Step-by-Step Execution Workflow for Calculating Ideal Votable Supply (IVS)

--By Chain_L and Team

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Overview of Files, Descriptions, and Data Dependencies

01_calculate_indexes.ipynb

1. **File Description**: Calculates indexes like AVPI, PR, and LAR based on raw data using predefined formulas.
2. **Files Used**:
    - Dataset\Historical_Data\Actual_Voting_Power_Index\AVPI_Raw_Data.csv
    - Dataset\Historical_Data\Participation_Ratio\PR_Raw_Data.csv
    - Dataset\Historical_Data\Liquidity_Activity_Ratio\LAR_Raw_Data.csv
3. **Files Generated**:
    - Dataset\Historical_Data\Actual_Voting_Power_Index\AVPI_Historical_Data.csv
    - Dataset\Historical_Data\Participation_Ratio\PR_Historical_Data.csv
    - Dataset\Historical_Data\Liquidity_Activity_Ratio\LAR_Historical_Data.csv

02_prepare_historical_data.ipynb

1. **File Description**: Cleans and merges historical data.
2. **Files Used**:
    - Dataset\Historical_Data\Participation_Ratio\Historical_PR_Data.csv
    - Dataset\Historical_Data\Liquidity_Activity_Ratio\Historical_LAR_Data.csv
    - Dataset\Historical_Data\OP_Price\Historical_OP_Price_Data.csv
    - Dataset\Historical_Data\Actual_Voting_Power_Index\Historical_AVPI_Data.csv
    - Dataset\Historical_Data\Votable_Supply\VS_Historical_Data.csv
    - Dataset\Historical_Data\Circulating_Supply\CS_Historical_Data.csv
3. **Files Generated**:
    - Dataset\Ideal_Votable_Supply_Data\All_Parameters_Historical_Data.csv

03_calculate_future_circulating_supply.ipynb

1. **File Description**: Calculates the future circulating supply.
2. **Files Used**:
    - Dataset\Historical_Data\Circulating_Supply\CS_Historical_Data.csv
3. **Files Generated**:
    - Dataset\Future_Circulating_Supply\FCS_Daywise_Data.csv

04_prepare_future_data.ipynb

1. **File Description**: Merges predicted future data.
2. **Files Used**:
    - Dataset\Prediction_Data\Actual_Voting_Power_Index\Future_AVPI_Data.csv
    - Dataset\Prediction_Data\OP_Price\Future_OP_Price_Data.csv
    - Dataset\Prediction_Data\Liquidity_Activity_Ratio\Future_LAR_Data.csv
    - Dataset\Prediction_Data\Participation_Ratio\Future_PR_Data.csv
    - Dataset\Future_Votable_Supply\FVS_Daywise_Data.csv
    - Dataset\Future_Circulating_Supply\FCS_Daywise_Data.csv
3. **Files Generated**:
    - Dataset\Ideal_Votable_Supply_Data\All_Parameters_Future_Data.csv

05_merge_and_scale_data.ipynb

1. **File Description**: Merges historical and future data, scales parameters, and calculates correlations.
2. **Files Used**:
    - Dataset\Ideal_Votable_Supply_Data\All_Parameters_Historical_Data.csv
    - Dataset\Ideal_Votable_Supply_Data\All_Parameters_Future_Data.csv
3. **Files Generated**:
    - Dataset\Ideal_Votable_Supply_Data\All_Parameters_Data.csv

06_generate_weight_combinations.ipynb

1. **File Description**: Generates valid weight combinations based on parameter weight ranges that is retrieved by executing 05_merge_and_scale_data.ipynb
2. **Files Used**:
    - Dataset\Ideal_Votable_Supply_Data\All_Parameters_Data.csv
3. **Files Generated**:
    - CSV files inside Dataset\Ideal_Votable_Supply_Data\all_weight_combinations\ folder

07_calculate_IVS_all_weight_combinations.ipynb

1. **File Description**: Calculates IVS for each weight combination.
2. **Files Used**:
    - Dataset\Ideal_Votable_Supply_Data\all_weight_combinations\ (CSV files)
3. **Files Generated**:
    - Updated CSV files inside Dataset\Ideal_Votable_Supply_Data\all_weight_combinations\

08_find_ideal_weights.ipynb

1. **File Description**: Finds the ideal weight combination for parameters.
2. **Files Used**:
    - Dataset\Ideal_Votable_Supply_Data\all_weight_combinations\ (CSV files)
3. **Files Generated**:
    - Dataset\Ideal_Votable_Supply_Data\all_weight_combinations\ideal_weights.csv

09_calculate_final_IVS.ipynb

1. **File Description**: Computes final IVS and stores daily and monthly IVS.
2. **Files Used**:
    - Dataset\Ideal_Votable_Supply_Data\ideal_weights.csv
    - Dataset\Ideal_Votable_Supply_Data\All_Parameters_Data.csv
3. **Files Generated**:
    - Dataset\Ideal_Votable_Supply_Data\Calculated_IVS\All_Parameters_Data_with_IVS.csv
    - Dataset\Ideal_Votable_Supply_Data\Calculated_IVS\Calculated_Monthly_VS_and_IVS.csv

10_predict_IVS.ipynb

1. **File Description**: Predicts future IVS using a polynomial regression model.
2. **Files Used**:
    - Dataset\Ideal_Votable_Supply_Data\Calculated_IVS\All_Parameters_Data_with_IVS.csv
3. **Files Generated**:
    - Dataset\Ideal_Votable_Supply_Data\Predicted_IVS\IVS_Predictions.csv
    - Dataset\Ideal_Votable_Supply_Data\Predicted_IVS\Predicted_Monthly_VS_and_IVS.csv

2. Execution Order

To ensure accuracy and consistency in deriving the **Ideal Votable Supply (IVS)**, the execution of the **Jupyter Notebook (.ipynb) files** must follow a strict sequential order. Each step in the process depends on the successful execution of the preceding files, as the outputs generated at each stage serve as inputs for subsequent calculations.

The execution flow is outlined as follows:

1. Index Calculation (01_calculate_indexes.ipynb)
2. Historical Data Preparation (02_prepare_historical_data.ipynb)
3. Future Circulating Supply Calculation (03_calculate_future_circulating_supply.ipynb)
4. Future Data Preparation (04_prepare_future_data.ipynb)
5. Data Merging and Scaling (05_merge_and_scale_data.ipynb)
6. Weight Combination Generation (06_generate_weight_combinations.ipynb)
7. IVS Calculation for Weight Combinations (07_calculate_IVS_all_weight_combinations.ipynb)
8. Optimal Weight Selection (08_find_ideal_weights.ipynb)
9. Final IVS Computation (09_calculate_final_IVS.ipynb)
10. IVS Prediction (10_predict_IVS.ipynb)

3. Execution Guidelines:-

- The files must be executed sequentially, **from 01_calculate_indexes.ipynb to 10_predict_IVS.ipynb**, as each step builds upon the outputs of the previous step.
- Any deviation from this order may result in missing datasets, incorrect computations, or inconsistencies in the final IVS predictions.
- After execution, all output files will be stored in the respective **Dataset directories**, ensuring proper organization and accessibility for analysis.

4. Configuration Settings and Definitions:-

4.1 General Data Paths

These paths define where the data files are stored for historical and future datasets. The analysis pipeline reads these files for calculations.

- **Historical Data Paths**
  - OP price historical dataset
  - AVPI historical dataset
  - PR historical dataset
  - LAR historical dataset
  - Votable supply historical dataset
  - Circulating supply historical dataset
- **Future Data Paths**
  - Predicted OP price dataset
  - Predicted AVPI dataset
  - Predicted PR dataset
  - Predicted LAR dataset
  - Predicted votable supply dataset
  - Predicted circulating supply dataset

4.2 Weight Ranges and Correlation Analysis

Weights are assigned to different parameters based on their correlation with VS in IVS computation. The defined weight ranges ensure that contributions remain within acceptable limits.

- Participation Ratio (PR): 0.23 - 0.51
- Liquidity Activity Ratio (LAR): 0.19 - 0.47
- OP Price: 0.15 - 0.43
- AVPI: 0.00 - 0.15

These ranges help balance the impact of each factor on IVS.

4.3 Forecasted Circulating Supply Targets

These values are used for future circulating supply predictions.

- 2024-2025: 1,695,895,615
- 2025-2026: 2,458,161,470
- 2026-2027: 2,827,999,809

4.4 IVS Calculation Parameters

- **Alpha (α) – Growth Rate of IVS/VS**
  - α controls the upper bound of IVS/VS, determining how quickly IVS increases as governance strength increases.
  - A higher α results in a larger range, meaning IVS increases more rapidly.
  - A lower α results in a smaller range, making IVS grow more slowly.
- **Beta (β) – Lower Bound of IVS/VS**
  - β determines the minimum IVS/VS ratio, setting the lowest possible IVS value when governance strength is at its weakest.
  - A higher β ensures a higher minimum scaling factor.
  - Example values:
    - β = 1.2 → Lower Bound of IVS/VS = 1.2x
    - β = 1.5 → Lower Bound of IVS/VS = 1.5x
- **How to Adjust IVS/VS Range**
  - To set the lower bound, adjust β.
  - To set the upper bound, adjust α.

4.5 Ideal Weights Computation

Weights assigned to different evaluation criteria:

- Monotonicity Score Weight = 0.5
  - Ensures that changes in parameters lead to a predictable increase or decrease in IVS.
- Standard Deviation Weight = 0.3
  - Controls variability and prevents extreme fluctuations.
- Average Proportional Increase Weight = 0.2
  - Adjusts for long-term trends in IVS calculation.

4.6 Merging and Scaling Data

The merged dataset combines historical and future data into a single dataset for analysis.

- Scaling ensures that values from different parameters remain comparable and do not dominate calculations due to differences in scale.

4.7 IVS Computation Outputs

- **Calculated IVS Data**
  - Daily computed IVS values
  - Monthly aggregated IVS values
- **Predicted IVS Data**
  - Forecasted daily IVS values
  - Forecasted monthly IVS trends