

Projecting Portfolio PERFORMANCE

Improved Diagnostics Become Critical in the 21st Century

by John R. Davies

Consumer loan portfolios, both secured and unsecured, comprise trillions of dollars of receivables globally. The accumulation of credit at this scale is a relatively new phenomenon and the annual losses from these huge pools of assets run in the billions of dollars. For the large portfolios, losses can exceed one billion dollars even in a normal year.

Despite these conditions, the consumer lending business is still very profitable. But history has shown that when the economy cycles downward, the risks to portfolios can become very large. For example, in the early 1990s when the economy and many financial institutions were in trouble, the unsecured Citibank Card portfolio began to move incrementally in the wrong direction at the same time the mortgage business was taking a large loss. Card profit was notching down from its typical \$1B+ towards \$500m, and the write-offs were moving from their typical \$1B+ towards \$2B. Had the economy not turned when it did, it is not clear how long Citicorp would have survived. With John Reed's leadership Citicorp made it through that difficult time by significantly cutting expenses and taking other aggressive measures such as selling businesses.

The ability to understand what is going on within portfolios and what that portends for the future has become essential. Just as portfolio effects in bonds or equities have been harnessed by modern finance, the time has come to better understand and predict the future dynamics of large consumer portfolios. Yet today there are few comprehensive tools that address this area due to modeling complexities. Portfolio risk modeling for commercial loans and corporate securities has seen several breakthroughs: RiskMetrics, the McKinsey model, and KMV come to mind. Meanwhile portfolio modeling for consumer portfolios remains a challenge, just as the consumer loan business has reached a point of maturity and scale that impacts the entire global economy. Experience tells us that portfolio performance is affected by:

- Economic cycles
- Seasonality
- Actions taken by portfolio managers, marketers and system operators
- Customer response to opportunities, requirements and limitations of their credit relationships
- Domestic and international fraud
- Competitive product offerings.

Today new effects have entered the scene and have expanded this list. Technology advances and global politics make consumer credit portfolios and customers associated with them vulnerable to dangerous attacks, which are costly whether mischievous, crim-



Signals

Segment-level Portfolio Behavior and the Science of Forecasting: Current Practice and EMERGING PROMISE

Consumer portfolio analysis occurs largely along familiar lines:

- Total portfolio results (the p&l)
- Segment analysis for channels or sub-products
- Vintage analysis, a form of segmentation
- Account-level or very small cohort analysis.

While forecasts are often derived and reported at such levels, we contend that projections become much more accurate when the underlying portfolio segmentation is tailored to the forecasting problem. A more rigorously defined segment analysis delivers a better understanding of the portfolio, its likely direction and its potential reaction to shocks. Such understanding assists senior managers to make decisions anticipating expected future returns, economic capital requirements, response to competitive threats and other strategic issues.

Despite the promise, few organizations pursue segmentation as a means to achieve better visibility and forecasting accuracy. Most often the choice of portfolio segmentation for forecasting is driven by preferences for familiarity or a corporate-reporting process that emphasizes product or channel. But with corporate commitment to new analytic technology, segmentation optimized for forecasting can deliver on its promises, particularly in the realm of risk-adjusted profit, portfolio predictability, early warning, and the pursuit of beneficial portfolio effects that reduce volatility and increase value.

Outlined below are current industry approaches to segmentation from the most basic practice to the emerging frontiers, examining the promise and potential pitfalls that can occur when segmentation meets the forecasting problem.

Segmented analysis allows managers to view the portfolio at an acceptable and sometimes intuitive level of aggregation. Common practice finds portfolios sliced along certain management realities of running the business: existing or historical partner channels, large portfolio acquisitions, and product or program features. Many segmentation schemes in use today are based largely on

origination channel (e.g., broker vs. branch-source), or reflect product types. Others reflect geographic location of customers or branch locations, which can be tapped to reflect variation in local economic conditions. While these segments can often deliver fine forecasts for some portfolios, they can also result in over-segmentation if your forecasting goal is to understand issues with a low event rate like charge-off or bankruptcy.

Analytically-based segmentation schemes typically support customer-level decisions and associated management information structures in consumer credit marketing and risk. On the risk side, segmentation is frequently influenced or created directly from score bands or some other measure of credit quality such as loan-to-value in real estate loan portfolios. These actions can be useful for credit analysis but often do not address issues of portfolio value or the timing of losses (sidebar, right). Similarly, marketing segmentation methods such as lifestage, demographics, and psychographics look to optimize contact, response and utilization rates but are not often employed beyond the point of origination.

Ultimately, any forecast benefits greatly from the identification of groups of customers or accounts exhibiting different timing of lifecycle events and divergent responses to environmental conditions.

In response to the credit risk and marketing-centric views illustrated above, institutions have developed profit and behavioral-based segmentations to try to identify, originate and develop high-value customer relationships. This is a sophisticated approach that requires excellent customer understanding and good information on internal costs and in some cases a total view of the customer relationship. While a value-based segmentation can provide a better answer, there can be issues with their robust application. One still runs the



Watch out when using credit scores to drive a forecast!

Most credit and behavior scores are ordinal (or rank order) measures of behavior. In other words, a score is simply a relative indicator of the likelihood of a future outcome. This is a powerful feature from the standpoint of score stability (one can feel confident that customers scoring 720 will always have less risk on average than those scoring 620 regardless of the environment), but a score does not by itself indicate the likelihood or magnitude of an event. The industry has relied upon “score-odds calibration” to align scores with their observed (historical) probability of occurrence, and this is one area where portfolio managers should exercise care and examine all assumptions in order to avoid surprises.

For instance, most credit scores are built from “ever-60+” (the odds that an account will become 60+ days past due) delinquency data measured over the past 18-24 months. That fact and sound engineering of the component parts will give it good stability but the period evaluated is often too short to encompass important lifecycle events. Thus a measure such as “ever-60+” potentially masks important segment behavior that can make a large impact on a growing portfolio, and won’t say much at all about how the losses will come in over an extended period of time, or how such loss patterns will vary across groups of customers.

Figure 1 (above right) illustrates a potential distortion

risk that some selection bias has occurred in developing the segmentation (and therefore the forecast) based on economic influences or reliable readings on the quality of originations.

For each of the segmentation strategies outlined above, a good understanding of the moving parts in a portfolio—parts like variation in origination quality, stability of the customer lifecycle, and the positive or negative bias introduced by economic conditions—brings clarity to historical portfolio performance. Each of these moving parts has unique patterns or signals as they occur in portfolio histories and as they project into the future. For accurate portfolio forecasting, the moving parts are not an annoyance but should be viewed as authentic contributors to a comprehensive picture of the portfolio going forward.

Advanced analytical and optimization techniques found in Strategic Analytics’ Dual-time Dynamics

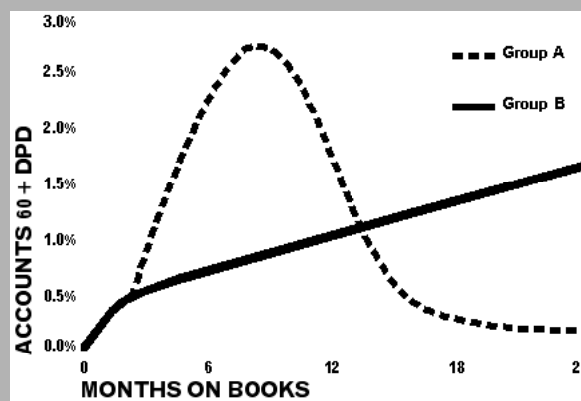


Figure 1 - Credit performance dynamics for two groups with similar credit scores

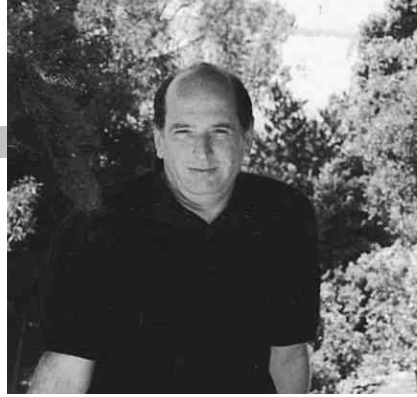
of this kind. Both Group A and Group B segments have the same average credit score—after 24 months of experience, both groups will register the same total level of delinquency. Yet, the portfolio implications of booking one group over the other could be striking. For example, if you choose to originate the majority of your new accounts among Group A, you had better understand the potential for early losses associated with this strategy. This example also has ramifications for pricing, since on a net present value basis Group B customers are more valuable if you look beyond 24 months. If you were relying on credit score alone as a proxy for loss (especially *timing* of loss) you could also be in for a surprise. More fundamentally, any sound forecast of the aggregate portfolio would have to recognize the fundamentally different loss patterns of the group, and ideally how those loss patterns might be affected by environmental or economic shifts that most certainly will occur. ○

(DtD) technology can help identify and quantify the moving parts of a sound portfolio forecast. Coupled with the adoption of a segmentation strategy specific to the forecasting issue at hand, the combination delivers unrivaled portfolio visibility. For example, segments of customers sensitive to the influence of economic changes, and customers not as sensitive can be identified, allowing the forecast to reflect the very distinct impact economic changes will have on future portfolio performance. Ultimately, any forecast benefits greatly from the identification of groups of customers or accounts exhibiting different timing of lifecycle events and divergent responses to environmental conditions. This dynamic clarity is at the heart of DtD’s contribution to the forecasting problem.

So what is the bottom line for having an “optimal forecasting segmentation” and better portfolio predictability as a result? Portfolio intelligence, that is,



Patrick CULHANE



Great architecture, acclaimed design, an unwavering dedication to professional standards. These are the first themes that come to mind for anyone who knows Pat Culhane, a key advisor and mentor to Strategic Analytics. Pat's impact on SA has been broad ranging, often focused on the message and style SA uses to communicate with the client community in banking and consumer lending.

Pat's involvement was eagerly sought by SA's founders, who recognized him as someone who shares their core principles of client focus, technical excellence, and creative analytic solutions. Pat's emphasis on sound structure and harmonic design elements underscores his careful yet inspired approach to delivering top-shelf products and services.

ROLE AT SA: In addition to his part-time duties as editor of *Signals*, Pat has contributed to the company's efforts to develop clear and consistent messages for markets, clients and investors. His network and industry experience has been invaluable for the company's development.

BACKGROUND: Pat has an M.S. degree in Statistics from Stanford University. Following a seven year tour with British Petroleum in the area of reserves estimation, Pat joined Fair, Isaac and Company in 1985. During a fifteen-year career there Pat developed Fair, Isaac's credit bureau scoring product line, and in his last five years managed the Financial Services practice worldwide. Today, Pat is engaged as an independent consultant by the marketing and planning organization at Providian Financial.

CLIENT PHILOSOPHY: SA has gained most from Pat's unremitting focus on the client. His early advocacy in this regard had a natural resonance with others at SA. Client focus, as a result, has become embedded as a core company philosophy.

HOBBIES: Pat's keenest obsession revolves around his homes in Northern California, where he can demonstrate his passion with form and function through his command of design. In particular, Pat is an important collector of Arts & Crafts furnishings and other period pieces of this distinctly American design movement. In his spare time he heads to the mountains to ski, boat or just relax at Lake Tahoe.

Pat's emphasis on sound structure and harmonic design elements underscores his careful yet inspired approach to delivering top-shelf products and services.

Also, since leaving Fair, Isaac, he has been on a quest to authenticate a set of rare postage stamps emanating from Hawaii in the 1850's—a quest involving extensive research work in Hawaii, at Rutgers University, and at London's British Library.

Pat's involvement in the community includes his current work as Chair of the Marin Board of Managers of the YMCA, and participation in the non-profit's Bay Area activities. ○

SA PRACTICES (cont.)

knowing how the portfolio will perform under different conditions and scenarios, gives the institution a better handle on capacity planning in collections, a clear picture of economic capital requirements and resulting investment decisions, and the ability to better forecast account groups used in securitization tranches. This next frontier in portfolio analysis ties

sophisticated measures of segment value directly to an ability to predict behavior accurately over the customer lifecycle and across economic cycles. Portfolio managers will then know with more certainty which levers to pull and which knobs to turn in order to move the portfolio in a given direction: toward higher value. ○

inal or terrorist in nature. Privacy and information security for consumers is being seriously challenged. The attacks, in turn, have created increased volatility in fear and greed, further affecting consumer behavior.

Over the years there have been several “quantum leaps” in the level of analytical sophistication brought to bear upon the management of consumer loan portfolios. Although Henry Wells of Spiegel is typically cited as having deployed the first credit model in the late 1940s, scoring did not gain widespread use until Bill Fair and Earl Isaac entered the field in the early 1950s. Even then it was slow going. By the 1970s behavior scores began to catch on, accompanied in the '80s and '90s by the widespread use of account management software to enable a more effective use of scores and an unbiased assessment of the impact of account management and acquisition strategies on portfolio performance.

In the late 1980s and early 1990s non-linear algorithmic techniques, and in particular neural networks, nearest neighbor algorithms, and genetic algorithms were being considered for operational use for fraud and bankruptcy detection, as well as other areas of behavior prediction and forecasting previously considered intractable. At Citicorp/Citibank we were working to deploy the first neural networks for credit card fraud detection. Given the economic conditions at the time, Card managers were not of an early-adopter mindset. Despite very strong early R&D results, we could not move forward.

During that same period Citi’s Advanced Technology Group worked with leading figures of academia and business including Brian Arthur and John Holland of the Santa Fe Institute, Peter Fry of Northwestern, and Alan Jost of HNC. Their early efforts led to new teams at Citibank focused on using emerging non-linear behavior analytic techniques. As the industry matured in the use of these non-linear science areas, commercially viable tools became available. Today, it is unthinkable for an organization to be engaged in consumer financial management, especially in a market as sophisticated as the US, without deploying these tools.

Consumer loan portfolios, in the context of the emerging global economy and related politics, require a thorough understanding of the underlying fundamentals for their effective management. It is critical that people responsible for these consumer portfolios develop and implement the ability to dynamically forecast every possible determinant of portfolio risk going forward into the 21st Century.

A timely understanding of value enhancing and value destroying strategies in the markets where an institution operates is critical. For example, strong capabilities are required to:

- Identify accurately high-risk situations while they are emerging
- Recognize unusual underlying market characteristic dynamics
- Evaluate the true potential and risk of a business.

Where these capabilities are available, key proactive actions can be taken to:

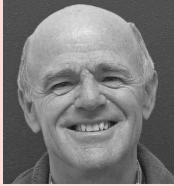
- Uncover situations where reported results are being “managed”
- Proactively address situations where managers may be either too cautious or too optimistic in their forecasting
- Bring rigor to the budgeting process
- Detect emerging illegal activities, e.g., fraud and mischief
- Avoid embarrassing public performance announcements.

Strategic Analytics has developed an operational, unbiased assessment of exogenous impacts upon portfolio performance that is cleanly separated from maturation effects or changing originations quality. Using this technology each determinant of portfolio dynamics is continuously evaluated looking for patterns and emerging characteristics. Accurate forecasts are now possible by using a portfolio’s unique experience and behavior in accurate simulations taking the portfolio through various scenarios. These scenarios use the best practice and expertise of key management, marketing, operations, and treasury people responsible for the portfolios.

Analysis of this kind has not been possible historically. Only over the past decade have combined efforts in technology and business resulted in such innovative approaches yielding operational solutions. The timing could not be better given the current state of both the value of the global consumer loan business and the state of global security. ○

John Davies

works with technology companies (including Strategic Analytics and Metacerebra), venture firms, and scientists to address critical emerging business needs and opportunities.



John co-founded Center for Adaptive Systems Applications (CASA), a for-profit research and development corporation dedicated to solving practical industry needs using complex adaptive systems. He has recently served on the Los Alamos National Laboratory External Advisory Board, a group dedicated to facilitating the commercialization of New Mexico’s extensive science and technology base. He is also a board member of the Los Alamos Commerce & Development Corporation.

John resides in New Mexico, spending much of his time researching family history and thinking about how advanced simulation techniques might be applied to this field.

SA's Joseph Breeden to Speak at Seventh Annual RMA Retail Risk Management Conference

One of the marquee risk management conferences in the US, the RMA Retail Risk Management Conference will be held this year in Chicago on June 3rd and 4th. The conference has been developed by and for consumer risk, review, and lending professionals. It brings together consumer-credit-risk individuals, product managers, and business-line heads to consider topical issues and the most effective means for managing risk for maximum return. During the event respected industry leaders will be addressing topics such as:

- Drivers behind the consumer lending environment, now and over the next few quarters
- Leading-edge practices for managing consumer risk
- Key insights and perspectives in measuring and assessing credit quality
- Regulators view of the consumer credit market and bank portfolios
- Technology in consumer credit.

Among the invited speakers will be Joseph L. Breeden, President and COO of Strategic Analytics. His talk, "An Overview of Forecasting Tools—How Are They

Changing?" will focus on current forecasting methodologies, problems and successes, and the promise of new technologies. Other industry leaders scheduled to speak are Maurice H. Hartigan II, President and CEO of the RMA; Darcy Walker, recently SVP of Credit Risk at Discover Financial Services; Diane Swonk, Chief Economist at Bank One; and Steven Alexander, EVP at FleetBoston Financial Group.

RMA, Risk Management Association, is one of the leading risk management organizations in the world with over 16,000 professional members. Their strong focus on risk management has prompted *American Banker* to describe RMA as "the trade group responsible for guarding credit quality and promoting risk management." For information about the conference and to register, visit RMA's website at www.rmahq.org.

SA Featured in *American Banker*

Strategic Analytics' Joseph Breeden was interviewed for an article appearing in the April 1, 2003 issue of *American Banker*. The article, entitled "Portfolio Trend Readers Get Wider Following" discusses the emerging business of portfolio forecasting. Subscribers to *American Banker Online* may access the article at www.AmericanBanker.com. A reprint of the article may also be found at www.StrategicAnalytics.com.



Strategic Analytics
3900 Paseo del Sol
Santa Fe, NM 87507

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email: signals@strategicanalytics.com
or phone: 505-438-9501

Editorial Director Patrick Culhane **Copy Editor** Barbara Riley
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