Customer Lifetime Value in Banking

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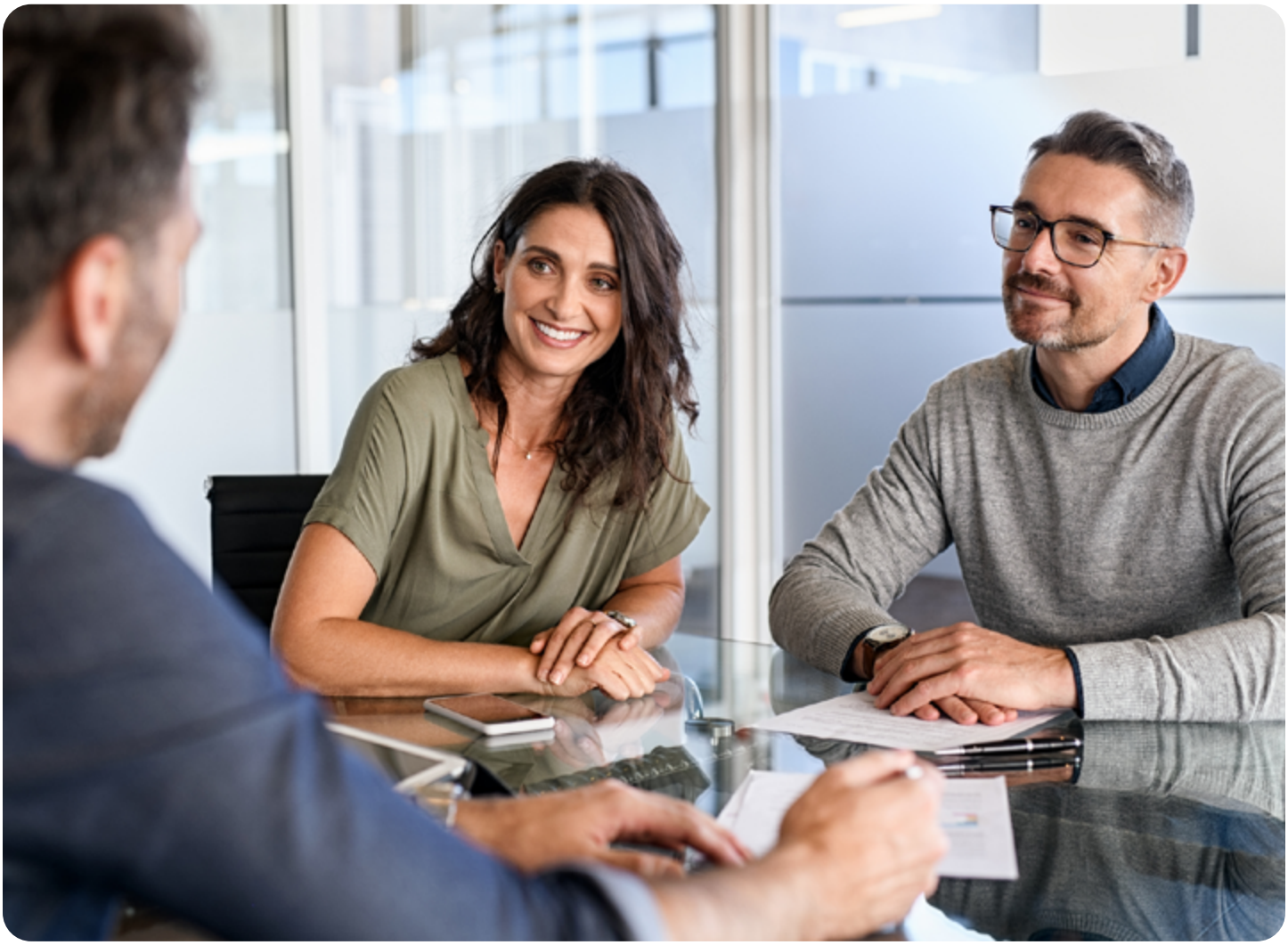

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Background

In “The Customer Centricity Playbook,” Wharton marketing professor Pete Fader relates how the development of the customer lifetime value (CLV) model begins with very basic questions: “Can we project how long the customer is going to stay?” and “How much is the customer going to spend over the time horizon?” In a banking context, CLV identifies the total net revenue attributable to a customer over the life of the relationship, carefully considering the breadth and depth of product usage and the marginal costs directly attributable to customer behavior.

Teradata believes that a holistic customer-centric measurement of value is essential for banks to directly enumerate the economic benefit of their strategies and tactics to cultivate relationships with their customers. Developing and deploying a robust and actionable CLV program requires the integration and harmonization of multiple data sources stored in many formats, including customer financial performance, product usage and channel activity, which is the type of workload where Teradata excels.

Definitions

Customer

A customer is defined by the relationship between the bank and a natural person (Joe Smith) or a legal person (Joe's Bar & Grill, LLP), as articulated in the account holder agreement. A valuable conceptual model of bank and its customers is the "party/identity model," where the party is a natural person and the nature of their relationship to an account is their identity.

Ultimately, a bank seeks to label each natural person with a numeric identifier, often called an "enterprise customer number," and which is derived from the superset of account ownership records. A common practice in the U.S. is to leverage the taxpayer identifier numbers of account holders, which are both exogenous to the bank and carefully maintained, to synthesize an endogenous enterprise customer number.[1]

Product

A product is the bundle of services and capabilities provided by the bank to address a financial need. As recognized by financial regulators, there are eight distinct product types: checking, savings, retirement, credit card, vehicle loan, mortgage, investments, and insurance. The organizational model of traditional banks is oriented around products and not customers.

Service

A service allows a customer to take advantage of a feature of a product. Generally, customers must subscribe to a service linked to an account within a product. For example, online bill pay is a service that allows customers to authorize scheduled payments for remittances. As it must be linked to a checking account, a debit card is also a service. The adoption and usage of services play a large role in value creation for bank customers, but they are always conditional on the adoption of an account within a product.

One tactic to increase the likelihood of deposit customer retention is to promote "services upsell" by extending the customer's enrollment to allow online bill payment, online wires, person-to-person payments, or the ability to view credit scores. While usage is paramount, enrollment in an additional service promotes customer retention.

Customer lifetime value defined

Given that traditional banks are organized by line of business, the initial focus at banks is often to develop lifetime value at the product level that utilizes a survivorship curve based on account data. The product lifetime value approach is ultimately self-defeating, as the life of a product, such as a credit card, is correlated with the survivorship of a checking account. Customers have a relationship with the bank that is realized via their product holdings, and the adoption and discard rates of products are not independent.

The CLV model is a framework to identify the economic contribution of individual customers in current and future periods. Customer lifetime value is a discounted cash-flow analysis of customer profitability forecast over the customers' expected future life, discounted at the bank's target return on equity. Robust measures of CLV carefully assess the likelihood of future period product expansion as well as the potential to increase the intensity of usage of current products.

1. Gary Class, "Customer in Five Dimensions," Teradata, 2024, https://www.teradata.com/insights/white-papers/customer-banking-relationship-in-5-dimensions.

Customer attrition model

The development of a comprehensive, predictive, and robust model of customer attrition is foundational for the successful estimation of customer lifetime value.

In banking, customer attrition is driven by the breadth of product holdings and the depth of product usage as dimensioned by payments intensity and channel usage. Fortunately, ClearScape Analytics® enables the development of a customer attrition model leveraging econometric methods, such as logistic regression, or tree-based methods, such as gradient-boosted decision trees. Logistic regression has the benefit of estimating coefficients that are directly interpretable and amenable to simulations.

Definition of attrition

Please recall that a customer is defined by the relationship between the bank and a natural person or legal person as articulated in the account holder agreement. Given the dependence on account ownership, it can be difficult to determine when an individual customer no longer has a relationship with the bank. It is optimal to define attrition using a business rule driven by a binary logic, such as that customer attrition occurs when the distinct customer can no longer be found to be associated with any open account. Diminishment in the breadth and depth of product usage, or "stealth attrition," is a valuable leading indicator of future period customer attrition, but is not customer attrition, per se.

Performance window

The next methodological issue to resolve is the length of time before the event that the bank should attempt to predict customer attrition. This interval, or performance window, should not be so brief as to introduce volatility nor so long that it cannot provide the bank guidance for near-term intervention. The consensus view is that a six-month performance window is optimal. The goal of the customer attrition model is to predict the likelihood that a customer will attrite, or close all of their accounts, in the forthcoming six months.

Product

The type of financial products that a given customer requires is determined primarily by the age and number of their dependents, including themselves, if they are the primary wage-earner. A type of Maslov's hierarchy exists in the household financial portfolio, evolving from daily transaction activity to long term retirement planning.

It is important for a bank to harmonize product classifications into a product catalogue that will allow a robust identification of product for the development and deployment of predictive models. One approach is to aggregate all the accounts into a hierarchy of 16 or, ultimately, eight distinct product types.

The unique combination of the distinct product types describes the breadth of financial needs that is being met by the bank and is the "secret sauce" in successfully predicting customer attrition; the broader the set of product types held by the customer, the greater the likelihood of retention.

Channel usage

Channel is the functional way in which banks facilitate the usage of the products held by their customers. A traditional metric of client value in marketing is the recency, frequency, and monetary value of purchases with the firm. To measure the intensity of channel usage, we can envision a similar approach that focuses on the recency, frequency and functionality, or the type of customer task that the customer is attempting to resolve in the channel.

The adoption and usage of digital banking channels is influenced both by the bank's ability to deliver high-order functionality in the digital channels and by the appetite of the customer to manage their account through a digital channel. The more intensively that a customer uses digital channels, the greater the likelihood of retention. Digital channels provide temporal convenience and facilitate direct and immediate control by the customer in the resolution of their banking task.[2]

2. Gary Class, "Customer Journey Analytics", Teradata, 2024, https://www.teradata.com/resources/white-papers/customer-journey-analytics-in-banking.

Payments

We can describe payments as the transfer of funds from one party to another in exchange for goods or services. Payments are the movement of money from one person to another (interparty) from one bank to another (interbank) to facilitate economic activity.

Payment instruments are a standardized mechanism to move funds between banks and are, in most countries, the exclusive province of the regulated banking system. Payment instruments in the U.S. include currency, check drafts, ACH interbank clearings, debit card, credit card, and wires. For customers with a checking account and or a credit card, the breadth and depth of payments instrument usage is an important indicator of customer engagement.

In practice, we find that it is important to split the customer base into customers who hold a checking account from those that do not. The intensity of usage of checking accounts and the voluminous "digital exhaust" that this usage generates allows a more precise prediction of future period customer attrition.

Teradata has a strong commitment and robust capability to help banks realize a true multidimensional view of their customers. Banks face a herculean challenge to acquire, integrate, and harmonize disparate customer data. QueryGrid® provides a unique capability to process data wherever it resides in the organization, including data stored in open file formats.

Survivorship curves

An important dimension of understanding customer attrition is to harvest historical data to produce a survivorship curve of customers over time, ideally over a 10 or even 15-year horizon. These survivorship curves can then be reported by the base period customer attrition model score deciles to produce a survivorship curve that is a highly accurate forecast of attrition at the distinct customer level.

Back-testing reveals that a well-specified and estimated customer attrition model will identify very accurately the future period retention of customers as the model is sufficiently sensitive to the small changes in customer behavior that impact customer attrition. While the point estimate of the propensity of the customer to churn is extremely valuable for many tactical applications, it is convenient to group the customer base into deciles based upon the likelihood of attrition for strategic analysis.

Exhibit A: Data sources required to identify customer lifetime value

Domain	Key Components			
Customer	Consumer, business or both	Demographics	Geography	Life-stage segment
Product	Account holdings	Tenure types	Product category	Unique product holding
Channel	Digital	Physical	Telephony	Customers task with journeys
Payments	Bank instruments	Debut and credit card	Person to person	Payment instrument preference
Risk	Account metrics	Credit bureau	Behavorial scor	Credit score
Marketing	Permission	Messaging	Campaign history	Next best action

Source: Gary Class, "Customer Banking Relationship in 5 Dimensions," https://www.teradata.com/insights/white-papers/customer-banking-relationship-in-5-dimensions, 2024.

Customer profitability definitions

Customer profitability is the net revenue of current products less the direct cost of product usage. In banking, revenue is largely net interest margin, or the difference between interest income and interest expense, and fees.

Retail banking is a "90-10 business," where 10% of customers account for 90% of the profits; most customers hover around zero profit and subtle differences in behavior—notably the breadth and depth of digital channel usage, materially impact customer profitability.

As the identification and allocation expense for overhead and taxes can be complicated and controversial, it is beneficial to calculate customer "profit contribution," which is analogous to "operating margin" in retailing. Profit contribution is defined as allocated direct revenue (net interest margin and fees) less direct costs (allocated credit losses and marginal cost of channel usage), calculated on an annualized basis.

In practice, it is prudent to decompose the customer base into two groups based on whether the profit contribution is positive or negative, with the latter conditioned on the expected time before the customer's profit contribution becomes positive.

Exhibit B: Definition of contribution

	Revenue	Description
Plus	Net interest income	Net interest income less non-interest expense by balance within product
Plus	Non-interest income	Fees from deposit accounts, loan originations, and wealth management
	Expense	
Less	Allocation for loan losses	Reserve based on probability of default and loss conditional on default
Less	Product costs	Functional marginal cost within product
Less	Allocation for channel activity	Marginal cost of activity within channel
Equals	Contribution	
Less	Taxes	Effective marginal tax rate
Equals	Contribution to profit	

Revenue: Net interest margin

Net interest margin is the interest earned on assets less the interest paid on liabilities, relative to the total amount of interest earning assets. Lending long and borrowing short is the classic model of banking; net interest margin typically accounts for most of a traditional bank's total profits.

To understand the performance of each line of business, banks employ a transfer pricing scheme known as "matched maturity cost of funds" to apportion the bank's net interest margin between earning assets, such as loans, and funding sources, such as deposits. This approach allows banks to identify interest rate premiums and the economic benefits of low or zero cost funding sources, like demand deposit accounts.

The treasury of the bank first establishes the yield curve by plotting treasury market interest rates by tenor, or maturity. The next step is to identify the bank's marginal borrowing cost by maturity in the marketplace. The bank's treasury will then decompose the bank's overall performance into a net interest margin for lending and for deposit gathering, as reflected in Exhibit C.

Revenue: Fees

Fees can be either recurring, such as the monthly statement fee, or intermittent, such as overdraft fees driven by customer activity. Mapping fees via the account to customers can be tricky and banks need to focus on collected versus assesses fees, as the latter can be automatically reversed if the account meets fee-waiver conditions, such as minimum balance requirements.

Costs: Allocations for loan losses

For individual accounts within most credit products, there is no attempt by the bank to identify the likelihood of loss specific to the distinct account. Banks assess the probability of default and loss conditional on default at the product level using models predicated upon the bank and industry experience.

A prevailing methodology to assess a period cost for loan losses is to express the probability of default and loss conditional on default on an annual basis, considering the expected life of an account within the product type. The best practice is to index this annual expected loss on the distinct customer's actual tenure of the account for the credit product.

Exhibit C: Net interest margin

Matched maturity costs of funds transfer pricing methodology						
Customer	**Borrower** Borrows $100K for three years, paying 4.55% interest				**Depositor** Deposits $100K for one year, earining 1.15% interest	
Funding	Consumer credit	< $100K for three years	Treasury	< $100K for one year	Retail deposits	Bank
Net interest margin	4.55%-3.30% =1.25%	< charges 3.30% for three year money	3.30-2.10% =1.20%	> credits 2.10% for 1 year money	2.10%-1.15% =0.95%	1.25+1.20% +0.95%= 3.40%

Costs: Product costs

The bank can estimate a functional cost for each product type that includes routine activities, such as statement mailings, that are not driven by customer behavior but is rather an artifact of the account agreement.

An important consideration is how to account for the bank's costs in providing payments that are not related to bank channels. As traditional payments instruments are displaced with digital payments, the volume has declined but the identification of these costs is still important to assess profitability. The most challenging task for the bank is how to allocate the cost of fraud mitigation and materialized fraud losses; generally, these fraud expenses are allocated as an indirect cost to the generic product type.

While it is important to consider the alignment of customer economic value to the bank's overall marketplace value by considering the allocation of all costs, including overhead, to individual customers, it is more practical to focus on the marginal costs that vary due to the behavior of the customer themselves. Expenses related to the legal and human resources departments of the bank do not vary by the activity of individual customers.

Annual contribution to profit should be identified after taxes. Each bank computes their own combined effective tax rate, which accounts for state and local taxes as well as corporate federal taxes.

Costs: Allocations for channel activity

On the expense side of the ledger, the single most important determinant of customer profitability is the customer's breadth and depth of channel usage. Historically, the very large costs related to channel usage were allocated generically to product types by the average monthly volume of channel activity (for example, the assumption that the average checking customer calls the bank once per month with an estimated cost of $5 per call). However, these averages at the product level disguise the true economics of customer channel usage as the incidence rate, extensive margin, and marginal cost of channel interactions vary greatly on a customer basis. The investment in collecting and organizing channel interactions data by customer by time allows an extremely robust channel cost allocation methodology.

The cost allocation of the branch and ATM network should align with how customers envision the benefit: first, a direct "activity charge" based on the marginal cost of the teller and banker time consumed by the customer in resolving a customer task, and second, for the residual costs not allocated directly to customer interactions, an "access charge" spread across all of the primary patrons of the branch.[2]

2. Gary Class, "Customer Journey Analytics", Teradata, 2024, https://www.teradata.com/resources/white-papers/customer-journey-analytics-in-banking.

Estimating customer lifetime value

The availability of a robust prediction of attrition plus a detailed estimate of the profit contribution for each customer are critical initial conditions for the assessment of customer lifetime value. Next, we need to extend these initial conditions to project value over future periods using discounted cash-flow analysis, which requires several important considerations.

Discount rate

Corporate finance theory indicates that a firm's cost of capital should be used for discounted cash-flow analysis.[3] Given the unique capital structure of a bank, the bank's cost of capital is the bank's target return on equity, as determined by the capital asset pricing model. To ensure adoption of the CLV model, it is important to work closely with the bank's chief financial officer, who can provide the bank's target return on equity or an alternative approved discount rate for cash flows.

Planning horizon

An enabling step to complete the estimation of CLV, where lifetime can refer to 30 years or more, is to focus on understanding customer value over a shorter planning horizon, say the next five years.

A recent paper authored by a team from National Westminster (NatWest) Bank presented a general framework for modeling customer lifetime value, which may be applied to industries with long-lasting contractual and product-centric customer relationships, of which retail banking is an example. "Whilst longer time horizons for predicting CLV were preferred, a decision to predict CLV for 5 years was made to balance longer prediction horizons with predictive performance."[4]

An incremental step in the development of a complete CLV is to forecast the "customer contribution to profit" for the five-year planning horizon and use the bank's hurdle rate for investments to discount the future period cash flows. With an appropriately high discount rate applied to the future period cash flow, this first five-year calculation will account for the majority of the average customer's CLV, so it is prudent to focus on accurately forecasting the first five years of cash flow.

Decaying annuity and terminal value

Unlike many other types of business enterprises, banks often have long-term relationships with the "natural persons" who are their retail customers and relationships that span generations with the "legal persons" who are their business customers.

To make the calculation of CLV tractable, it is prudent to constrain the time-period for the calculation to a maximum of 25 years. Rather than forecast the cash flows for each of the "out years," we can approximate the value contributed by years 6 to 25 with a terminal value calculated in year 6. The terminal value cash flow is estimated by a decaying annuity, discounted by the bank's hurdle rate. A decaying annuity is a closed-form mathematical expression that requires three assumptions: the maximum remaining life, the geometric mean annual customer attrition rate for the "out years" 6 to 25 and an assumption about the growth rate, if any, of the profit contribution for those years.

Customer lifetime value

We have now identified all the necessary components to calculate CLV as the discounted cash flow of customer profitability cast over the customers' expected future life discounted at the bank's hurdle rate for investments.

3. Franco Modigliani and Merton Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," American Economic Review, 1958.
4. Greig Cowan, Salvatore Mercuri, and Raad Khraishi, "Modelling Customer Lifetime Value in the Retail Banking Industry," 2023.

Validation of customer lifetime value

Conceptually, the sum of CLV across all customers should approximate the market value of the bank. This approach is congruent with an effort to integrate bottom-up customer valuation with top-down corporate valuation by academics such as Peter Fader and David McCarthy. These same principles can be applied to customer valuation in banking: "the valuation of customer loyalty in marketing science was largely disconnected from financial economics; the emergence of digital subscription businesses fueled interest in linking the value of a firm's customers to the overall value of the firm, as indicated by the emergence of the term customer-based corporate valuation."[5]

External financial validation

It is important to calibrate the internal estimate of CLV with external value benchmarks that reflect the marketplace assessments of bank customer portfolios. Leveraging the classic "make or buy" paradigm, a bank's calculation of CLV can be validated by analyzing small bank acquisitions, divestitures, and branch acquisitions in the marketplace. One performance metric for a make-versus-buy comparison is the "premium on deposits," or the adjusted purchase price expressed as a percentage of the total acquired deposit balances. The external premium on deposits can be directly compared to an internal metric calculated by taking the total CLV of the acquired customer base divided by the customers' total deposits.

Customer equity

To align with the overall value of the firm, an extension of CLV expands beyond the current and future value of existing customers to consider the value of potential future customers, a framework often referred to as "customer equity."[6]

While it is incontrovertible that a portion of the market value of the bank is its ability to acquire new customers in the future, this is primarily a consideration for marketing strategies and tactics, as it is extremely difficult to quantify. A related and achievable consideration is to carefully evaluate the performance of newly acquired customers and their estimated CLV—notably whether the descriptors of new customers, such as the depth of product usage, are consistent with previous acquisition cohorts with a known CLV.

Robust measures of CLV carefully assess the likelihood of future period product expansion as well as the potential to increase the intensity of usage of current products.

5. David McCarthy, Peter Fader, and Bruce Hardie, "Valuing Subscription-Based Businesses Using Publicly Disclosed Customer Data," 2017.
6. Roland Rust, Katherine Lemon, and Valarie Zeithaml, "Return on Marketing: Using Customer Equity to Focus Marketing Strategy," Journal of Marketing, 2004.

Complementary customer value models

Product cross-sell

The application of simulation models to understand the impact on CLV of adopting or discarding product holdings is extremely valuable. The impact of product cross-sell on CLV is complex, including the first-order effect of an additional profit from the new product; the second-order effect of an increased likelihood of customer retention; the third-order effect of an increased likelihood of using existing products more intensively; and the fourth-order effect of an increased likelihood of purchasing another new product.

Fortunately, ClearScape Analytics® provides econometric models, such as logistic regression, and tree-based methods, such as gradient-boosted decision trees, to develop these models.

Deposit balance build

Given the importance of net interest margin on bank profitability, identifying the customers most likely to materially increase their average monthly deposit balances—and why—is of paramount importance. Recent research has demonstrated that it is possible to model this phenomenon using innovative algorithms, as "customer balances are critical drivers of customer lifetime value in banking, asset management, brokerage, and financial technology."[7]

7. Ragip Gurlek, Daniel McCarthy, Stephen Samaha, Rex Du, and Donald K.K. Lee, "Modeling the Evolution of Customer Balances," 2024.

Strategic applications of customer lifetime value

Customer segmentation

CLV is an excellent diagnostic of the bank's overall performance that can reveal the dynamic nature of relationships and the path taken by the bank's most valuable customers. NatWest Bank asserts that "our definition of customer value captures expected and known dynamics in the customer base. We observed a large amount of movement of customers across customer value deciles between 2019 and 2020, with around 55% of customers moving deciles over this time period."[4]

Banks seek to develop relationships with customers that evolve over time, and banks need to understand the actions that they can take to engage customers and grow customer lifetime value: "Financial service companies can benefit from understanding how customers' service portfolios evolve over the course of their relationships. This can provide guidance for managerial issues, such as customer valuation and predicting customers' future behavior. We developed a dynamic hidden Markov model to identify latent states that govern customers' affinity for the available services through which customers evolve."[8]

Leveraging this methodology, Wells Fargo developed a family of interrelated "customer dynamics" behavioral predictive models to assess the current and future engagement with customers.

Direct marketing

Banks feel compelled to spend significantly on advertising and marketing to acquire new customers, yet they do not expend material marketing resources to retain existing customers. Bank marketing has traditionally focused on "product push" marketing by delivering targeted offers to a prequalified audience. One example is an airline miles bonus credit card offer. A careful consideration of the impact of attrition on CLV motivates banks to promote "services pull" marketing by focusing on the customer adoption of barriers to defection, such as the direct deposit of paychecks or online bill payments.

Another temptation for banks is to focus marketing expenditure on the attempt to win back customers who have recently departed. One best practice is to deploy CLV as a performance variable across a broad set of marketing programs. "We highlight the importance of distinguishing between which customers are at risk and which should be targeted—as they aren't necessarily the same customers. We identify tradeoffs between reactive and proactive retention programs, between short-term and long-term remedies, and between discrete campaigns and continuous processes for managing retention."[9]

Digital migration tactics

A less obvious application of CLV models is to identify the economic value created by a bank's strategy to change customer behaviors, such as the strategy to migrate customer banking activity to digital channels. Banks aggressively promote the migration of activity from physical channels, such as branches, to remote channels, such as digital banking, which can have an immediate positive impact on operating expenses.[10]

Some customers may react negatively to the promotion of remote banking and thereafter reduce deposit balances, drop accounts, or even leave the bank altogether. How can the bank understand this tradeoff between the opportunity for lower operating expenses today with the risk of reduced revenue tomorrow? Ultimately, the bank needs to measure how individual customers respond to the bank's digital migration strategy. The bank can identify the customers impacted by the strategy and use their CLV as a metric to enumerate the current- and future-period financial impact of the strategy. As the profitability of the customer base is highly skewed, it is critical to assess the CLV of the customer impacted by the bank's strategy.

8. David Schweidel, Eric Bradlow, and Peter Fader, "Portfolio Dynamics for Customers of a Multi-Service Provider," Management Science, 2009.
9. Pete Fader, et. al., "In Pursuit of Enhanced Customer Retention Management: Review, Key Issues, and Future Directions," Customer Retention Workshop, 10th Triennial Invitational Choice Symposium, University of Alberta, 2016.
10.Gary Class, "Digital Migration in Banking," Teradata,2024, https://www.teradata.com/insights/data-architecture/digital-migration-in-banking.

Conclusion

The CLV model is a framework to identify the economic contribution of individual customers in current and future periods. Customer lifetime value is a discounted cash-flow analysis of customer profitability forecast over the customers' expected future life discounted at the bank's target return on equity. The building blocks of CLV require the acquisition and harmonization of multiple dimensions of the bank's relationship with the customer, including product holdings, payment activity, and channel interactions.

The cornerstone of CLV is a robust model of customer attrition that incorporates these manifold dimensions as features. CLV requires a mature allocation of direct revenue and a disciplined allocation of direct costs within a discounted cash-flow framework that can be externally validated. Complementary predictive models, such as those for product cross-sell and deposit balance growth, can help to identify the efficacy of the bank's engagement strategy on future period customer value.

The development and deployment of the customer lifetime value framework provides the single most robust indicator of the bank's overall performance and the impact of the bank's strategies in product design, digital channel migration, and direct marketing.

Sources

1. Gary Class, "Customer in Five Dimensions," Teradata, 2024, https://www.teradata.com/insights/white-papers/customer-banking-relationship-in-5-dimensions.
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5. David McCarthy, Peter Fader, and Bruce Hardie, "Valuing Subscription-Based Businesses Using Publicly Disclosed Customer Data," 2017.
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7. Ragip Gurlek, Daniel McCarthy, Stephen Samaha, Rex Du, and Donald K.K. Lee, "Modeling the Evolution of Customer Balances," 2024.
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