HOW TO STRESS TEST YOUR CREDIT PORTFOLIO

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Understanding credit behavior (or any business) at the aggregate portfolio level is becoming increasingly important in an environment where competition abounds and management is under constant pressure to stress test baseline (business as usual) forecasts under a variety of conditions. The term *stress test* refers to applying different assumptions to your business' portfolio – especially in terms of anticipated economic conditions – to see their impact on demand, revenue, or expenses. In the credit world, significant emphasis is placed into predicting *charge-offs* because of the huge monetary impact it has on the company's financial status. "Charge-offs" refer to the dollars charged to consumer credit cards that are typically not paid within 120 days. An understanding of the financial risk associated with this type of behavior allows the issuer to set up strategies for accepting new applicants, better manage their current portfolio, develop more efficient collection policies, and decide which are the best territories for market expansion.

For example, what would happen to a portfolio's risk level if general economic conditions cause credit conditions to tighten? Drilling down further, the executive might want to know the impact of increased debt burdens over the next year on specific geographic areas. Besides using the corporation's internal data sources like delinquencies and credit scores as leading indicators of risk, it is often useful to have external sources that could capture trends and potential changes in economic conditions. Furthermore, understanding the portfolio at the geographic level can enable management to determine where to grow the portfolio, maximize profits, as well as when and where to implement conservative policies in future. The following discussion highlights how Equifax's Knowledge Engineering Division helps customers understand this behavior by developing a stress test simulation tool for strategic planning purposes.

PROCEDURE

Here is a step-by- step procedure for stress testing your portfolio:

Step 1: Collect data over time (at least two-three years by quarter) with respect to some level of geography – preferably at the state or MSA level. Data should include a balance of internal variables (variables under control of the firm like delinquencies, average credit limits, and average credit scores) and external factors such as variables reflecting general economic trends. Equifax, for example, has developed a database of geo-economic data aggregated at the MSA level covering every county in the U.S. In the example that follows, we are interested in predicting the charge-off rate for each of 231 MSA's defined as:

Charge-off Rate (%) =
(Charge-off Dollars / Outstanding Dollar Balances) %100

Where Outstanding Dollar Balances refer to the amount of money charged to a credit card within that MSA that has yet to be collected by the issuer.

Step 2: Estimate a pooled cross sectional time series regression model. "Pooling" here refers to combining all cross-sectional (MSA level) data that is available over time into a single regression equation. The basic idea behind using pooling models is that economic health is not only a time related phenomenon, but a relative one. For example, although the U.S. economy is healthy, it is part of a global economy that is currently experiencing economic difficulties. Likewise, within the U.S., some local geographies are outperforming the norm while others are under-performing. By evaluating these relative differences along with the typical changes we see over time, we can quantify reasons for the variation without collecting a long history of data that is often expensive or impossible to obtain. A good approach is the use of an estimation technique called Hetero-scedastic Time-Wise Autocorrelation Regression. Although the actual procedure is statistically complex, it produces an equation looking exactly like a textbook linear regression equation. Because of the nature of the estimation, it automatically corrects for problems such as heter-scedasticity and autocorrelation. These estimation techniques have been around for some time and are available in statistical software packages such as SHAZAM and SAS.

Often included in such models are dummy variables representing different intercepts for each MSA. Therefore, if the model covers 300 MSAs in the United States, there would be 299 dummy variables allowing us to write separate prediction equations for each MSA — all estimated within a single regression framework. For illustrative purposes, a typical model for predicting charge-off rates by MSA may have the following components:

Internal Variables (within the control of the issuer)

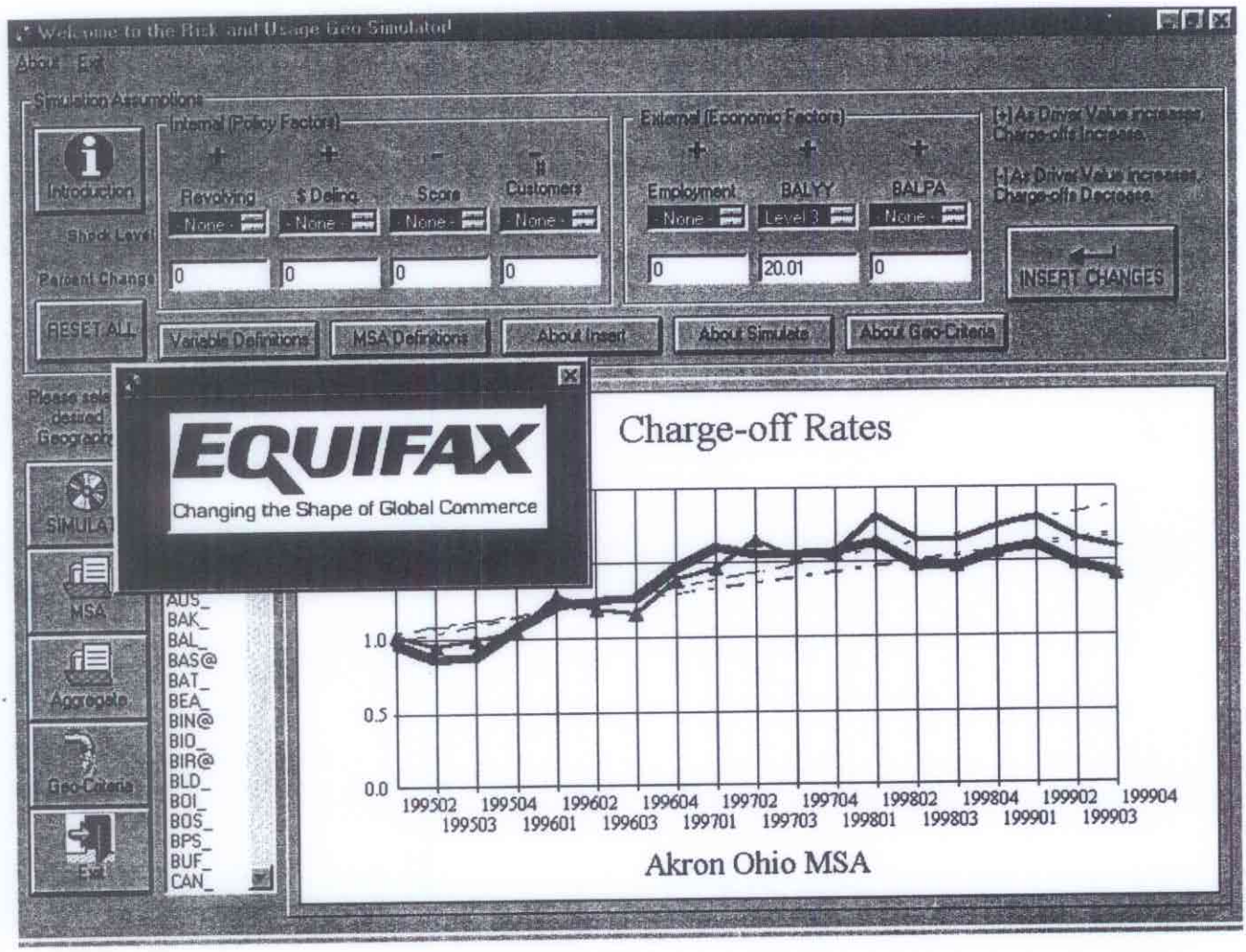
- Average MSA credit score
- Average MSA credit limit
- Average number of accounts within the MSA
- Average delinquency dollars per account within the MSA

External Variables (outside the control of the issuer)

- Average MSA debt burden across all industries (credit balances / disposable income)
- Average MSA 60+ day delinquency rates across all industries
- MSA level employment
- MSA bankruptcy rate

Step 3: Once the model has been estimated using both internal and external variables, a baseline (business as usual) forecast is

CHART 1



developed by multiplying the coefficients of the model by projected values of all the explanatory variables over time. The company's internal variables could be forecasted a number of ways — through univariate forecasting methods or simple trending approaches. Values for the external (economic) variables could be developed the same way or obtained from previously completed econometric projections.

Step 4: After the baseline forecast is developed, stress testing the portfolio simply becomes a matter of changing the values of the independent variables that comprise the equation and recalculating the forecasts. What should be the new simulation values for these variables? Although setting values is subjective, one approach for a recessionary stress test might be to determine benchmarks by calculating the standard deviations for each predictor about their means. These benchmarks would represent the variation of each variable across all levels of geography throughout the entire historical period. Let's say we make three benchmark levels for each variable in the equation. The first level might equate to the mean value plus 1/3rd of a standard deviation for debt burden. That may represent an increase of 5% for that variable. The second level might equate to adding 2/3 of a standard deviation to the mean, resulting in a 10% increase in debt burden. Finally, a level three benchmark might be to add a full standard deviation to the mean, creating a new value for that variable 15% higher. Once these percentages are developed, a level three stress test applied to debt burden for Atlanta could be developed by simply multiplying Atlanta's baseline forecasts for debt burden by 15% for each period in the forecast and recalculating the charge-off prediction using the regression equation. The difference between the baseline forecast and the stress test forecast is the impact of a recessionary scenario on charge-offs. Stress tests can be developed for a single scenario using one economic predictor, or a combination of scenarios using more than one economic shock variable.

CUSTOMIZING SCENARIOS & POLICY SIMULATIONS

Instead of using the standard deviation benchmarks, you might wish to select your own scenarios. For example:

- What would happen if we experienced changes in Debt Burden similar to what occurred in 1993?
- What would happen to our portfolio if the overall Employment increased at the same rate experienced in California in 1994?
- What would happen to our Georgia portfolio if the overall Bankruptcy Rate increased at the same rate experienced in North Carolina in 1995?

Internal (policy related) variables could also be stress tested the same way. This would be especially useful if the model included variables such as average credit scores, percent of new customers in the portfolio, and percent of the portfolio that had behavioral scores of 400 or less. For example:

- What would happen to our portfolio if we began an aggressive policy to increase the number of customers using our products?
- What would happen to our portfolio over time if we changed our front end approval strategies, reducing the risk levels from new customers?
- How would these changes flow through the portfolio over time?

The following is an example of how a simulation program might look using a real world example from the credit industry. The graph in Chart 1 compares credit issuer ABC's actual charge-off rate for Akron Ohio (abbreviated AKR) to what the model would have predicted over the historical period. In this chart, the line with the triangle markers represents the actual charge-off ratio for Akron over the period 1995 Quarter 2 - 1998 Quarter 1. The thick line in the middle of the chart represents the baseline projections over the historical period as well as the forecast horizon (1998 Quarter 2 – 1999 Quarter 4). The stress test variables available for the forecast simulation are shown at the top of the chart as:

Internal Factors

- Revolving (Percent of AKRON's Portfolio that represents revolving acccounts)
- #Delinq. (AKRON's Dollars 5+months delinquent divided by number of accounts)
- Score (AKRON's Average Credit Score – the higher the score, the lower the charge-offs)
- #Customers (Total number of accounts in the AKRON MSA)

External Factors

- Employment (AKRON's employment rate)
- BALYY (AKRON's Debt Burden, credit balances divided by disposable income)
- BALPA (AKRON's total credit balances)

Benchmark shock levels ranging from 0 to 3 were derived from the standard deviations of each predictor stated in percentage terms. For example, a level 3 shock to debt burden, BALYY, equates to a 20.01% increase in that predictor's value for every period over the forecast horizon. After entering these shock values, the user would click the Simulate button to recalculate new charge-off projections for the MSA. This produces a charge-off rate forecast greater than the baseline projections — results we would expect if we were to move towards a recessionary environment. In Chart 1, "forecast simulation appears above the thicker baseline graph, starting at the beginning of the forecast horizon. This particular application, called the Equifax Geo-Simulator, allows the user the flexibility to apply the stress test to a single MSA or globally across all MSAs. Once the changes to the stress factors are completed and the simulation is run, reports can be summarized at the corporate level to determine the overall impact of charge-offs on issuer ABC's credit portfolio. ■

REVENUE MANAGEMENT ...

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from a new front? You may be running a lean mean machine today and be history tomorrow if you are not selling the right product to the right customer at the right time for the right price.

To achieve sustainable volume growth, companies must adopt a much broader perspective. They must become less corporate-centric and more market-centric. The market, not the company, must become the center of the universe. For the past decade, too many companies have been concentrating on internal cost-cutting processes. It's time to focus on the external market and the revenue side of the profit equation.

Revenue Management is a single-minded effort to search out revenue opportunities that may not be readily apparent to others. In its most sophisticated form, RM is an exciting combination of marketing and technology, employing rocket science mathematics. The innermost working of Revenue Management focuses a company on profitable revenue growth. It helps your company understand consumer tradeoffs and achieve market domination.

RM PRACTICAL APPLICATIONS

On a practical note, RM is a micro-management tool that enables companies to run mountains of disparate marketing information into tactical intelligence, allowing them to take advantage of the short-lived opportunities of the market-place. RM is not a computer system, but rather an integrated set of business processes that combine people and systems with the goal of understanding the market, predicting customer behavior, and responding quickly to exploit opportunities that present themselves. RM is a strategy that can be used successfully at no-tech, low-tech, and high-tech levels.

What's most important is to adapt a Revenue Management program of appropriate size and scope. Whatever this