Appendix D: Technical Appendix

Introduction

This document serves as a companion to the Municipal Bank Feasibility Task Force Report ("Report"), offering additional details and information about the technical process and research that produced the three bank models presented in the full Report. As a reminder, the Municipal Bank Feasibility Task Force ("Task Force) and staff from the Office of the Treasurer and Tax Collector ("TTX") created three bank models with the assistance of an outside consultant:

1. Model One: Reinvest – A non-bank financial entity which offers low-cost financing for City priorities including affordable housing development and small business lending.
2. Model Two: Divest – A bank entity that can meet the City's cash management and commercial banking needs, allowing the City to avoid working with large banks with practices the City finds objectionable. The bank performs the City's commercial banking and participation lending.
3. Model Three: Combination – A bank entity combining Model One and Model Two, offering affordable housing and small business lending and performing the City's cash management and commercial banking functions.

These bank models are financial models which combine details about the banking industry and economic metrics to create an abstract representation of a municipal bank and forecast its performance and output over time. These models project a bank's loan output, expenses and revenue to determine profitability and total investment necessary to build a sustainable bank. This modeling seeks to provide concrete data to further the conversation around municipal banking and allow policymakers and the public to evaluate the costs and benefits of starting a bank.

Though financial modeling is a technical field, ultimately each input in a model must be explained and justified and all outputs should be presented clearly. This technical appendix seeks to unpack and outline the assumptions behind the municipal bank models. The appendix begins by providing an overview of financial modeling and the data sources used to produce the bank models. The next section outlines core bank concepts—income statements, balance sheets, bank capital and growth rates—and applies those fundamentals to the municipal bank models. Next, the appendix explains costs associated with chartering and operating the municipal bank models. The next section details the lines of business modeled and describes core assumptions driving their profitability, including interest rates, loss rates and operational costs. Lastly, the report presents the final output of the municipal bank models, including a pro forma income statement for Year 10 in low- and high-cost estimates, a simplified projection for Year 0-10 that outlines outstanding loans, total assets and net surplus or deficit in a low- and high-cost scenario, and a graph showing projected revenue and expenses from Year 1-60.

Financial Modeling Overview

The goal of the municipal bank models is to combine outcomes requested by the Task Force and details about the banking industry and economic and business metrics to create an abstract representation of municipal banks and to estimate those banks' performance and operation over time. Financial modeling necessarily requires making generalized assumptions about economic conditions and bank operations. To the maximum extent possible, TTX staff relied on data from existing banks and insights of experts to make these assumptions. The following section discusses the general assumptions used in the municipal model models as well as the data sources consulted during the modeling process.

General Modeling Assumptions

To the maximum extent possible, all assumptions used to develop the bank models are based on publicly available information about banks and financial institutions that operate in the U.S., specifically those that operate in the Bay Area and the Bank of North Dakota, the only long-standing publicly-owned bank in the U.S. Based on expert input in areas where fluctuations may impact the economics of the municipal bank, the report provides a low-end and high-end estimate to show the range of potential outcomes. For the sake of consistency, the models use constant rates for interest rates, loan loss rates, and annual loan growth rates. In reality, all of these rates will change over time depending on the economic cycle, inflation, external interest rate environment, and capital markets condition. Similarly, the annual headquarter operating costs remain the constant over time, whereas in real life, these costs are likely to shift, rising due to inflation or decreasing due to synergies and improved technology. While headquarter costs, interest rates, loss rates remain constant, the size of the bank models will increase over time. The model assumes that the bank begins with no assets and builds up to $1 billion in 10 years and then to approximately $13 billion at year 60. As the size of bank assets increase, some costs will increase proportionally as well. For example, the operating costs associated with lending will increase proportionally to asset size.

The most crucial assumption behind the financial models is not one that can be quantified. The feasibility and success of a municipal bank will largely depend on the skill and resourcefulness of its management, and a productive and cooperative relationship with regulators, policymakers and members of the public. Ultimately, the validity and applicability of all the financial analyses rest on these bedrock assumptions about functional management and strong relationships.

Data Sources

During the modeling process, TTX staff and the consultant utilized numerous sources including publicly available industry insights, financial performance of comparable financial institutions, and interviews with industry experts and executives. In particular, staff sought out information about comparable de novo and community banks in the San Francisco Bay Area. When this information was unavailable or inapplicable, the analysis relied on data about other de novo banks, Bank of North Dakota and financial technology companies.

Industry sources

Industry sources consulted include:

- Annual Reports from banks and non-bank financing companies
- 10-K Securities and Exchange Commission (SEC) Filings
- Call Reports for banks reported to California Department of Business Oversight
- Consolidated Reports of Condition and Income for A Bank reported to Federal Financial Institutions Examination Council
- Global S&P Industry Surveys (Banks, Thrifts, Consumer Finance)
- Federal Reserve Bank
- Bloomberg
- ibanknet.com
- crunchbase.com

Comparable Financial Institutions

The above sources were used to analyze and evaluate the finances and operations of a number of comparable banks and fintechs over a variety of different metrics. The analysis uses Bank of San Francisco, New Resource Bank, Beneficial State Bank and Bank of North Dakota as examples for many elements of the municipal bank models. Similarly, costs associated with some fintech and non-bank consumer financial companies were used as models for the non-bank entity presented in Model One. Other organizations and entities provided a framework

for various lines of business and start-up costs. For example, details on Bank of America and Wells Fargo were used to estimate costs associated with the cash management line of business, and OnDeck was used to evaluate small business lending costs. The table below outlines institutions and how they were used as a model. It does not include each and every financial institution that was used as a model—for example, when researching bank start-up costs, staff spoke with de novo banks across the country, and when researching the small business lending line of business, staff spoke with numerous local Community Development Financial Institutions (CDFIs) not included below. Similarly, the table does not include research done for lines of business that were not ultimately included in the bank models (for example, student lending and small-dollar consumer loans).

Table 1: Comparable Institutions Used as Models for Municipal Bank

Institution	Bank	Non-Bank	Lines of Business	Start-up Costs
S&P Industry Survey (Banks, Thrifts): A universe of more than 100 US banks and credit unions	x		x	
Bank of San Francisco (Bay Area)	x			x
New Resource Bank (Bay Area)	x			x
Beneficial State Bank (Bay Area)	x			
Wells Fargo (Cash Management)			x	
Bank of America (Cash Management)			x	
Bank of North Dakota (state-owned bank)	x		x	
Synchrony Financials		x	x	
Navient		x		
OnDeck – Small Business Lending		x	x	
Opportunity Fund – Small Business Lending			x	
Varo – Startup Bank				x
Chime – Startup Bank				x

Interviews with Bank Experts and Executives
Lastly and in many cases most crucially, staff performed extensive interviews with banking experts, bank executives and individuals with specialized knowledge of affordable housing, small business, and consumer lending and municipal infrastructure. These interviews helped staff gain perspective on opportunities for a municipal bank and reality-check assumptions and model outcomes. This expert assistance was invaluable, and the report would not have been possible without their generosity with their time, expertise and insight. A full list of individuals consulted and interviewed is included below:

Staff of banks, credit unions, CDFIs
Agnes Cheung (Working Solutions), Karla De Leon (Main Street Launch), Jennifer Finger (Beneficial State Bank), Ezra Garrett (Oportun), Mark Goldfogel (Fourth Corner Credit Union), Pete Hellwig (New Resource Bank), Phil Hitz (OneMain Financial), Rob Holden (New Resource Bank), Craig Johnson (Beacon Community Bank), Jen Leybovich (Main Street Launch), Stephanie Meade (New Resource Bank), Vera Moore (JP Morgan Chase), Adria Moss (Pacific Community Ventures), Deirdra O'Gorman (Fourth Corner Credit Union), Ed Obuchowski (Bank of San Francisco), Nathaniel Owen (Mission Economic Development Agency), Sara Ravazi (Working Solutions), Wendy Ross (Bank of San Francisco), Janel Schmitz (Bank of North Dakota), Ray Shams (San Francisco Federal Credit Union), Jacob Singer (Main Street Launch), Kenneth Till (CommerceOne Bank), Victor Vazquez (Bank of San Francisco),

Experts in affordable housing, small business, and consumer lending and municipal infrastructure
Avital Aboody (LA Más), Nick Bourke (Pew Charitable Trust), Paul Carney (Tenderloin Neighborhood Development Corporation), Peter Cohen (Council of Community Housing Organizations), Luis Diaz, (Community Check Cashers), Alejandro Dobie-Gonzalez (LA Más), Rebecca Center Foster (San Francisco Housing Accelerator Fund), Ipsheeta Furtado (Fluid Financial), John Grogan (LoansAtWork), Becca Hutman (San Francisco Housing Accelerator Fund), Kiran Jain (Neighborly), Katie Lamont (Tenderloin Neighborhood Development Corporation), Helen Leung (LA Más), Dan Leibsohn (Community Check Cashers), Jim Mather (Housing Trust Silicon Valley), Fernando Martí (Council of Community Housing Organizations), Sam Moss (Mission Housing Development Corporation), Abby Murray (San Francisco Housing Accelerator Fund), Heather Peters (San Mateo County), Jonny Price (WeFunder), Eric Tao (AGI)

Banking experts
Scott Arneson (Fiserv), Karl Beitel, Asya Bradley (SynapseFI), David Dubrow (Arent Fox), Ashley Elsner (Green Market Bank), Gary Findley (Gary Steven Findley & Associates), Pat Orchard (FIS), Mark Pinsky (Five/Four Advisors), Dave Rainer, Caitlin Sanford (Department of Business Oversight), Phillip Sprinkle (Jack Henry and Associates), Mike Stevens (Conference of State Bank Supervisors), Walker Todd (Middle Tennessee State University)

Other experts
Lauryn Agnew (Bay Area Impact Investing Initiative), Juliana Choy Sommer (Priority Architectural Graphics), Hannah Dithrich (The GIIN), Miguel Galarza (Yerba Buena Engineering & Construction, Inc), Cara Martinson (California State Association of Counties), Amanda Ream (United Domestic Workers Union/AFSCME), Nancee Trombley (California Infrastructure Bank)

Bank Model Fundamentals

Before unpacking the financial models, it is crucial first to begin with some basic details about bank structure and operation. The following section provides details on bank fundamentals and applies those theories to the three municipal bank models. The banking basics covered below include the difference between a bank and a non-bank entity, a description of a how a bank makes money and its income statement, an explanation of a bank's

balance sheet, and a discussion of bank capital and bank growth rates.

Each of these concepts is applied to the three bank models outlined in the full Report:

1. Model One: Reinvest – A non-bank financial entity which offers low-cost financing for City priorities including affordable housing development and small business lending.
2. Model Two: Divest – A bank entity that can meet the City's cash management and commercial banking needs, allowing the City to avoid working with large banks with practices the City finds objectionable. The bank performs the City's commercial banking and participation lending.
3. Model Three: Combination – A bank entity combining Model One and Model Two, offering affordable housing and small business lending and performing the City's cash management and commercial banking functions.

Bank vs. Non-Bank Entity

First it is important to differentiate between a bank and a non-bank entity. A bank is a financial institution licensed to receive deposits and offer loans, which holds a banking license and is supervised by banking regulatory agencies.[1] A bank may accept deposits from individuals, businesses, governments and other banks; however, these deposits typically must be insured either by the Federal Deposit Insurance Corporation or a private insurance company. In contrast, a non-bank financial entity is a financial institution that does not have a banking license. A non-bank entity cannot accept deposits, and instead must rely on other sources of funds, such as debt, to perform its lending. Non-banks typically have a lower regulatory burden than banks, leading to reduced compliance and regulatory operating costs.

One other difference between a bank and non-bank entity is the potential for a multiplier effect. Generally lending to those who can repay stimulates the economy and produces economic growth. However, by accepting deposits, banks can potentially create an even greater financial multiplier effect in the community, because the bank can deploy capital that it doesn't own directly, and that capital may cycle through the bank. For example, a bank may lend a business money and then that business may pay its workers who deposit their paychecks at the bank, allowing the bank to relend the money on another project. This cycling allows a bank to have a multiplier effect and grow the local economy in ways a non-bank cannot.

In the bank models outlined in the Report, Model One is a non-bank entity. It can make loans, but it cannot accept deposits, and it has lower start-up and operational costs. Model Two and Model Three are both bank entities which can accept deposits, perform the City's commercial banking functions and make loans.

Income Statement

A bank or a financial institution generates profits[2] by using its deposits or debt (liabilities) and capital to buy or issue income-earning assets. By using liabilities to finance assets (such as loans or to interest-earning securities), the bank or the financial institution can leverage its capital to earn much more profit than it would otherwise by using only its capital for lending or investment. The income a bank or financial institution receives on its interest-earning assets is called "interest income." It is calculated as lending interest rate multiplied by the asset level. For loans, lending interest rates depend on the riskiness of the borrowers, how long the loan is extended, and whether the loan is secured by other assets (e.g. real estate). For cash and securities, lending interest rate is the investment interest rate received by the bank

1 Cal. Fin. Code §§ 1004-1005.

2 Based on Task Force feedback, the Report used the term 'surplus' instead of 'profit' and 'deficit' instead of 'loss' in discussing bank operations. The technical appendix will use the term 'surplus' and 'profit' interchangeably.

or the financial institution. While banks earn interest income on their assets, they must also pay interest on their liabilities typically paid to depositors. The interest paid to depositors (or debtors) is called the "cost of funds," and the difference between the interest paid to depositors and the interest income received on loans and investments is called the "spread." Lending rates and borrowing rates are impacted by external fluctuations and factors, meaning the net interest spread for a bank or financial institution can become narrower or wider over time. Aside from revenue from this spread, banks also earn income by charging fees for services (such as account fees, loan origination and servicing fees etc.). This income is referred to as non-interest income. In general, banks make most of their income from interest income—a typical community bank earns 80-90 percent of its income from interest as opposed to fees.

When projecting income, banks must also consider the potential for loans to go bad, and they must write-off these bad loans on their income statement. The common practice is to set up a provision for loss, which is the management's estimate for the percent of loans in a given portfolio that are likely to be not repaid. The "net interest income after loss" is the income interest a bank will receive after it writes off bad debt, and it represents the difference (net interest spread) in lending rates and borrowing rates of a bank or financial institution, adjusted for losses on bad loans. The formula for net interest income after losses is:

Net Interest Income After Losses = Interest Income – Cost of Funds – Provisions for Losses

Putting all this information together, a bank's profit or losses can be represented as the net interest income and non-interest income less any operating expenses. A bank's income statement looks like following:

Profits (Losses) = Net Interest Income After Losses + Non-Interest Income – Operating Expenses

To build income statements, the municipal bank models all have estimated interest rates, loan loss rates and cost of funds. For simplicity's sake, in the bank model rates for interest income, cost of funds and provisions for losses have been kept constant over time to reflect a consistent net interest spread. However, in real life, the municipal bank is likely to experience fluctuations in the net interest spread due to changes in economic cycles and the interest rate environment. The municipal bank models' interest rates and provisions for loan losses are discussed below in the Lines of Business section. For cost of funds, Models Two and Three project that the bank's cost of funds would be one percent. By comparison, Bank of North Dakota's cost of funds is 0.6 percent, and most community banks and credit unions have a cost of funds around one percent. For example, members of the Federal Home Loan Bank of San Francisco reported a cost of funds of 1.06 percent for November 2018.[3] Model One, which lacks a banking charter, will have to pay a higher cost of funds, estimated at two percent, because it must raise debt rather than accept deposit. Debt requires a higher rate of return for investors, because it is perceived as riskier. The two percent borrowing rate for debt for Model One comes from other non-bank entities, such as Synchrony Financial with a cost of funds of 1.46 percent as of September 2018[4] and Navient with a cost of funds of 3 percent as of December 2017.[5]

3 Federal Home Loan Bank of San Francisco. Cost of Funds Indices. http://www.fhlbsf.com/resource-center/cofi/.

4 ibanknet.com. (Undated).

5 Navient. (2018). 2017 10-K form. Retrieved from: https://navient.com/assets/about/investors/shareholder/annual-reports/NAVI_2017_Form_10-K_D13_2.26.18_FINAL.PDF.

Balance Sheet

Another way to envision a bank's operation is through its balance sheet. A bank's balance sheet has two parts, which must equal one another and balance out. A balance sheets formula is:

Assets = Liabilities + Capital

Assets, used to generate income and fund day-to-day operations, are balanced by liabilities (financial obligations) and capital (equity investment plus any retained profits). For a bank or financial institution assets include cash, securities, and loans. Banks use liabilities and capital to fund assets. Liabilities are money borrowed by banks and financial institutions, such as deposits for banks and debt for non-banks, both must be paid back, often with interest. The difference is that deposits can be added or withdrawn at the discretion of the customer and debt payoff is determined by the debt financing contract. As indicated by the formula above, the two sides of a bank's balance sheet must always be equal, and the difference between the assets and liabilities is the net worth of the bank, called the bank's capital. A sample balance sheet for a very simple community bank looks as follows:

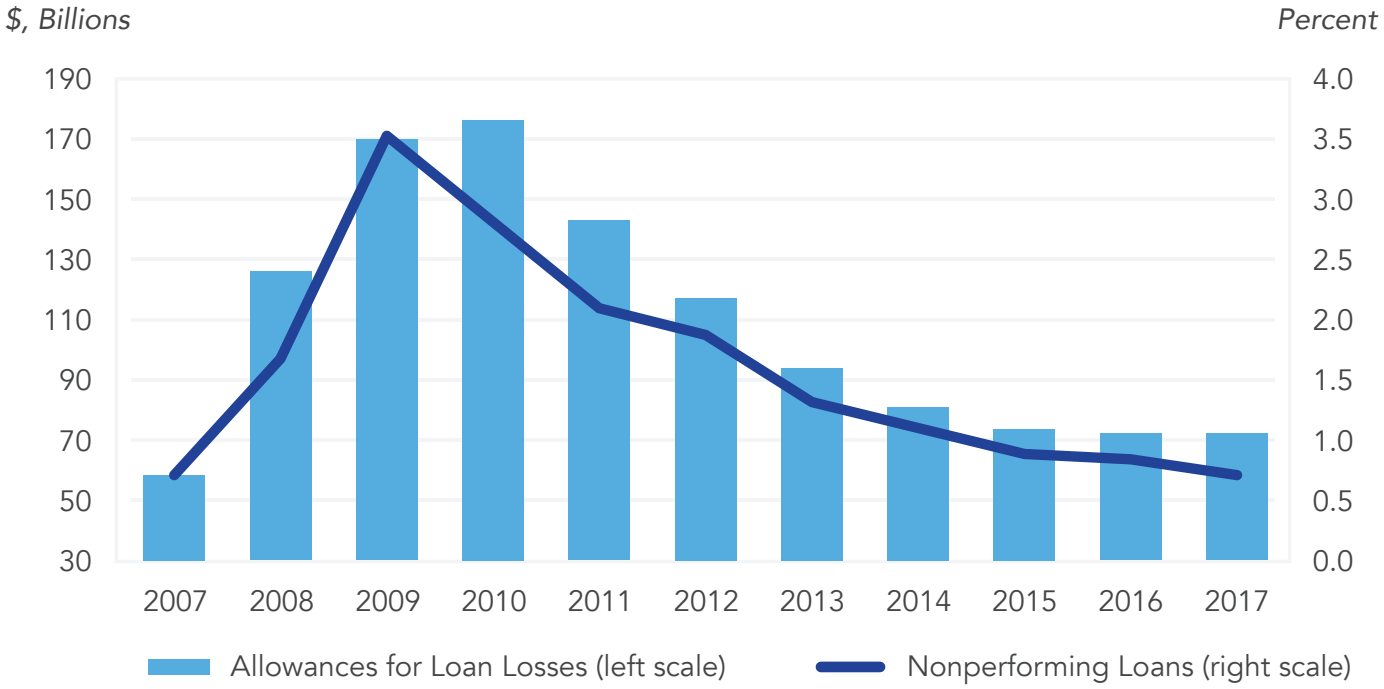
Liabilities plus capital must equal assets on the balance sheet.

Figure 1: Sample Bank Balance Sheet

Assets		Liabilities & Equity	
Loans	$1,010,000	Deposit	$935,000
Allowance For Loan Loss	$(10,000)		
Net Loans	$1,000,000	Equity	$165,000
Cash	$100,000		
Total	**$1,100,000**	**Total**	**$1,100,000**

The bank models' balance sheets are also relatively simple. On the asset sides, the bank will hold loans, which make up the bulk of its assets, as well as cash and securities for liquidity. Rather than report total loan portfolio, the balance sheets reflect the net loans outstanding, which includes the total loans outstanding less an allowance for loan losses. An allowance for loan losses is an estimate of loans that are unlikely to be repaid. These are subtracted from the total loans on a bank's balance sheet, because the bank is not expected to receive income from these loans. Intuitively, riskier loan portfolios tend to require holding higher allowances for loan losses, and an allowance amount reflects management's judgment regarding the quality of its loan portfolio. In general, allowance for loan losses for U.S. banks have been about 1 to 1.5 percent in the past five years (see Figure 1).

Figure 2: Historical Allowance for Loan Losses as Percent of Total Loans for U.S. Banks[6]



Source: CFRA, powered by data from S&P Global Market Intelligence

The municipal bank models hold loans and cash as their assets. Loans are the vast majority of municipal bank assets. Based on industry average, 1.5 percent is used as the allowance for loan losses for participation lending, real estate and wholesale small business lending, and 7 percent is used for direct small business lending.[7] The models also assume that the bank will hold cash and securities at ten percent of net loans. This ratio is based on industry average for US banks and credit unions.[8] This cash and securities can provide needed liquidity, helping the bank settle its debts at the end of the day. Additionally, this liquidity can further be used as a source of collateralization for government deposits. All public funds deposited in banks in California must be collateralized above the FDIC limit via securities (110 percent of value), first deed mortgages (150 percent of value) or a letter of credit from the Federal Home Loan Bank of San Francisco (105 percent of value).[9] Some of the securities held as liquid assets can be used to collateralize the government deposits, though they must be held in a separate account, and they cannot be used for day-to-day operations. At $1.1 billion in assets (with $100 million in liquidity), all the cash and securities must be pledged as collateral if the bank holds the City's $100 million in deposits. However, as the bank scales, it should

6 CFRA. (March 2018). Industry Surveys: Banks March 2018.

7 OnDeck. (2018). 2017 Annual Report. Retrieved from: https://s21.q4cdn.com/249473406/files/doc_financials/annual/2017-Annual-Report-on-Form-10-K.pdf; Synchrony Financial. (2018). 2017 Annual Report. Retrieved from: https://investors.synchronyfinancial.com/~/media/Files/S/Synchrony-Financial-IR-V3/reports-and-presentations/synchrony-financial-2017-annual-report.pdf.

8 Industry average determined by evaluating call reports for numerous local and national banks.

9 Cal Gov't Code § 53652.

be relatively easy to hold aside a portion of the 10 percent liquidity to serve as collateral for government deposits.

On the other side of the balance sheet, for liabilities, Model One is a non-bank institution, so it will hold debt as its liability. Model Two and Three are bank entities with deposits as their liabilities. Aside from the money in the City's cash management account, the source of deposits is not identified in the models. Capital in all models comes from a combination of investments by the City into the municipal bank initially and retained profits from the bank operations in the later years.

All models have the same level of assets, liabilities, and capital (in Model One the liabilities are debt, whereas in Models Two and Three the liabilities are deposits). Differences in bank performance and surplus (or deficit) in the models are a result of the type of assets, cost of funds on the liabilities, and the operating expenses of the businesses. Below are sample bank balance sheets for Model One and Model Two and Three (balance sheet is shown for illustrative purpose at year ten post-charter, for more information on why this benchmark was chosen see the Modeling Approach section below).

Figure 3: Model One Balance Sheet

Assets		Liabilities & Equity	
Loans	$1.015 billion	Debt	$935 million
Allowance For Loan Loss	$(15 million)		
		Equity	$165 million
Net Loans	$1 billion		
Cash & Securities	$100 million		
Total	**$1.1 billion**	**Total**	**$1.1 billion**

Figure 4: Model Two and Three Balance Sheet

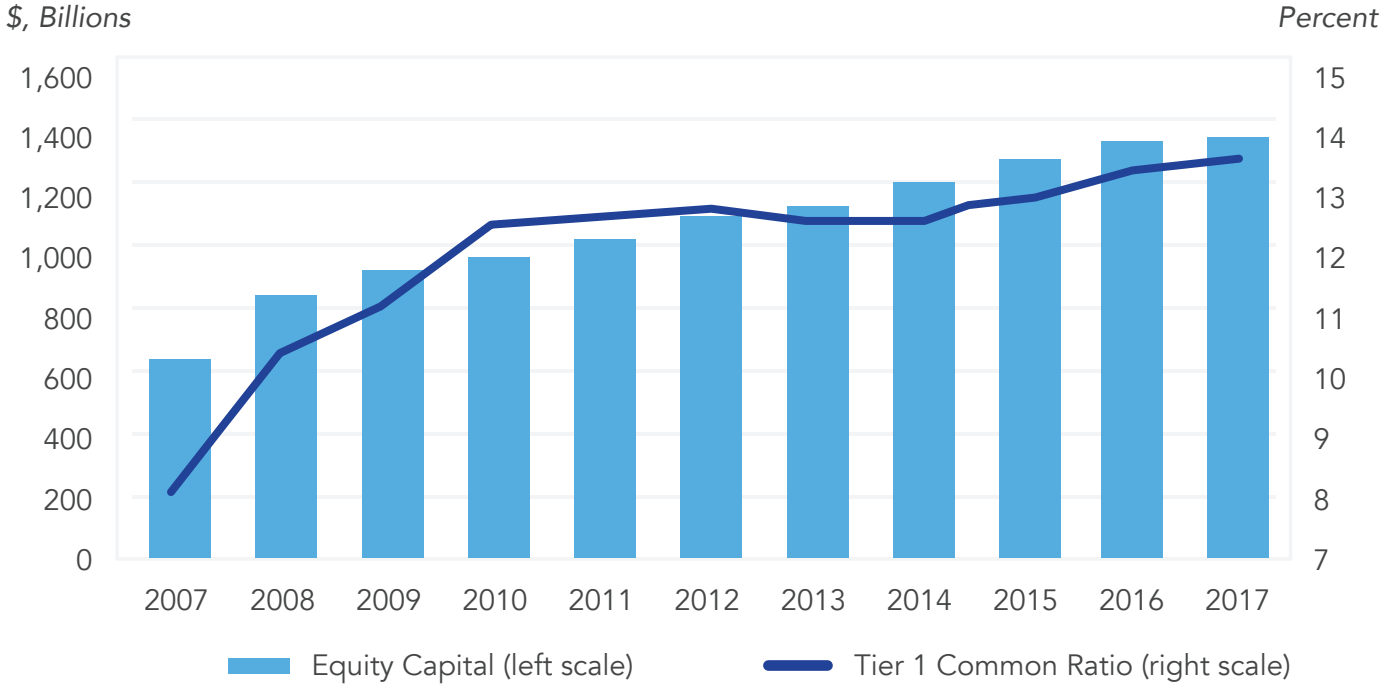
Assets		Liabilities & Equity	
Loans	$1.015 billion	Deposit	$935 million
Allowance For Loan Loss	$(15 million)		
		Equity	$165 million
Net Loans	$1 billion		
Cash & Securities	$100 million		
Total	**$1.1 billion**	**Total**	**$1.1 billion**

Bank Capital

Capital represents the investment into the bank or financial entity. Capital is shown as equity on the bank balance sheets above. Capital is the difference between a financial institution's assets (loans, investments, cash, real estate, and intangible assets), and liabilities (deposits and borrowings, mainly). If the value of a bank's assets decline, even though the liabilities remained the same, capital will fall. Capital can be considered "the percentage of assets that a bank can stand to lose without becoming insolvent" or "a measure of a bank's potential to absorb losses."[10] The more capital a bank has the more the bank can weather unexpected losses or downturns. In the case of total capital ratio (capital as a percent of assets on the balance sheet and off-balance sheet obligations), regulators typically require a minimum of 8 percent capitalization, and a bank with a total capital ratio of 10 percent is considered adequately capitalized. Capital ratios for U.S. banks have been trending upwards, in 2017 hitting 14 percent based on the S&P Industry Survey for U.S. Banks (see Figure 2).

Figure 5: Historical Capital Ratios for U.S. Banks[11]

Equity Capital and Tier 1 Common Ratio



Source: CFRA, powered by data from S&P Global Market Intelligence

Based on industry interviews, bank regulators typically require a higher capital ratio for newly established banks. Start-up banks do not make money initially, and it can take several years for a new bank to achieve profitability. New banks can use their bank capital to survive these initial years of loss. In these years, bank capital can fund operating costs, be used to make loans (if the bank does not have sufficient deposits) and serve as reserve capital for those loans.

10 Alden, W. (July 10, 2013). What is Bank Capital, Anyway? New York Times. Retrieved from: https://dealbook.nytimes.com/2013/07/10/what-is-bank-capital-anyway/. Similarly, the FDIC explains that bank capital "absorbs losses, promotes public confidence, helps restrict excessive asset growth, and provides protection to depositors and the deposit insurance funds." Federal Deposit Insurance Corporation. (April 2015). Capital. Retrieved from: https://www.fdic.gov/regulations/safety/manual/section2-1.pdf

11 CFRA. (March 2018). Industry Surveys: Banks March 2018.

The municipal banks are modeled with capital levels ranging from 15 to 20 percent. Recognizing that de novo banks typically need more capital than established and stable banks, the municipal bank models' capital ratios change over time with a higher ratio when the banks are smaller and newer. The models use a 20 percent capital ratio until the bank or financial entity reaches $500 million in assets. From $500 million to $750 million in assets, the capital ratio is modeled at 17 percent, and at $750 million and up the capital ratio is 15 percent in assets. In general, municipal bank capital levels are modeled at slightly higher than average due to the unique and higher-risk nature of the municipal bank structure and lending portfolio.

Growth Rates

In general, the larger a bank is the more profitable it is likely to be. Based on interviews with experts and banking industry reports, in today's economic environment, a bank is more likely to reach operational efficiency and achieve profitability if it has more than $1 billion in assets. This figure has changed over time. Many bank executives noted that previously it was possible to run a profitable and efficient community bank at $250-500 million in assets, but a low-interest rate environment and increasing IT and compliance costs have created more of a burden on small banks. The benefits of economies of scale has led to the consolidation of more than 2,700 small banks with less than $1 billion in assets over the past ten years.[12] For a de novo bank that will be starting essentially with no assets or liabilities (no loans or deposits), the rate of growth—which is to say the rate at which the bank can accumulate deposits and make loans—will drive its profitability and may ultimately determine its fate. However, a new bank should not grow in an unsustainable or reckless fashion, for example, by making risky loans or accepting significant chunks of unstable or brokered deposits (called "hot" money). The rate a de novo bank grows will vary significantly from bank to bank. For example, Bank of San Francisco, a community bank in San Francisco, formed in 2005 and took 13 years to scale up to $290 million in assets. In contrast, Beneficial State Bank began with $23 million in 2007 and had approximately $1 billion in assets after 10 years and multiple acquisitions.

To the maximum extent possible, the growth rates for municipal bank models are based on existing banks, interviews with banking experts and economic indicators. The bank models assume the same growth trends over time: first, it will take 10 years to reach $1 billion in loans and second after reaching $1 billion in loans the bank will grow its balance sheet by 5 percent per year for an additional 50 years, reaching approximately $13 billion in assets. The assumption it will take 10 years to reach $1 billion in loans comes from the growth trends of Beneficial State Bank (which took 10 years to reach $1 billion), New Resource Bank, and Bank of North Dakota. The assumption of a 5 percent growth rate per year after year 10 comes from the annual growth rate of the GDP of the Bay Area from 2014 to 2017.[13] These growth rates will result in a bank that is almost $13 billion in assets in year 60. By comparison, Bank of North Dakota, the only publicly owned bank in the continental U.S., has grown to $7 billion in assets over 100 years. Though the models project bank operations and profitability 60 years out, bank experts cautioned that models are valid for 5-10 years at most. Long-term models are less reliable given changes in business cycles (a 60-year timeframe will necessarily include multiple business cycles) and significant variance between how a bank operates and fares in a model versus reality.

12 Federal Reserve Bank of St. Louis. (Undated). Commercial Banks in the U.S. with average assets under $1 billion. Retrieved from: https://fred.stlouisfed.org/series/US1NUM; Bank BCLP. (April 7, 2017). Landscape of the U.S. Banking Industry. Retrieved from: https://bankbclp.com/2017/04/landscape-of-the-u-s-banking-industry/.

13 Bay Area Council Economic Institute. (July 2018). Continuing Growth and Unparalleled Innovation: Bay Area Economic Profile. Retrieved from: http://www.bayareaeconomy.org/files/pdf/BayAreaEconomicProfile2018Web.pdf.

Start-Up & Operational Costs

As with any business, a bank's profitability will depend on the balance between its revenue, the money it earns, and its expenses, the money it spends. The non-interest expenses associated with chartering and operating a bank can be broken down into three major categories:

- Start-up costs: The one-time cost to receive a charter and begin operations (described below)
- Day-to-day operational headquarter costs: Fixed annual costs that cover headquarters and administrative costs (described below)
- Day-to-day operating cost to support lending: A variable cost proportional to the type of and size of loan portfolio that covers cost to perform lending work (described in the Lines of Business section below)

Start-up costs are the cost to start the municipal bank before it begins operation. Creating a new bank requires significant preparation, time commitment, expertise and funding. Start-up costs for creating a de novo bank were calculated after conversations with banking experts, a review and assessment of large government technology products as well as an analysis of start-up costs for other recent de novo banks and large financial technology companies. Start-up costs are estimated at $20 million with an additional $75 million associated with performing the City's cash management. Because Model One is a non-bank, it has lower start-up costs due to less regulatory requirements and a smaller staff. Based on industry interviews, non-bank start-up costs are estimated at $5 million. To provide a cushion for unanticipated costs, a 50 percent multiplier was used for the high-cost estimate of starting a bank or a financial institution. The models assume that these start-up costs are incurred approximately two years prior to receiving a charter.

Aside from start-up costs, banks have annual operating costs that are typically broken down between headquarter costs and the costs to run the lending portfolios. Annual headquarter operational costs are a fixed annual expense covering executive management, administrative and compliance related activities. The annual headquarter costs are estimated at $10 million a year for a bank for Model Two and Three. In addition, Model Two and Three estimate $40 million operating expense per year for administering the City's cash management and commercial banking operations. The annual operating costs for the non-bank entity in Model One are significantly lower, only $2 million per year, given reductions in IT, compliance and regulatory burden. Similar to start-up cost, a 50 percent multiplier was used for the high-cost estimate to provide a cushion for unanticipated costs.

Start-Up Costs for Model Two and Three

Start-up costs for Model Two and Three are estimated at $95 million on the low-end and $142.5 million on the high-end. These costs include work related to regulatory filings, personnel, real estate, technology development, other services, and costs related to developing the infrastructure necessary for cash management (a significant driver of cost). The costs were estimated using a variety of data sources and were vetted by numerous banking experts. A table breaking down costs and full explanations for those costs are included below.

Table 2: Low- and High-End Bank Start-Up Costs by Category for Model Two and Three

Category	Low-End Estimate	High-End Estimate
Regulatory filings	$3 million	$4.5 million
Staff	$6 million	$9 million
Real estate	$2 million	$3 million
Technology development	$6 million	$9 million
Other services	$3 million	$4.5 million
Cash management IT development	$75 million	$112.5 million
Total	**$95 million**	**$142.5 million**

Below is a detailed description of the category, the cost associated with that category and data sources used to estimate that cost, including costs from comparable institutions.

- **Regulatory filings ($3 million):** One-time start-up regulatory costs are estimated at $3 million. The regulatory process to receive a bank charter is complex and lengthy. It requires significant staff time as well as numerous outside personnel, including attorneys, accountants and consultants. The de novo bank will need attorneys to help with creating the bank corporate structure, such as incorporating entities and drafting bylaws. Attorneys must also help with the regulatory process to receive a banking charter and insurance, including pre-filing meetings and drafting various application documents. Accountants must develop pro formas required for regulatory filings and the pre-opening exam. A banking consultant must help draft the business plan that forms the centerpiece of the banking charter application. Lastly the bank must prepare for and pass its pre-opening examination. De novo banks interviewed spent approximately $3 million on start-up regulatory costs, which included costs for both staff and outside consultants. However, these banks cautioned that this figure covers only costs associated with regulatory activities for a standard bank. Experts noted that regulatory costs for a public bank could be higher because it is an unfamiliar and novel idea and may be subject to additional regulatory scrutiny.
- **Staff ($6 million):** Though a start-up bank may require less staff initially, benchmarks suggest that a new public bank would require at least 20 experienced employees. Using an estimated $200,000 for salary plus fringe benefits, the total costs for these staff will be $4 million per year. When the bank is still applying for charter, fewer staff members are required. The estimate assumes that the bank will pay all 20 employees for 1.5 years. These employees include a Chief Executive Officer, Chief Financial Officer, Chief Lending Officer as well as staff in finance, compliance, IT and operations.
- **Real estate ($2 million):** In San Francisco, the real estate costs for a new bank with a main office that also serves as the branch location is estimated at $1 million per year. According to 2017 Call Reports, Bank of San Francisco and New Resource Bank which are both San Francisco-based banks with a main office that also serves as a branch spent between $750,000 and $1.2 million in 2017 on their premises. The bank model assumes that the bank would pay $1 million per year for each of the two pre-charter years, though it may be able to secure cheaper space during its start-up period.

- **Technology development (for non-cash management work) ($6 million):** A start-up bank will spend an estimated $6 million on technology. Banks have a mountain of highly sensitive data that they must manage effectively in a completely secure manner. Because of the data-intensive nature of modern banking, banks require significant information technology infrastructure, including both software and hardware, which will impose significant start-up costs on any new banks. Research shows that banks spend 14 percent of their budget on IT costs compared to a cross-industry average of just 7 percent.[14] Most importantly, banks require a "core banking system" which is the technology that enables banks to do basic functions such as gather deposits, process and post transactions, make loans, manage cash and settle accounts.[15] Core banking systems must support day-to-day operations flawlessly and also be nimble enough to allow for new capabilities and growth. The cost of a core banking system will depend on the company used and the amount of customization and integration required. Core banking systems have upfront costs, such as the initial license fee, customization charges (for data integration, third-party services), and hardware costs. On an ongoing basis, banks also need to pay a monthly license fee and internal IT costs. A survey of banks found that the average cost for changing their core banking system was $3.5 million, and the initial license fee was $2.6 million with another $2.2 million required for customization.[16] Based on discussions with recently started banks and financial technology companies, bank models include start-up IT costs of $6 million.
- **Other services ($3 million):** Aside from regulatory, real estate, staff and technology costs, a start-up bank must support a host of other miscellaneous services, such as marketing, customer service, human resources and security which will cost about $1.5 million per year. Though a bank may choose to provide these services through their own staff, many new banks outsource at least some of these functions initially to streamline operations.
- **City's commercial banking costs ($75 million):** The City requires banking services similar to that of a large multi-national corporation. Annually, it generates approximately 8 million payment transactions amounted to approximately $13 billion in flows. For a municipal bank to serve as the City's banker, it would need to make a significant investment in technology and infrastructure. The analysis estimates it would cost $75 million to build up the capacity to serve as the City's banker. To estimate this cost, the City spoke with vendors that provide core banking systems, including Jack Henry, FIS, and Fiserv as well as financial technology companies such as SynapseFI. Staff also reviewed the cost spent by start-up financial technology companies to bring products to the market. Based on expert conversations, the City estimates it will cost $15 million per line of business with five total lines of business associated with the City's commercial banking (deposits, disbursements, payment processing, reporting and technology, and cash management).

Start-Up Costs for Model One

It is much less expensive to create a non-bank entity compared to a bank because there are fewer regulatory hurdles, less infrastructure required and less compliance costs. Banking

14 Banking Industry Architecture Network. (2013). Cutting Costs in Core Banking. Retrieved from: https://bian.org/news-room/bian-in-the-news/cutting-costs-in-core-banking/.

15 Capgemini. (2014). Core Banking Transformation: Measuring the Value. Retrieved from: https://www.capgemini.com/wp-content/uploads/2017/07/core_banking_transformation_measuring_the_value_1.pdf.

16 Id.

experts and others assume that start-up costs for a non-bank entity are about 25 percent of the start-up costs for a bank assuming limited regulatory filing, no bank compliance program development and about a third of a bank's footprint in terms of staffing, real estate and other services.

The model estimates that the start-up costs for Model One are $5 million on the low-end and $7.5 million on the high-end or 25 percent of the $20 million start-up costs for Model Two and Three (calculated as total start-up costs less the costs for the commercial banking line of business).

Annual Headquarter Costs for Model Two and Three

Annual headquarter operation costs for Model Two and Three are estimated at $50 million on the low-end and $75 million on the high-end. These costs are a fixed annual expense covering real estate, executive management, administrative, cash management and compliance activities. As with start-up costs, cash management work is a significant driver of costs. These annual costs do not include the cost to administer and oversee the loan portfolio. That cost is included below in the Lines of Business section. The costs were estimated using a variety of data sources and were vetted by numerous banking experts. A table breaking down costs and full explanations for those costs are included below.

Table 3: Low- and High-End Bank Annual Headquarter Operating Costs by Category for Model Two and Three

Category	Low-End Estimate	High-End Estimate
Regulatory and compliance work	$1 million	$1.5 million
Staff	$4 million	$6 million
Real estate	$1 million	$1.5 million
Technology development	$2.5 million	$3.75 million
Other services	$1.5 million	$2.25 million
Cash management IT development	$40 million	$60 million
Total	**$50 million**	**$75 million**

Below is a detailed description of the category, the cost associated with that category and data sources used to estimate that cost, including costs from comparable institutions.

- **Regulatory and compliance work ($1 million):** Aside from one-time start-up regulatory costs, the municipal bank will have significant ongoing regulatory and compliance work. This work includes monitoring the bank's activities, ensuring adherence to legislation and internal policies, testing the sufficiency of bank security and risk protocols and preparing for examinations and audits by outside regulators. One study found that banks with assets under $100 million spend 8.7 percent of their noninterest expenses on regulatory

and compliance work.[17] Regulatory and compliance costs include the cost to hire outside experts, including consultants, accountants and lawyers to perform the work as well as specific data processing and personnel costs associated with compliance and regulatory work.

- **Staff ($4 million):** Benchmarks from other de novo banks suggest that a bank will require approximately 20 staff to start-up. Using an estimated $200,000 for salary plus fringe benefits, the total costs for these staff will be $4 million per year. These employees include management, for example, Chief Executive Officer, Chief Financial Officer, Chief Lending Officer as well as staff in finance, compliance, accounting, IT and operations.
- **Real Estate ($1 million):** In San Francisco, the real estate costs for a new bank with a main office that also serves as the branch location is estimated at $1 million per year. According to 2017 Call Reports, Bank of San Francisco and New Resource Bank—San Francisco-based banks with a main office that also serves as a branch—spent between $750,000 and $1.2 million in 2017 on their premises.
- **Technology costs ($2.5 million):** The bank will also need to pay for ongoing technology costs, which include the annual cost for the core banking system and other software licenses as well as costs for ongoing technology development and maintenance. For technology projects, TTX typically budgets 20 percent of the cost of development for annual maintenance work. Given the development costs will be about $6 million, the analysis estimates about $1-1.5 million in ongoing technology maintenance costs along with approximately $1 million for the core banking system and other software licenses.
- **Other services ($1.5 million):** Other services include miscellaneous annual costs associated with running a bank, such as marketing, customer service, human resources, security, supplies, and deposit insurance (if applicable). Banks benchmarked these costs at approximately $1 to $2 million per year.
- **City's commercial banking costs ($40 million):** Model Two and Three will incur additional costs related to technology maintenance and staffing for the City's cash management work. As with general technology costs, the model assumes that the bank will spend 20 percent of the original $75 million development costs on maintenance each year, leading to $15 million in maintenance costs per year. Additionally, the bank will need significant staff to assist with the cash management work. The model assumes the bank will need 25 people per lines of business, resulting in 125 staff total or $25 million in salaries.

Annual Headquarter Costs for Model One

As with start-up costs, Model One, a non-bank entity, will have significantly less annual operational costs than Model Two and Three. The model estimates $2 million in annual operating costs for Model One based on a benchmark that non-bank operating costs are about 20 to 25 percent of bank costs. A non-bank entity will have limited regulatory filing, no bank compliance infrastructure and only about a third of a bank's foot footprint in terms of staffing, real estate and other services.

Lines of Business

Loans are the core assets of a bank, and lending activity drives bank profitability. Understanding the rationale behind the municipal bank lines of business and their operations is crucial to understanding how the bank models operate and their ultimate financial projections. This section describes the lines of business included

17 Dahl, D., Meyer, A., and Neely, M. (July 2016). Scale Matters: Community Banks and Compliance Costs. The Regional Economist. Retrieved from: www.stlouisfed.org/~/media/publications/regional-economist/2016/july/scale_matters.pdf.

in the three municipal bank models and outlines the assumptions used to model the operation and profitability of these lines of business. The section describes the lines of businesses, their interest rates, their anticipated loss rates and operational costs.

Description

Once the Task Force outlined the major goals of divestment and reinvestment, and the specific goals of affordable housing and small business lending, the Task Force and staff then evaluated how a municipal bank could achieve these goals by offering various lines of business. For each goal, the Task Force and staff met with various subject matter experts to determine how additional financing through a public bank could help address current gaps and to develop the lines of business. Many of the lines of business offered an opportunity to support and expand the work that the City and its partners are currently doing. The lines of business are described below. These products and services should be viewed as examples that can and should change over time as market demands evolve.

Participation lending

Participation Lending – Participation lending occurs when banks collaborate on loans, by providing capital contributions, guaranteeing loans, buying down interest rates or purchasing loans outright. A municipal bank could support local banks and credit unions by performing participation lending. A municipal bank could begin by buying other banks' SBA loans like the California State Treasurer's investment program. As the municipal bank evolves, it could expand its participation lending practice to include additional forms of participation and more diverse loan-types.

Real Estate

Mezzanine Debt Financing – Given high costs, City officials, advocates and developers all agree that cheaper financing could spur more affordable housing development. Currently, developers often utilize more high-cost equity financing because they cannot secure sufficient debt due to loan-to-value ratios. To fill this gap, a municipal bank could provide lower-cost mezzanine debt financing (capital that falls between equity and senior debt) for the development and preservation of affordable housing.

Small Sites Acquisition Mortgages – The Mayor's Office of Housing and Community Development runs the small sites acquisition program which helps non-profits acquire, rehabilitate and manage rent-controlled buildings at risk of conversion. To purchase these units, non-profits receive a City subsidy of $175,000 to $350,000 per unit and must also find traditional mortgage financing that is repaid over time via tenant rents. The public bank could provide these traditional mortgages at lower-rates and potentially longer-terms to the support small sites acquisition program and allow non-profits to acquire more units.

Accessory Dwelling Unit (ADU) Lending – An ADU is a unit added to an existing residential property, and ADUs offer opportunities for small-scale urban infill, adding needed units of housing to San Francisco. Though ADU construction is on the rise in San Francisco, individual homeowners without savings or sufficient equity in their home may not be able to get financing to build an ADU. The public bank can fill this gap by offering ADU financing to cover the cost of ADU construction with a float period during construction.

Small Business

Wholesale Small Business Lending – To support existing small business lending efforts, a public bank could offer wholesale loans to Community Development Financial Institutions (CDFIs), which make small business loans. Currently, CDFIs cobble together their funding—the money that they lend out—from a variety of sources, including the CDFI Fund, the U.S. Small

Business Administration, and private sources, such as banks. Like banks, CDFIs make a profit on the spread, difference between the rate at which they borrow their funding and lend their money. A municipal bank could offer lower costs funds to CDFIs to allow them to issue small business loans at lower rates.

Direct Small Business Lending – San Francisco has a robust ecosystem of small business support, including Community Development Financial Institutions (CDFIs), non-profits and City programs. Nevertheless, experts all noted that Local Business Enterprise (LBE) contractors (which are small- and micro- businesses that contract with the City) and other general contractors have difficulty accessing loans, and all small businesses struggle to get lines and letters of credit.[18] The municipal bank could support small businesses by lending to LBE contractors as well as other general contractors and offering lines and letters of credit to small businesses.

City's Commercial Banking

City's Cash Management and Commercial Banking – TTX currently utilizes Bank of America and U.S. Bank to support the City's banking needs. To reduce the City's reliance on Wall Street banks, the municipal bank would serve as the City's commercial banker, providing disbursements, deposits, cash management, payment processing, and reporting and technology solutions. The municipal bank would need the capacity to handle approximately 8 million payment transactions annually that amount to about $13 billion flowing in and out of the bank accounts. Because this line of business is purely operational and does not include any lending, the assumptions and costs associated with the City's commercial banking are presented above in the Start-Up & Operational Costs section rather than below.

Interest Rates

As noted above, all banks, including the municipal bank models, make their money on the interest spread, the difference between interest rates charged on loans and paid on deposits. Interest is an amount charged to the borrower for the loan, and it is typically calculated and presented as an annual percentage of the loan that is still outstanding. Interest rates can vary widely across industries and products, but they will depend on several factors: (1) the riskiness of the loan and the credit-worthiness of the borrower (a higher risk of default will lead to a higher interest rate), (2) the length of the loan (a longer loan will have a higher risk of default and therefore a higher interest), and (3) prevailing economic conditions (various indicators such as the Federal funds rate, prime rate and inflation rates may impact interest rates).

Each line of business modeled for the municipal bank models has a separate interest rate. To the maximum extent possible, these interest rates were estimated based on industry comparables and interviews with experts in the field. In some instances, the interest rates were deliberately modeled at below-market rates to fill a gap or address a market failure. The interest rates used below vary based on the riskiness of the line of business. For example, wholesale small business lending has an interest rate of 2.5 percent, because CDFIs are well-capitalized, credit-worthy institutions that are unlikely to default on their loans. In contrast, direct small businesses are riskier borrowers and more likely to default and therefore small business lending has a comparably high interest rate of 15 percent. The table below outlines the interest rates for all of the lines of business described above as well as the source for this interest rate and any additional explanations, for example a description of why an interest rate was modeled at below market rate.

18 The bank will still utilize financial technology companies for IT systems and an armored courier provider for transporting currency.

Table 4: Lending Interest Rates for Lines of Business in Models One, Two and Three

Asset Type	Lending Rate	Source & Explanation
90-Day US Treasury Bill	2.50%	Bank of North Dakota
Participation Lending: Guaranteed Loan Purchase Program Rate (7-year adjusted)	4.00%	Bank of North Dakota
Real Estate Lending	5.00%	Based on Call Reports of San Francisco-based community banks and Bank of North Dakota plus interviews with San Francisco-based affordable housing developers. For some lines of business, this is rate is deliberately below-market to help spur affordable housing development that would not otherwise occur.
Wholesale Small Business Lending	2.50%	Based on interviews with San Francisco-based CDFIs. CDFIs currently access capital from a variety of sources. While the CDFI Fund and U.S. SBA offer low-cost funds, the funding that CDFIs get from banks via private debt instruments have rates of about 3-4%. The municipal bank will charge 2.5% interest rate for its loans to CDFIs to offer CDFIs lower-cost funding than they can currently access from the private market while also ensuring that the municipal bank can make a profit.
Direct Small Business Lending	15.00%	OnDeck (a publicly-traded small business lender) reported a 30% effective lending rate in its 2017 Annual Report. The municipal bank will offer direct small business lending at a rate that is 50% lower than the private market to provide relief and financing access to local small businesses in San Francisco.

Loss Rates

All lending portfolios will experience losses, and bank models must incorporate estimated losses to create accurate projections. Provisions for loan losses are based on the riskiness of the loan. The riskier the loan type and the borrower, the higher the provision for loan loss, meaning the bank must put aside more money to cover losses for bad loans, which are written off. Bank models must include estimated loss rates for all lines of business, where a loss rate is the proportion of borrowers that default on their loans. As with provisions for loan losses, the riskier the lending portfolio, the higher the anticipated and modeled loss rate.

The loss rates for the municipal bank lines of business vary based on the type of loan, the duration of the loan, and the anticipated borrower. In general, real estate loans secured by land and buildings are less risky than unsecured consumer loans, where nothing is pledged as collateral. Modeled loan losses are low for real estate lending and wholesale small business lending due to CDFIs' history of strong performance and capitalization. In contrast, direct small business lending can be highly risky as evidenced by the high loss rate in the industry. For example, OnDeck, a public small business lender reported 16 percent loan loss rate in its 2017 Annual Report.[19] To address uncertainty in loss rates, models include a low-end and high-end estimate for loss rates. In the low-rate scenario, the loss rates are based on the current market trends for healthy, well-performing banks and financial institutions. The high-end rate scenario doubles the loss rate for each lines of business to address losses that could occur due to poor underwriting standards or an economic downturn. The following table outlines the lines of business as well as low-end and high-end loss rates and the source for these rates along with an explanation.

Table 5: Projected Loss Rates for Lines of Business in Models One, Two and Three

Asset Type	Low-End Rate	High-End Rate	Low-End Rate Source & Explanation
Participation Lending: Guaranteed Loan Purchase Program Rate (7-year adjusted)	0.25%	0.50%	Based on historical loan loss performance of participation lending programs at California State Treasurer and Bank of North Dakota
Real Estate Lending	1.00%	2.00%	Based on Call Reports of San Francisco based community banks and Bank of North Dakota and interviews with San Francisco-based housing developers
Wholesale Small Business Lending	0.50%	1.00%	Based on interviews with San Francisco-based CDFIs and their past loan performance
Direct Small Business Lending	15.00%	30.00%	Based on OnDeck's 2017 Annual Report reported 16% loan loss rate

Lending Operational Costs

As discussed above, there are three components to bank operational costs: (1) start-up costs, (2) fixed annual headquarter costs, and (3) lending operational costs. Lending operational costs are day-to-day costs associated with running a lending portfolio. They will vary based on the type of the loan portfolio and the size of the loan portfolio and include personnel and materials for sourcing, originating and servicing the loans. Some lines of business may be more difficult to administer than others—for example, a lending portfolio with many small loans will have higher administrative overhead costs than a portfolio with fewer large loans. Also, intuitively, as a lending portfolio increases in size, the costs associated with managing that portfolio increase proportionally. The operational costs associated with a lending

19 OnDeck. (2018). 2017 Annual Report. Retrieved from: https://s21.q4cdn.com/249473406/files/doc_financials/annual/2017-Annual-Report-on-Form-10-K.pdf.

portfolio are typically expressed as a a percent of the revenue resulting from the portfolio or as a proportion of the that lending portfolio.

Operational costs for the lines of business vary by the line of business and are all described below as a percentage of revenue or net loans. Similar to start-up cost and headquarter operating costs, a 50 percent multiplier was applied to the operational costs for all lines of business for the high-end cost estimate to provide a cushion for unanticipated costs. In general, for all FDIC-insured banks, the average operating cost was 58 percent of revenues in 2017.[20] Wholesale banks have lower lending operating ratios due the larger size of the average transaction. Bank of North Dakota's operating ratio was 20 percent in 2017.[21]

- Real estate lending: The bank models assume that the cost to perform wholesale real estate lending is 50 percent of revenues based on call reports of San Francisco-based community banks. Though real estate lending is direct lending (targeted at developers, non-profits and homeowners rather than other financial institutions), the loans are for very large amounts (the average is modeled at $5 million). In general, loans have generally the same cost to originate and service regardless of the size, so originating a few large loans will result in lower costs than originating many small loans. For reference, at $1 billion in loans (approximately $850 million in real estate loans), the lending costs associated with the real estate portfolio is $13 million.
- Wholesale small business lending: The bank models assume that the cost to perform wholesale small business lending is 20 percent of revenues. This estimate comes from Bank of North Dakota, which is primarily a wholesale lender. While a municipal bank must still underwrite, originate and service these large wholesale loans, this process is easier and less time-intensive because the origination process will be primarily based on the existing solid underwriting track records of the CDFIs with a long-standing history of low loss rates in their loan portfolios.
- Direct small business lending: The bank model assumes that the cost to perform direct small business lending is 10 percent of net loans. Small business lending is an expensive line of business, because it requires extensive due diligence during origination and results in relatively small loans (the average loan is modeled at $35,000). A portfolio of $25 million in small business loans, results in 714 loans, that the bank must underwrite, originate and service. Staff at CDFIs, such as Main Street Launch and Opportunity Fund, emphasize that small business lending is a high-touch business with significant administrative work, including collecting and reviewing documentation and performing due diligence. Experts noted that lending costs of 10 percent of net loans were reasonable. For example, OnDeck's operating expenses were 13 percent of net loans in 2017,[22] and OneMain (a direct consumer finance lender) had operating expenses of 10 percent of net loans in 2017.[23]

20 CFRA. (March 2018). Industry Surveys: Banks March 2018.

21 Bank of North Dakota. (2018). 2017 Annual Report. Retrieved from: https://bnd.nd.gov/pdf/2017_bnd_annual_report.pdf.

22 OnDeck. (2018). 2017 Annual Report. Retrieved from: https://s21.q4cdn.com/249473406/files/doc_financials/annual/2017-Annual-Report-on-Form-10-K.pdf.

23 OneMain Holdings, Inc. (2018). 2017 Annual Report. Retrieved from: http://investor.onemainfinancial.com/Cache/1500108802.PDF?O=PDF&T=&Y=&D=&FID=1500108802&iid=4405478.

Model Approach & Outcomes

The following section outlines the outcomes for the three municipal bank models, using all assumptions outlined above to project bank operations and profitability. Prior to providing the figures, the section explains the modeling approach, detailing the process for creating the models. Next, the section outlines results for all three municipal bank models providing:

- A low- cost estimate pro forma income statement in Year 10
- A high-cost estimate pro forma income statement in Year 10
- A table with low-cost and high-cost profit and loss projections for Year 0-10
- A graph of projected revenue and expenses from Year 1-50 (or 60 for Model Three)

Modeling Approach

To create the municipal bank models, TTX staff and consultant began by creating the pro forma of a steady state bank with $1 billion in loans and $1.1 billion in assets. This pro forma provided a baseline of an analytical framework for bank profitability. Given the uncertainties around bank operations, this framework was expanded to include low- and high-cost scenarios.

Once this steady state analysis was completed, staff projected bank growth and profitability over time using the growth rates described above. Given the assumption that it would take the bank 10 years to reach $1 billion in loans, the steady state analysis became the model of bank operations in year 10. Using year 10 as an anchor, TTX staff used two different methodologies to extrapolate bank growth over time. For year 1 to year 10, staff assumed the bank would begin at $50 million in loans and $55 million in assets and scale up from there in increments that increase over time (first the bank scales up by $25 million per year then $50 million per year hitting $200 million per year in growth between years 9 and 10) until the bank reaches $1 billion in net loans at 10 years. For years 11 to 60, staff assumed bank assets would grow at 5 percent per year consistent with Bay Area annual GDP growth.

The year 10 income statement pro formas included numerous assumptions about bank operations that were directly applicable to banks of smaller or larger sizes. Only one assumption, headquarter costs, was fixed, meaning that cost stayed constant regardless of bank size. In contrast, all other assumptions were variable, meaning they grew proportionally to bank assets. Though the ratio remains the same, actual expenses, revenues or losses will change with bank size. The table below exhibits this principle using participation lending income over time as bank size increases.

Table 6: Model Two Participation Lending Interest Income Over Time

Year	Net Loans	Interest Rate	Interest Income
1	$50 million	4%	$2 million
10	$1 billion	4%	$40 million
50	$8 billion	4%	$320 million

Using the combination of the steady state pro forma, fixed and variable modeling assumptions and growth projections, staff modeled year-by-year balance sheet and income statements. These analyses were used to calculate year-by-year estimates for bank expenses and revenue, and ultimately bank profitability or losses.

Model One Outcomes

The following four figures outline Model One's estimated performance over 50 years.

The low-cost pro forma income statement for year 10 shows that at $1.1 billion in size Model One would generate over $6 million in profits.

Overall, the bank would bring in $20 million in revenue with the vast majority of that ($18 million) coming from real estate lending. On the expense side, headquarter costs would require $2 million and operational expenses associated with lending would be almost $12 million.

Figure 6 Model One: Year 10 Pro Forma Income Statement (Low-Cost Estimate)

	Real Estate	Small Business - Wholesale	Small Business - Direct	Cash & Investments	Total
Total Loans	$862,944,162	$126,903,553	$26,881,720		$1,016,729,436
Loan Loss Reserve	($12,944,162)	($1,903,553)	($1,881,720)		($16,729,436)
As % of Total Loans	*1.5%*	*1.5%*	*7.0%*		
Net Loans	850,000,000	125,000,000	25,000,000		$1,000,000,000
Net Loans	$850,000,000	$125,000,000	$25,000,000		$1,000,000,000
Average Loan Size	$5,000,000	$2,000,000	$35,000		
# of Loans	170	62	714		
Cash & Investments				$100,000,000	$100,000,000
Yield	5.0%	2.5%	15.0%	2.5%	
Interest Income	$42,500,000	$3,125,000	$3,750,000	$2,525,000	$51,900,000
Cost of Funds %	2.0%	2.0%	2.0%		
Deposit & Debt as % of Total Loans	92.0%	92.0%	92.0%		
Cost of Funds	($15,871,534)	($2,334,049)	($494,417)		($18,700,000)
Provision for Losses %	1.0%	0.5%	15.0%		
Provision for Losses	($8,500,000)	($625,000)	($3,750,000)		($12,875,000)
Net Interest Income After Losses	2.0%	0.0%	-2.0%		
	$18,128,466	$165,951	($494,417)	$2,525,000	$20,325,000
Fees	$0	$0	$0	$0	$0
TOTAL REVENUES	**$18,128,466**	**$165,951**	**($494,417)**	**$2,525,000**	**$20,325,000**
Operating Expenses % of Revenues	50%	20%	10%		
Operating Expenses	($9,064,233)	($33,190)	(2,500,000)		($11,597,423)
HQ Expenses				(2,000,000)	($2,000,000)
TOTAL EXPENSES	**($9,064,233)**	**($33,190)**	**($2,500,000)**	**($2,000,000)**	**($13,597,423)**
PROFIT	**$9,064,233**	**$132,761**	**($2,994,417)**	**$525,000**	**$6,727,577**

Note: Operating expenses for Small Business Lending - Direct is a percent of Net Loans (not a percent of Revenues).

In contrast, the high-cost pro forma income statement for year 10 shows that Model One at $1.1 billion in size would lose over $6 million. The bank would bring in a total of $7.5 million in revenue. The $9 million in revenue from real estate lending and $2.5 million in revenue from investments is offset by losses from direct and wholesale small business lending which together lose almost $5 million due to high loss rates. On the expense side, headquarter costs require $3 million in expenditures and lending operational costs will be about $11 million.

Figure 7: Model One Year 10 Pro Forma Income Statement (High-Cost Estimate)

	Real Estate	Small Business - Wholesale	Small Business - Direct	Cash & Investments	Total
Total Loans	$862,944,162	$126,903,553	$26,881,720		$1,016,729,436
Loan Loss Reserve	($12,944,162)	($1,903,553)	($1,881,720)		($16,729,436)
As % of Total Loans	*1.5%*	*1.5%*	*7.0%*		
Net Loans	850,000,000	125,000,000	25,000,000		$1,000,000,000
Net Loans	$850,000,000	$125,000,000	$25,000,000		$1,000,000,000
Average Loan Size	$5,000,000	$2,000,000	$35,000		
# of Loans	170	62	714		
Cash & Investments				$100,000,000	$100,000,000
Yield	5.0%	2.5%	15.0%	2.5%	
Interest Income	$42,500,000	$3,125,000	$3,750,000	$2,525,000	$51,900,000
Cost of Funds %	2.0%	2.0%	2.0%		
Deposit & Debt as % of Total Loans	92.0%	92.0%	92.0%		
Cost of Funds	($15,871,534)	($2,334,049)	($494,417)		($18,700,000)
Provision for Losses %	2.0%	1.0%	30.0%		
Provision for Losses	($17,000,000)	($1,250,000)	($7,500,000)		($25,750,000)
Net Interest Income After Losses	1.0%	-0.5%	-17.0%		
	$9,628,466	($459,049)	($4,244,417)	$2,525,000	$7,450,000
Fees	$0	$0	$0	$0	$0
TOTAL REVENUES	**$9,628,466**	**($459,049)**	**($4,244,417)**	**$2,525,000**	**$7,450,000**
Operating Expenses % of Revenues	75.0%		15.0%		
Operating Expenses	($7,221,349)	($49,785)	(3,750,000)		($11,021,135)
HQ Expenses				($3,000,000)	($3,000,000)
TOTAL EXPENSES	**($7,221,349)**	**($49,785)**	**($3,750,000)**	**($3,000,000)**	**($14,021,135)**
PROFIT	**$2,407,116**	**($508,834)**	**($7,994,417)**	**($475,000)**	**($6,571,135)**

Note: Operating expenses for Small Business Lending - Direct is a percent of Net Loans (not a percent of Revenues).
Small Business Wholesale Lending operating expenses is 1.5 times of the operating expenses from the Low Cost scenario (not a percent of Revenues).

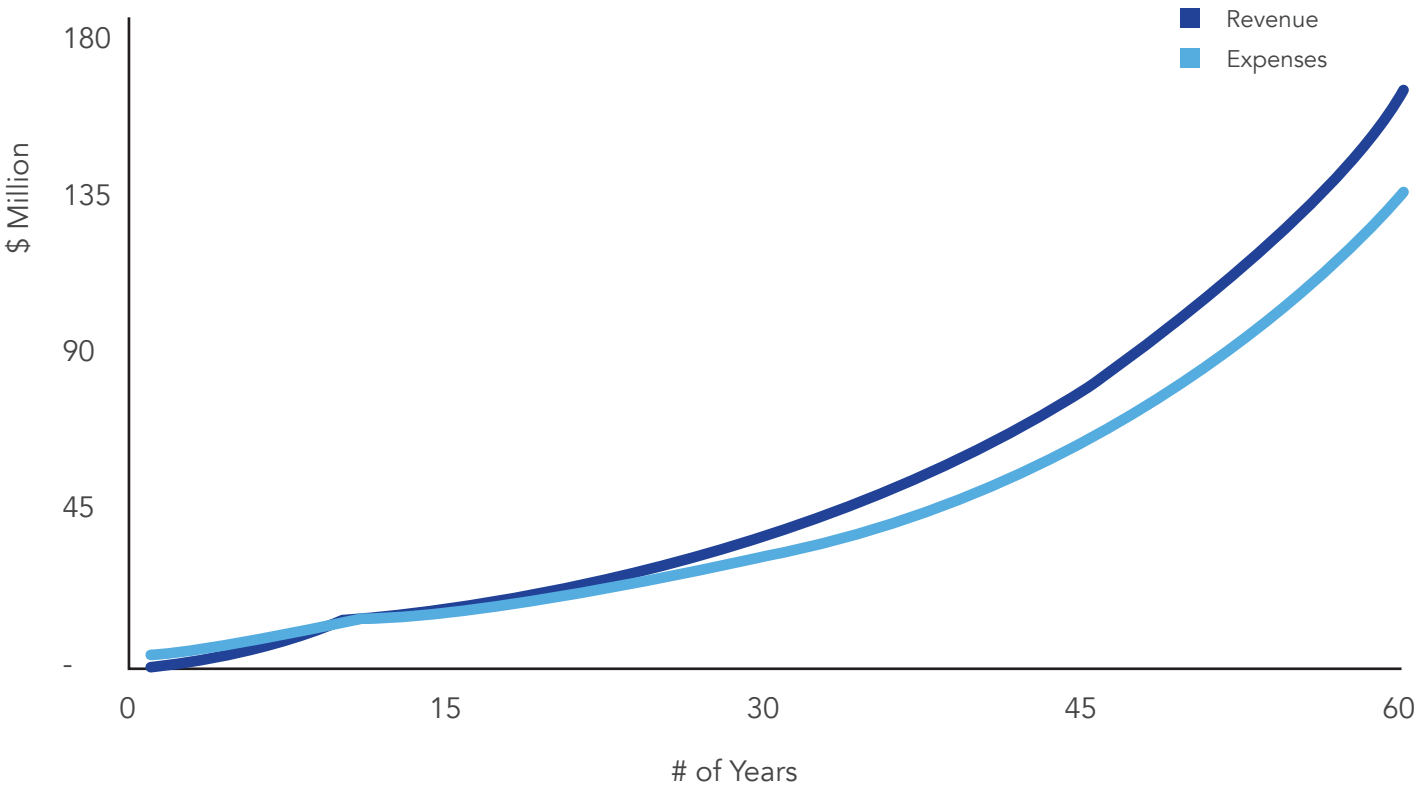
The next analysis shows growth in net loans and total assets over the first 10 years of bank operation and indicates Model One's overall surplus or deficit given revenue and expenses. The table includes start-up costs in pre-charter years ($5-$7.5 million outlined above). In terms of outcomes, in the low-cost estimate, Model One will first achieve a surplus in year 5, making $12 million over the first ten years. In the high-cost estimate, the bank will not achieve a surplus within the first ten years and will lose $51 million in total.

Table 7: Model One Financial Projections for the First Ten Years (Low & High Estimates)

	Value of Net Outstanding Loans Per Year ($ million)	Total Assets Per Year ($ million)	Net Surplus (Deficit) Per Year - Low Range ($ million)	Net Surplus (Deficit) Per Year - High Range ($ million)
Start-Up Years	-	-	(5)	(8)
Year 1	50	55	(2)	(3)
Year 2	75	83	(1)	(3)
Year 3	125	138	(1)	(3)
Year 4	200	220	(0)	(4)
Year 5	300	330	1	(4)
Year 6	400	440	2	(4)
Year 7	500	550	2	(5)
Year 8	650	715	4	(5)
Year 9	800	880	5	(6)
Year 10	1,000	1,100	7	(6)
Total			12	(51)
Capital for Balance Sheet			(165)	(165)

The final analysis projects long-term expenses and revenues for Model One over time, using an average of the low- and high-cost scenarios. This analysis shows that the bank would achieve annual breakeven at about 10 years with revenues outstripping expenses for the first time. This trend will continue over the next 40 years, though bank revenues will only slightly exceed expenses, meaning Model One will never make a large profit. At year 50 and almost $8 billion in loans, bank profit is only $18 million.

Figure 8: Model One Projected Expenses & Revenue Over Time (Average Estimate)



Model Two Outcomes

The following four figures outline Model Two's estimated performance over 60 years.

The low-cost pro forma income statement for year 10 shows that at $1.1 billion in size Model Two would lose almost $25 million. Overall, the bank would bring in $30 million in revenue, mostly from participation lending. On the expense side, headquarter costs would require $10 million, operational expenses associated with lending would be $6 million and annual costs for cash management would be $40 million. The annual expense for the cash management work alone outstrips all revenue, leading to an overall loss.

Figure 9: Model Two Year 10 Pro Forma Income Statement (Low-Cost Estimate)

	Participation Lending	Cash Management	Cash & Investments	Total
Total Loans	$1,015,228,426			$1,015,228,426
Loan Loss Reserve	($15,228,426)			($15,228,426)
As % of Total Loans	*1.5%*			
Net Loans	1,000,000,000			$1,000,000,000
Net Loans	$1,000,000,000			$1,000,000,000
Average Loan Size	$5,000,000			
# of Loans	200			
Cash & Investments			$100,000,000	$100,000,000
Cash & Treasury Transaction Volume		$10,000,000,000		$10,000,000,000
Yield	4.0%		2.0%	
Interest Income	$40,000,000		$2,000,000	$42,000,000
Cost of Funds %	1.0%			
Deposit & Debt as % of Total Loans	92.1%			
Cost of Funds	($9,350,000)			($9,350,000)
Provision for Losses %	0.3%			
Provision for Losses	($2,500,000)			($2,500,000)
Net Interest Income After Losses	2.8%			
	$28,150,000	$0	$2,000,000	$30,150,000
Fees	$0	$600,000	$0	$600,000
TOTAL REVENUES	**$28,150,000**	**$600,000**	**$2,000,000**	**$30,750,000**
Operating Expenses % of Revenues	20%			
Operating Expenses	($5,630,000)	($40,000,000)		($45,630,000)
HQ Expenses			($10,000,000)	($10,000,000)
TOTAL EXPENSES	**($5,630,000)**	**($40,000,000)**	**($10,000,000)**	**($55,630,000)**
PROFIT	**$22,520,000**	**($39,400,000)**	**($8,000,000)**	**($24,880,000)**

The high-cost pro forma income statement for year 10 shows that at $1.1 billion in size Model Two would lose over $54 million. Overall, the bank would earn almost $28 million in revenue, mostly from participation lending. On the expense side, headquarter costs would require $15 million, operational expenses associated with lending would be $8 million and annual costs for cash management would be $60 million. The annual expense for the cash management work is double the revenue brought in, leading to large losses.

Figure 10: Model Two Year 10 Pro Forma Income Statement (High-Cost Estimate)

	Participation Lending	Cash Management	Cash & Investments	Total
Total Loans	$1,015,228,426			$1,015,228,426
Loan Loss Reserve	($15,228,426)			($15,228,426)
As % of Total Loans	*1.5%*			
Net Loans	1,000,000,000			$1,000,000,000
Net Loans	$1,000,000,000			$1,000,000,000
Average Loan Size	$5,000,000			
# of Loans	200			
Cash & Investments			$100,000,000	$100,000,000
Cash & Treasury Transaction Volume		$10,000,000,000		$10,000,000,000
Yield	4.0%		2.0%	
Interest Income	$40,000,000		$2,000,000	$42,000,000
Cost of Funds %	1.0%			
Deposit & Debt as % of Total Loans	92.1%			
Cost of Funds	($9,350,000)			($9,350,000)
Provision for Losses %	0.5%			
Provision for Losses	($5,000,000)			($5,000,000)
Net Interest Income After Losses	2.5%			
	$25,650,000	$0	$2,000,000	$27,650,000
Fees	$0	$600,000	$0	$600,000
TOTAL REVENUES	**$25,650,000**	**$600,000**	**$2,000,000**	**$28,250,000**
Operating Expenses % of Revenues	30%			
Operating Expenses	($7,695,000)	($60,000,000)		($67,695,000)
HQ Expenses			($15,000,000)	($15,000,000)
TOTAL EXPENSES	**($7,695,000)**	**($60,000,000)**	**($15,000,000)**	**($82,695,000)**
PROFIT	**$17,955,000**	**($59,400,000)**	**($13,000,000)**	**($54,445,000)**

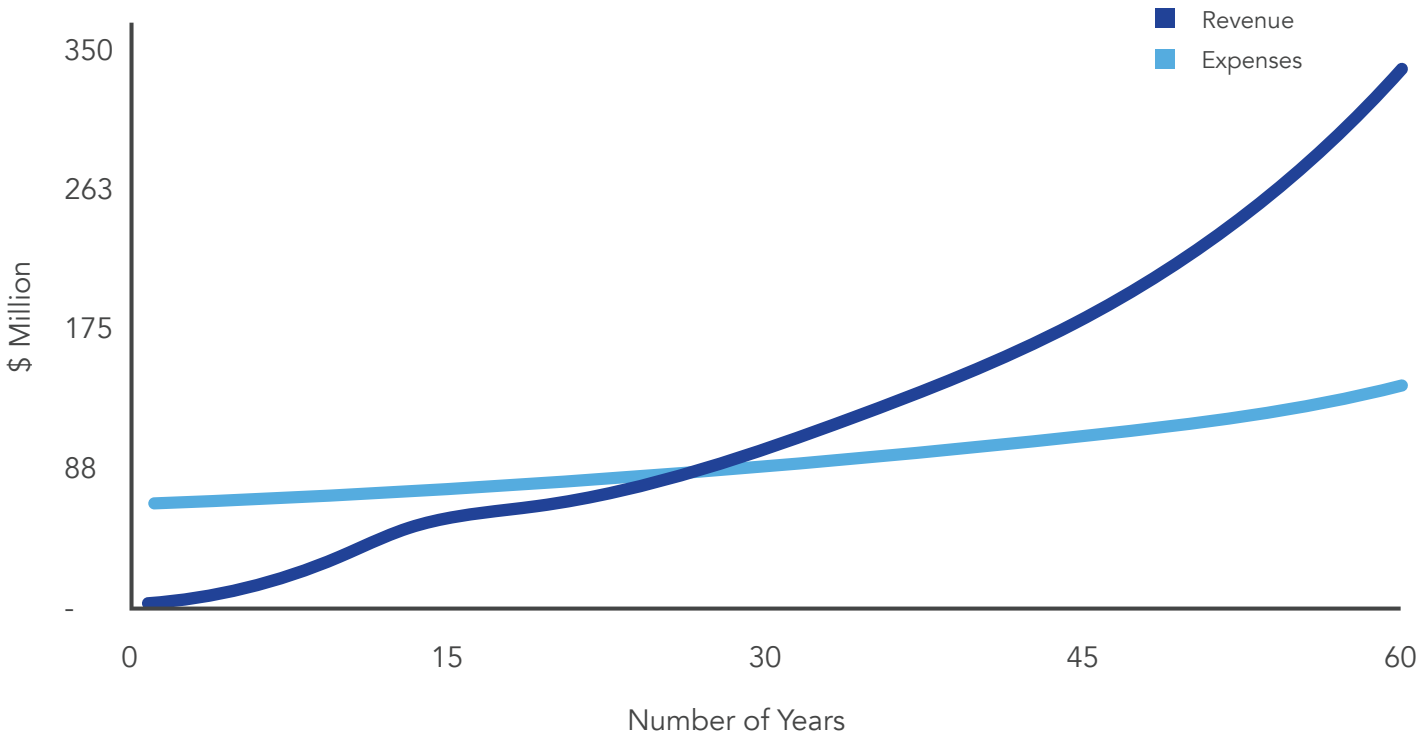
The next analysis shows growth in net loans and total assets over the first 10 years of bank operation and indicates Model Two's overall surplus or deficit given revenue and expenses. The table includes start-up costs in pre-charter years ($95-$143 million as outlined above). In terms of outcomes, the bank does not achieve a surplus in the first 10 years of operation in either the low- or high-cost scenarios. In the low-cost estimate, Model Two requires $488 million over the first 10 years, and in the high-cost estimate, it requires $804 million.

Table 8: Model Two Financial Projections for the First Ten Years (Low & High Estimates)

	Value of Net Outstanding Loans Per Year ($ million)	Total Assets Per Year ($ million)	Net Surplus (Deficit) Per Year - Low Range ($ million)	Net Surplus (Deficit) Per Year - High Range ($ million)
Start-Up Years	-	-	(95)	(143)
Year 1	50	55	(48)	(73)
Year 2	75	83	(48)	(73)
Year 3	125	138	(46)	(72)
Year 4	200	220	(44)	(70)
Year 5	300	330	(42)	(68)
Year 6	400	440	(39)	(66)
Year 7	500	550	(37)	(64)
Year 8	650	715	(33)	(61)
Year 9	800	880	(30)	(58)
Year 10	1,000	1,100	(25)	(54)
Total			(488)	(804)
Capital for Balance Sheet			(165)	(165)

The final analysis projects long-term expenses and revenues for Model Two over time, using an average of the low- and high-cost scenarios. This analysis shows that the bank would break even at about 31 years with revenues outstripping expenses for the first time. After 31 years, revenues begin to sharply exceed expenses as the bank grows larger, and the bank will bring in significant profits. At year 50 and almost $8 billion in loans, the bank will make over $100 million per year.

Figure 11: Model Two Projected Expenses & Revenue Over Time (Average Estimate)



Model Three Outcomes

The following four figures outline Model Three's estimated performance over 60 years.

The low-cost pro forma income statement shows that at $1.1 billion in size Model Three would lose over $35 million. Overall, the bank would bring in $30 million in revenue, mostly from real estate lending, which accounts for $26 million in revenue. On the expense side, headquarter costs would require $10 million, operational expenses associated with lending would be $15 million and annual costs for cash management would be $40 million. As in Model Two, the annual expense for the cash management work alone exceeds all revenue, leading to an overall loss.

Figure 12: Model Three Year 10 Pro Forma Income Statement (Low-Cost Estimate)

	Real Estate	Small Business - Wholesale	Small Business - Direct	Cash Management	Cash & Investments	Total
Total Loans	$862,944,162	$126,903,553	$26,881,720			$1,016,729,436
Loan Loss Reserve	($12,944,162)	($1,903,553)	($1,881,720)			($16,729,436)
As % of Total Loans	*1.5%*	*1.5%*	*7.0%*			
Net Loans	850,000,000	125,000,000	25,000,000			$1,000,000,000
Net Loans	$850,000,000	$125,000,000	$25,000,000			$1,000,000,000
Average Loan Size	$5,000,000	$2,000,000	$35,000			
# of Loans	170	62	714			
Cash & Investments					$100,000,000	$100,000,000
Cash & Treasury Transaction Volume				$10,000,000,000		$10,000,000,000
Yield	5.0%	2.5%	15.0%		2.5%	
Interest Income	$42,500,000	$3,125,000	$3,750,000		$2,525,000	$51,900,000
Cost of Funds %	1.0%	1.0%	1.0%			
Deposit & Debt as % of Total Loans	92.0%	92.0%	92.0%			
Cost of Funds	($7,935,767)	($1,167,025)	($247,208)			($9,350,000)
Provision for Losses %	1.0%	0.5%	15.0%			
Provision for Losses	($8,500,000)	($625,000)	($3,750,000)			($12,875,000)
Net Interest Income After Losses	3.0%	1.0%	-1.0%			
	$26,064,233	$1,332,975	($247,208)	$0	$2,525,000	$29,675,000
Fees	$0	$0	$0	$600,000	$0	$600,000
TOTAL REVENUES	**$26,064,233**	**$1,332,975**	**($247,208)**	**$600,000**	**$2,525,000**	**$30,275,000**
Operating Expenses % of Revenues	50%	20%	10%			
Operating Expenses	($13,032,116)	($266,595)	(2,500,000)	($40,000,000)		($55,798,712)
HQ Expenses					($10,000,000)	($10,000,000)
TOTAL EXPENSES	**($13,032,116)**	**($266,595)**	**($2,500,000)**	**($40,000,000)**	**($10,000,000)**	**($65,798,712)**
PROFIT	**$13,032,116**	**$1,066,380**	**($2,747,208)**	**($39,400,000)**	**($7,475,000)**	**($35,523,712)**

Note: Operating expenses for Small Business Lending - Direct is a percent of Net Loans (not a percent of Revenues).

The high-cost pro forma income statement for year 10 shows that at $1.1 billion in size Model Three would lose almost $75 million. Overall, the bank would bring in $17 million in revenue, mostly from real estate lending. On the expense side, headquarter costs would require $15 million, operational expenses associated with lending would be $17 million and annual costs for cash management would be $60 million.

Figure 13: Model Three Year 10 Pro Forma Income Statement (High-Cost Estimate)

	Real Estate	Small Business - Wholesale	SMB Lending - Direct	Cash Management	Cash & Investments	Total
Total Loans	$862,944,162	$126,903,553	$26,881,720			$1,016,729,436
Loan Loss Reserve	($12,944,162)	($1,903,553)	($1,881,720)			($16,729,436)
As % of Total Loans	*1.5%*	*1.5%*	*7.0%*			
Net Loans	850,000,000	125,000,000	25,000,000			$1,000,000,000
Net Loans	$850,000,000	$125,000,000	$25,000,000			$1,000,000,000
Average Loan Size	$5,000,000	$2,000,000	$35,000			
# of Loans	170	62	714			
Cash & Investments					$100,000,000	$100,000,000
Cash & Treasury Transaction Volume				$10,000,000,000		$10,000,000,000
Yield	5.0%	2.5%	15.0%		2.5%	
Interest Income	$42,500,000	$3,125,000	$3,750,000		$2,525,000	$51,900,000
Cost of Funds %	1.0%	1.0%	1.0%			
Deposit & Debt as % of Total Loans	92.0%	92.0%	92.0%			
Cost of Funds	($7,935,767)	($1,167,025)	($247,208)			($9,350,000)
Provision for Losses %	2.0%	1.0%	30.0%			
Provision for Losses	($17,000,000)	($1,250,000)	($7,500,000)			($25,750,000)
Net Interest Income After Losses	2.0%	0.5%	-16.0%			
	$17,564,233	$707,975	($3,997,208)	$0	$2,525,000	$16,800,000
Fees	$0	$0	$0	$600,000	$0	$600,000
TOTAL REVENUES	**$17,564,233**	**$707,975**	**($3,997,208)**	**$600,000**	**$2,525,000**	**$17,400,000**
Operating Expenses % of Revenues	75%		15%			
Operating Expenses	($13,173,175)	($399,893)	(3,750,000)	($60,000,000)		($77,323,067)
HQ Expenses					($15,000,000)	($15,000,000)
TOTAL EXPENSES	**($13,173,175)**	**($399,893)**	**($3,750,000)**	**($60,000,000)**	**($15,000,000)**	**($92,323,067)**
PROFIT	**$4,391,058**	**$308,083**	**($7,747,208)**	**($59,400,000)**	**($12,475,000)**	**($74,923,067)**

Note: Operating expenses for SMB Lending is % of Net Loans (not % of Revenues).
Small Business Wholesale Lending operating expenses is 150% of the operating expenses from the Low Cost Estimate scenario.

The next analysis shows growth in net loans and total assets over the first 10 years of bank operation and indicates Model Three's overall surplus or deficit given revenue and expenses. The table includes start-up costs in pre-charter years ($95-$143 million outlined above). In terms of outcomes, the bank does not achieve a surplus in the first 10 years of operation in either the low- or high-cost estimate. In the low-cost estimate, Model Three requires $532 million over the first 10 years, and in the high-cost estimate, it requires $888 million.

Table 9: Model Three Financial Projections for the First Ten Years (Low & High Estimates)

	Value of Net Outstanding Loans Per Year ($ million)	Total Assets Per Year ($ million)	Net Surplus (Deficit) Per Year - Low Range ($ million)	Net Surplus (Deficit) Per Year - High Range ($ million)
Start-Up Years	-	-	(95)	(143)
Year 1	50	55	(49)	(74)
Year 2	75	82.5	(48)	(74)
Year 3	125	137.5	(48)	(74)
Year 4	200	220	(47)	(74)
Year 5	300	330	(45)	(74)
Year 6	400	440	(44)	(74)
Year 7	500	550	(42)	(75)
Year 8	650	715	(40)	(75)
Year 9	800	880	(38)	(75)
Year 10	1,000	1,100	(36)	(75)
Total			(532)	(888)
Capital for Balance Sheet			(165)	(165)

The final analysis projects long-term expenses and revenues for Model Three over time, using an average of the low- and high-cost scenarios. This analysis shows that the bank would achieve annual breakeven at about 54 years with revenues outstripping expenses for the first time. At year 60 and over $12 billion in loans, the bank will make $16 million per year.

Figure 13: Model Three Projected Expenses & Revenue Over Time (Average Estimate)