Australian Banking

A deep dive into customer churn

Summit Capital

Andrew Joseph
z5470509

Justin Vo
z5421217

Evan Xiong
z5421149

Alex Wang
z5420393

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Executive Summary

Overview

Customer churn in the banking industry refers to where customers cease using banking services or switch to competitors. It is a critical metric that measures the rate of customer attrition, impacting revenue streams and customer retention efforts. High churn rates can signal dissatisfaction, or failure to meet customer needs.

Customer Churn Impact

Market Risk

Customer churn reduces bank deposit base and investments, causing funding gaps. Fluctuations in interest rates, foreign exchange rates, and real asset value can harm earnings.

Credit Risk

Higher churn increases the risk of loan defaults as departing customers may struggle with financial obligations.

Liquidity Risk

Decreased stable funding leads to lower liquidity, especially during periods of high withdrawal demands or market disruptions.

Market Conditions/Causes of Churn

Macroeconomic Conditions

Inflationary pressures, driven by high inflation rates impacting consumer spending and GDP growth, have led banks to improve customer experience

Digital Transformation

Australians prefer digital banking, indicating CBA can boost retention by 5% through improved online services, crucial for reducing churn and fostering loyalty.

Model Findings

GDP, inflation impact churn differently: debt negatively, savings positively. Unemployment, deposits affect churn; cash rate is insignificant.

Customer Churn Solutions

Commbank MATES Initiative

The CommBank MATES solution integrates interactive forums, networking events, gamification, personalized financial plans, AI-powered insights, and budgeting tools to enhance customer engagement, foster financial wellness, and provide actionable financial guidance.

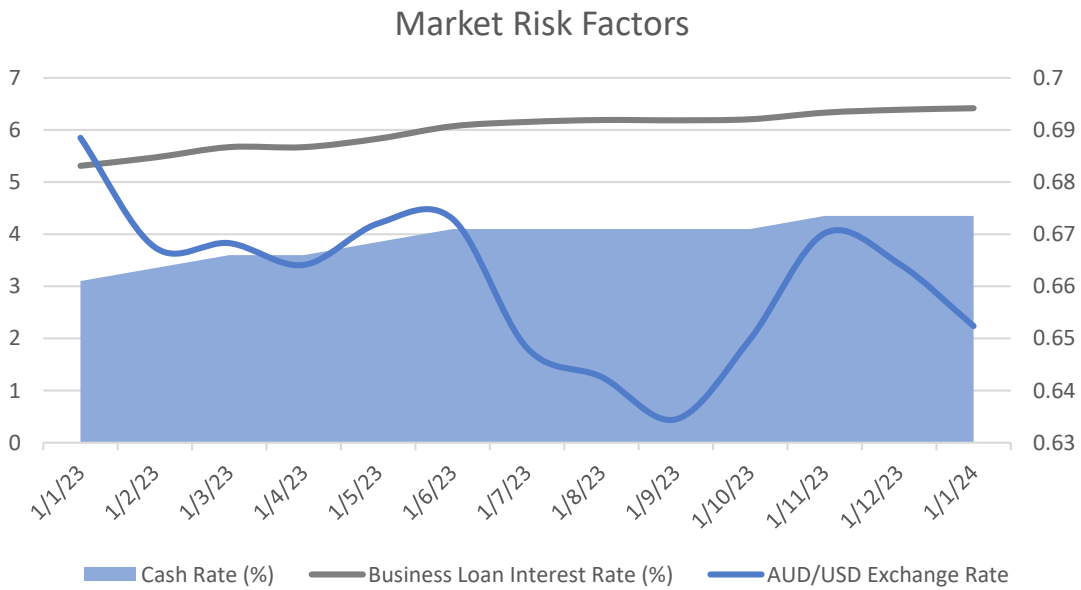
01 Customer Churn Impacts

Customer Churn Impacts

Customer churn in banks triggers credit risk with potential defaults and diminished interest revenue where market risk escalates with liquidity strains and asset value swings, compounded by liquidity risk from dwindling stable funding.

Market Risk

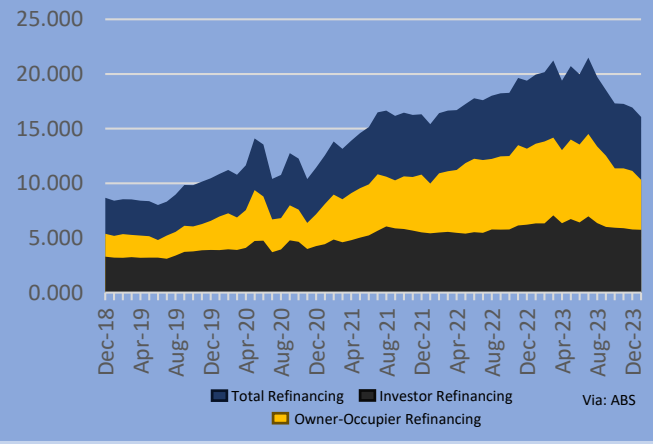
- Customer churn decreases bank's deposit base and investment portfolio, leading to funding gaps
- Fluctuations in interest rates, foreign exchange rates and real asset value adversely impact earnings



Via: The World Bank

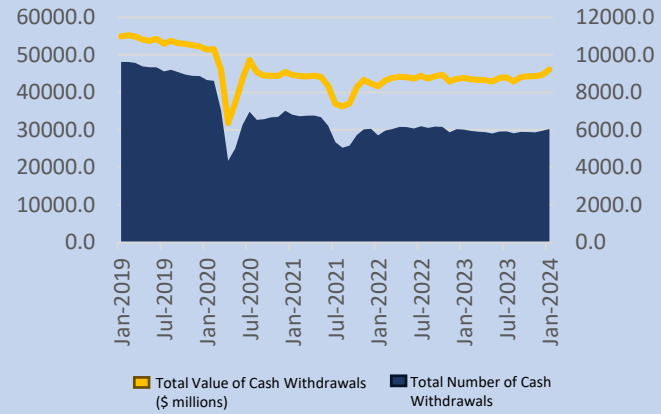
Credit Risk

- Leads to an increased risk of default on loans as departing customers may fail to meet financial obligations
- A reduction in interest income and profitability due to loss of interest-earning assets



Liquidity Risk

- Loss of stable funding reduces liquidity, especially during periods of heightened withdrawal demands or market disruptions
- May need to rely on alternate funding sources or liquidity management tools



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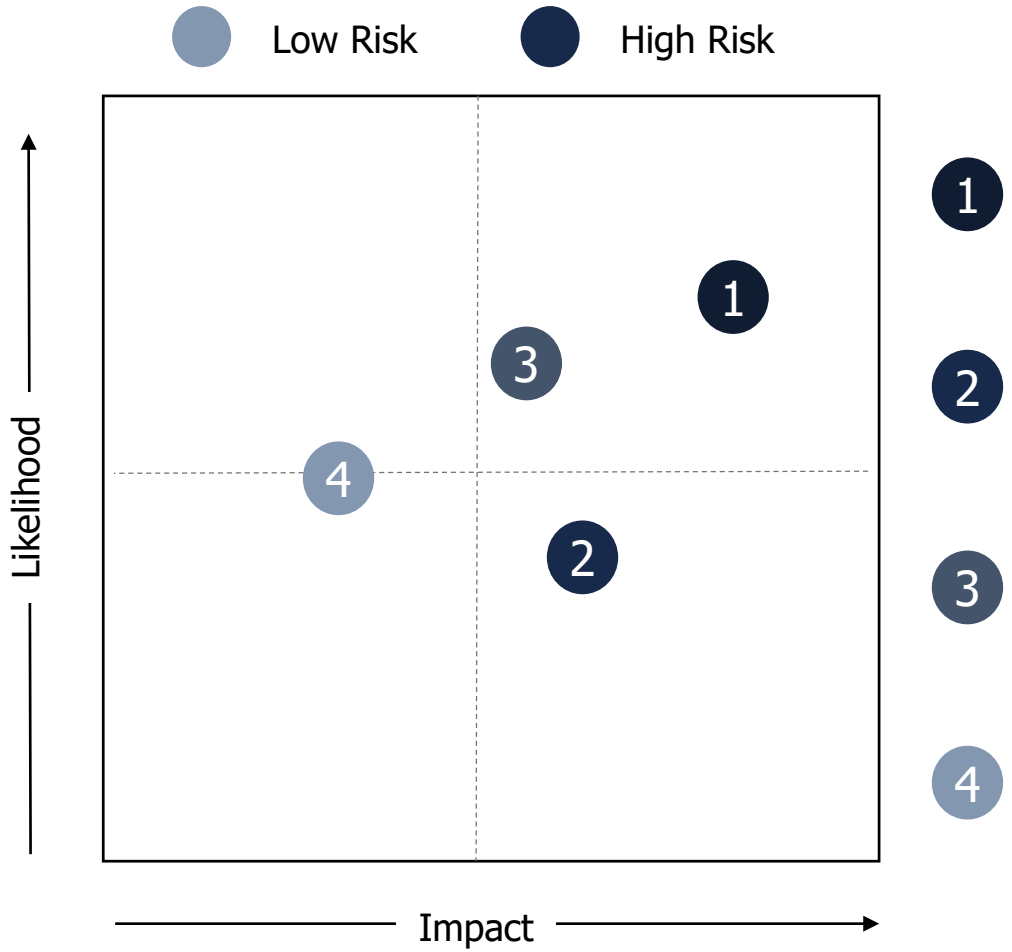
Risks & Mitigations



Risks	Mitigations
Market Risk	- Diversify funding sources - Utilise hedging instruments to mitigate interest rate and currency exchange risks
Credit Risk	- Enhance credit risk assessment models - Implement proactive risk-identifying measures
Liquidity Risk	- Maintain adequate liquidity buffers and stress test scenarios - Establish contingence funding plans
Financial Position	- Improve focus on customer retention - Optimise operational efficiencies - Strengthen investor relations and transparency

02 Current and Future Market Conditions

Current and Future Market Conditions

The ever-changing macroeconomic conditions of the current and future market effect the customer churn rates of banks.

Macroeconomic Trends

Inflationary Pressures

Eased from a peak **6.9%** inflation rate.

Monetary policies have been set in place such that inflation eventually reaches RBA's target of **2-3%.**

Customer Experience

73% of Australians have expressed that digital experiences would enhance the banking experience.

69% of Australians prioritize up-to-date technology when selecting a bank for financial services.

Positive Output Gap

Positive since 2021. Excess demand in the economy.

Slowdown in GDP

Dropped significantly from **4% to 0%** over the past year.

Digital Transformation

Banks have undergone digital transformations to provide a personalised digital experience for the customer.

89% of banks have not launched a digital transformation strategy.

Effect on Customer Churn

According to the customer churn rate formula:

$$Customer\ Churn\ Rate = \left(\frac{Lost\ Customers}{Total\ Customers\ at\ the\ Start\ of\ the\ Period}\right) \times 100$$

Customers choose to switch to other banks that offer better interest rates:

- With **higher interest rates** on savings accounts, customers can swell their savings
- With **lower interest rates** on loan accounts, customers reduce home loan payments

More Lost Customers → **Customer Churn Rate** ⇑

Banks cultivate a stronger bond of loyalty with the customer by:

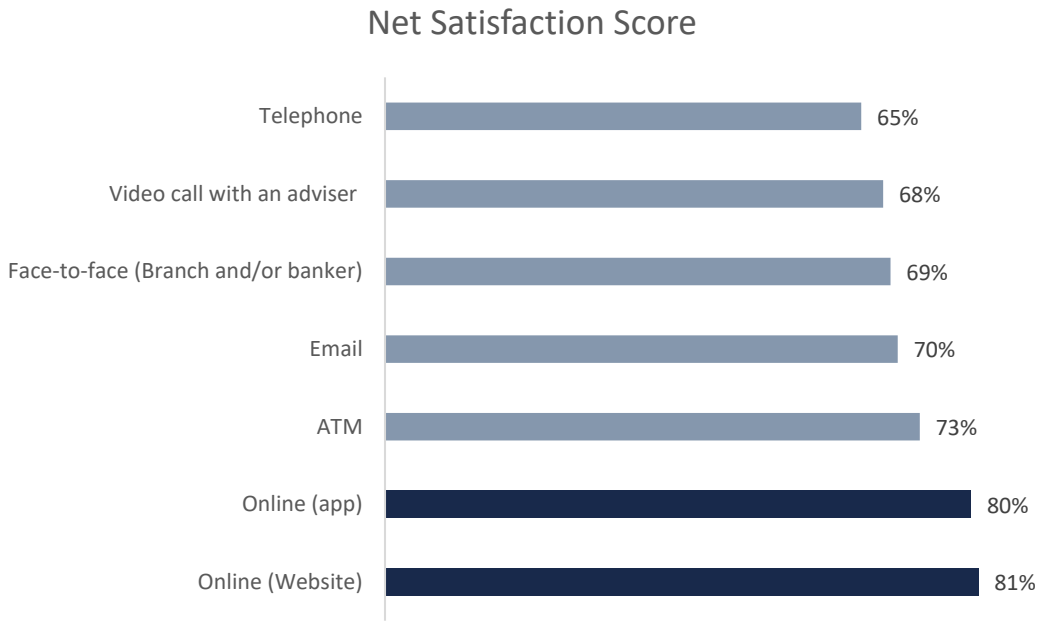
- Prioritising **trust and transparency**
- Offering a **personalised and digital experience**

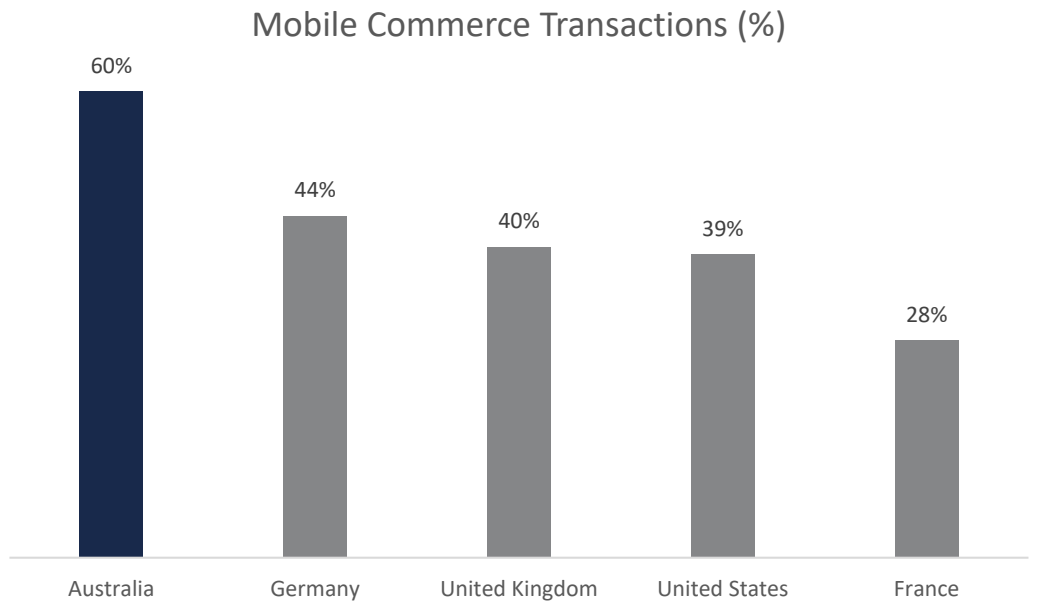
Increasing the customer retention rate by **5%**. Customers therefore are less likely to switch banks.

Higher retention rate → **Customer Churn Rate** ⇓

Digital Transformation

The factor that most significantly affects the churn rate of CBA's retail line is its ability to offer a digital experience to its customers.





Australian consumers are most satisfied with **digital channels** and use these channels most frequently.

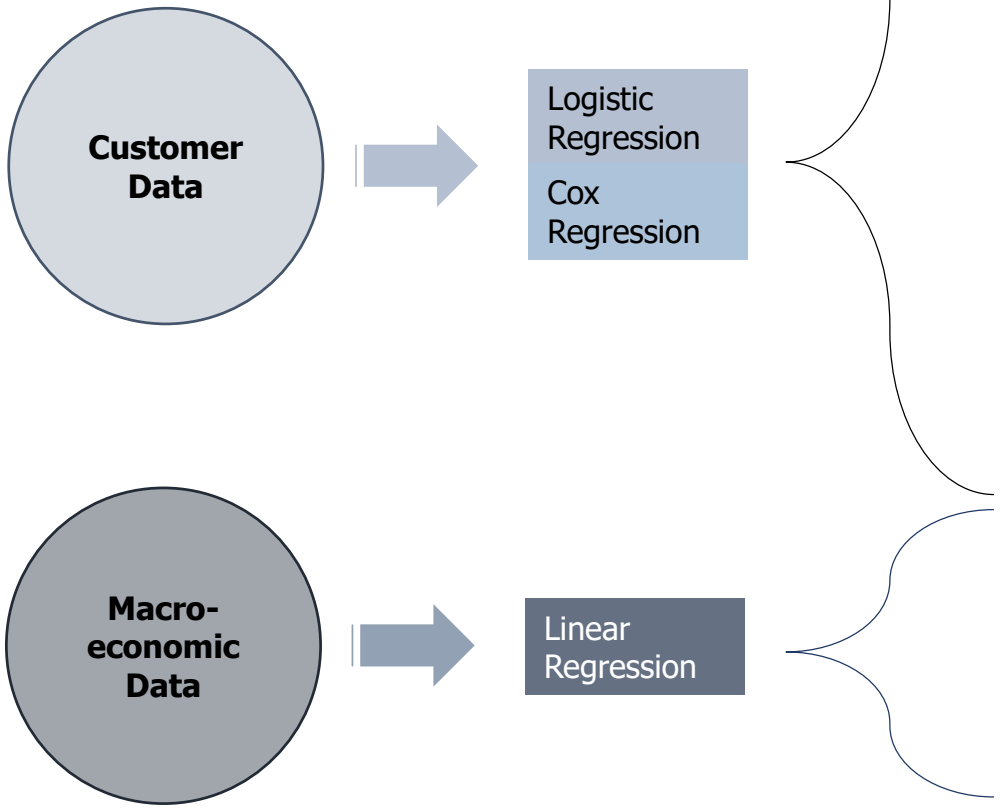
Australian consumers are quicker **adopters** of **cashless and mobile payments** compared to consumers in other countries.

Harnessing technology and providing a robust banking system that is tailored to the customer would improve the customer experience → **customer churn rate** ⇓

Source: Australian Banking Association

03 Identifying Causes of Churn

Role of Predictive Modelling



Capabilities	Example	Action
Estimate probability that a customer will leave within a certain timeframe or the hazard rate function	- Harvard study on effects of transparency on retail customer churn in CBA using logistic regression - Analysis found that churn rate for younger customers who were given transparency and joined with no incentive had a significantly lower churn rate - Suggests that there is a significant customer segment looking for fair value propositions rather than short term incentives	Focus proactive customer retention strategies on individuals identified as likely to leave
Identify customer segments that have an increased rate of attrition through analysis of coefficient values and corresponding p-values		Create tailored marketing and product offerings or provide more streamlined custom er service to customer segments vulnerable to churn
Gain insight on how macroeconomic conditions impacts customer churn	- Refer to slide 13	CBA will be able to respond quickly and take action based on current market economic conditions

Data Variables & Modelling Implementation

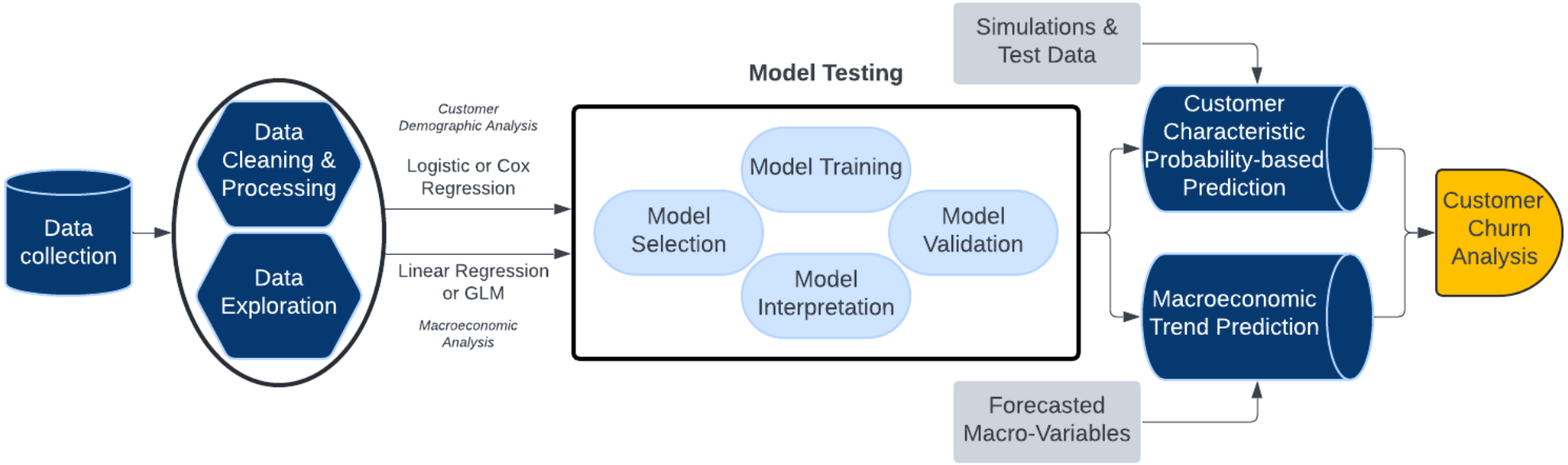
Macroeconomic
- Inflation Rate
- Real GDP Growth
- GDI Growth
- Cash Rate
- Unemployment Rate
- Household Assets
- Household Liabilities
- Total Balances

Demographics
- Age
- Gender
- Postcode
- Education
- Marital status
- Housing status
- Employment
- Income level

Products
- Home loan
- Personal loan
- Savings
- Term deposit
- Home insurance
- Car insurance

Preferences
- Engagement
- Survey responses
- Digital Usage
- Account open method
- Reason for joining

Other
- Indicator for churn
- Tenure
- Date of entry
- Date of exit
- Average wait time for customer service



Macroeconomic Modelling to approximate Customer Churn

$$\text{\% Change in Customer Churn Rate} \approx 21.97\% \times (\text{\% Change in External Refinancing} + \text{\% Change in Direct-Entry Payments})$$

Target Variable | CBA Market Share | Macroeconomic Approximation Variables

- The change in customer churn can be split into changes in debt and savings which can be approximated by the macroeconomic variables ***external refinancing*** and ***direct-entry payments***

Macroeconomic Approximation Variables to Customer Churn

External Refinancing

- **External Refinancing**: When customers switch to a different lender and obtain a revised/new loan. This is because customers can get a better rate and new banking experience
- The bank will *lose their loan asset and interest revenue* when customer external refinances, contributing towards increased customer churn
- Hence, we utilize the value of external refinancing loans as a good approximation to the customer churn rate on the debt side

Direct-Entry Payments

- **Direct-Entry Payments**: The number of transactions occurring between authorized deposit-taking institutions (ADIs).
- The bank will *lose their funds* when customer switches or deposits money to other banks (that they could've used to lend money and generate interest revenue), contributing towards increased customer churn
- Hence, we utilize the number of direct-entry payments as a good approximation to the customer churn rate on the savings side

Macroeconomic Factors and Predicting Future Trends

Ext. Refinancing or Direct-Entry Payments = **Inflation Rate + Real GDP Growth + Household Deposits + Total Credit Balances + Cash Rate + Unemployment Rate + GDI Growth**

Dependent Variables

Independent Variables

Accuracy & Characteristics of Model

External Refinancing

Mean Squared Error	2.32%
Multiple R-Squared	0.9626

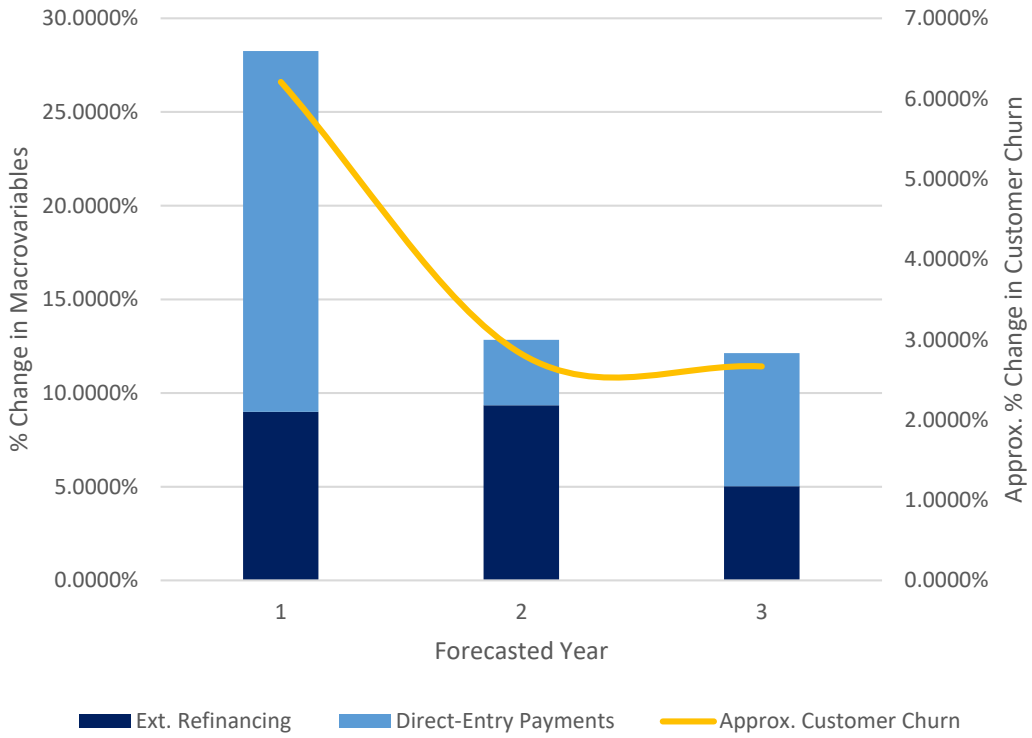
Direct-Entry Payments

Mean Squared Error	0.42%
Multiple R-Squared	0.9186

1. • **GDP growth** and **inflation rate** negatively impact customer churn on the debt side but positively on retaining customer savings. However, **GDI** and **credit balances** are the opposite.
2. • **Unemployment rate** and **household deposits** both increase customer churn. However, the **cash rate** is considered statistically insignificant in the creation of the regression models.
3. • **Accurate Model**: Yields a low regression error with a high R-squared value when performed against a sample test data.

Predictions & Future Trends

Macrovariable Impact on Customer Churn



Model Limitations

Assumptions

- Assumes **observations are independent** from one another – not true as individuals may be influenced by others to leave, which may generate bias in the model
- Assumes **no multicollinearity** between independent variables – not true as variables may be correlated

Problems

- **Requires large datasets** – a limitation that is no problem for CBA, who have the largest retail customer base in Australia.
- Customer-provided **data may be faulty** and become outliers which may distort the model
- Customer churn may be **hard to definitively identify**
  - Decrease in activity -> churn or temporary behaviour shift?
  - Customers may have accounts in multiple banks
  - Each individual customer may exhibit different behaviours that may be hard to quantify

Linear Regression
- Linear relation between independent and dependent variables
- Homoscedasticity

Logistic Regression
- Linear relation between variables and log odds of event
- Requires data to be balanced
  - Can be addressed with methods such as upsampling or downsampling

Cox Regression
- Assumes that the relative hazard remains constant over time
  - Generally not true as bank policies and customer behaviour change with time

04 Recommendations

Proposed Solution: CommBank MATES Initiative

The CommBank MATES initiative combines a robust community platform with personalised financial coaching, utilising AI technology and expert guidance to enhance customer engagement, financial wellbeing, and retention within the banking industry.

Community Platform

- **Interactive Forums**: Enable customers to ask questions, share experiences and provide advice to each other.
- **Networking events**: Organise online events such as webinars, workshops and networking sessions to foster connections.
- **Gamification**: Introduce gamified elements such as challenges, badges and rewards to encourage engagement and participation.

Impact obtained by applying behavioural economics in savings products:

41%

Savings balance

Impact obtained by applying behavioural economics to loans:

36%

Digital conversion

Via: EY Pathenon Behavioural Economics

Customer Intimacy

Customised Solutions CommBank develops plans and services that align with specific customer needs and usage patterns.	**Dedicated Support** Offering robust customer service with a personal touch to resolve issues and provide guidance.
Feedback Implementation Actively incorporating customer feedback into service improvements and product development.	**Relationship Building** Fostering long-term customer relationships by loyalty programs, personalised offers and engagement

Financial Coaching

- **Personalised financial plans**: Offer personalised financial plans based on customers' goals, financial situation and risk tolerance.
- **AI-Powered Insights**: Utilise algorithms to analyse customers' financial data and provide actionable insights for improving financial health.
- **Budgeting tools**: Provide tools and resources for budgeting, tracking expenses, and managing cash flow effectively.

Proposed Solution: Solution Quantitative Analysis & Modelling Assumptions

- To quantitatively analyze the impact of Commbank MATES on customer churn, we can use a stochastic process to model the different interactions customers have with Commbank MATES.

Control Model

States = {Customer, Not Customer}

$$M = \begin{bmatrix} 79.3\% & 20.7\% \\ 50\% & 50\% \end{bmatrix}$$

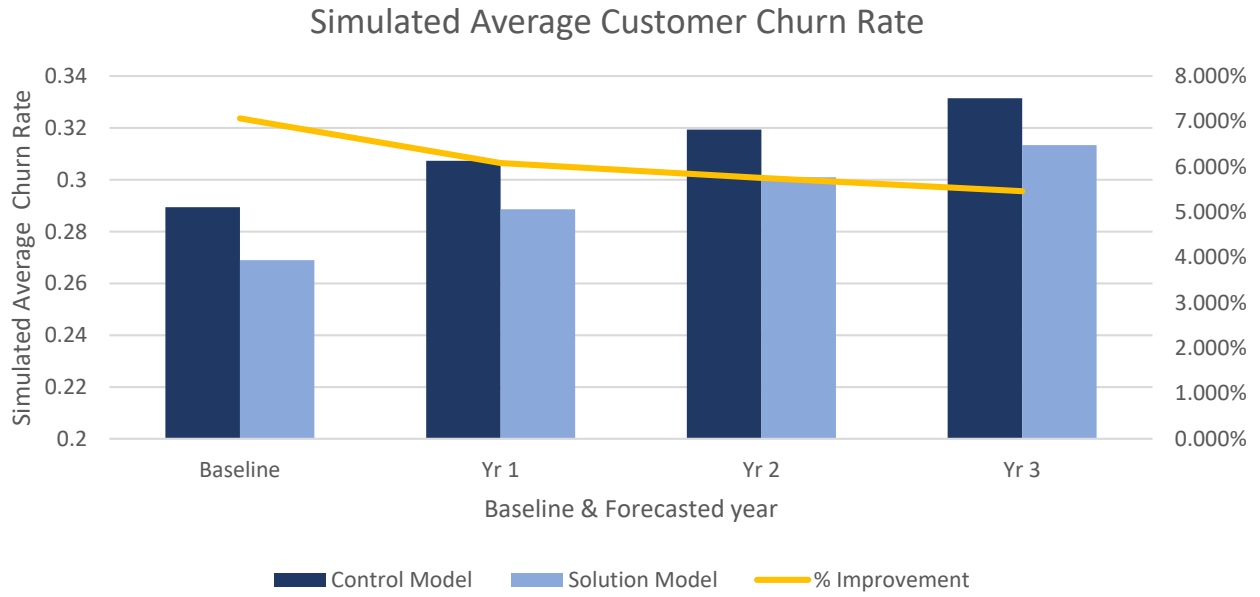
Solution Model

States = {Customer, Discussion, FA Coach, Not Customer}

$$M = \begin{bmatrix} 65.82\% & 5.55\% & 7.93\% & 20.7\% \\ 41\% & 48.97\% & 5.9\% & 4.13\% \\ 87\% & 0 & 0 & 13\% \\ 50\% & 0 & 0 & 50\% \end{bmatrix}$$

Simulation Assumptions

1. The experiment has 1000 identical customers who currently bank with CBA
2. No new customers enter the simulated experiment
3. Each "state" transition happens every month with experiment lasting 36 months
4. Old customers are indifferent to going back to CBA or to another bank – memory-less property
5. All external research probabilities are valid



Result Discussion

1

- By implementing CommBank MATES into CBA's current services for customers, CBA will directly reduce customer churn by more than 7%. This reduction is prevalent throughout the forecasted years which accounts for macroeconomic impacts

2

- As expected, customer churn will increase over the forecasted years as the economy slows and (potentially) go into a recession. As such, this causes the % improvement to slightly shrink as the future becomes more uncertain and unpredictable

Proposed Solution: Impact and Financial Position

Financial Analysis

Balance Sheet

- With the decrease in customer churn, CBA's **deposits** (liabilities) are expected to increase while inflationary pressures demand higher-yielding deposits.
- However, CBA's **operating income** (assets) would increase due to monetary policies set by the RBA, incentivising banks to raise the interest rates on the loans. The NIM is expected to grow by **0.24%.**

Capital Adequacy

- Since CBA's liabilities are expected to increase; CBA's strong capital position maybe at risk. CBA, however, has undertaken various initiatives to mitigate the risk, their **reinvestment in dividends into shares buyback** and the issue of **Basel III capital securities** have improved their capital levels.

Financial Position

Revenue growth: Increased customer retention through the MATES initiative can lead to higher recurring revenue from existing customers.

Cost Savings: Lower customer churn reduces the need for marketing and promotional expenses to attract new customers.

Risk management: Improved customer retention supports liquidity management by ensuring steady inflow of deposits from customers.

Limitations

Market:
- Incapable of adapting to changes in macroeconomic environment
- Able to be implemented by other banks and thus lose competitive advantage
- Effectiveness on churn dependent on quality of implementation or else may be seen as ingenuine

Inefficiencies:
- Ineffective on hands-off customers who are uninterested in networking and forums
- Fixed costs related to the maintenance and moderation of forums and organisation of events that may otherwise be abused by scammers

Ethics:
- Bias in AI insights will require need for human oversight
- Data privacy concerns
- Must ensure accessibility and inclusivity of service and networking communities to customers with non-traditional backgrounds

05 References

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06 Appendix

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Appendix

Main Deck

Appendix

Macroeconomic Variable Descriptions

Cash Rate

- The interest rate on commercial banks for short-term loans, determined by the RBA. It is recorded and revised monthly
- Fluctuations in the cash rate affect the borrowing expenses for loans and interest on savings
- Cash rate increases lead to lower demand for loans, decreasing customer churn, but attracts more savings
- However, competing banks may offer better rates causing customers to switch their deposits, increasing customer churn

Household Deposits

- The real value of household deposits (adjusted for inflation) in all Australian banks recorded quarterly
- Higher household deposits indicate more people are holding onto more money into the economy
- While the bank is able to issue more loans at a competitive rate, attracting customers, this could destimulate economic activity leading to lower demand for loans
- Thus, the bank cannot acquire more customers, increasing customer churn

Inflation

- The rise in everyday prices compared to a year ago measured as a percentage and recorded every quarter
- In an inflationary environment, the cost of living rises which affect borrowers' ability to repay loans and erodes consumer confidence in the economy
- This causes consumers to become concerned about their future debts and savings. Hence, consumers seek alternative banking providers that offer better advice against inflation, causing customer churn to increase

Total Credit Balance

- The total value of credit card balance seasonally adjusted and recorded monthly
- High credit card balances indicate poor customer financial health with an increased probability of delinquencies and defaults
- Customers may become dissatisfied and will consider switching banks, increasing customer churn
- However, high credit balances allow banks to obtain higher interest income, able to retain their customer base and decreasing customer churn

Unemployment

- Percentage of people who are unemployed in the labor force recorded monthly
- Rising unemployment rates could lead to an increase in delinquencies and defaults on loans, and may require refinancing their loans, increasing customer churn.
- Further, increased financial stress can cause increased savings withdrawal to cover expenses, decreasing deposits and indirectly increasing customer churn

Real GDP & GDI Growth

- GDP: value added from goods and services; GDI: total disposable income; both measured per annum and recorded every quarter
- Fluctuations in GDP/GDI indicate changes in economic activity, particularly, the provision of loans and retained savings for a bank decreasing customer churn
- However, Increased loan demand may require banks to offer competitive rates, causing customers to consider switching banks
- Furthermore, more disposable income will cause customers to spend more, lowering customer deposits

Improving Customer Compatibility with Tradeoff Transparency (Harvard Research with CBA)

- customer churn caused by lack of transparency, how different customer demographics are affected by this
- prospective customers who experienced transparency -> 9.9% higher monthly spending, 20.5% lower cancellation rates, 10.8% less likely to make late payments in first 6 months
- experienced customers who experienced transparency -> 19.2% higher monthly spending, 33.7% less likely to defect after 9 months
- transparency more effective on experienced customers

- logistic regression model
- output variable - probability of customer retention after 6 and 9 months
- input variables - TREAT (whether the customer was given transparency), PROMOTION, AGE, TENURE, GENDER, HLOAN, PLOAN, ...
- results (page 29)
- identify which variables were important depending by looking at the p-values
- in general,
- the study found that older customers and those with tenure were less likely to retained (albeit a small coefficient)
- positive effect of tradeoff transparency on retention can be diminished among customers attracted to an offering by promotion
- i.e tradeoff between acquisition and retention based strategies
- people who had a personal loan or transaction product were more likely to stay while those with home, savings or term deposit products were more likely to leave

	(1) Pr(Retain6)	(2) Pr(Retain6)	(3) Pr(Retain6)	(4) Pr(Retain9)	(5) Pr(Retain9)	(6) Pr(Retain9)
Treatment	0.259	0.099	0.437*	0.249**	0.111	0.447***
	(0.202)	(0.340)	(0.231)	(0.115)	(0.183)	(0.163)
Promotion	-1.736***	-1.693***	-1.758***	-1.344***	-0.882**	-1.647***
	(0.256)	(0.633)	(0.275)	(0.231)	(0.422)	(0.294)
Treatment x promotion	-0.239	-0.055	-0.410	-0.223	0.114	-0.569**
	(0.220)	(0.365)	(0.258)	(0.165)	(0.258)	(0.226)
Customer age	-0.219***	-0.038	0.060	-0.094**	0.469	0.010
	(0.038)	(0.323)	(0.044)	(0.041)	(0.320)	(0.055)
Customer age^2	0.003***	-0.002	-0.000	0.001***	-0.011	0.000
	(0.001)	(0.007)	(0.001)	(0.001)	(0.007)	(0.001)
Customer tenure	-0.009***	-0.011***	-0.009***	-0.005***	-0.007**	-0.006***
	(0.001)	(0.002)	(0.001)	(0.002)	(0.003)	(0.002)
Customer tenure^2	0.000***	0.000***	0.000***	0.000***	0.000*	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male indicator	0.046	0.011	0.065	0.078	0.039	0.118
	(0.074)	(0.110)	(0.095)	(0.091)	(0.100)	(0.133)
Retirement product	0.245	0.110	0.414*	-0.107	-0.255	0.036
	(0.154)	(0.221)	(0.229)	(0.155)	(0.176)	(0.235)
Home loan product	-0.595***	-0.775***	-0.539***	-0.564***	-0.545*	-0.538***
	(0.105)	(0.192)	(0.124)	(0.167)	(0.278)	(0.189)
Personal loan product	0.767***	0.408**	1.025***	0.246**	-0.007	0.497***
	(0.110)	(0.159)	(0.164)	(0.106)	(0.171)	(0.164)
Savings product	-0.188**	-0.141	-0.188**	-0.132	-0.070	-0.179
	(0.080)	(0.165)	(0.092)	(0.096)	(0.168)	(0.119)
Term deposit product	-0.617***	-0.574	-0.618***	-0.662***	-0.309	-0.796***
	(0.167)	(0.352)	(0.203)	(0.235)	(0.484)	(0.294)
Transaction product	1.603***	2.235***	1.312***	1.402***	2.034***	1.074***
	(0.125)	(0.269)	(0.159)	(0.222)	(0.413)	(0.282)
Home insurance policy	0.084	0.504	-0.012	-0.068	0.777	-0.233
	(0.154)	(0.383)	(0.162)	(0.170)	(0.668)	(0.199)
Motor insurance policy	0.082	0.585	-0.045	0.027	0.744	-0.109
	(0.198)	(0.492)	(0.224)	(0.202)	(0.561)	(0.235)
Constant	7.509***	5.895	1.963**	3.739***	-2.343	1.345
	(0.711)	(4.006)	(0.914)	(0.773)	(3.835)	(1.219)
Observations	15,942	7,864	8,010	6,314	3,231	3,083
Customers	All	Age≤28	Age>28	All	Age≤28	Age>28
Pseudo R2	0.0845	0.0916	0.0977	0.0551	0.0509	0.0948
Pred(Y): Non-Promotion: Control	98.07%	98.32%	97.76%	93.40%	92.99%	93.38%
Pred(Y): Non-Promotion: Treatment	98.50%	98.47%	98.53%	94.75%	93.66%	95.61%
Pred(Y): Promotion: Control	90.50%	92.14%	88.99%	79.43%	84.98%	75.00%
Pred(Y): Promotion: Treatment	90.67%	92.43%	89.23%	79.83%	87.54%	72.87%

Macroeconomic Modelling approximations to Customer Churn – Part 1

Ext. Refinancing or Direct-Entry Payments = **Inflation Rate + Real GDP Growth + Household Deposits + Total Credit Balances + Cash Rate + Unemployment Rate + GDI Growth**

Dependent Variables | Independent Variables

External Refinancing Model Output

```
Residuals:
     Min       1Q   Median       3Q      Max
-2.45912 -0.62666  0.03262  0.62228  2.53310

Coefficients:
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)       8.937e-01  1.870e+00   0.478  0.63350
Inflation.p.a     5.003e-01  8.790e-02   5.692 6.18e-08 ***
Real_GDP_Growth   3.599e-01  7.041e-02   5.112 9.34e-07 ***
House_Deposits    1.210e-02  5.702e-04  21.222  < 2e-16 ***
Total_Balances   -1.760e-04  1.741e-05 -10.114  < 2e-16 ***
Cash_Rate         4.724e-02  1.080e-01   0.437  0.66247
Unemployment_Rate 5.893e-01  2.185e-01   2.697  0.00777 **
GDI_Growth       -9.599e-02  3.734e-02  -2.571  0.01110 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.9578 on 154 degrees of freedom
Multiple R-squared:  0.9626,    Adjusted R-squared:  0.9609
F-statistic:   567 on 7 and 154 DF,  p-value: < 2.2e-16
```

Table 1A. Linear Regression External Refinancing Model Output

Direct-Entry Payments Model Output

```
Residuals:
   Min     1Q Median     3Q    Max
-35794  -7493  -1003   5787  51605

Coefficients:
                  Estimate Std. Error t value Pr(>|t|)
(Intercept)      -8.306e+04  2.768e+04  -3.001 0.003141 **
Inflation.p.a    -2.691e+03  1.301e+03  -2.069 0.040215 *
Real_GDP_Growth  -8.959e+02  1.042e+03  -0.860 0.391174
House_Deposits    1.294e+02  8.438e+00  15.336  < 2e-16 ***
Total_Balances    3.968e+00  2.576e-01  15.405  < 2e-16 ***
Cash_Rate        -1.724e+02  1.598e+03  -0.108 0.914244
Unemployment_Rate 7.103e+03  3.233e+03   2.197 0.029519 *
GDI_Growth        2.198e+03  5.526e+02   3.978 0.000107 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 14170 on 154 degrees of freedom
Multiple R-squared:  0.9186,    Adjusted R-squared:  0.9149
F-statistic: 248.3 on 7 and 154 DF,  p-value: < 2.2e-16
```

Table 1B. Linear Regression Direct-Entry Payments Model Output

Macroeconomic Modelling approximations to Customer Churn – Part 2

External Refinancing Model Accuracy
80%:20% data split

Training Mean Squared Error	1.60%
Test Mean Squared Error	2.32%

Direct-Entry Payments Model Accuracy
80%:20% data split

Training Mean Squared Error	0.27%
Test Mean Squared Error	0.42%

External Refinancing ANOVA Table

Analysis of Variance Table

Response: Ext.Refinancing

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
Inflation.p.a	1	947.18	947.18	1032.4882	< 2.2e-16	***
Real_GDP_Growth	1	100.77	100.77	109.8497	< 2.2e-16	***
House_Deposits	1	2495.64	2495.64	2720.4068	< 2.2e-16	***
Total_Balances	1	77.68	77.68	84.6795	2.371e-16	***
Cash_Rate	1	0.44	0.44	0.4834	0.487912	
Unemployment_Rate	1	13.02	13.02	14.1968	0.000234	***
GDI_Growth	1	6.06	6.06	6.6084	0.011098	*
Residuals	154	141.28	0.92			

Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Table 4A. Analysis of Variance External Refinancing Model Output

Direct-Entry Payments ANOVA Table

Analysis of Variance Table

Response: Direct_Entry

	Df	Sum Sq	Mean Sq	F value	Pr(>F)	
Inflation.p.a	1	1.6772e+09	1.6772e+09	8.3494	0.0044151	**
Real_GDP_Growth	1	5.6566e+09	5.6566e+09	28.1590	3.83e-07	***
House_Deposits	1	2.8092e+11	2.8092e+11	1398.4631	< 2.2e-16	***
Total_Balances	1	5.5975e+10	5.5975e+10	278.6477	< 2.2e-16	***
Cash_Rate	1	1.6173e+09	1.6173e+09	8.0510	0.0051606	**
Unemployment_Rate	1	1.7206e+08	1.7206e+08	0.8565	0.3561616	
GDI_Growth	1	3.1787e+09	3.1787e+09	15.8240	0.0001067	***
Residuals	154	3.0936e+10	2.0088e+08			

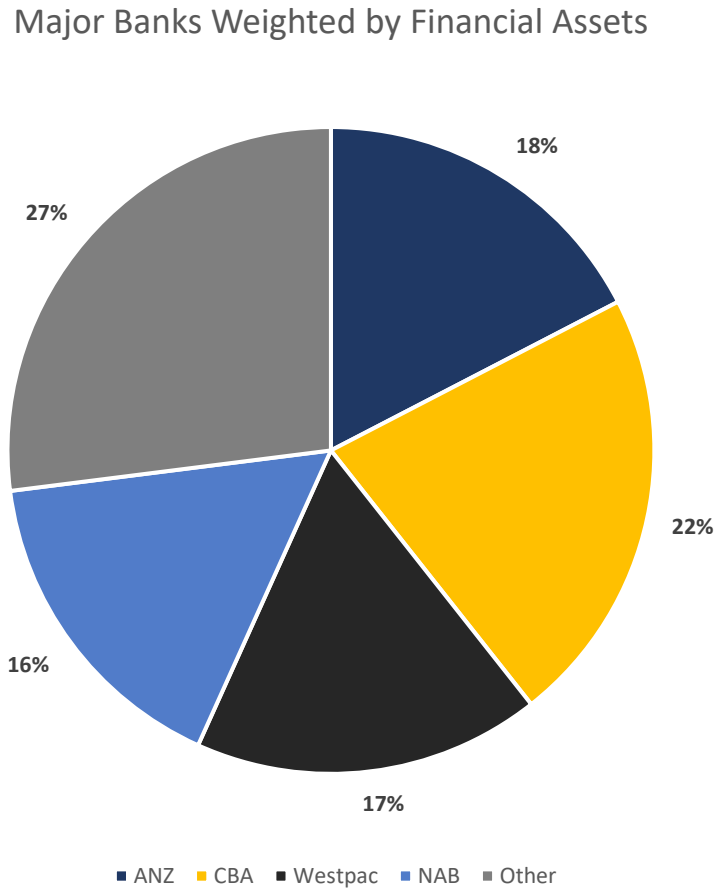
Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Table 4B. Analysis of Variance Direct-Entry Payments Model Output

Estimated Macroeconomic Variables and Bank Market Share

Quarterly Macroeconomic Variables	Current	Q1 2024	Q2 2024	Q3 2024
Inflation	4.1	3.7	3.6	3.2
Real GDP Growth	1.5	1.2	1	1.2
Cash Rate	4.35	4.35	4.35	4.1
Unemployment	3.9	4.1	4.3	4.5
GDI Rate	0.5	1	2.1	0.5
Household Deposits	1614	1712	1745	1778
Total Balances	41086.554	41345.07	41732.85	42120.63

Yearly Macroeconomic Variables	Current	2024	2025	2026
Inflation	5.6	3.3	2.8	2.5
Real GDP Growth	2.1	1.4	2.2	2.5
Cash Rate	4.35	3.85	3.25	3
Unemployment	3.7	4.5	4.5	4.4
GDI Rate	1.5	4.1	-1.3	-0.1
Household Deposits	1581	1812	1945	2077
Total Balances	40399.48	42508.41	44059.53	45610.65



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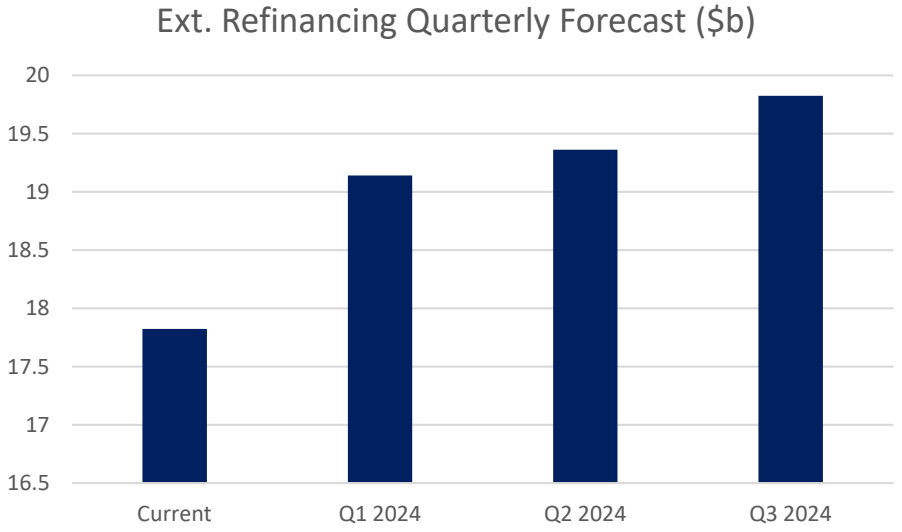
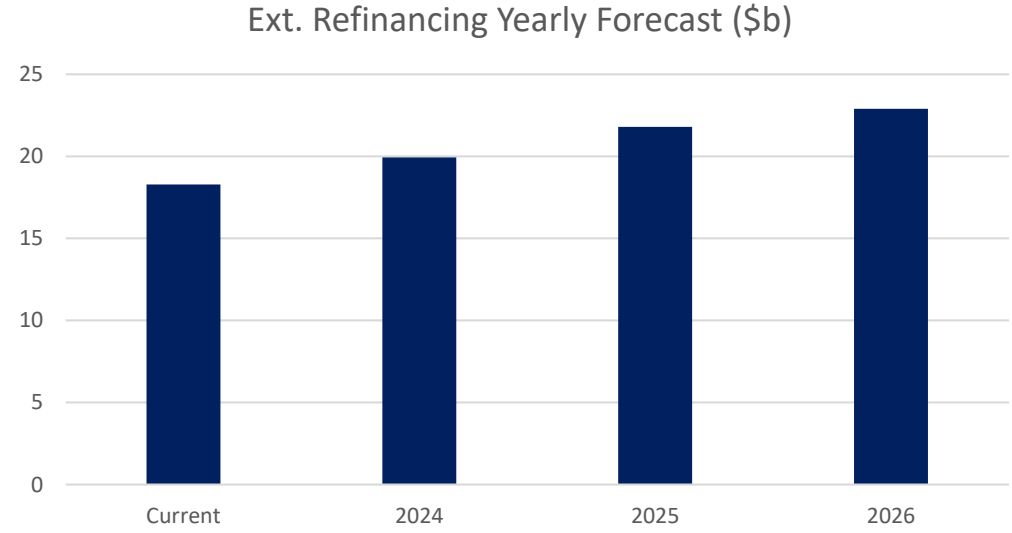
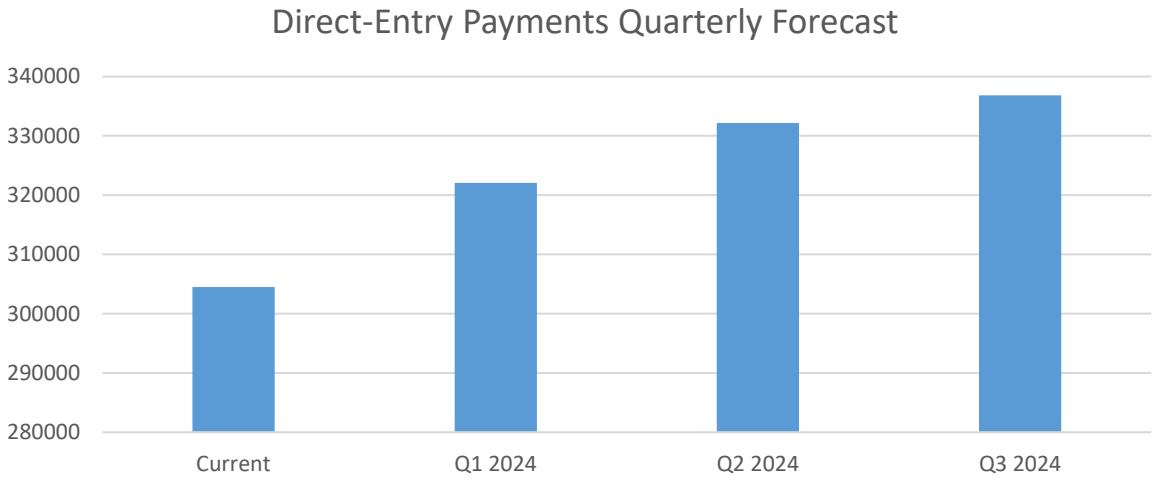
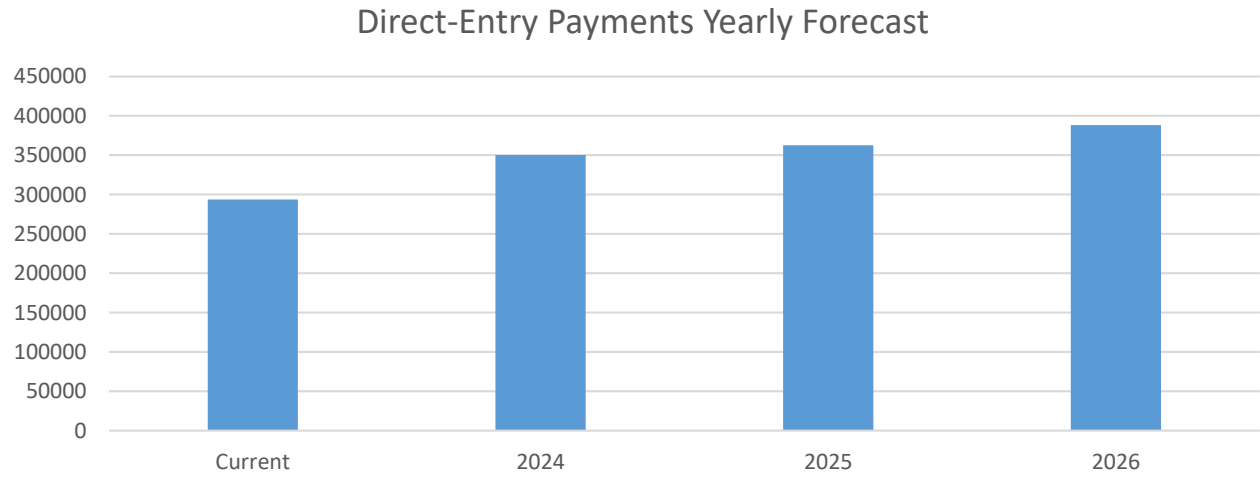
Trend Forecasting for Macroeconomic Variables









Appendix

Understanding Customer Behaviour – Behavioural Economics

Attentional Bias

- Attentional bias refers to our lack of ability to consider all possibilities when making an important decision.
- Although we would like to think that we take into account all alternatives, the reality is that we often overlook some options, and some possible outcomes.
- The lack of tangible references in our daily life related to saving prevents us from seeing it as a priority.
- Hence, providing a service that gives continuous feedback, remembering past achievements, or using social references is a powerful tool that can reinforce savings and spending behaviour and compares them with like-minded peers

Loss Aversion

- The cognitive bias where losses are asymmetrically more servere than their equivalent gains. Hence, people are more willing to make decisions that avoid losses
- Small barriers in acquiring loans such as insecurity, risk perception, or the idea of indebtedness, cause customers to delay making a decision
- As such, having tangible benefits through goal setting and budgeting tools allows to shift our financial mindset
- Furthermore, discussions with peers on online forums reinforces these tangible benefits and communicate the benefit of acquiring loans or investing

Projection & Present Bias

- Present bias refers to the tendency of people to prefer a smaller immediate reward rather than a greater one in the future.
- Projection bias refers to people's erroneous belief that their preferences will remain the same over time. Underestimating one's own consumption and our overconfidence financial thinking gives rise to these biases
- Hence, providing a service that "eases the action" through gamification and a financial assitance with a coach are great tools that can improve financial planning for the future, alleviating these biases

Availability Heuristics

- How we judge the probability of an event happening in relation to what is easiest for us to recall which provides the best context for making future predictions
- Customers are usually not well-informed about the ideal loan configuration considering their personal financial situation, heavily relying on small bits of information
- Large number of customers are unaware of the specific characteristics of the product and the details of the process. They often assume that it is more complex and tedious than it really is, increasing distrust and slowing down consumption.

Decision-Making Architecture & Behavioural Communication

- Customers do not want the loan, they need it to satisfy a specific desire. However, customer preferences are not stable or present and are created at the time of the decision depending on our the options are presented.
- Banks can complement propensity segmentation with behavioral segmentation to find out customer desires and focus communications on those. They can anticipate customer desires by identifying their financial footprints/characteristics.
- When creating digital journeys, it is more important to reduce cognitive friction than to try to shorten the process by reducing the number of steps.

Understanding Customer Behaviour – Modelling Probabilities

Control Model

States = {Customer, Not Customer}

$$M = \begin{bmatrix} 79.3\% & 20.7\% \\ 50\% & 50\% \end{bmatrix}$$

- Row 1: 20.7% Y23 (current) customer churn rate estimated by Adam Grocke, CEO and founder of fintech firm Sherlock. This is the same for the Solution Model
- Row 2: Memory-less property – old customers are indifferent to going back to CBA or to another bank. Hence, 50%:50% split. This is the same for the Solution Model
- Incorporating Macroeconomic Impacts – Multiply the customer churn rate (customer --> not customer) by the growth rate computed in the "Trend Forecasting for Macroeconomic Variables"
- Offset other probabilities equally to maintain Markovchain Model (summation of probabilities equal to 1)

Solution Model

States = {Customer, Discussion, FA Coach, Not Customer}

$$M = \begin{bmatrix} 65.82\% & 5.55\% & 7.93\% & 20.7\% \\ 41\% & 48.97\% & 5.9\% & 4.13\% \\ 87\% & 0 & 0 & 13\% \\ 50\% & 0 & 0 & 50\% \end{bmatrix}$$

- Discussion State: 7% of customers (79.3%*7%=5.55%) will engage in the discussion forum to ask questions and clarifications --> research by Gasmi A. from the Centre of Preparatory Studies
- Financial Advisory Coach: 10% of customers (79.3%*10%=7.93% & 59%*10%=5.9%) will search for financial support --> from Australian Government's Financial Advice Report
- Row 2 Customer State: 41% improvement in customer experiences when implementing behavioural economic solutions (such as social references, gamification, tangible benefits, etc...)
- Row 2 Discussion State: 83% who previously participated in discussion forum will engage with the service again (83%*59%=48.97%)
- Row 3: After obtaining financial assistance, 87% were satisfied with the experience

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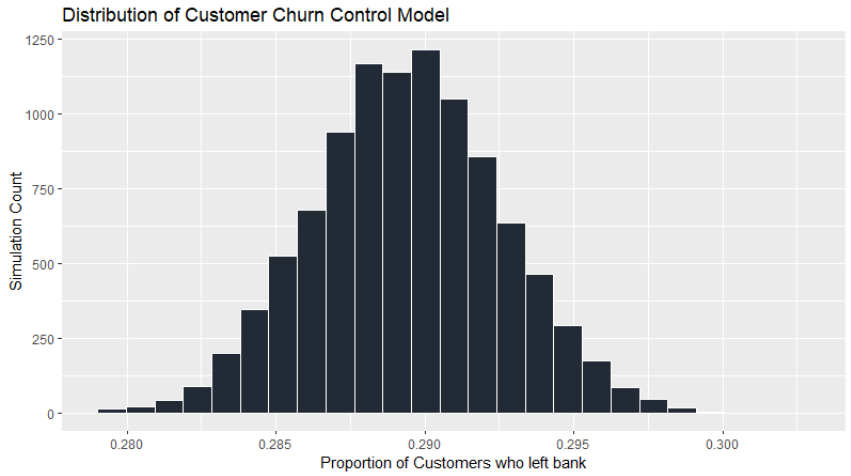
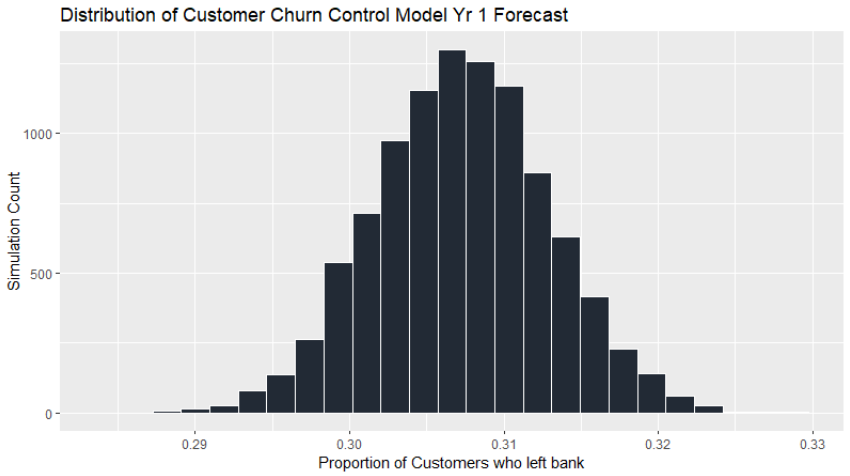
EY

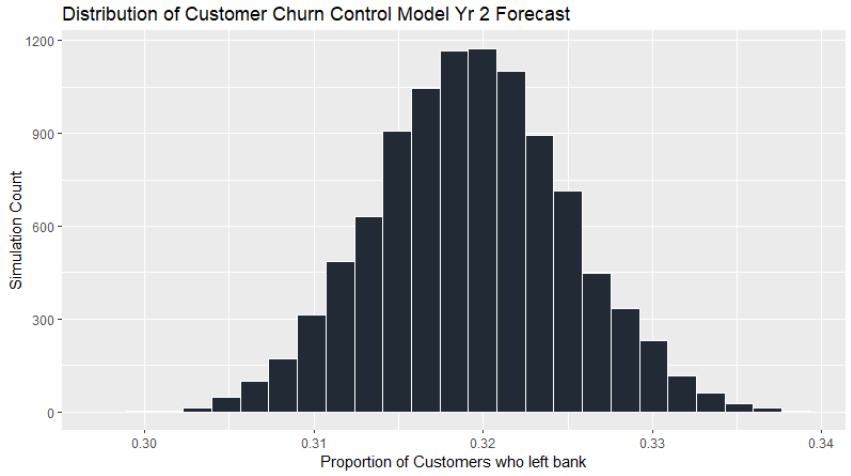
Quantitative Solution Analysis using Simulations – Control Model



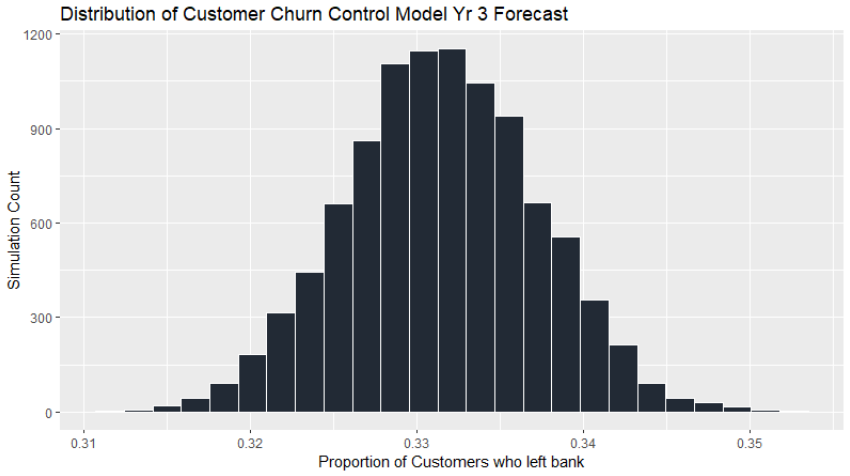
Mean	28.94%
Standard Deviation	0.00316
Minimum	27.90%
Maximum	30.20%
Skewness	0.0246
Kurtosis	2.915



Mean	30.73%
Standard Deviation	0.00565
Minimum	28.50%
Maximum	32.93%
Skewness	0.0201
Kurtosis	2.998



Mean	31.93%
Standard Deviation	0.00567
Minimum	29.87
Maximum	33.91%
Skewness	0.0512
Kurtosis	2.924

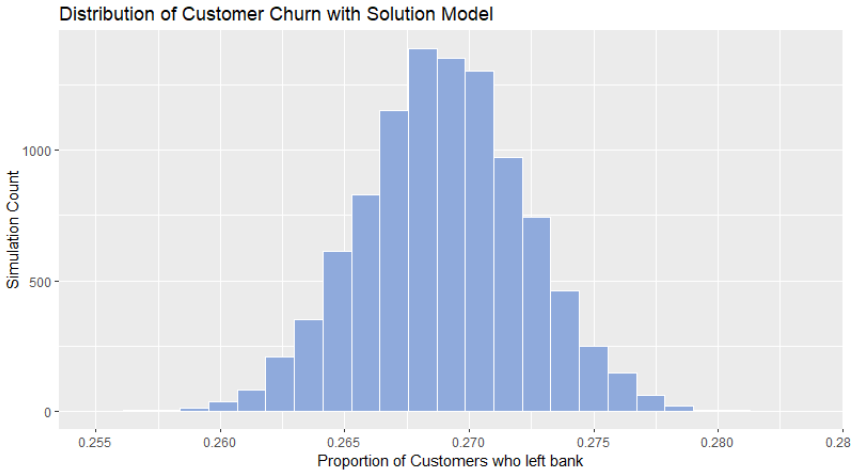


Mean	33.15%
Standard Deviation	0.00580
Minimum	31.12%
Maximum	35.23%
Skewness	0.0229
Kurtosis	2.996

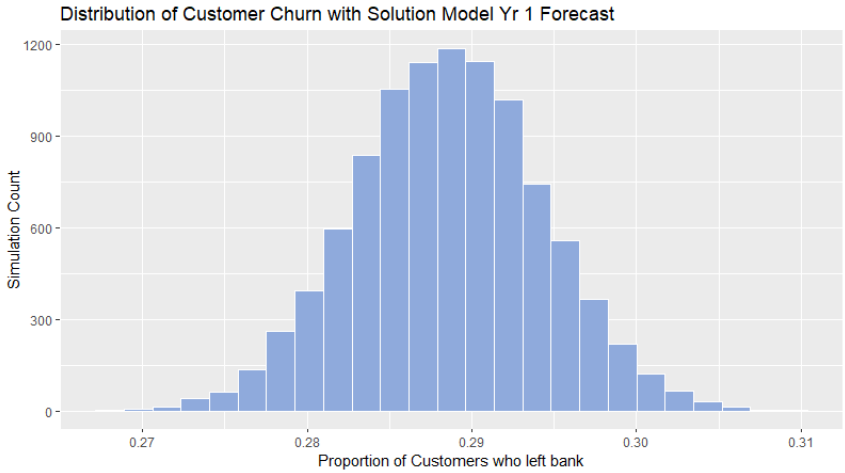
Summit Capital

EY

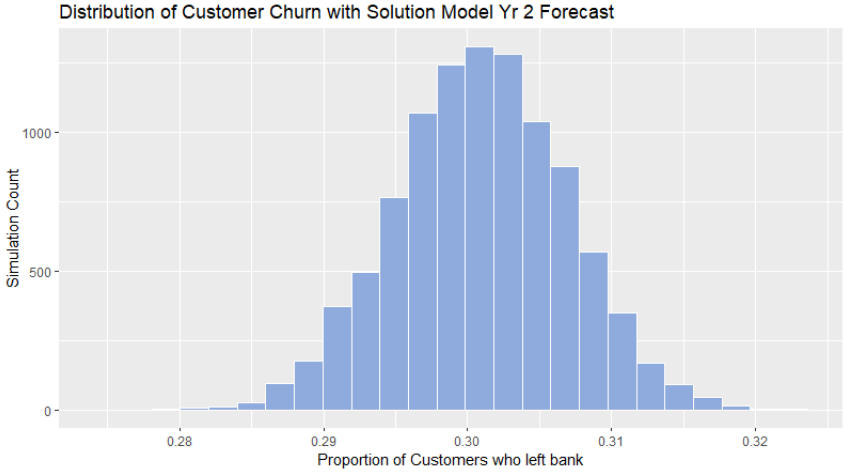
Quantitative Solution Analysis using Simulations – Solution Model



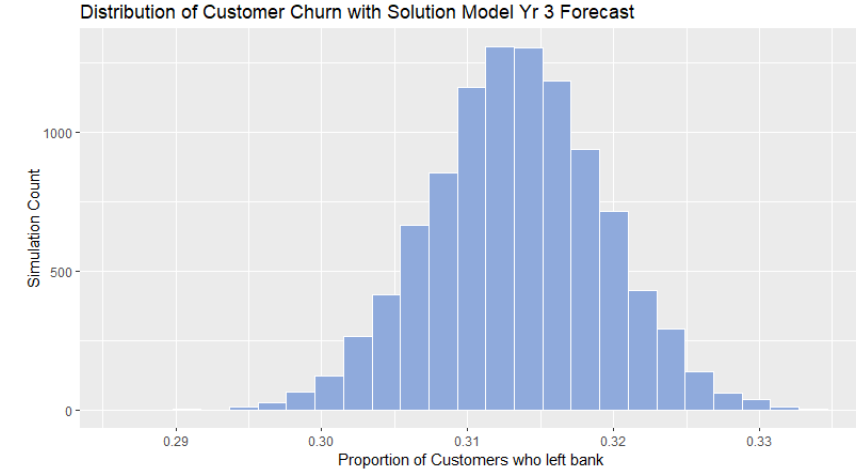
Mean	26.90%
Standard Deviation	0.00328
Minimum	25.53%
Maximum	28.28%
Skewness	-0.00648
Kurtosis	3.013



Mean	28.86%
Standard Deviation	0.00572
Minimum	26.86%
Maximum	31.01%
Skewness	0.0193
Kurtosis	3.009



Mean	30.09%
Standard Deviation	0.00594
Minimum	27.58%
Maximum	32.33%
Skewness	-0.0238
Kurtosis	2.983



Mean	31.33%
Standard Deviation	0.00594
Minimum	28.76%
Maximum	33.44%
Skewness	-0.0142
Kurtosis	3.020