Cargill™

Advanced Concepts of Value at Risk (VaR).

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Introduction

The introduction to VaR module reviewed the definition of VaR, and its purpose, strengths, and weaknesses. Moving ahead, this guide will unfold the history of VaR, highlight additional details about VaR, and show you how to calculate VaR at Cargill.

Overview

The document will introduce you to:

The history of VaR

The approach used to calculate VaR in Cargill

The assumptions used in this approach
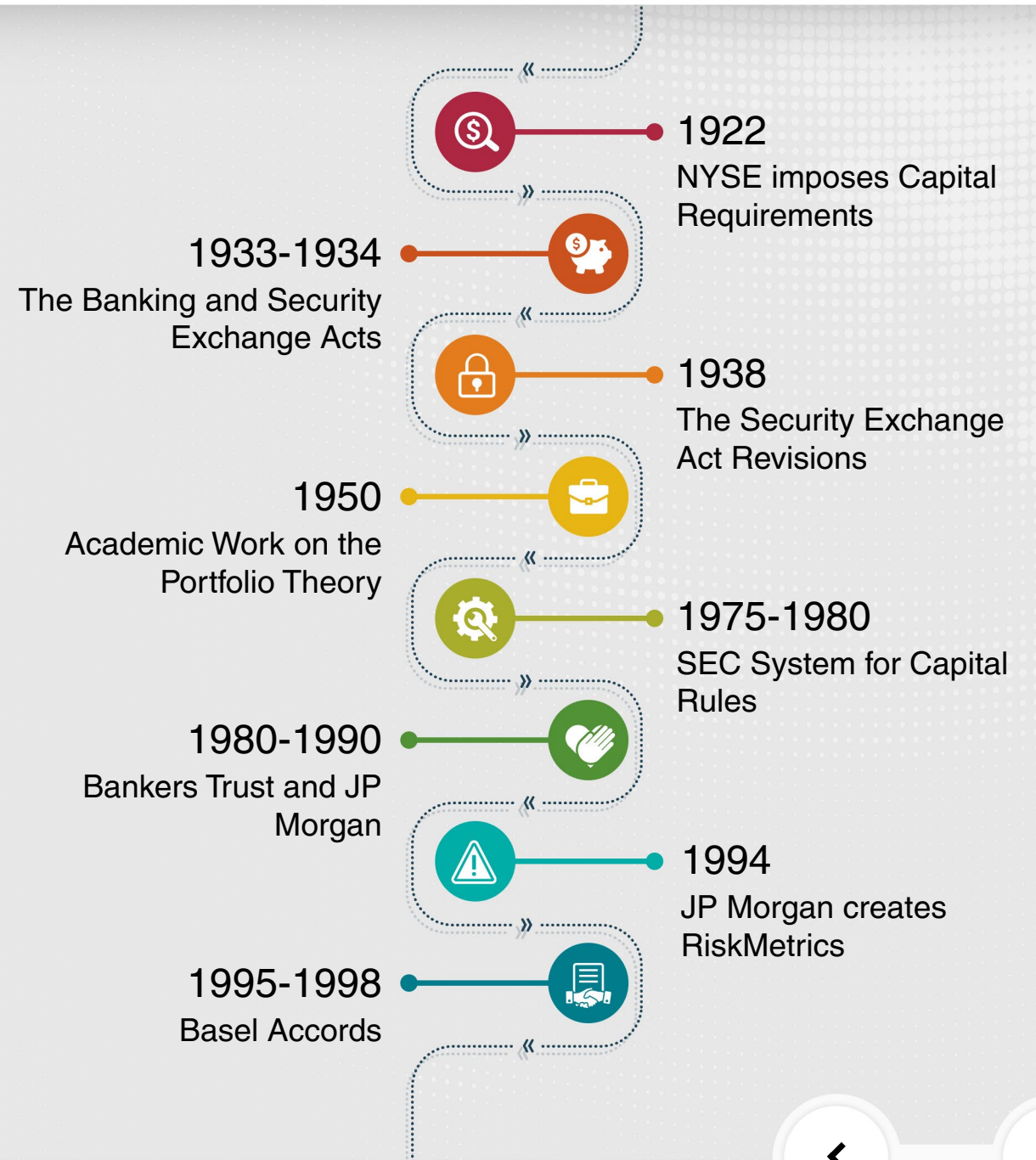
An example of how to calculate VaR using the Cargill methodology

History of VaR

The origins of Value at Risk date back to the early 1920s when the NYSE first applied capital requirements. These requirements evolved over time into the concept we know today as VaR.

Select each icon on the timeframe right to explore key events associated with measuring and managing risk.

1922
NYSE imposes Capital Requirements

1933-1934
The Banking and Security Exchange Acts

1938
The Security Exchange Act Revisions

1950
Academic Work on the Portfolio Theory

1975-1980
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1980-1990
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1994
JP Morgan creates RiskMetrics

1995-1998
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NYSE imposes Capital Requirements

They NYSE imposes capital requirements on bonds and on proprietary holdings of liquid securities.

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The Banking and Security Exchange Acts

1933

The Banking Act of 1933 was passed in response to the stock market crash of 1929.

The act created a segregation between commercial and investment banking activities.

1934

The Securities Exchange Act resulted in the creation of the Securities and Exchange Commission (SEC).

The SEC was established as the primary regulatory authority for security firms, and the act also imposed a capital requirement on securities firms in order to ensure securities firms had sufficient liquidity to meet client obligations. The initial rule required firms to not incur indebtedness in excess of 2,000% of their net capital.

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1938

The Security Exchange Act Revisions

The Securities Exchange Act was modified to allow the SEC to develop and implement a Net Capital Rule for determining capital requirements on security firms.

The Net Capital Rule allowed firms to subtract 10% of the market value of most proprietary positions from their net capital. The haircut was designed to allow for a margin of safety against any losses which might arise during the time it would take to liquidate a position.

In 1965 the haircut for equity securities was increased to 30%.

Basel Accords

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Academic Work on the Portfolio Theory

Harry Markowitz published academic research on portfolio theory, which provided the mathematical underpinning for VaR.

Portfolio theory shows that an investor can construct a portfolio of multiple assets that will maximize returns for a given level of risk.

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1975-1980
SEC System for Capital Rules

The SEC redesigned the systems of haircuts by classifying financial positions into different categories such as government debt, corporate debt and preferred stock.

The SEC also created rules for any concentrations in risk in a single asset.

The SEC further revised the system of haircuts to reflect higher volatility in interest rates in 1980. The revised system based the haircuts on a statistical analysis of historical security price returns.

The haircut percentages were designed to cover sufficient losses with 95% confidence over a 30-day period and is considered to be the beginning of a rudimentary VaR measure.

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1922

1980-1990
Bankers Trust and JP Morgan

Bankers Trust distributed research to clients for assessing capital requirements. The work established the concepts of a standard deviation of loss and a 99th percentile of loss.

JP Morgan developed a firmwide VaR system based on a one-day 95th percentile loss scenario.

This VaR replaced the system of notional market risk limits and was incorporated with P&L into a report, which came to be known as the 4:15 report in JP Morgan and was forwarded to the Chairman of JP Morgan daily.

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JP Morgan creates RiskMetrics

JP Morgan developed a service called RiskMetrics, allowing clients to access the JP Morgan VaR methodology and time series data sets, necessary to compute a VaR.

RiskMetrics was later spun off as an independent company that was purchased by MSCI, a provider of equity and fixed income indexes and portfolio analytics.

JP Morgan creates RiskMetrics

1995-1998
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The Basel Committee of the Bank of International Settlements approved the use of VaR models for calculating the market risk component of a bank's capital requirements.

The ability of firms to be able to use their internal VaR model required regulatory approval and also required banks to have an independent risk management function to satisfy regulators that it was following acceptable risk management practices.

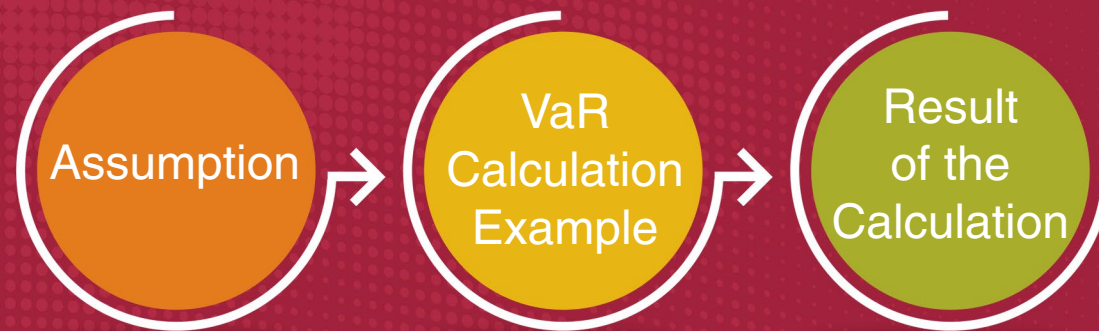RiskMetrics

1995-1998
Basel Accords

How is VaR Calculated in Cargill?

The Cargill standard is based on the **Variance Covariance Approach**.

This method uses 30 days of historical prices to calculate volatilities and correlations.

Let's look at an example of how to calculate VaR based on the methodology we use at Cargill.

Select the steps to learn the calculation.

Assumption → VaR Calculation Example → Result of the Calculation

30 Days of Price History

Date	Price	Price Return	Simulated P/L = USD Exposure X Price Return
11/1	$5.00		
11/2	$4.88	-2.53%	-$25,318 = $1mm X -2.53%
11/3	$5.06	-3.77%	$37,740 = $1mm X 3.77%
......	......		
12/12	$5.55		
12/13	$5.27	-5.13%	-$51,293 = $1mm X -5.13%

Standard Deviation of Simulated P/Ls = $45k
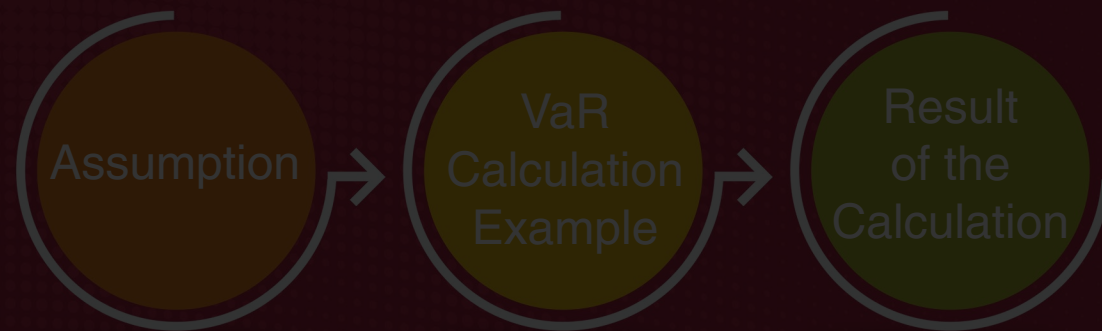
$45k X 1.645 = $75k VaR

How is VaR Calculated in Cargill?

The Cargill standard is based on the **Variance Covariance Approach**.

Assumption ⊗

This example assumes we have a long corn dollar exposure of $1,000,000.

Note: For more information about dollar exposure, please access the online module on Dollar Exposure.

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30 Days of Price History

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VaR Calculation Example

Step 1 ► In order to calculate the VaR we first begin by obtaining a 30-day price history of corn futures prices and calculate the daily % changes in prices.

Step 2 ► From there we compute what is termed the simulated P/Ls for the corn position.

Note: This is the amount of money the position would make or lose over each day in the 30-day sample, based on the dollar exposure of $1,000,000.

Select arrows to navigate. ‹ 1/2 ›

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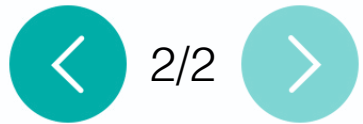
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VaR Calculation Example ⊗

Step 3 ▶ Then calculate the standard deviation of the simulated Profit or Loss to get the portfolio volatility, which in this example, equals $45,000.

Step 4 ▶ Finally, multiply the portfolio volatility by **1.645**, which refers to the **95% confidence level** for a normal distribution, and represents the number of standard deviations from the mean. This produces a **VaR of $75,000**.
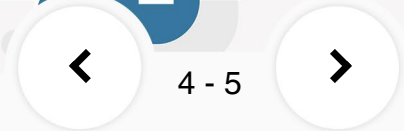
Select arrows to navigate. ◀ 2/2 ▶

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Result of the Calculation

The example produced a daily **VaR of $75k, with a 95% confidence interval**.

A P/L loss greater than $75,000 would be expected approximately 5% of the time, or 1 out of 20 business days.

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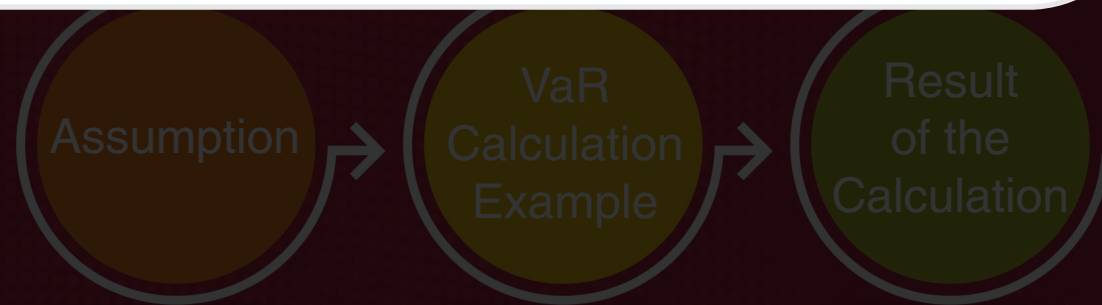
Summary

This brings you to the end of this guide. You have now learned:

| How VaR evolved over time | How to calculate VaR metrics at Cargill |

You may now proceed to the VaR Supportive Metrics in Trading and Risk Management eLearning.