BOK Financial Corporation

Market Risk Disclosures

For the quarter ended September 30, 2020

Introduction

With more than $1 billion in gross market value of trading assets and liabilities, effective April 1, 2018, BOK Financial Corporation (“BOKF” or the “Corporation”) became subject to revised risk-based capital guidelines for market risk (“Market Risk Rule”), issued jointly by the Office of the Comptroller of the Currency, Department of the Treasury; Board of Governors of the Federal Reserve System; and the Federal Deposit Insurance Corporation.

The Market Risk Rule establishes regulatory capital requirements and sets out certain key market measurement and management techniques. As part of the Market Risk Rule, the Corporation is required to publicly disclose certain quantitative and qualitative aspects of trading portfolios that are subject to the rule.

Quantitative Disclosures

Based on the requirements detailed in the Market Risk Rule, BOKF must disclose Value-at-Risk ("VaR") and Stressed VaR based measures. VaR measures the potential loss at a certain confidence level and timeframe based on market risk factors. Stressed VaR measures the potential loss at a certain confidence level and timeframe based on market risk factor movements calibrated to historical data from a continuous 12-month period that reflects a period of significant financial stress appropriate for current trading portfolios.

Financial institutions that use internal models to calculate specific risk must calculate incremental and comprehensive risk. BOKF uses the standardized measurement method for specific risk in place of an internal model to calculate specific risk.

Overall VaR and Stressed VaR

(Dollars in thousands)	High	Low	Mean	Period-End
High, low, and mean VAR-based measures over the reporting period and the VaR-based measure at period-end	$ 6,093	$ 1,150	$ 3,306	$ 4,814
High, low, and mean stressed VaR-based measures over the reporting period and the stressed VaR-based measure at period-end	14,476	1,802	6,155	10,779

The following table shows VaR by risk factor. Totals of the following table do not add to the totals in the table above because VaR’s appear at different dates for different risk factors.

VaR by Risk Factor

(Dollars in thousands)	Commodity	Foreign Exchange	Equity	Interest Rate	Credit
VaR					
High	$ —	$ 157	$ —	$ 6,777	$ 3,782
Low	—	—	—	1,544	594
Average	—	35	—	3,729	1,949

We compare actual gains and losses to VaR daily. During the three and six months ended September 30, 2020, there was one day and two days respectively where this subset of trading revenue had losses that exceeded our total covered portfolio VaR, utilizing a one-day holding period.

Qualitative Disclosures

Covered Positions

BOK is required to attribute market risk regulatory capital for "covered" trading positions. BOK's covered trading positions are a subset of its overall trading assets and liabilities, as defined by the Market Risk Rule, and consist of portfolios that provide its customers access to derivatives (primarily interest rate contracts), foreign exchange (spot and forward transactions), commodities and securities markets.

Composition of Material Portfolios

Portfolio	Composition	Sep 30, 2020
Equities trading portfolio	Equity Trading Securities	$ 272,052
Fixed income trading portfolio	U.S. Government Agency, Municipalities, and Corporate Obligations	80,280,387
Fixed income trading portfolio	Other debt securities	110,976,959
Fixed income trading portfolio	Brokered CDs	14,167,994
Fixed income trading portfolio and Hedges of BOK non-traded mortgage assets	Mortgage-backed securities	2,281,125,939
Fixed income trading portfolio, End user hedge program, Hedges of BOK non-traded mortgage assets	Derivatives with a positive fair value	272,359,299
Fixed income trading portfolio, End user hedge program, Hedges of BOK non-traded mortgage assets	Derivatives with a negative fair value	133,869,270

Valuation Policies for Covered Positions

Securities and Securitizations

The fair values of trading securities are based on quoted prices for identical instruments in active markets, when available. If quoted prices for identical instruments are not available, fair values are based on significant other observable inputs such as quoted prices of comparable instruments or interest rates and credit spreads, yield curves, volatilities, prepayment speeds and loss severities.

As of September 30, 2020, BOKF's covered positions portfolio does not include any positions that meet the definition of securitization positions as outlined by the Market Risk Rule. Risk Management monitors credit metrics of these covered positions, including delinquency rates of the underlying collateral pools, changes in attachment and detachment points of individual tranches held by the company, and credit ratings. Adverse changes are assessed and escalated through the governance process based on level of materiality.

Derivatives

Fair values for exchange-traded contracts are based on quoted prices. Fair values for over-the-counter interest rate, commodity and foreign exchange contracts are based on valuations provided either by third-party dealers in the contracts, quotes provided by independent pricing services, or a third-party provided pricing model that uses significant other observable market inputs.

Credit risk is considered in determining the fair value of derivative instruments. Management determines fair value adjustments based on various risk factors including but not limited to current fair value, probability of default and loss given default.

We also consider our own credit risk in determining the fair value of derivative contracts. Changes in our credit rating would affect the fair value of our derivative liabilities. In the event of a credit downgrade, the fair value of our derivative liabilities would increase.

Correlation Trading Positions

As of September 30, 2020, BOK's covered positions portfolio does not include any positions that meet the definition of correlation trading positions as outlined by the Market Risk Rule.

Characteristics of Internal Models

Approach Used to Determine Liquidity Horizons

BOK uses the prescribed "one-tail, 99.0 percent confidence level, ten-business-day holding period, or liquidity horizon, and a historical observation period of at least one year."

Backtesting

Backtesting facilitates the assessment of model performance and is also used to determine the multiplier for VaR and Stressed VaR for market risk regulatory capital.

BOK compares 250 days' worth of clean PnL values with their corresponding daily 1-day VaR. Clean PnL is a measure of a position's daily profit or loss while excluding fees, commissions, reserves, net interest income and intraday trading. The VaR measure used for comparison is calibrated to a one-day holding period at a one-tail, 99.0 percent confidence level. BOKF performs these comparisons at both the trading desk and total roll-up levels.

Specific Approaches Used in Model Validation

BOK's independent model validation team evaluates data used in the models, conceptual design, theory, and assumptions, implementation, model output analysis and uncertainty, and process and model governance. Additionally, an internal audit function independent of business line management assesses the effectiveness of the controls supporting model validation.

Stress Testing and Capital Adequacy

With respect to market risk associated with trading activities, risk management and calculations of regulatory capital are based primarily on internal VaR models and stress-testing analysis. Stress-testing analysis is used to support the Corporation's capital adequacy assessments.

Management performs a stress test to measure market risk from changes in interest rates on its trading portfolio. The stress test shocks applicable interest rates up and down 50 basis points and calculates an estimated change in fair value, net of economic hedging activity that may result.

BOK's trading portfolio is composed of Energy, Agriculture, Foreign Exchange, Interest Rate Derivative, To-be-announced and Fixed Income trading desks. This means the portfolio is sensitive to different risk factors such as commodity prices, currency exchange rates and different interest rate curves. The portfolio's sensitivity to each risk factor was estimated by determining the daily historical portfolio composition over the last year.

The stress period represents a one year window in which our portfolio was most volatile. VaR calculations from these periods were considerably higher than during periods not used in model development.

Disclosure Attestation

The Board of Directors and Senior Management are responsible for establishing an effective internal control structure over financial reporting, including disclosures required by the Market Risk Rule. This disclosure is submitted concurrently with the quarterly Form 10-Q and annual Form 10-K filings.