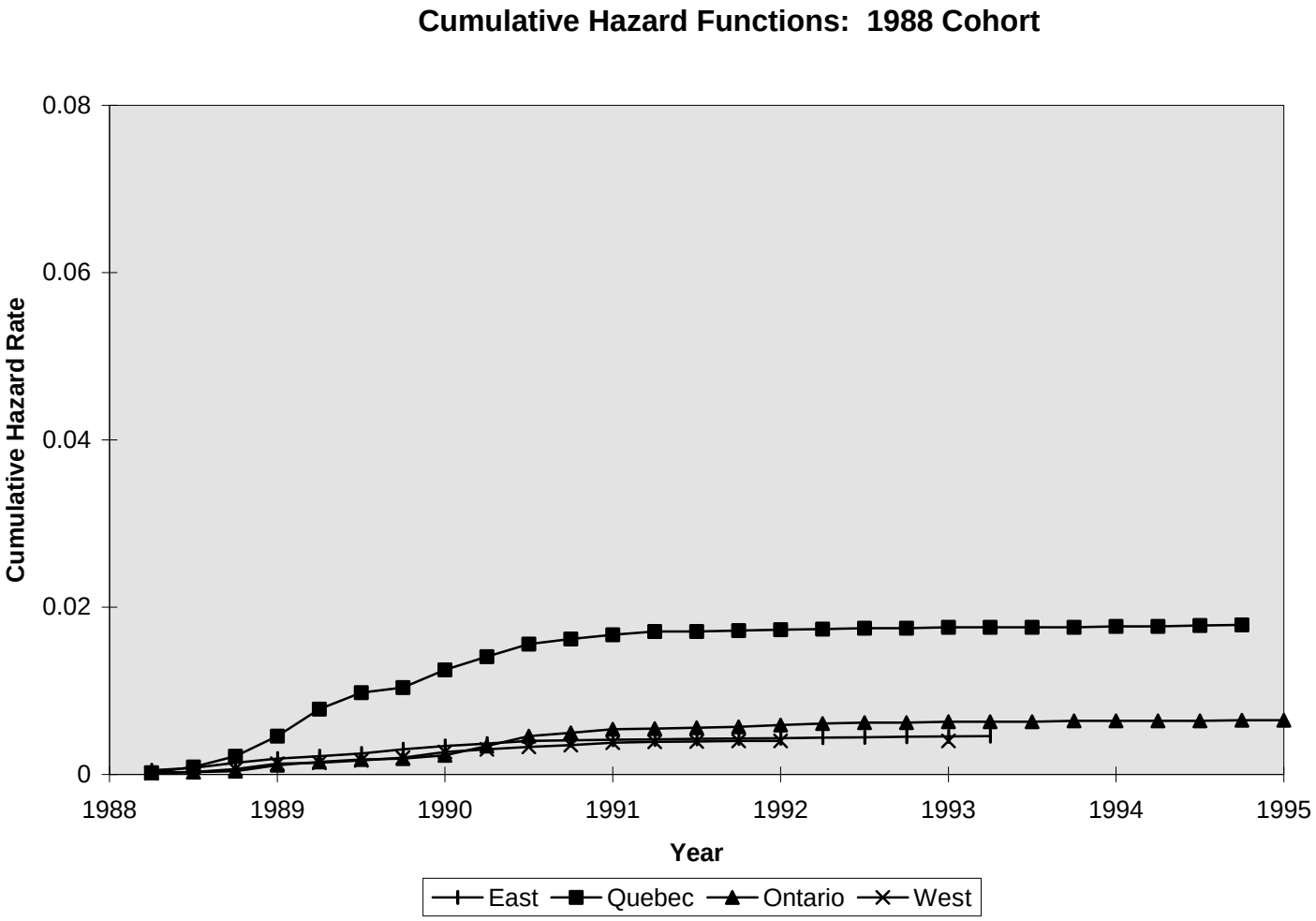
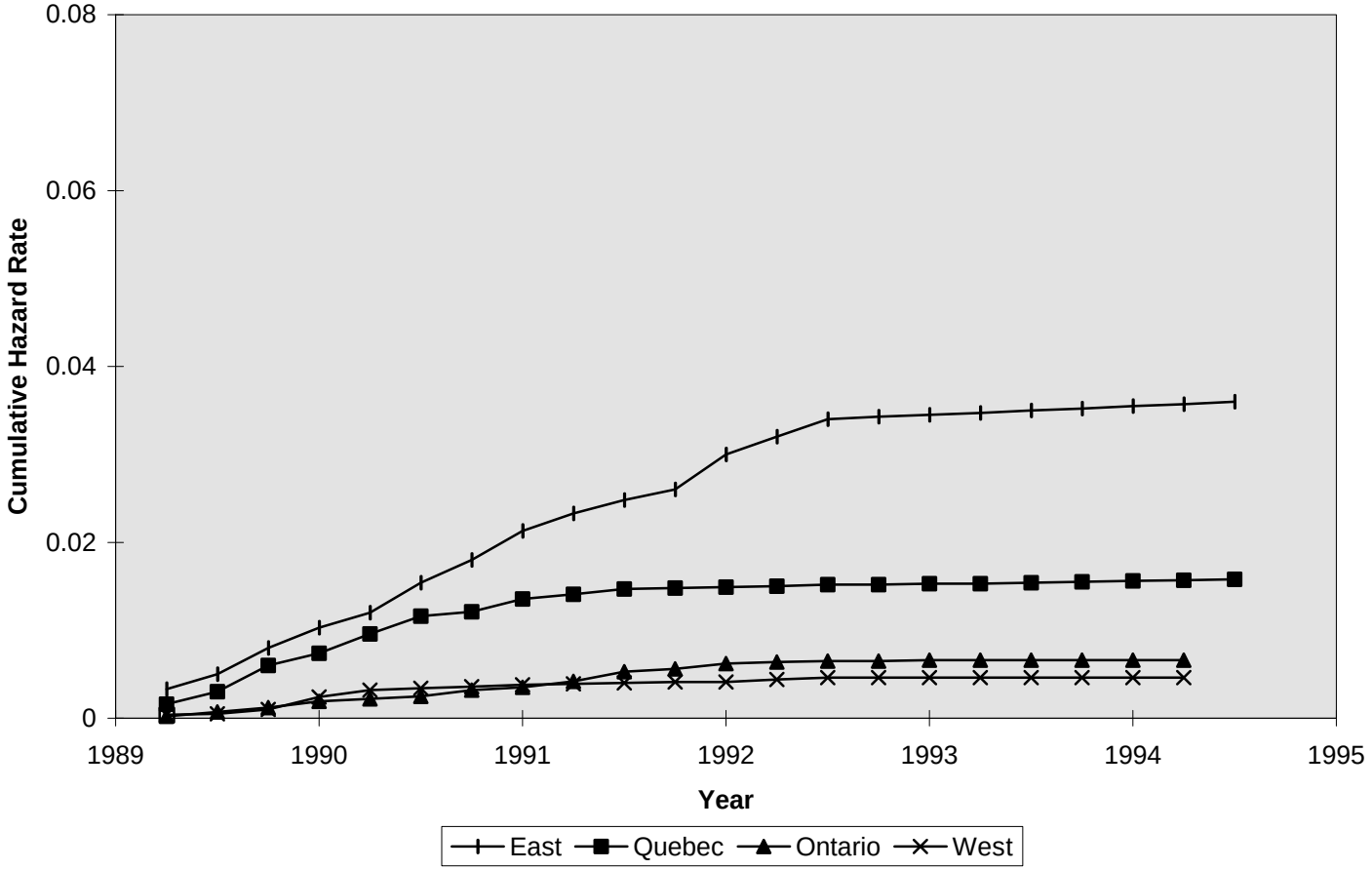


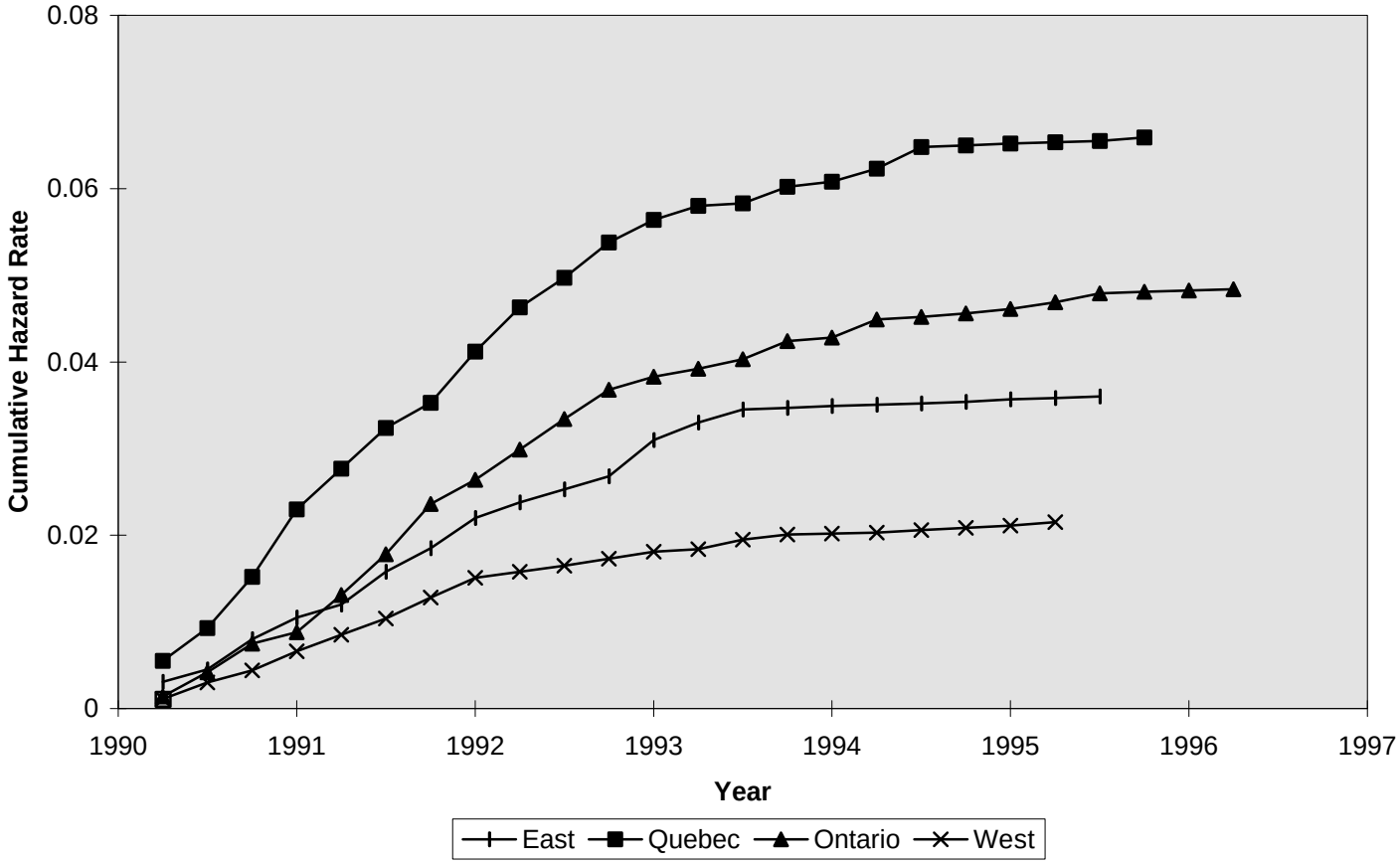
Chart A-3

APPENDIX B: CUMULATIVE HAZARD RATES BY REGION AND COHORT

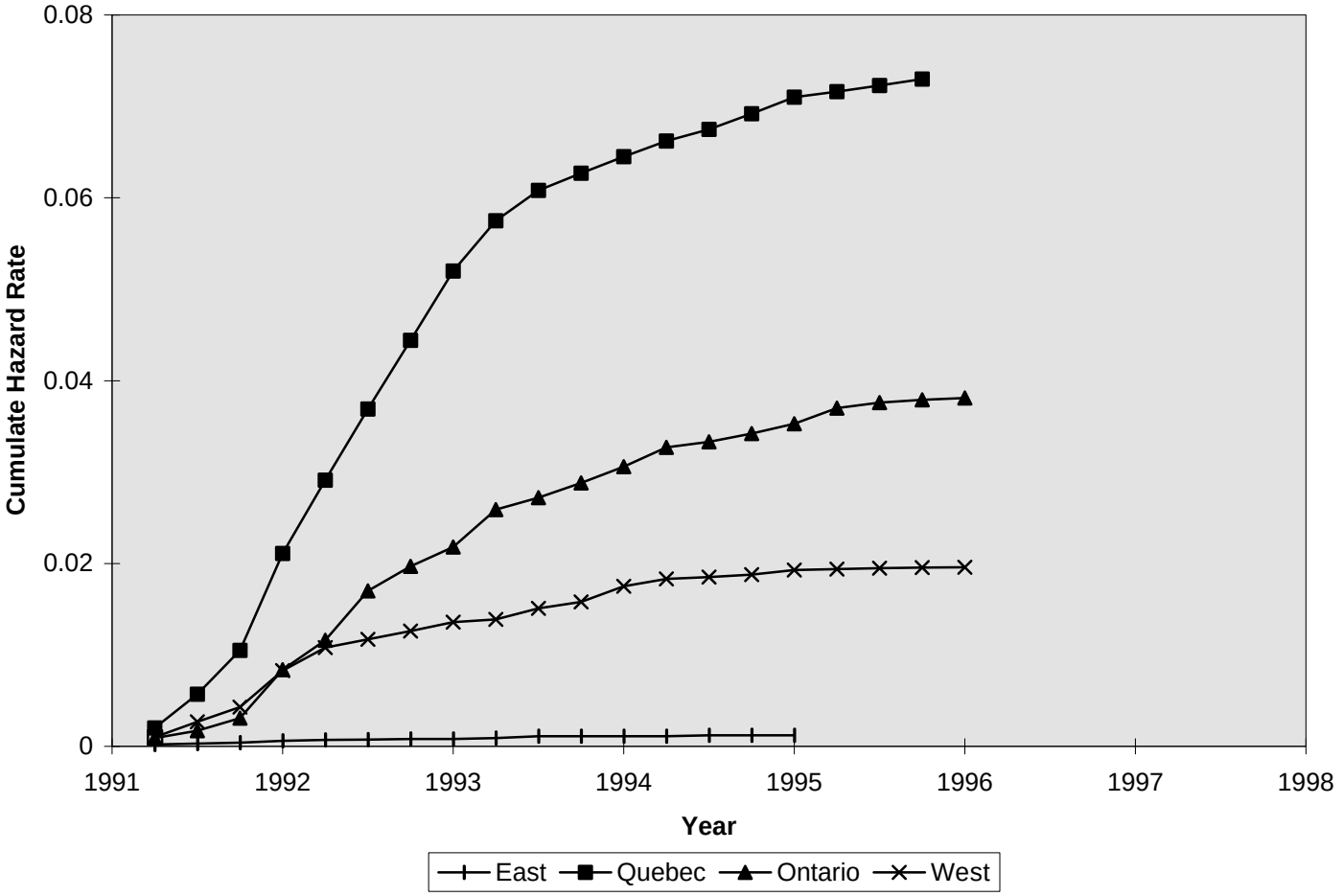


Cumulative Hazard Functions: 1989 Cohort

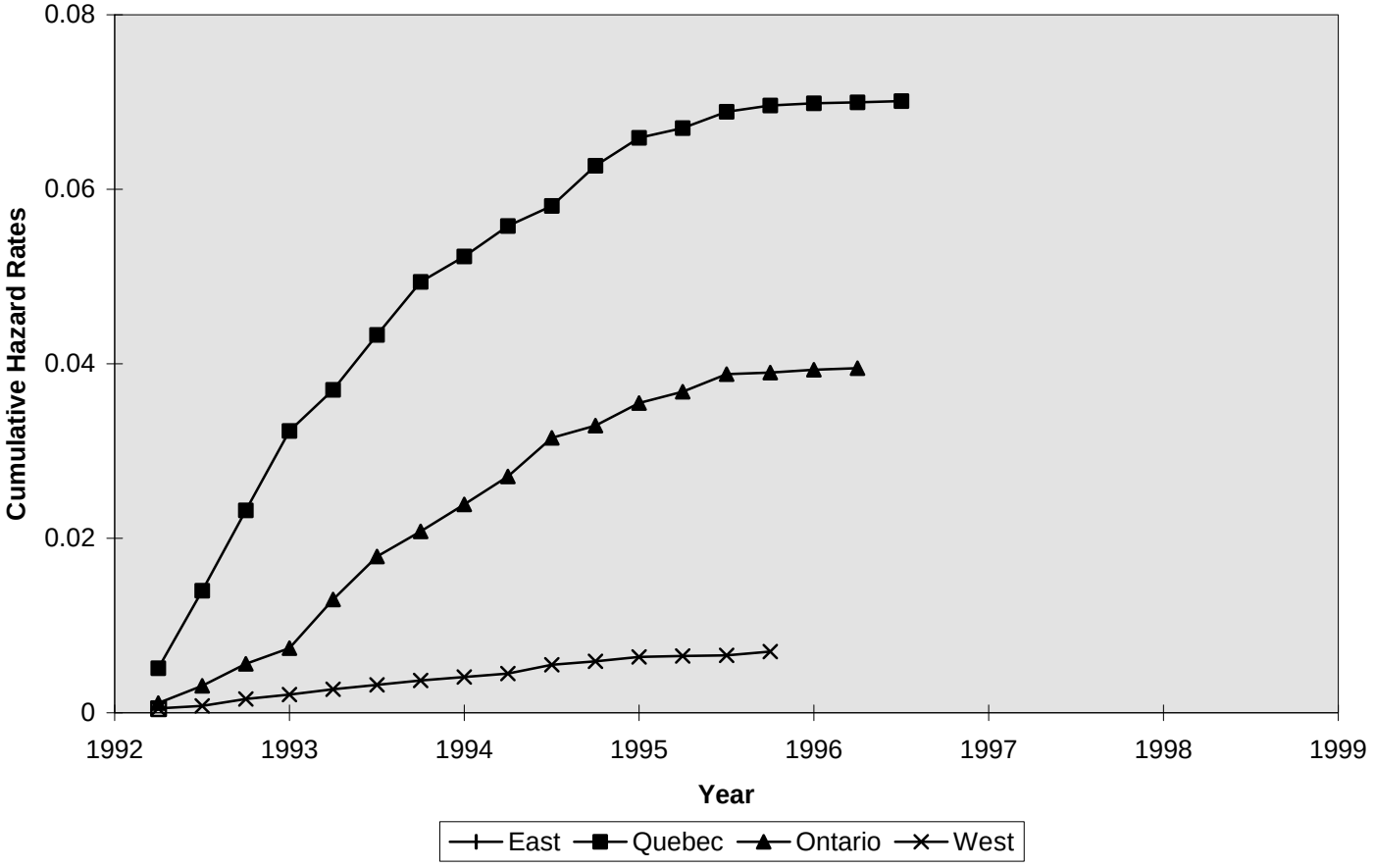



Cumulative Hazard Functions: 1990 Cohort
Cumulative Hazard Rate
0.08
0.06
0.04
0.02
0
1990
1991
1992
1993
1994
1995
1996
1997
Year
East
Quebec
Ontario
West

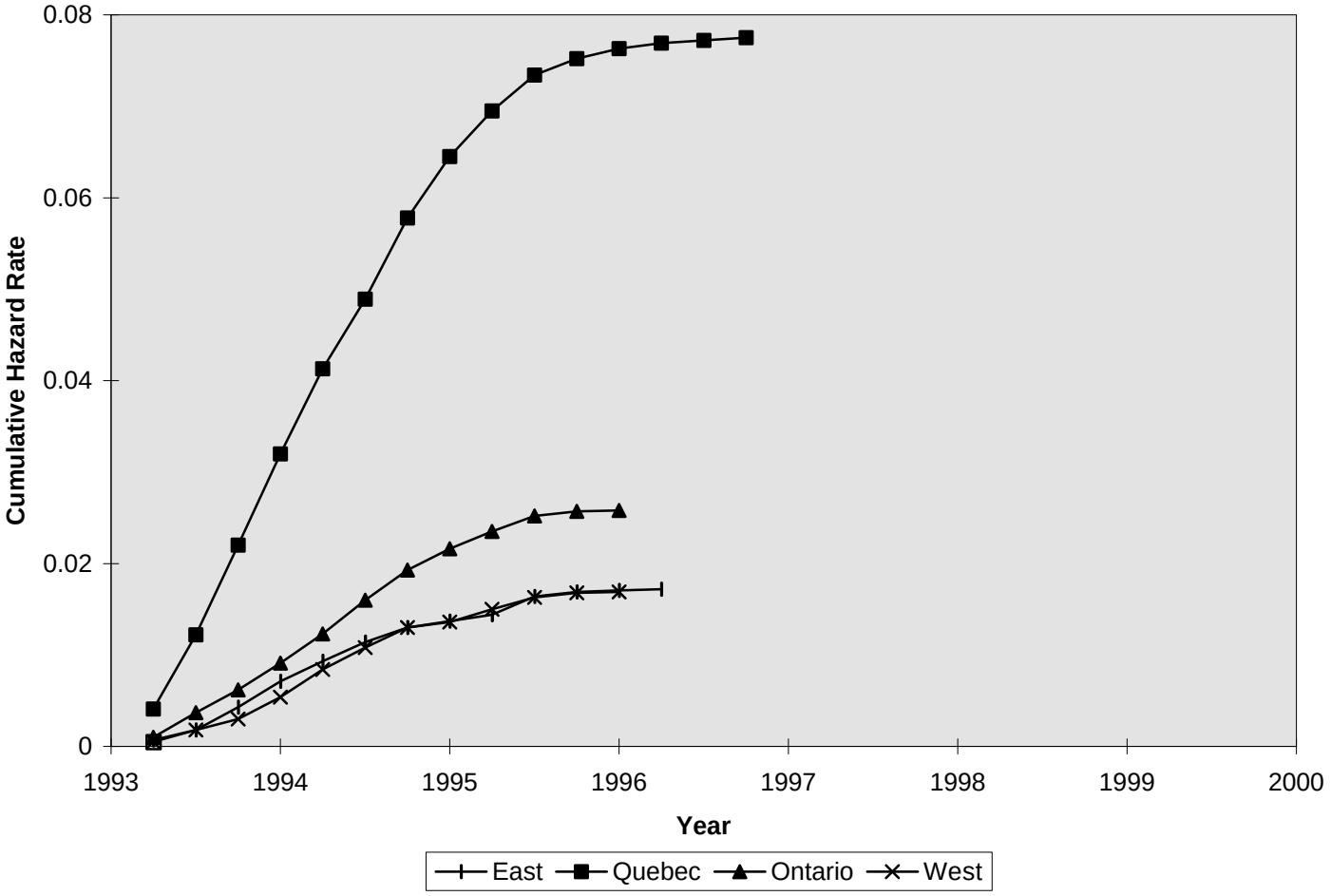
Cumulative Hazard Functions: 1991 Cohort



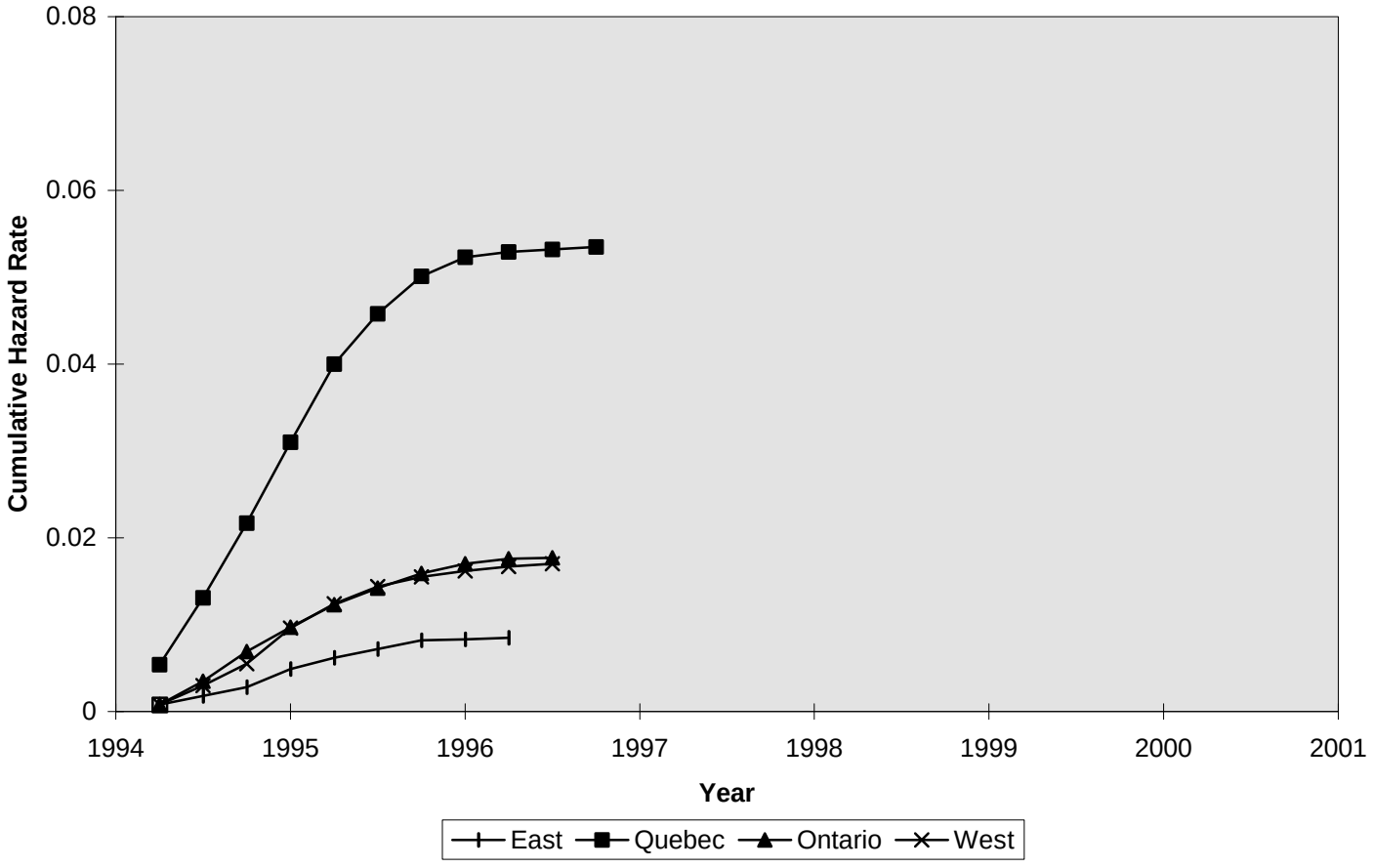
Cumulative Hazard Functions: 1992 Cohort

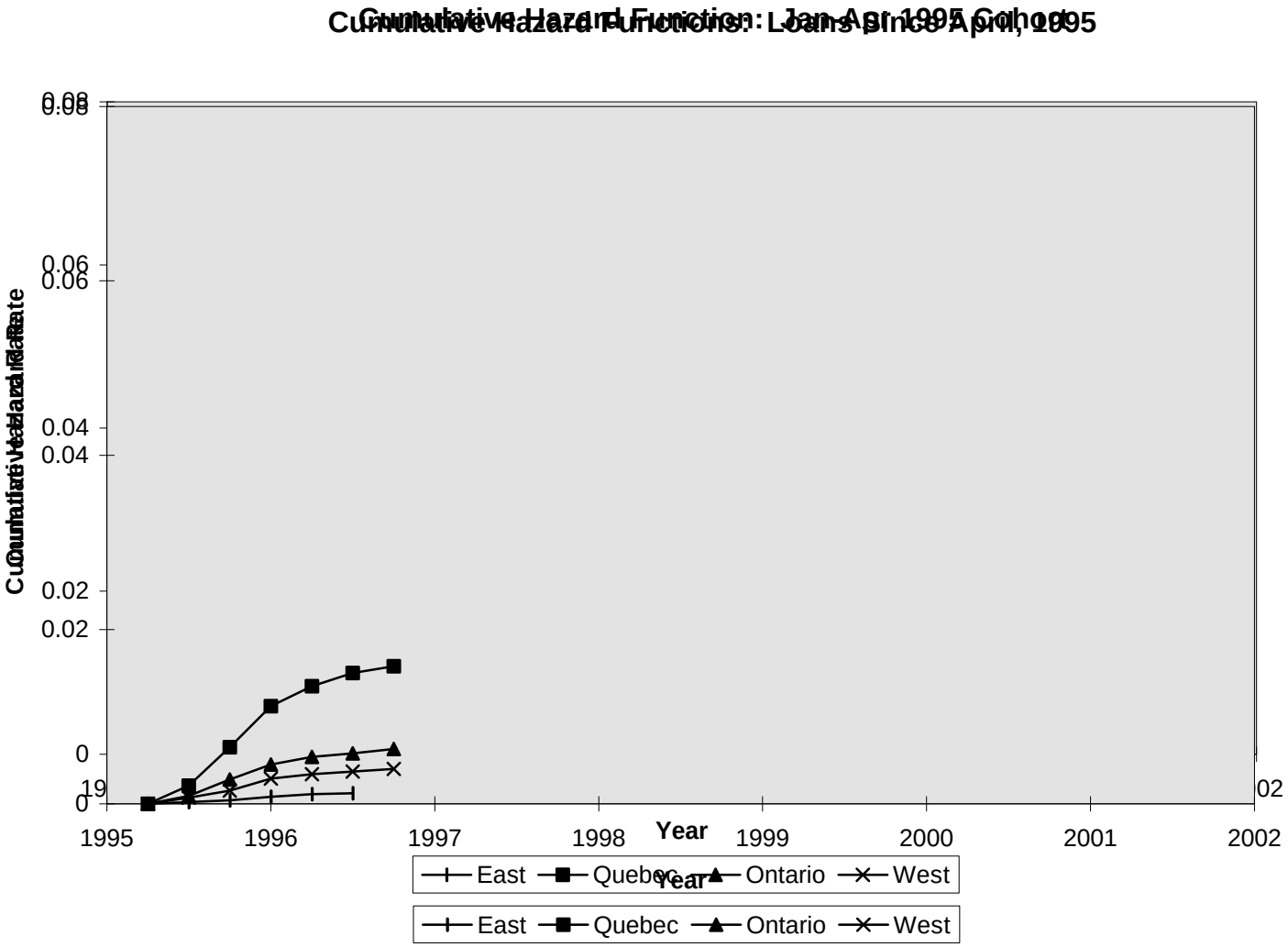


Cumulative Hazard Functions: 1993 Cohort



Cumulative Hazard Rates: 1994 Cohort




Cumulative Hazard Functions: Loans since April, 1995
Cumulative Hazard Rate
0.08
0.06
0.04
0.02
0
1995
1996
1997
1998
1999
2000
2001
2002
Year
East
Quebec
Ontario
West

APPENDIX C: SHORT-TERM DEFAULT RATES: AN ANALYSIS OF QUEBEC-BASED LENDERS

To analyze the impact that lenders might have on the disproportionately high default rates on Quebec-based SBLA loans, the share of defaults must be compared with the share of lending. Accordingly, Table C-1 and Chart C-1 illustrate the shares of SBLA-lending among the active lenders within the province of Quebec. Table C-2 and Chart C-2 present the shares of defaulted loans across the various lenders, again for each annual cohort.

Table C-1: Shares of SBLA Lending in Quebec (%)

(% of SBLA Loans)	BNS	BMO	ROY	TD	NAT	CIBC	Caisses	Other
1989	3.1	5.6	15.4	10.5	14.8	3.6	45.9	1.1
1990	3.4	7.0	10.4	9.3	17.4	3.3	48.0	1.2
1991	2.4	6.9	9.9	5.4	20.7	1.3	52.7	0.7
1992	1.8	7.9	5.1	3.5	22.2	1.2	57.9	0.4
1993	2.4	8.8	8.7	2.5	30.1	2.5	44.1	0.9
1994	3.4	9.6	10.4	3.5	27.8	3.8	38.8	2.7
1995	3.0	9.3	9.3	3.7	19.8	4.8	46.0	4.1
Mean	**2.79**	**7.87**	**9.89**	**5.49**	**21.83**	**2.93**	**47.63**	**1.59**

Chart C-1

Shares of SBLA Lending in Quebec: 1989-1995 by Lender

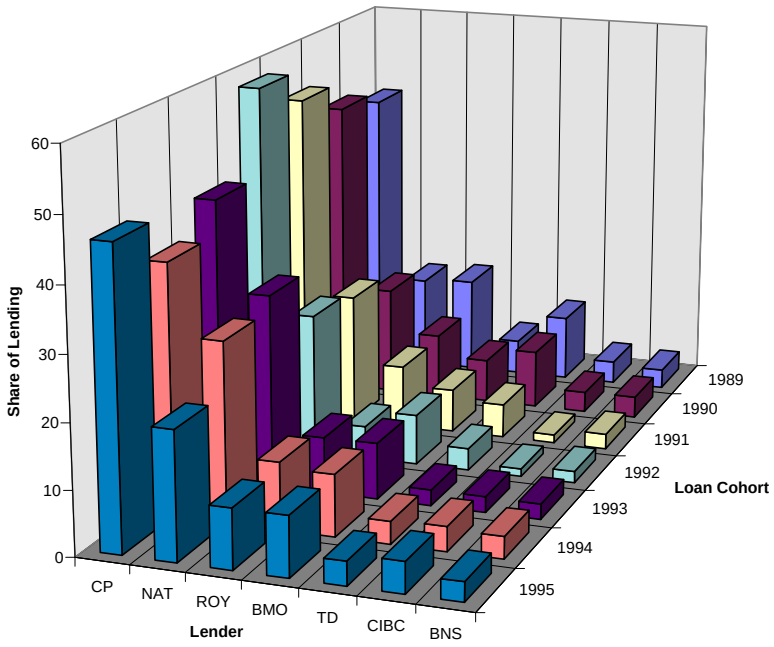
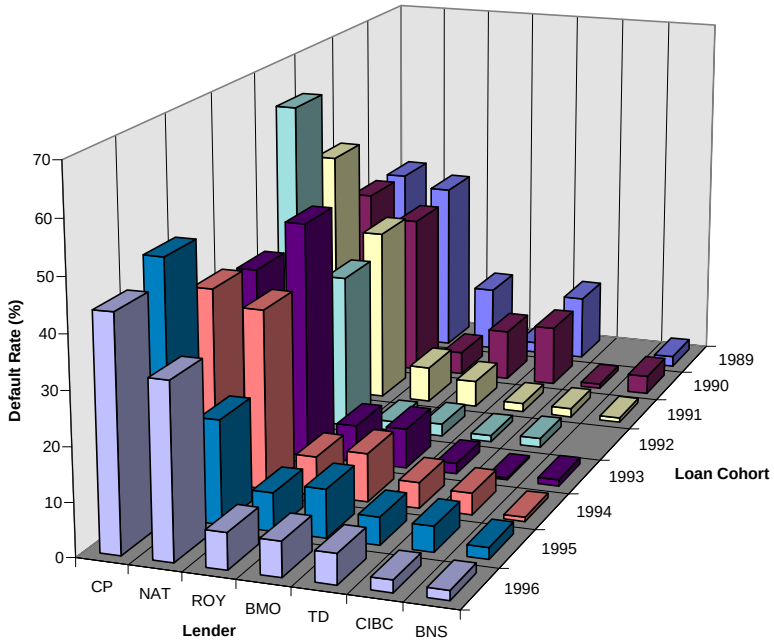


Table C-2: Shares of One-Year Defaults on SBLA Lending in Quebec (%)

% of Defaults	BNS	BMO	ROY	TD	NAT	CIBC	CP	Other
1989	2.1	2.1	12.8	12.8	34.0	0.0	36.2	0.0
1990	3.6	10.0	4.5	11.8	31.8	0.9	36.4	1.0
1991	0.9	5.2	7.0	1.7	33.9	1.7	48.7	0.9
1992	0.0	2.4	1.8	1.2	29.9	1.8	62.9	0.0
1993	1.2	7.6	7.1	2.0	45.5	0.4	35.7	0.5
1994	0.8	9.2	7.4	4.9	34.2	4.1	37.2	2.2
1995	2.2	9.1	7.2	5.2	19.5	4.8	48.2	3.8
Mean	**1.54**	**6.51**	**6.83**	**5.66**	**32.69**	**1.96**	**43.61**	**1.20**

Chart C-2

Shares of Defaults on SBLA Loans, 1989-1995, by Lender



Comparison of the average shares of SBLA defaults (Table C-2, last row) with the average shares of SBLA loans (Table C-1, last row) provides an initial indication of the role of lender. The BMO, BNS, ROY, CIBC, and the Caisses Populaires account for lower shares of defaults than shares of lending. The TD share of one-year defaults is marginally greater than its share of lending. For the National Bank, however, the share of one-year defaults is approximately 150% of its share of loans. Moreover, the National Bank accounts for a substantial share of total SBLA-lending within Quebec.

Further insights can be obtained by exploring how the ratio of {share of one-year defaults to share of lending} varies over time. A value of 1.0 for this ratio indicates that the share of one-year defaults is proportionate to the share of lending. A value in

excess of 1.0 indicates that the lender accounts for disproportionately more one-year defaults than is commensurate with its share of SBLA loans. Chart C-3 presents time series of this ratio.

Chart C-3

Ratio: Shares of Defaults to Loans

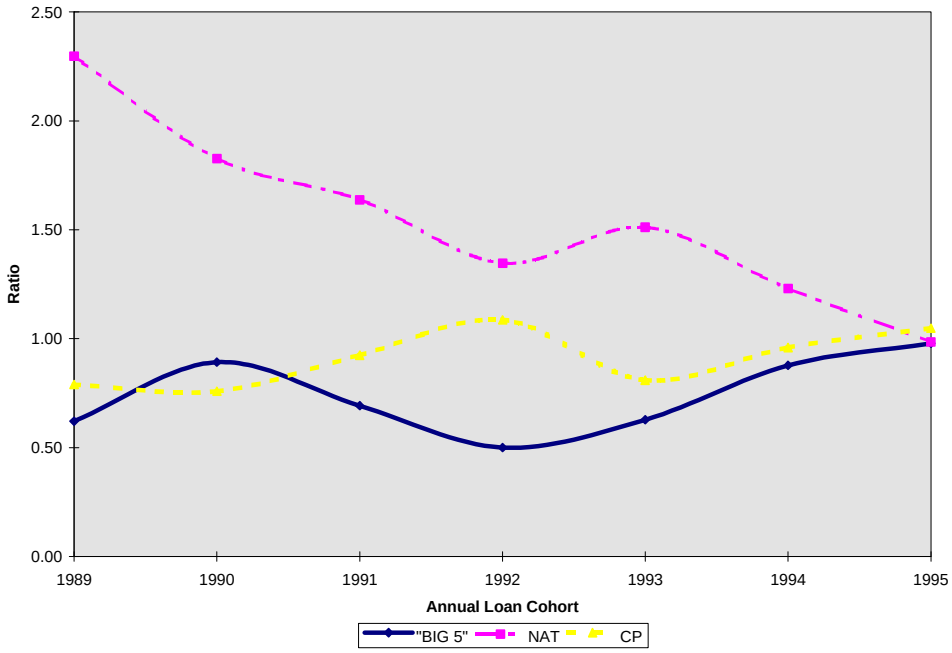


Chart C-3 shows that while the National Bank had historically exhibited a disproportionately high share of defaults on SBLA loans, its share of defaults relative to its share of lending has decreased in recent years. For example, the shares of defaults within the first year for loans made during the first four months of 1995 are approximately equal across lenders.

APPENDIX D: SHORT-TERM DEFAULT RATES: QUEBEC AND REST OF CANADA

TABLE D-1: SHARES OF SBLA LENDING, ALL REGIONS BY LENDER

	BNS	BMO	ROY	TD	NAT	CIBC	Caisses	TOTAL LOANS
ATLANTIC								
1988	56.8	7.3	11.1	7.2	2.8	13.1		1730
1989	63.6	7.1	9.8	5.2	4.5	9.1	0.2	1163
1990	64.7	10.1	9.7	5.1	4.6	4.1	1.1	938
1991	72.2	9	6.4	4.5	4.5	2.8	0.2	864
1992	67.6	13	6.9	3.3	6.1	3.3		857
1993	55.8	13.6	10.1	5.6	8.4	5.7	0.2	2959
1994	47.5	13	15.9	7.9	6.5	6.5	0.1	5580
1995	38.6	13	17.7	10.6	4.9	8.7	0.4	4124
QUEBEC								
1988	2.6	4.6	21.4	10.2	6.6	3.7	48.5	5732
1989	3.1	5.6	15.4	10.5	14.8	3.6	45.9	4509
1990	3.4	7	10.4	9.3	17.4	3.3	48	3878
1991	2.4	6.9	9.9	5.4	20.7	1.3	52.7	3974
1992	1.8	7.9	5.1	3.5	22.2	1.2	57.9	4852
1993	2.4	8.8	8.7	2.5	30.1	2.5	44.1	13219
1994	3.4	9.6	10.4	3.5	27.8	3.8	38.8	19974
1995	3	9.3	9.3	3.7	19.8	4.8	46	16228
ONTARIO								
1988	13.7	10.4	26.2	23.4	0.3	22.6	0.2	5495
1989	15.5	9.2	27.4	20.6	0.3	22.9	0	4193
1990	16.4	9.9	23.8	20.6	0.3	23.8	0.1	2704
1991	16.1	13.1	23.8	16.9	0.9	25.3	0.4	1923
1992	13	18.6	22.5	21.1	0.3	22.6	0.3	2035
1993	19.2	17.3	17.8	21.8	0.7	21.1	0.7	8227
1994	21.9	17.2	17.3	23.1	1.1	14.7	0.7	18391
1995	19.4	16.9	17.2	21.8	1.4	15.6	0.9	15224
WEST & NORTH								
1988	11.8	12.6	18.1	15.6	0	34.2	0.1	5745
1989	13.6	13.9	19	15.5	0	29.3	0	4637
1990	11.9	17.4	17.2	14.8	0	27.2	0.1	3769
1991	12.8	19.3	16	13.6	0	25.1	0.1	3636
1992	10.4	22.1	13	14.1	0	21.7	0.1	4093
1993	21.1	19.4	13.7	12.7	0	16.9	0.1	9982
1994	21.9	17.7	14.1	12.9	0.1	15	0.1	16744
1995	18.8	17.1	14.5	13	0	14.5	0.1	12914

TABLE D-2: SHARES OF CLAIMS, ALL REGIONS BY LENDER								
	BNS	BMO	ROY	TD	NAT	CIBC	Caisses	TOTAL CLAIMS
ATLANTIC								
1988	60	0			15	25		20
1989	26.7	0	33.3		33.3	6.7		15
1990	68.4	2.6	18.4	2.6	5.3		2.6	38
1991	41.4	10.3	24.1	3.4	20.8			29
1992	45.5	9.1	18.2	9.1	18.2			11
1993	31.1	16.2	23	6.8	14.9	6.8		74
1994	22	12.6	27.6	16.5	8.7	12.6		127
1995	26.8	8.9	33.9	16.1	3.6	7.1		56
QUEBEC								
1988	1.8	4.5	9.8	9.8	10.7	4.5	58	112
1989	0.9	3.8	13.2	7.5	22.6	5.7	45.3	106
1990	2.6	6.2	12.5	10.5	28.2	1.3	38	305
1991	1.4	5.1	11.2	3.4	26.7	0.6	50.6	356
1992		5.2	3.5	1.7	19.7	1.2	68.8	346
1993	1.1	8.3	9.7	1.5	38.5	8	39.8	1126
1994	1.2	8	10.1	4.9	11	3	37.4	1392
1995	2.4	9.3	7.9	4.7	2.5	4.7	47.9	535
ONTARIO								
1988	4.5	13.6	52.3	15.9	2.3	6.8		44
1989	6.1	4.1	55.1	18.4		14.3		49
1990	14	8.5	33.5	20.7		20.1		164
1991	9.7	8.8	36.3	13.3	2.7	27.4	0.9	113
1992	6.3	15.2	42	20.5		16.1		112
1993	11.3	17.5	34.4	20.5	0.6	15.1	0.3	337
1994	14	18.2	22.2	33.9	1.7	7.8	0.3	708
1995	8.6	16.2	29.6	29.2	1.7	8.9	0.3	291
WEST & NORTH								
1988	4	4	48	4		20		25
1989	7.7	19.2	53.8	7.7				26
1990	7.8	19.6	28.4	13.7		19.6		102
1991	9	19.1	33.7	6.7		19.1		89
1992	7	17.5	17.5	12.3		19.3		57
1993	14.5	12.9	24.6	10.9		14.1		256
1994	14.7	17.5	20.8	12.4		16.2		394
1995	9.9	13.5	24.8	16.3		19.1		141

TABLE D-3: RATIOS OF CLAIMS TO LOANS, ALL; REGIONS BY LENDER							
	BNS	**BMO**	**ROY**	**TD**	**NAT**	**CIBC**	**Caisses**
ATLANTIC							
1988	1.06	0.00	0.00	0.00	5.36	1.91	
1989	0.42	0.00	3.40	0.00	7.40	0.74	0.00
1990	1.06	0.26	1.90	0.51	1.15	0.00	2.36
1991	0.57	1.14	3.77	0.76	4.62	0.00	0.00
1992	0.67	0.70	2.64	2.76	2.98	0.00	
1993	0.56	1.19	2.28	1.21	1.77	1.19	0.00
1994	0.46	0.97	1.74	2.09	1.34	1.94	0.00
1995	0.69	0.68	1.92	1.52	0.73	0.82	0.00
MEANS	**0.69**	**0.62**	**2.20**	**1.11**	**3.17**	**0.82**	**0.39**
QUEBEC							
1988	0.69	0.98	0.46	0.96	1.62	1.22	1.20
1989	0.29	0.68	0.86	0.71	1.53	1.58	0.99
1990	0.76	0.89	1.20	1.13	1.62	0.39	0.79
1991	0.58	0.74	1.13	0.63	1.29	0.46	0.96
1992	0.00	0.66	0.69	0.49	0.89	1.00	1.19
1993	0.46	0.94	1.11	0.60	1.28	3.20	0.90
1994	0.35	0.83	0.97	1.40	0.40	0.79	0.96
1995	0.80	1.00	0.85	1.27	0.13	0.98	1.04
MEANS	**0.49**	**0.84**	**0.91**	**0.90**	**1.09**	**1.20**	**1.00**
ONTARIO							
1988	0.33	1.31	2.00	0.68	7.67	0.30	0.00
1989	0.39	0.45	2.01	0.89	0.00	0.62	
1990	0.85	0.86	1.41	1.00	0.00	0.84	0.00
1991	0.60	0.67	1.53	0.79	3.00	1.08	2.25
1992	0.48	0.82	1.87	0.97	0.00	0.71	0.00
1993	0.59	1.01	1.93	0.94	0.86	0.72	0.43
1994	0.64	1.06	1.28	1.47	1.55	0.53	0.43
1995	0.44	0.96	1.72	1.34	1.21	0.57	0.33
MEANS	**0.54**	**0.89**	**1.72**	**1.01**	**1.79**	**0.67**	**0.49**
WEST & NORTH							
1988	0.34	0.32	2.65	0.26		0.58	0.00
1989	0.57	1.38	2.83	0.50		0.00	
1990	0.66	1.13	1.65	0.93		0.72	0.00
1991	0.70	0.99	2.11	0.49		0.76	0.00
1992	0.67	0.79	1.35	0.87		0.89	0.00
1993	0.69	0.66	1.80	0.86		0.83	0.00
1994	0.67	0.99	1.48	0.96	0.00	1.08	0.00
1995	0.53	0.79	1.71	1.25		1.32	0.00
MEANS	**0.60**	**0.88**	**1.95**	**0.76**	**0.00**	**0.77**	**0.00**

APPENDIX E: VALUES OF CLAIMS FROM SHORT-TERM DEFAULTS: QUEBEC AND REST OF CANADA

TABLE E-1: TOTAL LENDING, ALL REGIONS BY LENDER

($000,000)	BNS	BMO	ROY	TD	NAT	CIBC	Caisses
ATLANTIC							
1988	31.475	4.891	7.929	3.877	2.095	5.942	0.000
1989	22.053	3.080	5.530	2.096	2.721	2.500	0.065
1990	17.765	4.668	4.281	1.554	1.648	1.505	0.132
1991	17.517	3.291	2.166	1.450	1.949	0.831	0.045
1992	17.202	4.510	2.737	0.959	3.135	0.400	0.000
1993	70.308	20.417	21.171	8.315	18.160	11.137	0.355
1994	126.408	37.183	54.856	23.844	31.304	25.995	0.302
1995	83.605	31.657	54.047	28.517	16.788	21.006	1.925
QUEBEC							
1988	5.491	10.380	42.749	23.143	19.747	11.576	96.664
1989	5.836	9.972	27.991	20.694	35.359	9.001	73.366
1990	4.256	10.227	16.984	13.129	35.004	6.398	63.667
1991	4.040	11.656	17.176	8.031	40.539	2.057	76.161
1992	3.011	13.574	11.419	5.485	55.350	2.393	105.709
1993	15.926	67.299	68.522	16.801	276.030	19.136	291.485
1994	40.105	109.685	126.944	46.880	400.266	56.272	407.630
1995	30.392	99.247	102.573	43.419	226.225	58.604	413.315
ONTARIO							
1988	26.376	22.824	64.836	47.648	0.906	50.959	0.662
1989	25.502	14.999	60.315	36.782	0.524	41.839	0.000
1990	15.125	10.653	32.732	24.039	0.690	28.563	0.128
1991	10.064	10.087	23.789	11.743	1.107	22.025	0.237
1992	10.432	16.062	22.750	14.874	0.468	19.312	0.277
1993	87.305	82.930	92.606	97.347	5.254	95.584	5.084
1994	242.109	193.249	197.968	279.557	17.563	180.646	9.360
1995	184.972	194.860	195.282	233.593	20.419	178.061	11.440
WEST & NORTH							
1988	23.519	27.819	39.991	26.964	0.000	111.402	0.146
1989	19.001	23.953	36.166	22.642	0.000	38.993	0.000
1990	13.270	22.651	25.923	16.518	0.000	31.420	0.045
1991	12.642	24.200	22.920	14.623	0.000	25.632	0.081
1992	11.731	32.585	19.725	15.836	0.000	23.952	0.524
1993	107.102	93.181	81.275	57.405	0.000	85.787	0.899
1994	196.764	166.912	149.568	115.755	0.495	137.061	1.563
1995	144.733	137.643	120.587	95.187	0.000	116.069	0.000

TABLE E-2: AVERAGE CLAIM PER DEFAULT, ALL REGIONS BY LENDER							
	BNS	**BMO**	**ROY**	**TD**	**NAT**	**CIBC**	**Caisses**
ATLANTIC							
1988	37802				99900	10000	
1989	79100		53787		48990		
1990	37529		52998				16725
1991	53565	50710	40000	86583	65322		
1992	100000		50000		45000		
1993	63710	76846	52975	56960	71740	114476	
1994	55102	56766	50079	44529	92931	73885	
1995	39688	41650	89049	14223	47430	30200	
QUEBEC							
1988		81350	55692	39583	65415	89000	49397
1989		100000	72500	43710	78954	80673	50931
1990	71435	44647	48422	37403	53679	39150	48221
1991	39616	41695	46090	37425	63347	45000	49392
1992		30108	83455	32300	51995	48385	45438
1993	68572	68372	78979	50839	81186	135121	61569
1994	65152	74049	71130	67058	84878	68967	54870
1995	56254	54832	80140	72312	67878	78601	51623
ONTARIO							
1988	38681	72875	72173	60520		59533	
1989	33346	100000	77517	91866		64590	
1990	60174	73450	75048	57393		54470	
1991	63074	57135	55078	56258	58833	45767	100000
1992	10553	44767	43572	52364		53064	
1993	67076	85790	65123	83460	157332	81006	8160
1994	75251	63307	74571	73738	69067	56422	
1995	101831	60672	83197	87100	101983	74347	
WEST & NORTH							
1988			61410	56000			
1989	58350	67928	48456	33500			
1990	40080	32690	51692	40666		42942	
1991	41810	42215	55235	26775		52836	
1992	13314	70516	56580	23200		66825	
1993	63120	52840	45898	60960		72574	
1994	57635	54485	70539	68468		72403	
1995	55274	42617	44887	60213		47704	

TABLE E-3: VALUE OF CLAIM PER DOLLAR LOANED, ALL REGIONS BY LENDER								
	BNS	**BMO**	**ROY**	**TD**	**NAT**	**CIBC**	**Caisses**	**Means**
ATLANTIC								
1988	1.44%	0.00%	0.00%	0.00%	14.30%	0.84%	No Loans	**1.43%**
1989	1.44%	0.00%	4.86%	0.00%	8.99%	0.00%	0.00%	**2.18%**
1990	5.49%	0.00%	8.66%	0.00%	0.00%	0.00%	12.49%	**4.32%**
1991	3.67%	4.60%	12.91%	5.89%	20.22%	0.00%	0.00%	**5.70%**
1992	2.91%	0.00%	3.66%	0.00%	2.87%	0.00%	No Loans	**2.39%**
1993	2.09%	4.51%	4.26%	3.45%	4.36%	5.17%	0.00%	**3.30%**
1994	1.22%	2.44%	3.20%	3.91%	3.28%	4.55%	0.00%	**2.45%**
1995	0.71%	0.66%	3.13%	0.45%	0.57%	0.57%	0.00%	**1.19%**
QUEBEC								
1988	0.00%	3.95%	1.43%	1.88%	3.97%	3.87%	3.32%	**2.81%**
1989	0.00%	4.04%	3.62%	1.68%	5.35%	5.42%	3.33%	**3.62%**
1990	13.31%	8.26%	10.87%	9.12%	13.19%	2.43%	8.78%	**9.90%**
1991	4.89%	6.49%	10.70%	5.64%	14.85%	4.67%	11.68%	**11.44%**
1992	0.00%	3.99%	8.85%	3.46%	6.40%	8.40%	10.23%	**8.28%**
1993	5.33%	9.49%	12.59%	5.11%	12.75%	63.61%	9.47%	**12.14%**
1994	2.71%	7.52%	7.88%	9.76%	3.25%	5.12%	7.01%	**5.75%**
1995	2.38%	2.75%	3.30%	4.19%	0.40%	3.37%	3.20%	**2.54%**
ONTARIO								
1988	0.29%	1.91%	2.56%	0.89%	0.00%	0.35%	0.00%	**1.30%**
1989	0.39%	1.34%	3.47%	2.25%	0.00%	1.08%	No Loans	**2.04%**
1990	9.13%	9.61%	12.60%	8.11%	0.00%	6.29%	0.00%	**9.18%**
1991	6.87%	5.63%	9.50%	7.20%	16.21%	6.43%	42.83%	**7.67%**
1992	0.71%	4.74%	9.01%	8.08%	0.00%	4.95%	0.00%	**5.99%**
1993	2.93%	6.10%	8.15%	5.92%	6.05%	4.31%	0.16%	**5.44%**
1994	3.08%	4.22%	5.92%	6.33%	4.73%	1.72%	0.00%	**4.37%**
1995	1.38%	1.47%	3.67%	3.17%	2.47%	1.08%	0.00%	**2.20%**
WEST & NORTH								
1988	0.00%	0.00%	1.84%	0.21%	No Loans	0.00%	0.00%	**0.34%**
1989	0.61%	1.42%	1.87%	0.30%	No Loans	0.00%	No Loans	**0.85%**
1990	2.40%	2.89%	5.78%	3.44%	No Loans	2.73%	0.00%	**3.55%**
1991	2.65%	2.97%	7.23%	1.09%	No Loans	3.50%	0.00%	**3.76%**
1992	0.45%	2.16%	2.86%	1.03%	No Loans	3.07%	0.00%	**2.13%**
1993	2.19%	1.87%	3.56%	2.96%	No Loans	3.05%	0.00%	**2.65%**
1994	1.70%	2.25%	3.87%	2.89%	0.00%	3.37%	0.00%	**2.71%**
1995	0.53%	0.59%	1.30%	1.45%	No Loans	1.11%	No Loans	**0.95%**