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**Approved By:** Product Owner

# Executive Summary

The **Margin Calculator** Business Requirement Document (BRD) outlines the functional and technical specifications for a platform designed to help **CCP members, clients, operations teams, and risk teams** calculate margin requirements and assess portfolio risks efficiently.

The platform aims to enhance **risk management and trading decision-making** by incorporating key features such as:

- **What-If Analysis**: Allows users to evaluate the impact of new trades on their existing portfolio before submission.
- **Portfolio Risk Assessment**: Enables stress testing to analyse how a portfolio performs under different market scenarios.
- **Trade File Upload & Validation**: Ensures users can submit trades in a structured format, with automated validation checks to maintain data integrity.
- **Automated Risk Model Execution**: Updates margin calculations in real time and reflects changes in portfolio risk on the dashboard.

The system follows a strict set of **business rules**, ensuring compliance with data accuracy standards, trade expiration constraints, and file size limitations. By providing **real-time insights**, the platform empowers users to make informed trading decisions and efficiently manage their margin requirements.

This document defines the **scope, features, and business rules** governing the platform's functionality, ensuring alignment with the needs of all stakeholders involved in risk and margin management.

# Table of Contents

**1.0 INTRODUCTION ..... 4**

1.1 SCOPE ..... 4
1.2 BUSINESS OBJECTIVE ..... 4

**2.0 BUSINESS REQUIREMENT ..... 5**

2.1 STAKEHOLDER LIST ..... 5
*2.1.1 Stakeholder matrix ..... 5*
*2.1.2 Constraints ..... 6*
*2.1.3 Use Case Diagram ..... 7*
*2.1.4 System Activity Diagram ..... 9*
*2.1.5 Level 0 and Level 1 Data flow diagram ..... 10*
2.2 SYSTEM COMPONENTS ..... 11
*2.2.1 Margin Calculator ..... 11*

**3.0 FUNCTIONAL REQUIREMENTS. ..... 23**

**4.0 NON- FUNCTIONAL REQUIREMENTS . ..... 28**

# 1.0 Introduction

This Business Requirement Document defines the requirements for the Margin Calculator. The purpose of this document is to outline how the platform will enable CCP members, clients, operations, and the risk team to calculate margin requirements and assess portfolio risk. The platform will include features like stress testing, allowing users to analyse how their existing portfolio responds to various market scenarios. Additionally, it will enable members and clients to evaluate the impact of their entire portfolio by adding new trades to existing cleared instruments and conducting "What-If" analyses.

## 1.1 Scope

This system will enable users to:

- Submit new trade data from their own device for margin calculation.
- Perform "What-If" analysis to assess the impact of a trade before submitting it for clearing and settlement.
- Provide feature called as Stress Analysis, allowing users to select predefined historical stress scenarios to evaluate how their existing portfolio performs under extreme conditions.
- View and export detailed margin reports for further analysis and regulatory compliance.
- Integrate with market data sources for real-time margin calculations, ensuring accuracy and up-to-date risk assessment.
- Provide a User Dashboard with real-time trade details, margin breakdown, profit/loss tracking, risk metrics, and interactive analysis tools.

## 1.2 Business objective

- **Enhance Service Offerings** – Provide an advanced margin calculation and risk assessment tool to strengthen the company's financial services portfolio.
- **Increase Client Engagement & Retention** – Offer a value-added platform that improves user experience, encouraging long-term client relationships.
- **Ensure Regulatory Compliance** – Develop a solution that aligns with financial regulations, reducing compliance risks and improving transparency
- **Accurate Margin Calculation** – Ensure clients can easily compute margin requirements, improving financial planning and decision-making.
- **Seamless User Experience** – Provide an intuitive and efficient platform that simplifies margin management and enhances usability.

# 2.0 Business Requirement

## 2.1 Stakeholder List

This table outlines the key **stakeholders** involved in the **Margin Calculator Project**, along with their respective **teams, roles, and sign-off responsibilities**. It ensures that every stakeholder's contribution and approval authority are well-defined, reducing confusion and improving project execution.

| Sr No | Stakeholder | Team | Role & Responsibility | Sign-Off Responsibility |
|---|---|---|---|---|
| 1 | **Project Manager** | Change Management | Oversees project planning, timeline, budget, and successful delivery. | Project Scope, Delivery Milestones |
| 2 | **Trader/Client** | End User | Submits trades, analyzes margin impact, and provides feedback on usability. | Functional Validation (UAT) |
| 3 | **Risk Managers** | Risk Management | Defines risk policies, ensures risk model aligns with regulatory requirements, and monitors risk exposure. | Risk Model & Policies Approval |
| 4 | **Quants Developer** | Quants Team | Designs, develops, and tests risk models used for margin calculation. | Risk Model Validation |
| 5 | **Business Analyst** | Change Management | Gathers business requirements, designs process maps, creates test cases, conducts UAT, writes user stories, and provides post-release support. | Business Requirements Document (BRD), UAT Sign-Off |
| 6 | **Software Developer** | Software Engineering | Develops the web-based application, handling both front-end and back-end s ystems. | Technical Implementation Review |
| 7 | **Solution Architect** | DevOps | Designs system architecture, provides data solutions, and manages cloud services. | System Architecture Approval |
| 8 | **Data Engineer** | Database Team | Designs the database architecture, including schema, and integrates data from internal/external systems. | Database Architecture Approval |
| 9 | **Compliance Analyst** | Compliance Team | Ensures the platform meets regulatory requirements (Basel, EMIR, Dodd-Frank) and validates compliance adherence. | Compliance & Regulatory Approval |
| 10 | **Quality Assurance (QA) Engineer** | Testing Team | Conducts system testing, UAT, and performance testing to ensure the platform works as expected. | Test Case Validation, UAT Testing Sign-Off |
| 11 | **Operations Team** | Operations | Ensures smooth implementation, supports ongoing operations, and troubleshoots user issues post-launch. | Operational Readiness Sign-Off |
| 12 | **Senior Management / Sponsors** | Executive Team | Provides strategic direction, approves budgets, and oversees project success. | Final Project Approval & Budget Sign-Off |

### 2.1.1 Stakeholder matrix

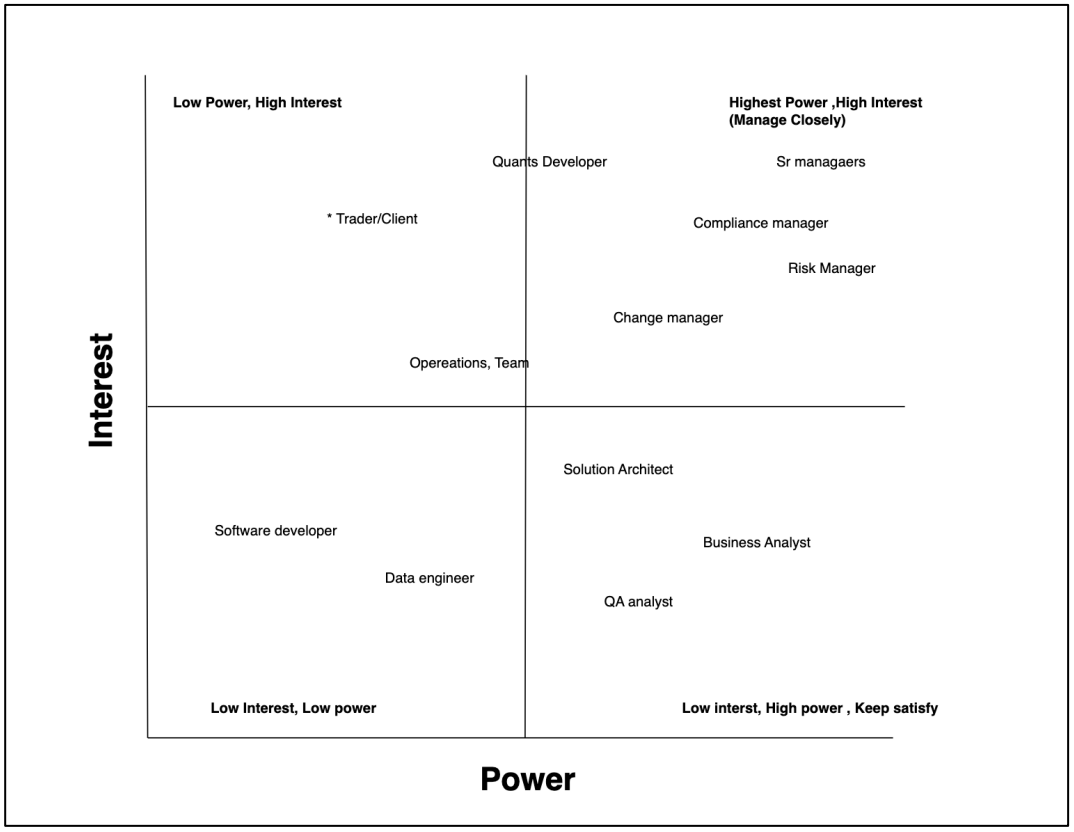



*Fig 2.1.1 Stakeholder matrix*

#### 2. 1.2.1Business Assumptions

- **Regulatory Compliance** – The system will comply with **Basel III, EMIR, Dodd-Frank, and other applicable regulations**.
- **Trader Usage** – Traders and clients will **accurately input trade data** for margin calculations.
- **Risk Model Validation** – The **Risk Engine** follows pre-approved risk methodologies defined by the **Quant team**.
- **Sign-Off by Key Stakeholders** – The Business, Risk, and Compliance teams will **review and approve all margin calculation logic** before implementation.
- **Defined Risk Policies** – Risk Managers will provide **fixed risk policies** that won't frequently change.

#### 2.1.2.1 Technical Assumptions

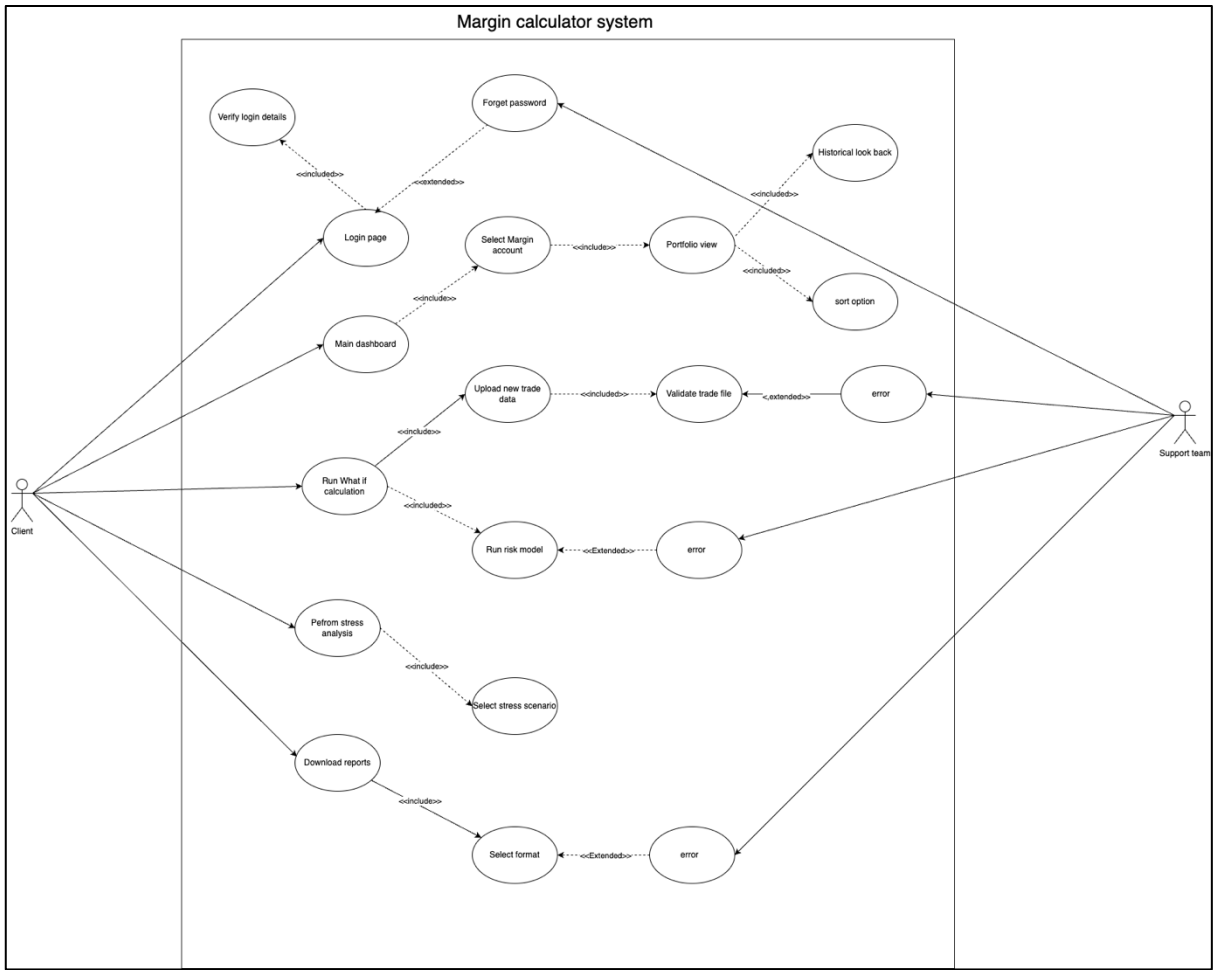
- **Real-Time Market Data Availability** – The system assumes **market data providers (e.g., Bloomberg, Reuters) will provide accurate and timely market data** for calculations.
- **Stable System Architecture** – The Risk Engine, Margin Calculator, and Database will communicate seamlessly **without unexpected delays or failures**.
- **APIs & External Data Feeds** – External APIs (pricing feeds, risk data) will be **available, secure, and have sufficient response times**.
- **Performance Scalability** – The system can handle **high trade volumes** without degradation.
- **Single Source of Truth** – The database will serve as **the only source of record** for margin data.

### 2.1.2 Constraints

#### 2.1.3.1 Business Constraints

- **Regulatory Deadlines** – The system must go live before **specific regulatory enforcement dates**.
- **Stakeholder Availability** – Sign-offs from multiple teams (Risk, Compliance, IT) might cause **delays in approval cycles**.
- **Fixed Budget & Resources** – The development budget and team size are **predefined and cannot be extended significantly**.
- **Defined Scope** – Features like **What-If Analysis and Stress Testing** are **included**, but **automated risk model recalibration is out of scope**.
- **User Training** – Training will be **limited to documentation and webinars**, no one-on-one coaching.

## 2.1.3 Use Case Diagram




*2.1.4 Use Case Diagram*

**Use Case: Margin Calculator System**

**1. Overview**

The Margin Calculator System enables clients to calculate margin requirements, perform risk assessments, and download reports. The system also provides error handling and support assistance to ensure smooth functionality.

**2. Actors**

- **Client**: The primary user who logs in and performs margin-related calculations.
- **Support Team**: Provides assistance in case of errors or issues encountered by the client.

**3. Use Case Descriptions**

**3.1 Login Page**

**Description**: The client logs into the system to access margin-related features.

- **Includes**: Verify login details.
- **Extends**: Forgot password option if the user fails authentication.

**3.2 Main Dashboard**

**Description**: The client lands on the dashboard to navigate margin-related functionalities.

- **Includes**: Selecting a margin account.

**3.3 Portfolio View**
**Description**: The client views their portfolio details.
- **Includes**: Sorting options, historical look-back feature.

**3.4 Upload New Trade Data**
**Description**: The client uploads new trade data for margin calculation.
- **Includes**: Trade file validation.
- **Extends**: In case of validation errors, the issue is escalated to the Support Team.

**3.5 Run What-If Calculation**
**Description**: The client performs hypothetical margin calculations based on different scenarios,The client executes risk model simulations.
- **Extends**: If an error occurs, the issue is escalated to the Support Team.

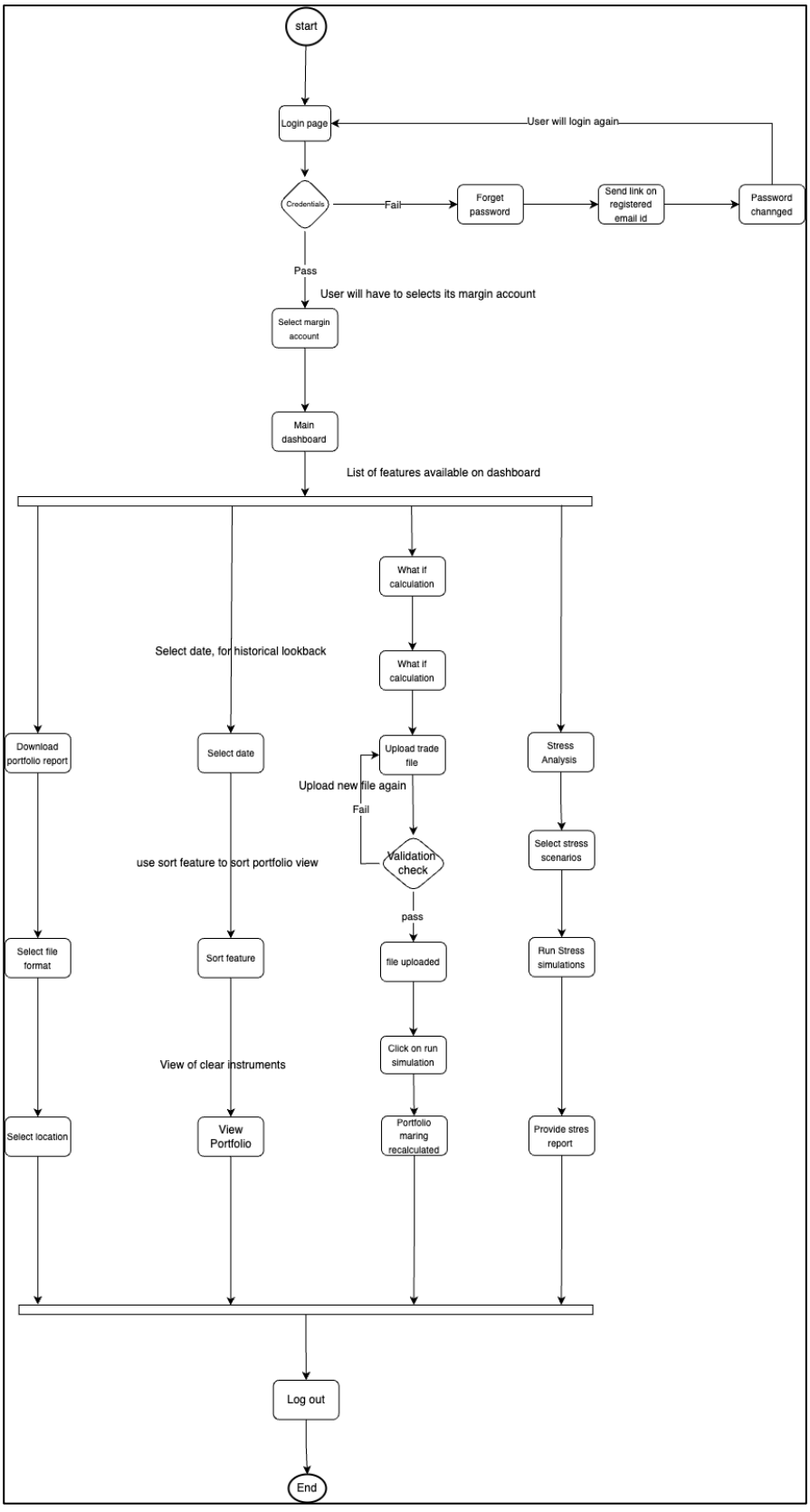
**3.6 Perform Stress Analysis**
**Description**: The client tests different stress scenarios to analyze market impact.
- **Includes**: Selecting a specific stress scenario.

**3.7 Download Reports**
**Description**: The client downloads reports for analysis.
- **Includes**: Selecting report format.
- **Extends**: If an error occurs in report generation, the issue is escalated to the Support Team.

**4. Error Handling & Support**
Errors in trade validation, risk modeling, or report generation require intervention from the **Support Team** to resolve system issues and ensure seamless operation.

**5. Dependencies & Assumptions**
- Clients must have valid credentials to access the system.
- Trade data must adhere to system validation rules.
- The Support Team must be available to resolve escalated issues.

## 2.1.4 System Activity Diagram




*2.1.4 system activity diagram*

## 2.1.5 Level 0 and Level 1 Data flow diagram

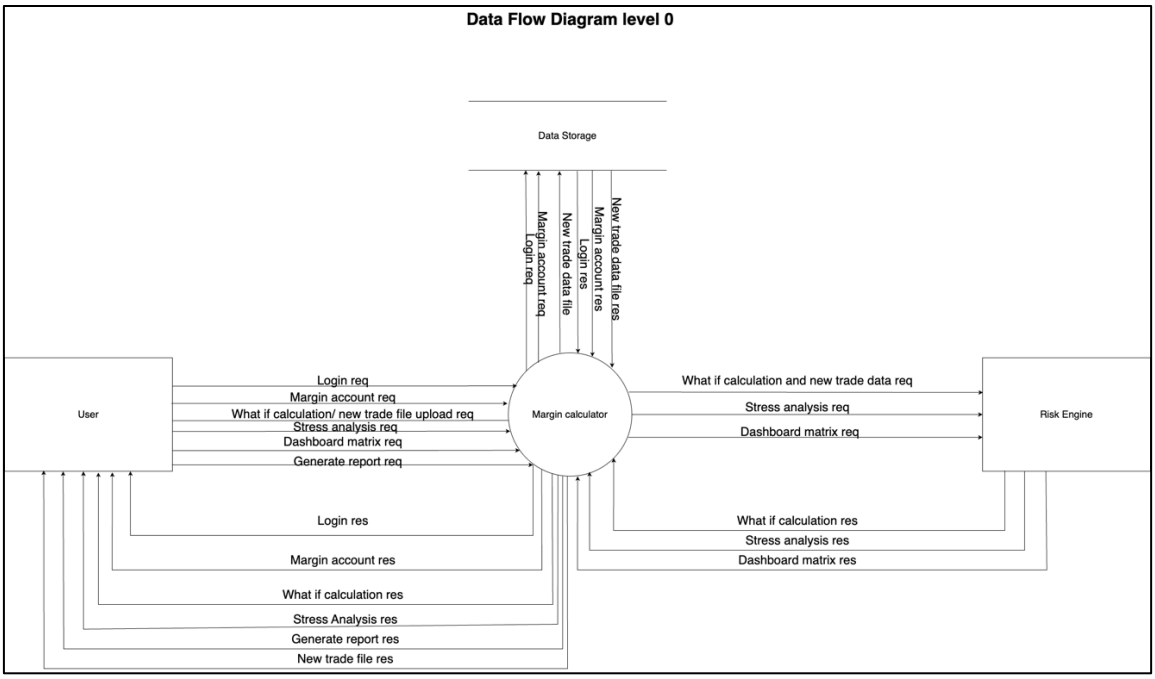



*Fig 2.1.5(a) Level 0 dataflow diagram*

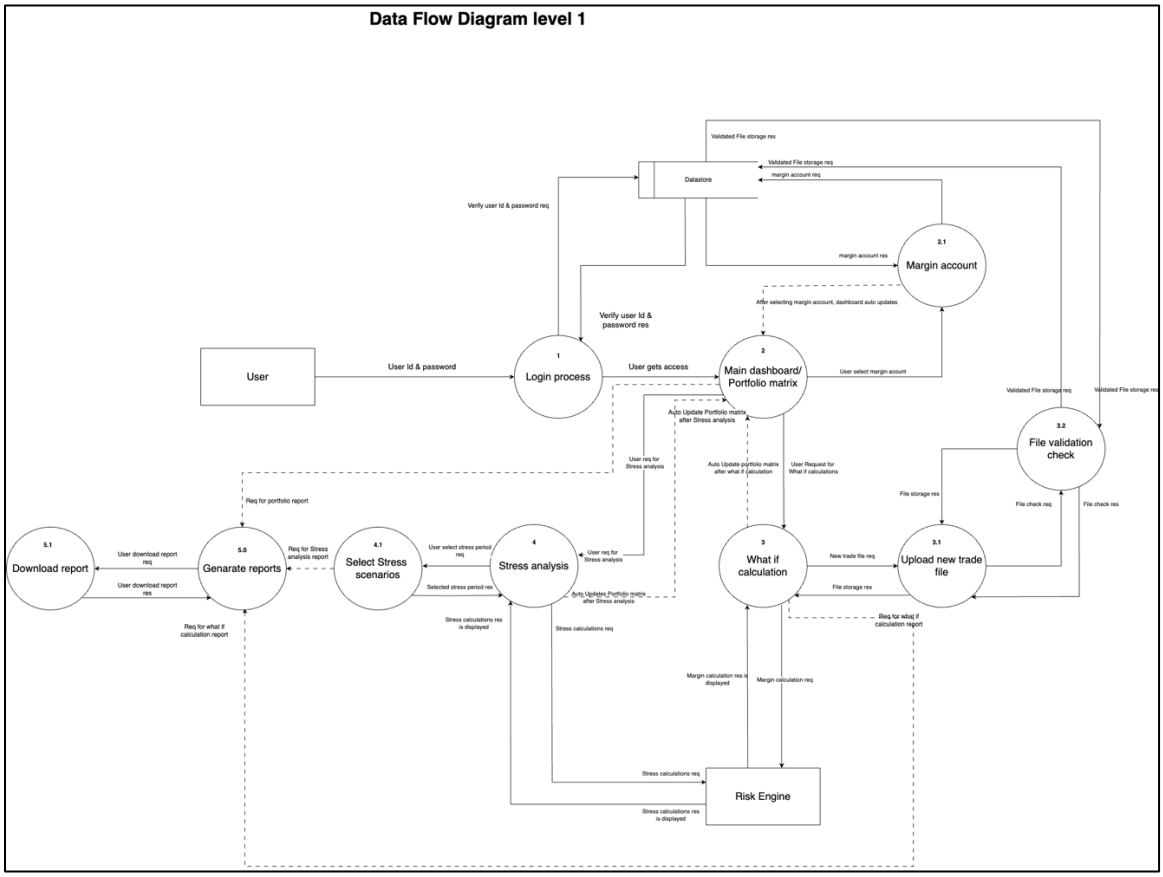



*Fig 2.1.5(b) Level 1 dataflow diagram*

## 2.2 System components

The system contains two main components margin calculator, and risk engine (ref:- risk model specification document  for risk engine)

### 2.2.1 Margin Calculator

The margin calculator is a web-based application designed for members and clients of the clearing house to regularly monitor their portfolios. The platform enables clients to upload new trade data files and perform "what-if" calculations, allowing them to analyse their margin requirements before submitting new trade instruments for clearing and settlement. Additionally, the system includes a stress analysis feature, which helps users assess how their portfolio performs under stressed market conditions. The user can also export both filtered and unfiltered portfolio reports in CSV format.
Below are the key components of the Margin Calculator

#### 2.2.1.1 Login Page

The system will include a login page where users must enter their registered user ID and password to gain access. If the credentials are correct, the user will be granted access. In case a user forgets their user ID or password, the system will provide an alternative recovery option. The user must enter their registered email ID, after which a link will be sent to reset the password. For username recovery, the system will directly send the user ID to the registered email.
For security reasons, the system will implement two-factor authentication during password recovery. Two separate emails will be sent—one containing the reset link and the other providing a four-digit OTP.

**Business Rules:**

1. Users will only be granted access if they enter the correct credentials.
2. After three failed login attempts, the account will be temporarily locked.
3. Passwords must be at least 10 characters long and include at least one digit (0-9), one uppercase letter, one lowercase letter, and one special character.
4. Users must change their password every 28 days, and the new password cannot be the same as any of the last four passwords.

**Sequence flow(Login page):**

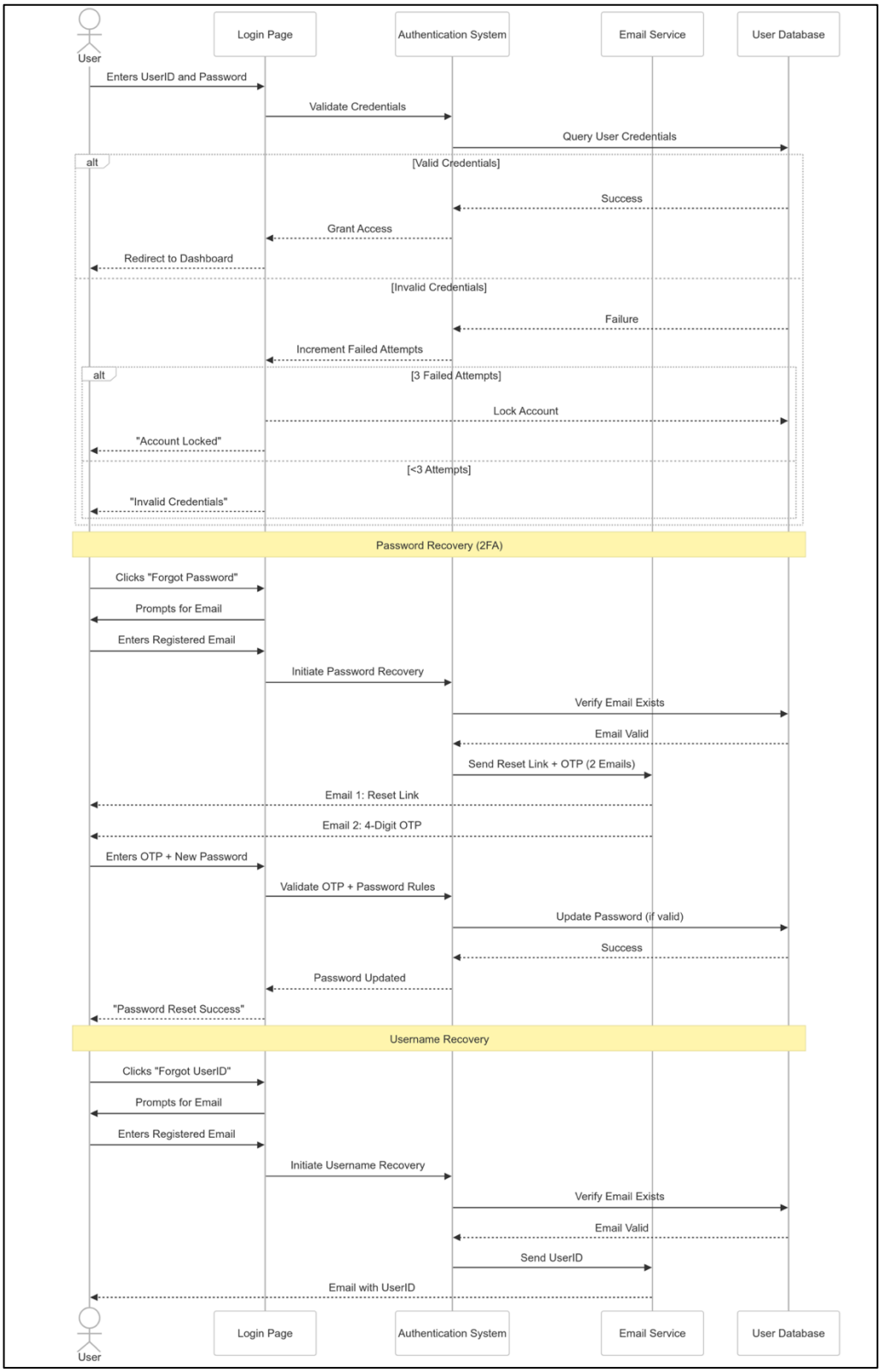



*Fig 2.2.1.2(a) Sequence flow (login page)*

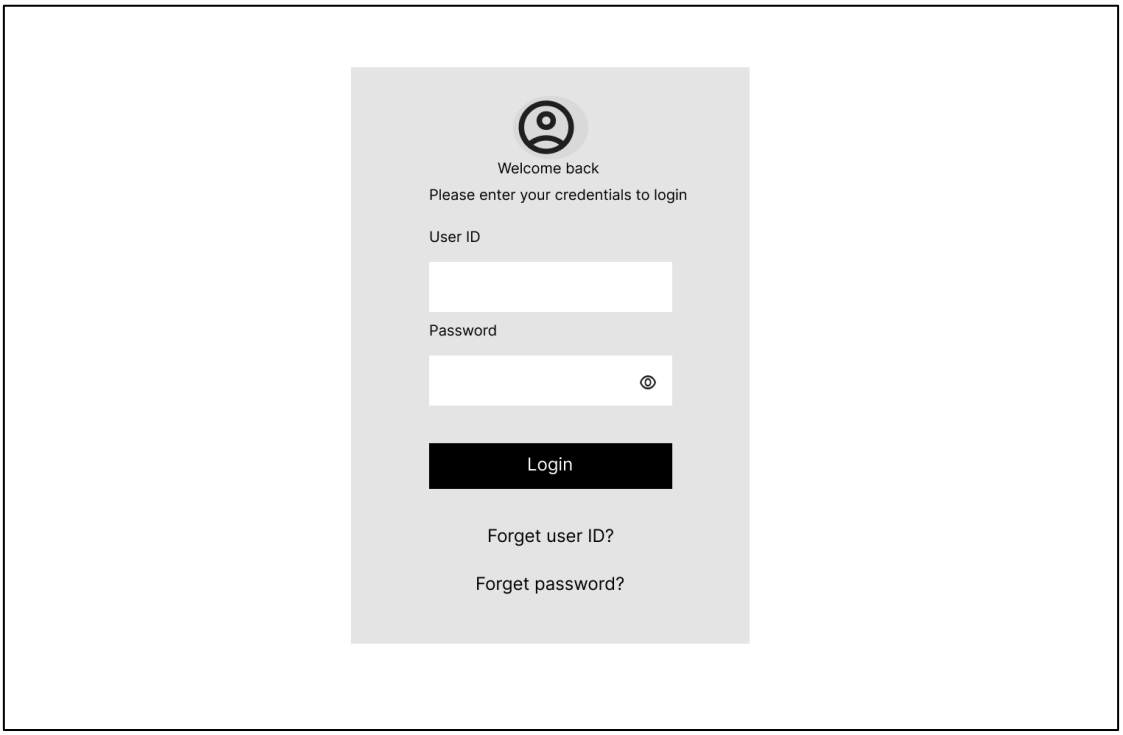



*Fig 2.2.1.2(b) wireframes (login page)*

### 2.2.1.2 Main dashboard

Once the user successfully logs into the system, they will be navigated to the **Main Dashboard**, which will provide the necessary interface for users to carry out essential functionalities. The key tasks that the user will be able to perform from the main dashboard are as follows:

- **Portfolio View:** The dashboard will display the user's portfolio details, including all relevant asset information.
- **What-If Calculations:** A button will be provided to allow users to perform hypothetical trade scenarios to evaluate margin impacts.
- **Stress Analysis:** Users will be able to access the stress testing feature, which will analyse how their portfolio is expected to perform under stressed market conditions.
- **Report Download Option:** Users will have the capability to download both filtered and unfiltered versions of their portfolio report in CSV format.

**Margin Account Selection**

The system will have functionality for selecting margin accounts:

- If the user holds multiple margin accounts, they will be required to select the desired account from a **dropdown menu**.
- If the user holds only a single margin account, the system will automatically select the default margin account.

Once the margin account is selected, the user's portfolio will be populated on the dashboard. System will allow user to check historical lookback for portfolio by providing Business date option, where user can select a business date from its dropdown menu

**Business Date Selection:**

- The dashboard will include a **Business Date section**, allowing users to select a specific date for a historical portfolio lookback.
- Users can view how their portfolio performed on any previous **business date**, including past margin values, simulated asset values, and cleared asset losses as of that date.
- If the user selects a non-business date (e.g., weekends or holidays), the system will automatically display the **last available business day's data**.

**Dashboard Metrics**

The top section of the dashboard will display key financial metrics related to the user's portfolio, including:

1. **Cleared Asset Margin value:** Reflecting margin value required for cleared assets.
2. **Simulated Asset Margin value:** Displaying the estimated margin value of simulated assets or new trade
3. **Total Margin Value:** Showing the total margin required for the selected portfolio.

To enhance usability and provide critical margin alerts, the system will incorporate a **threshold indicator**:

- If the **Total Margin Value** falls **below the predefined threshold**, the value will be displayed in **red**, indicating that the user needs to top up funds to meet the required initial margin.
- If the **Total Margin Value** is **above the threshold**, the value will appear in **green**, signalling that the user has adequate margin.

**Filtering Options**

To improve data accessibility and customization, the portfolio view will include **filtering options for each column**. This functionality will allow users to filter and sort the data based on specific criteria, helping them focus on relevant portfolio information.

Business Rules:-

1. If the user has **multiple margin accounts**, the system shall display a **dropdown menu** allowing the user to select the desired margin account.

2. If the user has **only one margin account**, the system shall automatically select it as the default account upon login.
3. The system shall display the user's portfolio details (asset classes, positions, values) on the main dashboard after the margin account is selected.
4. Users shall have a **filtering option for each column** in the portfolio view (e.g., asset type, exposure, value).
5. If the **Total Margin Value** falls **below the predefined threshold**, the margin box on the dashboard shall turn **red**, indicating that the user must deposit additional initial margin.
6. If the **Total Margin Value** is **above the threshold**, the margin box shall be displayed in **green**, indicating that the margin requirement is met.
7. The system shall ensure that the data displayed on the dashboard is accurate and reflects the latest trade uploads and margin calculations.
   Wireframes

**Sequence flow**

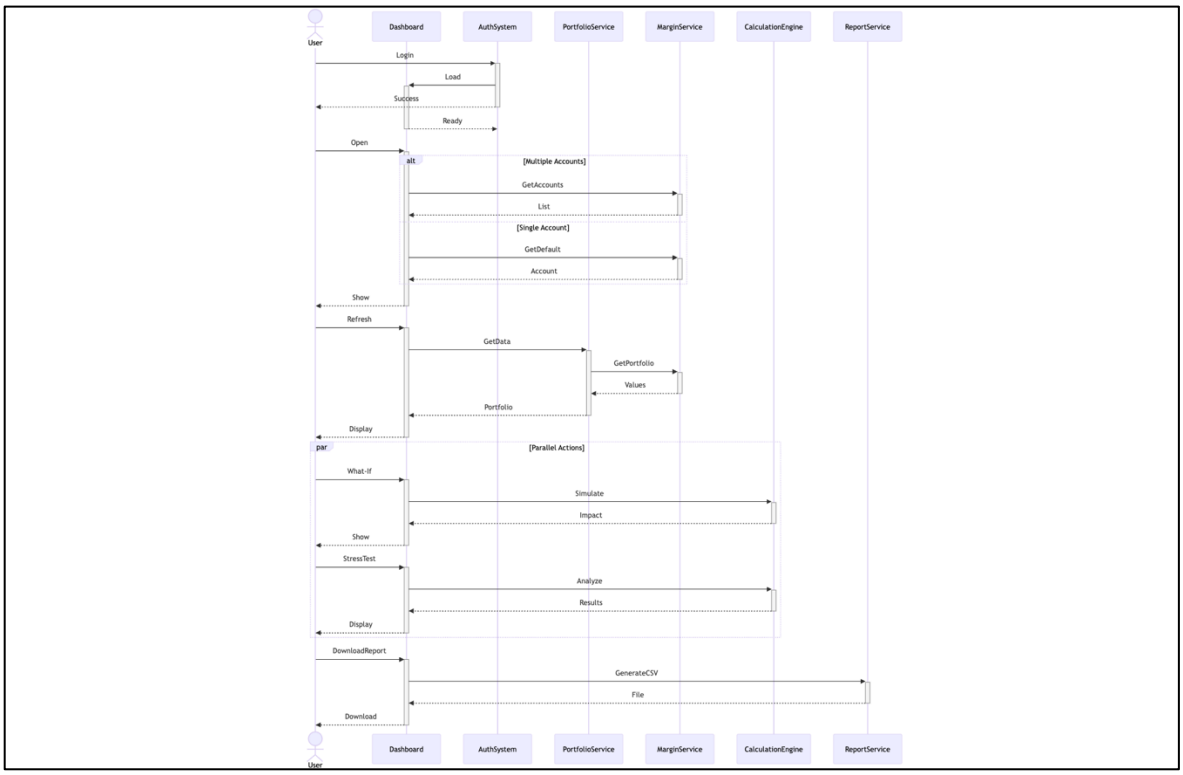



***Fig 2.2.1.3(a) Sequence flow Main dashboard***

**Wireframes**

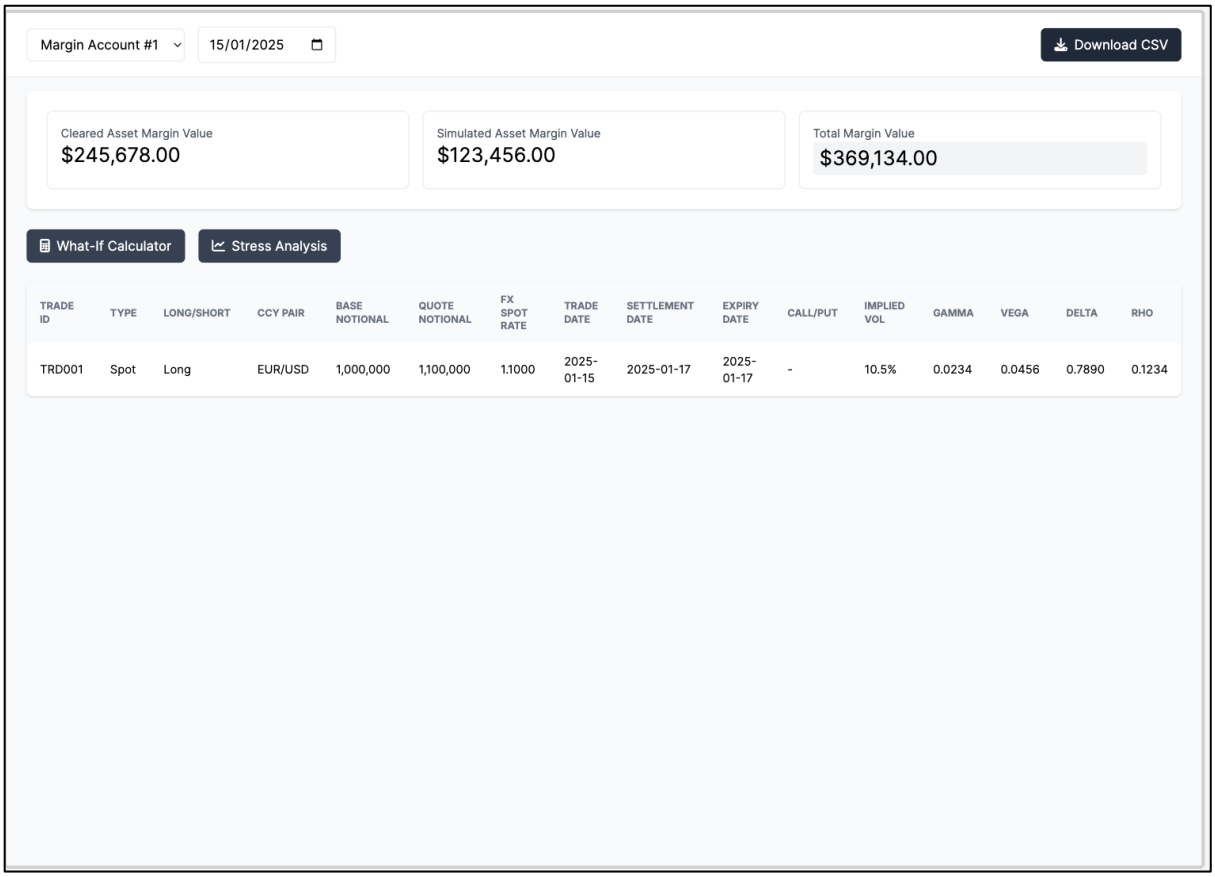



***Fig 2.1.2.1 Wireframes for main dashboard***

### 2.2.1.2 What if calculation

The **What-If Calculation** feature provides users with the ability to analyse how their current portfolio would perform if additional trades were introduced. This functionality allows users to gain insights into their updated margin requirements before submitting new trade instruments to the clearing house for **clearing and settlement** purposes.

**File Upload Process**

The system will offer users the ability to **upload a new trade file** for analysis. This trade file must adhere to a predefined template that is compatible with the system. The template will ensure that the data structure and format meet the system's validation requirements.

**Validation Check**

Once the file is uploaded, the system will automatically perform a **validation check** to ensure data accuracy and integrity. During this validation process, the system will check for:

1. **Missing or Incomplete Data** – Ensuring that all mandatory fields are filled.
2. **Expired Trade Dates** – Verifying that trade dates are valid and within the acceptable range.
3. **File Format Compliance** – Ensuring that the uploaded file follows the correct template and format.

If any of these checks fail, the system will display an **error message** indicating the specific issue, such as "Invalid Data" or "Inappropriate File Format." The user will then be required to correct the file and re-upload it.

**Risk Model Execution and Portfolio Update**

Once a valid trade file is successfully uploaded, the system will initiate a **risk model calculation** on the user's entire portfolio, incorporating the data from the newly added trades. This will allow the user to:

- View the updated portfolio metrics, including any changes in **margin requirements**, **simulated asset values**, and **risk exposure**.
- Analyse how the inclusion of new trades affects the overall portfolio performance.

The updated portfolio matrix will then be displayed on the user's dashboard, reflecting the impact of the new trades in real time. This process enhances the user's ability to make informed trading decisions and manage margin requirements proactively.

**Business Rule**

1. The uploaded trade file must adhere to the predefined system template. Any file that does not follow the template will be rejected
2. All required fields in the trade file must be completed. Missing or incomplete data will trigger an error message, and the file will not be processed until corrections are made
3. All trade expiry dates must be in the future or within the system's defined allowable range. Trades with expired dates will trigger a validation error
4. If the file fails validation, the system will display a descriptive error message (e.g., "Invalid Data" or "Inappropriate File Format") and prompt the user to re-upload a corrected file.
5. The system may impose a limit on the file size and the number of trades in a single upload to ensure optimal performance. Exceeding these limits will trigger a warning message
6. Upon successful file validation, the system will run the risk model on the entire portfolio, including the newly uploaded trades. This ensures that updated portfolio metrics reflect any margin impact caused by the additional trades.
7. The system will update the portfolio metrics (e.g., total margin, simulated asset value) on the main dashboard to show the impact of the added trades.

**Sequence flow**

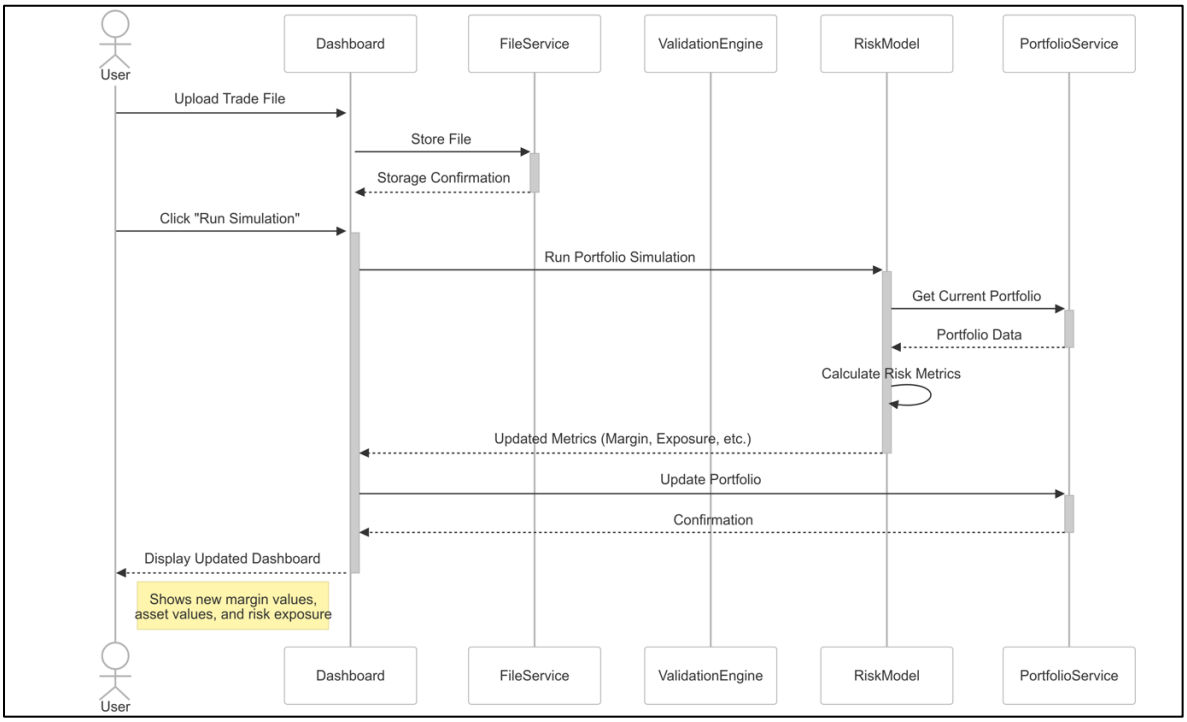



***Fig 2.2.1.2(a) Sequence flow What if calculation***

## *Wireframes*

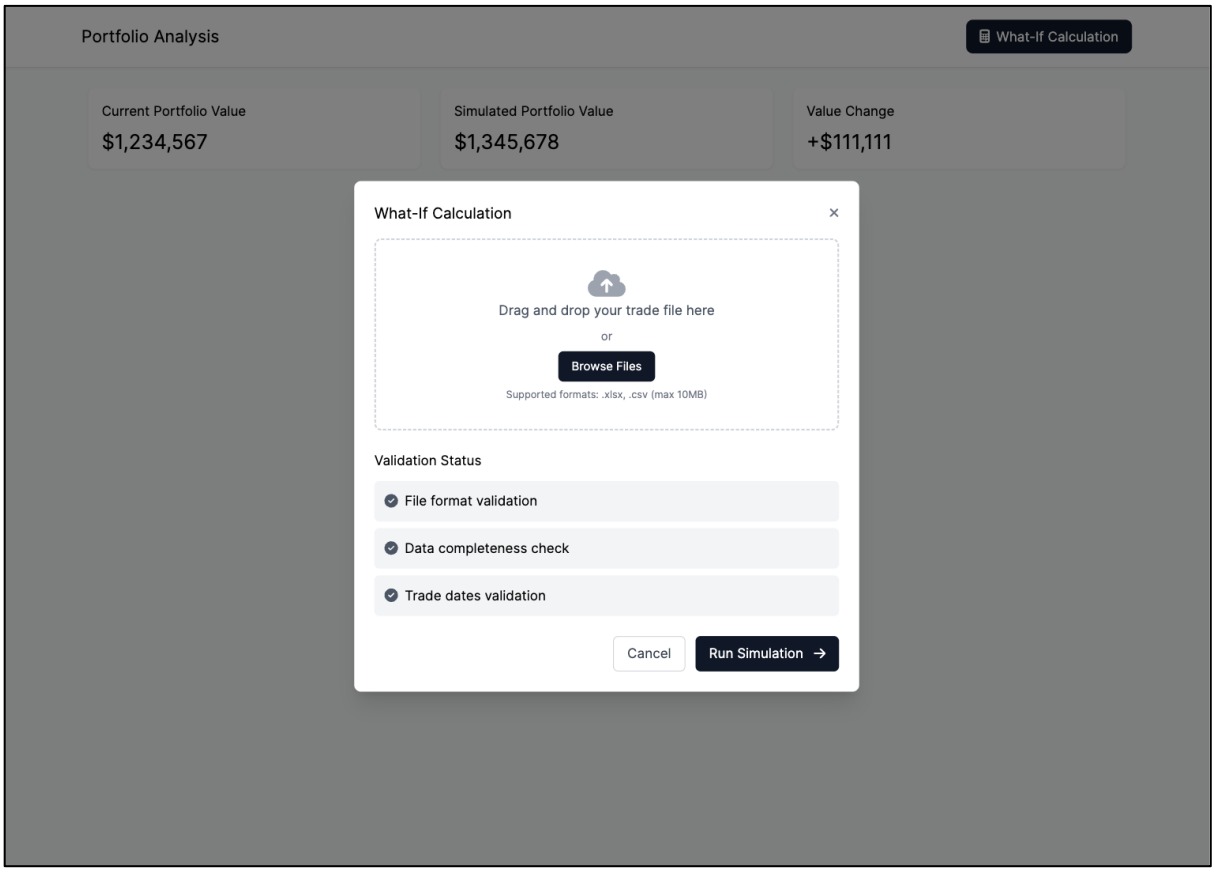



***Fig 2.2.1.2(b) wireframe for What if calculation pop-up window***

### 2.2.1.3 Stress Analysis

The system will provide a **Stress Analysis** feature designed to help users evaluate how their portfolio might perform under extreme market conditions. This feature allows users to simulate historical financial stress events and assess the impact on their current portfolio. The stress analysis aims to enhance users' risk awareness by modelling the effects of past crises on their holdings, aiding in better margin management and strategic decision-making.

**Functionality**

1. **Accessing Stress Analysis:**

    - On the **main dashboard**, the user will see a designated **"Stress Analysis"** button.

2. **Pop-Up Window Interaction:**

    - When the user clicks the **"Stress Analysis"** button, a **pop-up window** will appear.
    - This window will contain:

    - A **drop-down menu** listing five predefined historical stress periods.
        - A **"Run Simulation"** button.

- **Dropdown Menu – Predefined Stress Scenarios:**
  Users will be able to select one of the following predefined stress scenarios from the drop-down menu:

- **Global Financial Crisis (2008-2009)**
  **Description:** This scenario simulates the turbulence that followed the collapse of Lehman Brothers in 2008, reflecting massive selloffs in risky assets, liquidity disruptions, and a flight to safe-haven currencies.
- **COVID-19 Pandemic Market Crash (March 2020)**
  **Description:** This scenario captures the sharp market downturn caused by the onset of the COVID-19 pandemic, global lockdowns, and economic uncertainty, with high FX volatility and selloffs in risk assets.
- **Russia-Ukraine War (February 2022 Onward)**
  **Description:** This simulation models geopolitical instability resulting from the Russia-Ukraine conflict, which led to significant stress in global markets, particularly in FX, energy, and commodity sectors.
- **Swiss Franc Shock (January 2015) – The SNB Black Swan Event**
  **Description:** This event replicates the unexpected removal of the Swiss Franc's currency peg by the Swiss National Bank (SNB), leading to a sudden 30% appreciation of the CHF and causing widespread margin calls.

4. **Running the Simulation:**

- After selecting the desired stress period from the drop-down menu, the user will click the **“Run Simulation”** button within the pop-up window.
- This action will trigger the system’s **risk engine**, which will run a stress test on the user’s entire portfolio based on the selected scenario.

**Displaying Stress Test Results:**

- Once the simulation is completed, the pop-up window will close, and the stress test results will be displayed directly on the **main dashboard**, where key portfolio metrics will be updated. These metrics include:
- **Cleared Asset Losses** – Displaying estimated losses if the user holds assets vulnerable to the selected stress event.
- **Simulated Asset Value** – Reflecting the post-stress value of the user’s assets.
- **Total Margin Value** – Indicating the margin impact under the stressed conditions.
- If the **Total Margin Value** falls below the threshold, the system will highlight the margin value in **red** on the dashboard to alert the user of a possible margin shortfall. If the margin is above the threshold, it will be displayed in **green**, signalling that the user’s portfolio is adequately covered.

**Business Rules**

1. The pop-up window must appear when the user clicks the **“Stress Analysis”** button and should close automatically after the simulation runs, with updated results displayed on the dashboard.
2. Users must select a stress period from the drop-down menu before clicking the **“Run Simulation”** button. The system will not proceed with the simulation unless a valid scenario is selected
3. The simulation results must accurately reflect potential losses, margin impacts, and asset value changes based on the selected stress period.

**Sequence flow**

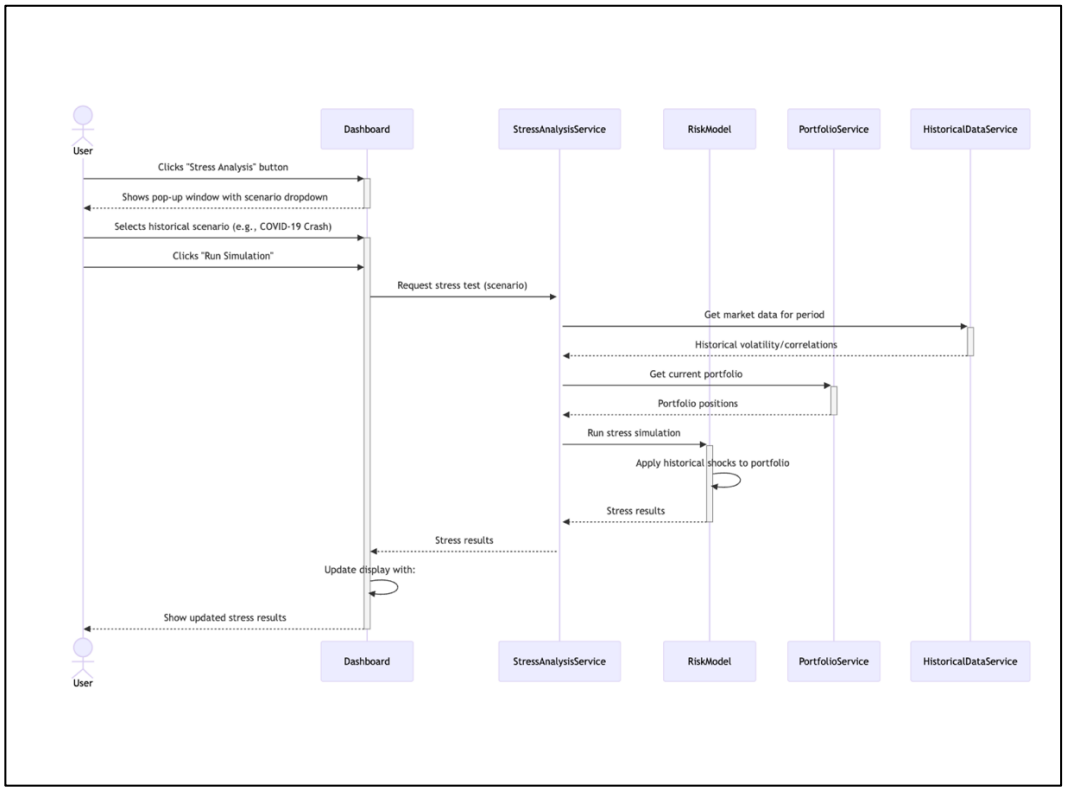



***Fig*** 2.2.1.3 ***Sequence flow Stress analysis calculation***

## Wireframes

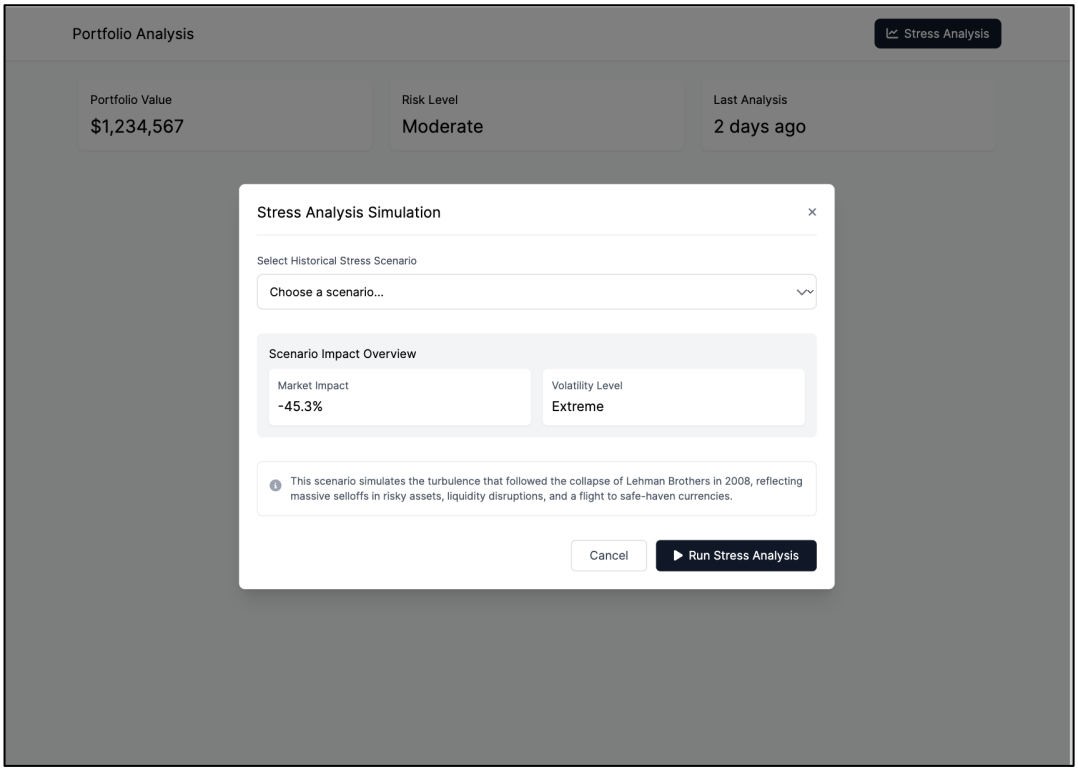



***Fig 2.2.1.2 Sequence flow Stress analysis calculation***

#### 2.2.1.4 Report generation

The system will provide users with flexibility when downloading reports after performing specific portfolio analyses. This feature will ensure that users can choose between downloading their original portfolio (reflecting live and cleared trades) or the modified portfolio generated from What-If calculations or Stress Analysis.

**Process and Functionality**

1. **Viewing the Original Portfolio:**
   When the user selects a margin account from the dropdown menu, the **original portfolio** will be displayed on the dashboard. This includes all live and cleared trades and will serve as the base portfolio for further actions.

2. **Post-What-If Calculation – Report Download Options:**
   After running a What-If calculation (which includes hypothetical trade data), if the user clicks the **"Download Report"** button, the system will trigger a **pop-up window** offering the following options:

   - **Original Portfolio Report** – This option allows the user to download the original, unmodified portfolio data (without the hypothetical trade values).

   - **What-If Portfolio Report** – This option allows the user to download the modified portfolio, reflecting the hypothetical trades and updated portfolio metrics.

3. **Post-Stress Analysis – Report Download Options:**
   After running a stress analysis (which simulates the portfolio under specific historical stress scenarios), clicking the **"Download Report"** button will trigger a similar pop-up window with these options:

   - **Original Portfolio Report** – To download the live and cleared trades portfolio (without stress-adjusted values).

   - **Stress Analysis Portfolio Report** – To download the portfolio reflecting stress simulation results.

4. **Reverting to the Original Portfolio:**
   At any point after performing What-If calculations or stress analysis, users will have the option to **revert the dashboard to display the original portfolio** (live and cleared trades). This will allow users to discard any temporary trade data or stress-adjusted values and return to their standard view.
5. **File Naming Convention:**
   The system will apply a clear naming convention to help users distinguish between different versions of the portfolio report:

   - **Original Portfolio Report:** Portfolio_Report_Original_<Date>_<UserID>.csv
   - **What-If Portfolio Report:** Portfolio_Report_WhatIf_<Date>_<UserID>.csv

- **Stress Analysis Portfolio Report:**
  Portfolio_Report_Stress_<StressPeriod>_<Date>_<UserID>.csv

**Business Rules**

1. After performing What-If calculations or stress analysis, the system must trigger a pop-up window with options to download the original or modified portfolio report
2. The downloaded CSV file will reflect the exact portfolio data as shown on the dashboard at the time of the download request (i.e., original, What-If modified, or stress-adjusted).
3. The downloaded CSV file will reflect the exact portfolio data as shown on the dashboard at the time of the download request (i.e., original, What-If modified, or stress-adjusted).

# 3.0 Functional Requirements.

Here is your Functional Requirements (FR) document in a tabular format:

| FR# | Requirement Description |
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| **Login Functionality** | |
| FR1 | The system must have a login page where users can enter their registered user ID and password to access their account. |
| FR2 | Upon clicking the "Login" button, the system must validate the user ID and password against the internal database. |
| FR3 | If the credentials are correct, the user must be granted access to the system. |
| FR4 | If the credentials are incorrect, the system must display an error message: “Invalid user ID or password. Please try again.” |
| FR5 | After three consecutive failed login attempts, the user account must be temporarily locked, and the system must send a notification email to the user’s registered email ID, informing them of the lockout. |
| FR6 | The login page must display a "Forgot Password?" link. |
| **Forgot Password Process** | |
| FR7 | When the user clicks "Forgot Password," the system must open a pop-up window where the user can input their registered email ID. |
| FR8 | After the user submits their registered email ID, the system must:<br>- Validate the email ID against the internal database.<br>- If valid, send two separate emails:<br>1. A password reset link.<br>2. A 4-digit OTP for verification. |

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| | - If invalid, display an error message: “The email ID is not registered. Please try again or contact support.” |
| FR9 | The password reset link must direct the user to a secure password reset page with fields for:<br>- New password (validated per business rules).<br>- 4-digit OTP.<br>- “Submit” button. |
| FR10 | The system must validate the OTP and new password.<br>- If invalid, display an error message: “Invalid OTP or password. Please try again.”<br>- If valid, update the password in the database. |
| FR11 | After a successful password reset, the system must send a confirmation email to the user. |
| **Forgot User ID Process** | |
| FR12 | The login page must display a "Forgot User ID?" link. |
| FR13 | When clicked, a pop-up window must open where the user can input their registered email ID. |
| FR14 | After submission:<br>- Validate the email ID against the database.<br>- If valid, send an email with the user ID.<br>- If invalid, display an error message. |
| **Password Security Requirements** | |
| FR15 | The password must be at least 10 characters long and include:<br>- One digit (0-9).<br>- One uppercase letter.<br>- One lowercase letter.<br>- One special character (@, #, !, etc.). |
| FR16 | Users must change their password every 28 days. The system must prevent reuse of the last four passwords. |
| FR17 | After three failed login attempts, the user account must be locked, and a lockout email must be sent, suggesting password recovery. |
| FR18 | Implement two-factor authentication (2FA) for password recovery via a reset link and OTP in separate emails. |
| **Post-Login Navigation** | |
| FR19 | Upon successful login, the system must navigate the user to the Main Dashboard. |
| **Portfolio View** | |
| FR20 | The system must display portfolio details, including asset classes, positions, exposure, values, and margin calculations. |
| FR21 | Users must be able to filter and sort portfolio data based on criteria (e.g., asset type, exposure, value). |

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| **Margin Account Selection** | |
| FR22 | If a user has multiple margin accounts, a dropdown menu must display the available accounts. |
| FR23 | If a user has only one margin account, it must be auto-selected upon login. |
| FR24 | Upon selection, the system must dynamically update the portfolio details. |
| **Business Date Selection** | |
| FR25 | A “Business Date” dropdown must allow users to select a specific date for historical analysis. |
| FR26 | Users must be able to view historical data, including past margin values and cleared asset losses. |
| FR27 | If a non-business date (weekend/holiday) is selected, data from the last available business day must be displayed. |
| **Data Accuracy & Real-Time Updates** | |
| FR28 | The dashboard must reflect real-time updates, including the latest trades, portfolio changes, and margin calculations. |
| FR29 | All displayed data must be accurate, error-free, and compliant with business rules and trade regulations. |
| **What-If Calculations** | |
| FR30 | The dashboard must include a “What-If Calculations” button for hypothetical trade scenarios. |
| FR31 | Upon selection, the system must display potential margin impacts. |
| **Stress Analysis Feature** | |
| FR32 | The dashboard must include a "Stress Analysis" feature for stress testing portfolios. |
| FR33 | The system must display stress test results with key risk metrics. |
| FR34 | The top dashboard section must display:<br>- Cleared Asset Losses<br>- Simulated Asset Value<br>- Total Margin Value |
| FR35 | These metrics must be updated dynamically. |
| **Margin Threshold Indicator** | |
| FR36 | If the Total Margin Value falls below a threshold, display the margin box in red. |
| FR37 | If the margin is above the threshold, display the box in green. |

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| **Report Download Functionality** | |
| FR38 | Users must be able to download portfolio reports in CSV format. |
| FR39 | Both filtered and unfiltered reports must be available for download. |
| **What-If Calculation Process** | |
| FR40 | The system must allow users to analyze additional trades before submission. |
| FR41 | Users must be able to upload a trade file for analysis. |
| FR42 | The file must follow a predefined template; non-compliant files must be rejected. |
| FR43 | A file upload interface must allow users to browse and upload compatible files (CSV). |
| **Validation Process** | |
| FR44 | Upon file upload, the system must validate data accuracy and compliance. |
| FR45 | The validation must include:<br>- Missing mandatory fields (error: "Invalid Data: Missing Mandatory Fields").<br>- Expired trade dates (error: "Trade Date Expired").<br>- Template compliance (error: "Inappropriate File Format"). |
| FR46 | If errors are detected, an error message must prompt the user to correct and re-upload. |
| FR47 | Files exceeding size limits must trigger a warning and be rejected. |
| **Risk Model Execution & Portfolio Update** | |
| FR48 | After validation, the system must have a “Run Simulation” button to execute risk models. |
| FR49 | The risk model must update portfolio metrics, including:<br>- Total Margin Value<br>- Simulated Asset Value<br>- Risk Exposure Metrics |
| FR50 | Once executed, updated portfolio metrics must be displayed dynamically. |
| FR51 | Users must see changes in margin requirements and risk exposure. |
| FR52 | The system must enable users to analyze how trades impact portfolio performance in real time. |
| **Stress Analysis Process** | |

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| FR53 | A "Stress Analysis" button must be available on the main dashboard. |
| FR54 | A pop-up must guide the user through the stress simulation process. |
| FR55 | The pop-up must include:<br>- A dropdown menu with stress scenarios.<br>- A “Run Simulation” button. |
| FR56 | Scenarios include:<br>- 2008 Financial Crisis<br>- COVID-19 Market Crash<br>- Russia-Ukraine War<br>- Swiss Franc Shock |
| FR57 | Users must select a scenario before simulation. |
| FR58 | Clicking "Run Simulation" must trigger the stress test. |
| **Margin Alert Mechanism** | |
| FR62 | If Total Margin Value falls below the threshold after stress simulation, highlight in red. |
| FR63 | If it remains above the threshold, highlight in green. |
| **FR67** | After performing a What-If calculation, clicking “Download Report” must trigger a pop-up window with options. |
| **FR67.1** | Download Original Portfolio Report (without hypothetical trade data). |
| **FR67.2** | Download What-If Portfolio Report (including hypothetical trades and updated metrics). |
| **FR68** | After performing a Stress Analysis, clicking “Download Report” must trigger a similar pop-up window with options. |
| **FR68.1** | Download Original Portfolio Report (live and cleared trades, without stress-adjusted values). |
| **FR68.2** | Download Stress Analysis Portfolio Report (reflecting stress simulation results). |
| **FR69** | Users must have an option to revert the dashboard to the original portfolio (live and cleared trades) after What-If calculations or stress analysis. |
| **FR70** | The system must apply specific file naming conventions for portfolio reports. |
| **FR70.1** | Original Portfolio Report:<br>Portfolio_Report_Original_<Date>_<UserID>.csv |
| **FR70.2** | What-If Portfolio Report:<br>Portfolio_Report_WhatIf_<Date>_<UserID>.csv |
| **FR70.3** | Stress Analysis Portfolio Report:<br>Portfolio_Report_Stress_<StressPeriod><Date><UserID>.csv |
| **FR71** | After performing What-If calculations or stress analysis, a pop-up window must automatically appear with report download options. |
| **FR72** | The downloaded CSV file must reflect the exact portfolio data as displayed on the dashboard at the time of download. |

# 4.0 Non- Functional Requirements .

| NFR# | Requirement Description |
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| **Performance and Scalability** | |
| NFR1 | The login system must be able to handle at least 500 concurrent login requests without performance degradation. |
| NFR2 | The average response time for user login validation (including database verification) must not exceed 2 seconds. |
| NFR3 | The system must ensure that password reset and user ID recovery emails are sent within 10 seconds of the user's request. |
| NFR4 | The system must be scalable to support future load increases of up to 10,000 concurrent users during peak times. |
| NFR5 | The Main Dashboard must load key financial metrics and portfolio-related data within 3 seconds of successful login for an optimal user experience. |
| NFR6 | The system must be capable of handling 500 concurrent dashboard loads without significant performance degradation. |
| NFR7 | Data retrieval for filtering and sorting must occur within 2 seconds when users apply filters to portfolio details. |
| NFR8 | The system must display the dropdown menu listing margin accounts within 1 second of the login process or user interaction. |
| NFR9 | What-If calculations must be completed, and results displayed on the dashboard, within 5 seconds after the user initiates the calculation. |
| NFR10 | Stress test results must be generated and displayed within 10 seconds for predefined stressed market conditions. |
| **Security** | |
| NFR11 | All login and password recovery data transmissions must be encrypted using TLS 1.2 or higher to protect user credentials from unauthorized access. |
| NFR12 | The system must implement robust intrusion detection mechanisms to monitor and block any unusual login attempts, including brute-force attacks. |
| NFR13 | The system must comply with relevant security standards, including OWASP Top 10 guidelines and GDPR for user data protection. |

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| NFR14 | Passwords must be securely stored using a one-way hashing algorithm such as bcrypt or Argon2, with a minimum hashing strength as per security best practices. |
| NFR15 | Implement automatic logout after 15 minutes of inactivity to prevent unauthorized access. |
| NFR16 | The system must perform continuous monitoring and logging of login attempts, lockouts, and password recovery actions for security auditing purposes. |
| NFR17 | Multi-Factor Authentication (MFA) must be enabled for all high-privilege accounts to prevent unauthorized access. |
| NFR18 | The system must support role-based access control (RBAC) to restrict access based on user roles. |
| NFR19 | The login system must block accounts after 5 failed login attempts within 10 minutes to mitigate brute-force attacks. |
| **Usability and User Experience (UX)** | |
| NFR20 | The login page must be designed with a user-friendly and intuitive interface, including clear instructions, error messages, and accessible navigation for all users, including those with disabilities (following WCAG 2.1 AA accessibility standards). |
| NFR21 | Error messages must be specific, actionable, and non-technical to guide users effectively, e.g., “Invalid user ID or password. Please try again.” |
| NFR22 | Password reset and account recovery workflows must be optimized to minimize the number of user steps while maintaining security. |
| NFR23 | The dashboard must be designed to meet WCAG 2.1 AA accessibility standards, ensuring usability for all users, including those with visual impairments. |
| NFR24 | The interface must provide intuitive navigation and tooltips to help users understand portfolio metrics and filter functionality. |
| NFR25 | The system must provide responsive UI elements that adjust seamlessly across different screen sizes and resolutions. |
| **Reliability and Availability** | |
| NFR26 | The login system must provide 99.9% uptime, ensuring high availability and minimal service disruptions. |
| NFR27 | The system must recover from temporary failures (e.g., network issues) within 5 seconds and allow users to retry their login without losing session data. |
| NFR28 | The system must support session persistence, ensuring that the user's session is not prematurely terminated unless explicitly logged out. |

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| NFR29 | The application must continue functioning in a degraded mode (e.g., read-only access) in case of partial system failures. |
| **Maintainability and Extensibility** | |
| NFR30 | The system must be designed to allow easy maintenance and upgrades, enabling future implementation of additional security features such as biometric authentication or CAPTCHA without major architectural changes. |
| NFR31 | The system must have modular components for login, password recovery, and user ID recovery to facilitate easy debugging and maintenance. |
| NFR32 | The codebase must follow industry best practices, including proper documentation, modularization, and version control. |
| NFR33 | The system must allow seamless integration with third-party authentication providers (e.g., OAuth, SAML) for future expansion. |
| **Data Integrity and Accuracy** | |
| NFR34 | The system must ensure data accuracy and consistency by validating input fields in real-time, e.g., email format validation and password strength validation before form submission. |
| NFR35 | Password change and lockout notifications must contain clear timestamps to provide users with transparency about when actions were performed. |
| NFR36 | The system must ensure that duplicate user accounts cannot be created with the same email or phone number. |
| NFR37 | The system must perform periodic data integrity checks to prevent corruption and ensure accurate record-keeping. |
| **Compliance and Legal Requirements** | |
| NFR38 | The system must comply with relevant legal and regulatory requirements, including GDPR, PCI-DSS (if applicable), and local privacy laws, ensuring user consent for storing and processing their data. |
| NFR39 | Implement an audit trail to log login attempts, password recovery requests, and account lockouts for at least 6 months to meet compliance and audit requirements. |
| NFR40 | The system must allow users to request account deletion and ensure data is erased per GDPR's right-to-be-forgotten regulations. |
| **Logging and Monitoring** | |
| NFR41 | The system must log all login attempts, including timestamps, IP addresses, and device information, for security monitoring. |

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| NFR42 | A centralized monitoring dashboard must be available to track authentication metrics such as failed logins, password resets, and lockout events. |
| NFR43 | The system must generate alerts for repeated failed login attempts from the same IP address within a short time frame. |
| **Interoperability and Integration** | |
| NFR44 | The authentication system must support API-based authentication for third-party applications. |
| NFR45 | The system must integrate with Single Sign-On (SSO) providers for enterprise users. |
| NFR46 | The login service must allow seamless session transfer across multiple devices without requiring repeated authentication. |
| **Disaster Recovery and Backup** | |
| NFR47 | The system must have a disaster recovery plan in place, ensuring a full recovery within 30 minutes of a major failure. |
| NFR48 | Database backups must be taken every 12 hours and stored securely for at least 30 days. |
| **Localization and Multi-Language Support** | |
| NFR49 | The system must support multilingual interfaces, including English, Spanish, and French, for global users. |
| NFR50 | Error messages and user notifications must be translated accurately into supported languages. |
| **Audit and Reporting** | |
| NFR51 | The system must generate periodic reports on authentication trends, security incidents, and login success rates for compliance auditing. |
| NFR52 | All reports must be exportable in common formats such as CSV and PDF for analysis. |
| **Energy Efficiency** | |
| NFR53 | The system must optimize resource usage to reduce unnecessary server loads, minimizing energy consumption for sustainability. |