

Automated Detection of Sectoral Credit Growth for Banking Risk Management

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Education

- *Universitas Surabaya*
(2017–2021)

Working

- *Data Engineer - NTT DATA*
(2022–2024)

Overview Project

- **Web Scraping**
Scraping of Excel Data from BI's SEKI Website
- **ETL Pipeline**
Transform Excel into normalized format, compute MoM growth, and detect anomalies
- **Data Warehouse Using Postgres**
store sectoral credit statistics and risk indicators
- **Interactive Metabase Dashboard**
showing sectoral trends, credit spikes, and concentration risk

GitHub


- <https://github.com/nandaaristo/Dibimbing-Final-Project>

On the left side of the slide, there are three overlapping geometric shapes: a large black parallelogram at the top, a medium-sized light orange parallelogram in the middle, and a smaller dark orange parallelogram at the bottom. All shapes are slanted to the right.

Project Background

This project implements an end-to-end data engineering pipeline to detect and monitor rapid credit growth across economic sectors in Indonesia, using publicly available data from Bank Indonesia (BI). It supports banking risk management by identifying abnormal credit surges and risk concentration patterns through automated processing and visualization.

The solution of ETL processes orchestrated with Apache Airflow, data storage in PostgreSQL, and interactive dashboards with Metabase. It includes anomaly detection logic and sectoral risk flagging to assist financial analysts and regulators in proactive decision-making.

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Problem Statement

Banks and regulators require timely and reliable insights into sectoral credit distribution to monitor risk concentration and identify abnormal credit growth patterns. However, sector-level credit data published by Bank Indonesia (BI) is:

- Available only in manual Excel format
- Spread across multiple sheets
- Not structured for analysis or dashboarding

This results in delayed analysis, lack of proactive risk detection, and high dependency on manual processes.

The goal of this project is to build an automated data pipeline that:

1. Scrapes and consolidates sectoral credit data from Bank Indonesia's SEKI website
2. Transforms raw Excel sheets into a analyzable format
3. Calculates Month-over-Month (MoM) credit growth per economic sector
4. Flags abnormal growths as early indicators of credit concentration risk
5. Loads the output into a PostgreSQL data warehouse
6. Visualizes insights through a dynamic Metabase dashboard

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Data Platform Understanding

Data Source Identification

The primary data source is the official website of **Bank Indonesia**, specifically from the SEKI portal (Economic and Financial Statistics of Indonesia). The dataset used is:

- **File Name:** TABEL1_5.xls
- **Content:** Posisi Pinjaman/Kredit Rupiah yang Diberikan oleh Bank Umum dan BPR, berdasarkan sektor ekonomi dan jenis bank.
- **Format:** Microsoft Excel (.xls)

The data represents how credit is distributed across sectors, helping identify sectoral credit growth and liquidity risks

Orchestration

- **Tool:** Apache Airflow
- **Definition:** A workflow orchestration tool to automate and schedule ETL processes
- **Usage:** Handles scraping, transformation and load to data warehouse

Storage

- **MinIO:**
 - **Definition:** Local object storage system compatible with Amazon S3
 - **Purpose:** Stores raw Excel files and processed `.parquet` files by date
- **PostgreSQL:**
 - **Definition:** A relational database system (RDBMS)
 - **Purpose:** Stores the final transformed and analyzed data used for visualization

Transformation

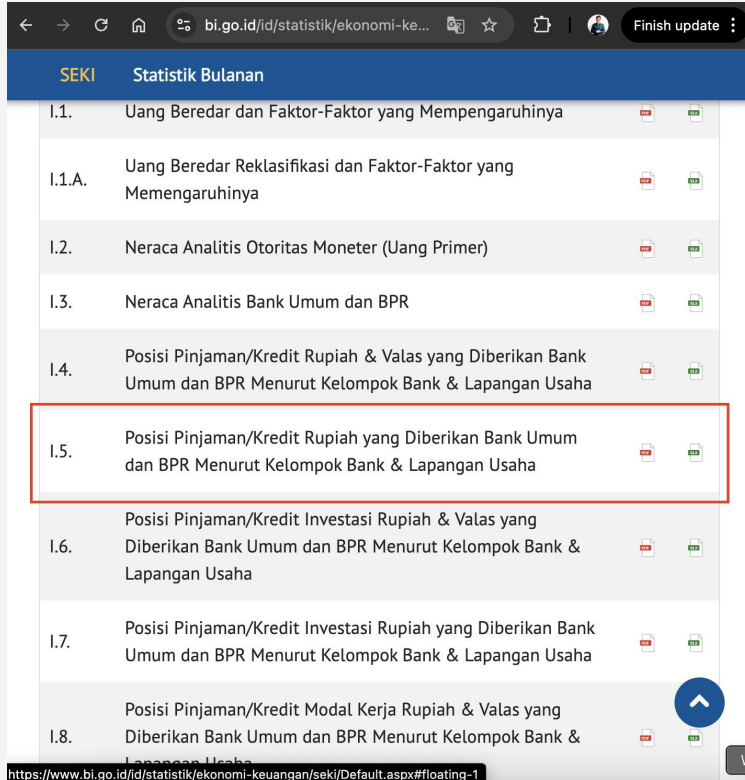
- **Tools:** Python, pandas
- **Function:**
 - Merges 3 Excel sheets into a unified format
 - Cleans and reshapes the data
 - Calculates Month-over-Month (MoM) credit growth
 - Flags abnormal spikes for risk monitoring
- **Output:** Cleaned `.parquet` files and PostgreSQL tables



















Visualization

- **Tool:** Metabase
- **Function:** Connects to PostgreSQL to visualize:
 - Sectoral credit trends
 - Anomaly detection (MoM > 15%) for each Bank
 - Credit distribution and concentration across economic sectors

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Data Understanding



| SEKI | | Statistik Bulanan | |
|--------|---|---|---|
| I.1. | Uang Beredar dan Faktor-Faktor yang Mempengaruhinya |  |  |
| I.1.A. | Uang Beredar Reklasifikasi dan Faktor-Faktor yang Mempengaruhinya |  |  |
| I.2. | Neraca Analitis Otoritas Moneter (Uang Primer) |  |  |
| I.3. | Neraca Analitis Bank Umum dan BPR |  |  |
| I.4. | Posisi Pinjaman/Kredit Rupiah & Valas yang Diberikan Bank Umum dan BPR Menurut Kelompok Bank & Lapangan Usaha |  |  |
| I.5. | Posisi Pinjaman/Kredit Rupiah yang Diberikan Bank Umum dan BPR Menurut Kelompok Bank & Lapangan Usaha |  |  |
| I.6. | Posisi Pinjaman/Kredit Investasi Rupiah & Valas yang Diberikan Bank Umum dan BPR Menurut Kelompok Bank & Lapangan Usaha |  |  |
| I.7. | Posisi Pinjaman/Kredit Investasi Rupiah yang Diberikan Bank Umum dan BPR Menurut Kelompok Bank & Lapangan Usaha |  |  |
| I.8. | Posisi Pinjaman/Kredit Modal Kerja Rupiah & Valas yang Diberikan Bank Umum dan BPR Menurut Kelompok Bank & Lapangan Usaha |  |  |

<https://www.bi.go.id/statistik/ekonomi-keuangan/seki/Default.aspx#floating-1>

Data Source and Description

The data originates from the official **Bank Indonesia (BI)** on SEKI portal (Statistik Ekonomi dan Keuangan Indonesia).

The specific file used in this project is:

- **File Name:** `TABEL1_5.xls`
- **Title:** Posisi Pinjaman/Kredit Rupiah yang Diberikan oleh Bank Umum dan BPR, berdasarkan sektor ekonomi dan jenis bank.
- **Data:** ~ 150 Record
- **Format:** Microsoft Excel (.xls)
- **Access Method:** Public URL (scraped programmatically via `requests`)

Data Collection Method

- The Excel file is scraped using Python's `requests` library and stored directly into a **MinIO object storage** as the data lake.
- Filename is versioned by scrape date (e.g., `TABEL1_5_20250704.xls`)
- Raw files are preserved in the folder: `kredit-data/raw/YYYY-MM-DD/`

Data Structure & Sheets Used

The Excel file contains multiple sheets. This project uses three main sheets:

| Sheet Name | Description | Use in Project |
|------------|---|--|
| I.5_1 | Bank Persero and Bank Pemerintah Daerah | Used for aggregation and sector analysis |
| I.5_2 | Bank Swasta Nasional and Kantor Cabang di Luar Negeri | Used for aggregation and sector analysis |
| I.5_3 | Bank Pengkreditan Rakyat | Used for aggregation and sector analysis |

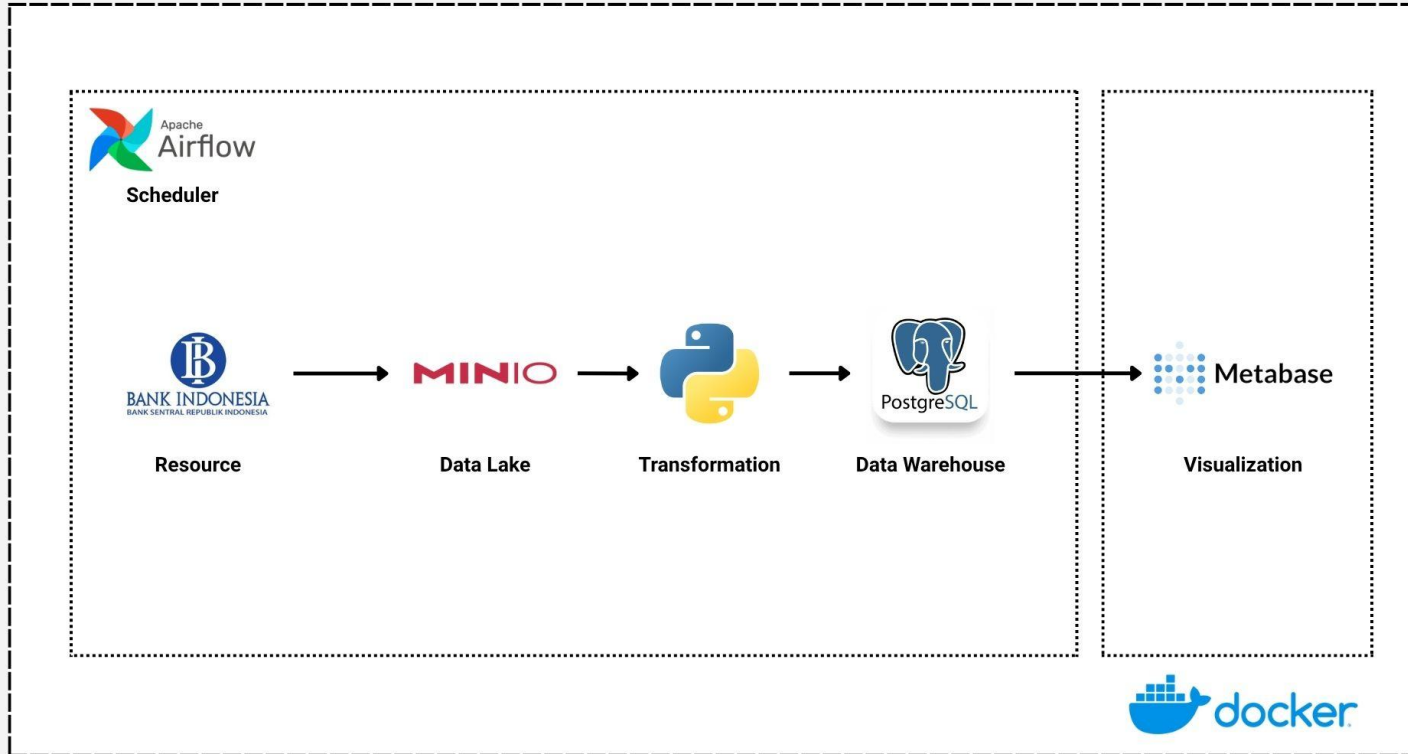
Each sheet contains:

- Rows representing economic sectors (e.g., Agriculture, Manufacturing, Services)
- Columns representing monthly credit values, labeled by date
- Credit values in billions of Indonesian Rupiah (IDR)

| I.5 POSISI PINJAMAN/KREDIT RUPIAH YANG DIBERIKAN BANK UMUM DAN BPR MENURUT KELOMPOK BANK & LAPANGAN USAHA (Miliar Rp) | | | | I.5 OUTSTANDING COM BY GROUP |
|--|-----------|-----------|-----------|------------------------------------|
| KELOMPOK BANK & LAPANGAN USAHA | | | | 2025 |
| | Jan | Feb | Mar | Apr |
| 1 1. Bank Persero | 2.975.617 | 2.982.704 | 2.995.291 | 3.009.529 |
| 2 Pinjaman Berdasarkan Lapangan Usaha | 2.051.022 | 2.053.338 | 2.062.084 | 2.075.856 |
| 3 Pertanian, Kehutanan & Perikanan | 356.847 | 360.624 | 358.938 | 371.823 |
| 4 Pertambangan dan Penggalian | 110.841 | 110.220 | 112.050 | 107.749 |
| 5 Industri Pengolahan | 278.174 | 276.607 | 266.690 | 266.017 |
| 6 Pengadaan Listrik dan Gas | 42.525 | 41.699 | 43.338 | 47.590 |
| 7 Pengadaan Air, Pengelolaan Sampah, Limbah dan Daur Ulang | 2.461 | 2.447 | 2.454 | 2.435 |
| 8 Konstruksi | 184.064 | 188.696 | 193.101 | 194.012 |
| 9 Perdagangan Besar dan Eceran, Reparasi Mobil dan Motor | 549.854 | 548.076 | 561.137 | 559.383 |
| 10 Transportasi dan Pergudangan | 101.094 | 101.654 | 101.527 | 102.703 |
| 11 Penyediaan Akomodasi dan Minum | 61.392 | 61.134 | 61.184 | 60.763 |
| 12 Informasi dan Komunikasi | 66.265 | 59.297 | 55.607 | 57.721 |
| 13 Jasa Keuangan dan Asuransi | 96.566 | 97.915 | 93.136 | 89.626 |
| 14 Real Estate | 65.246 | 67.750 | 67.778 | 70.291 |
| 15 Jasa Perusahaan | 29.241 | 30.448 | 31.125 | 31.476 |
| 16 Administrasi Pemerintahan, Pertahanan dan Jaminan Sosial Wajib | 72 | 73 | 126 | 85 |
| 17 Jasa Pendidikan | 2.522 | 2.560 | 2.549 | 2.559 |
| 18 Jasa Kesehatan dan Kegiatan Lainnya | 16.608 | 16.689 | 16.831 | 17.289 |
| 19 Jasa Lainnya | 87.251 | 87.446 | 94.514 | 94.337 |
| 20 Pinjaman Kepada Bukan Lapangan Usaha (Konsumsi Rumah Tangga) | 924.595 | 929.366 | 933.207 | 933.672 |

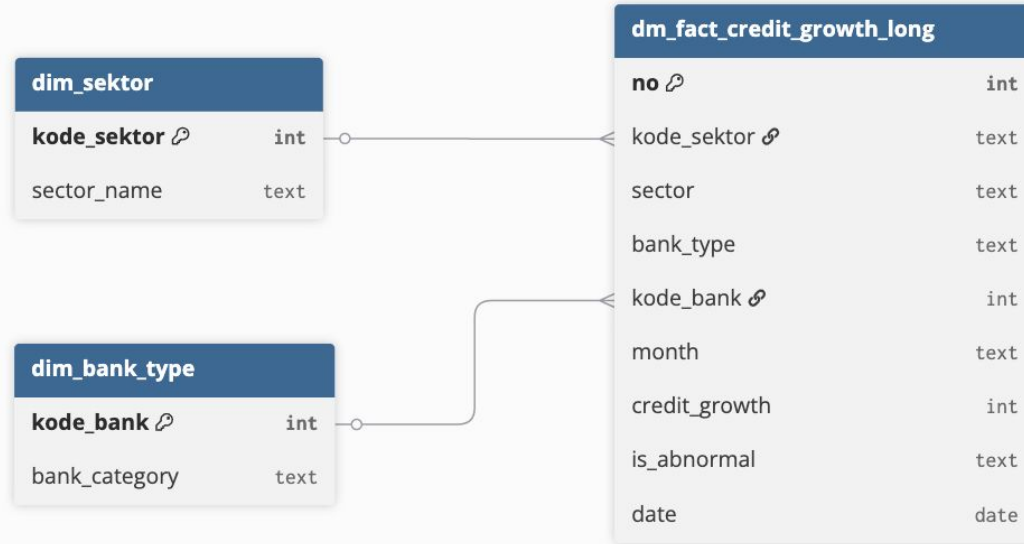


Transformation & Consideration



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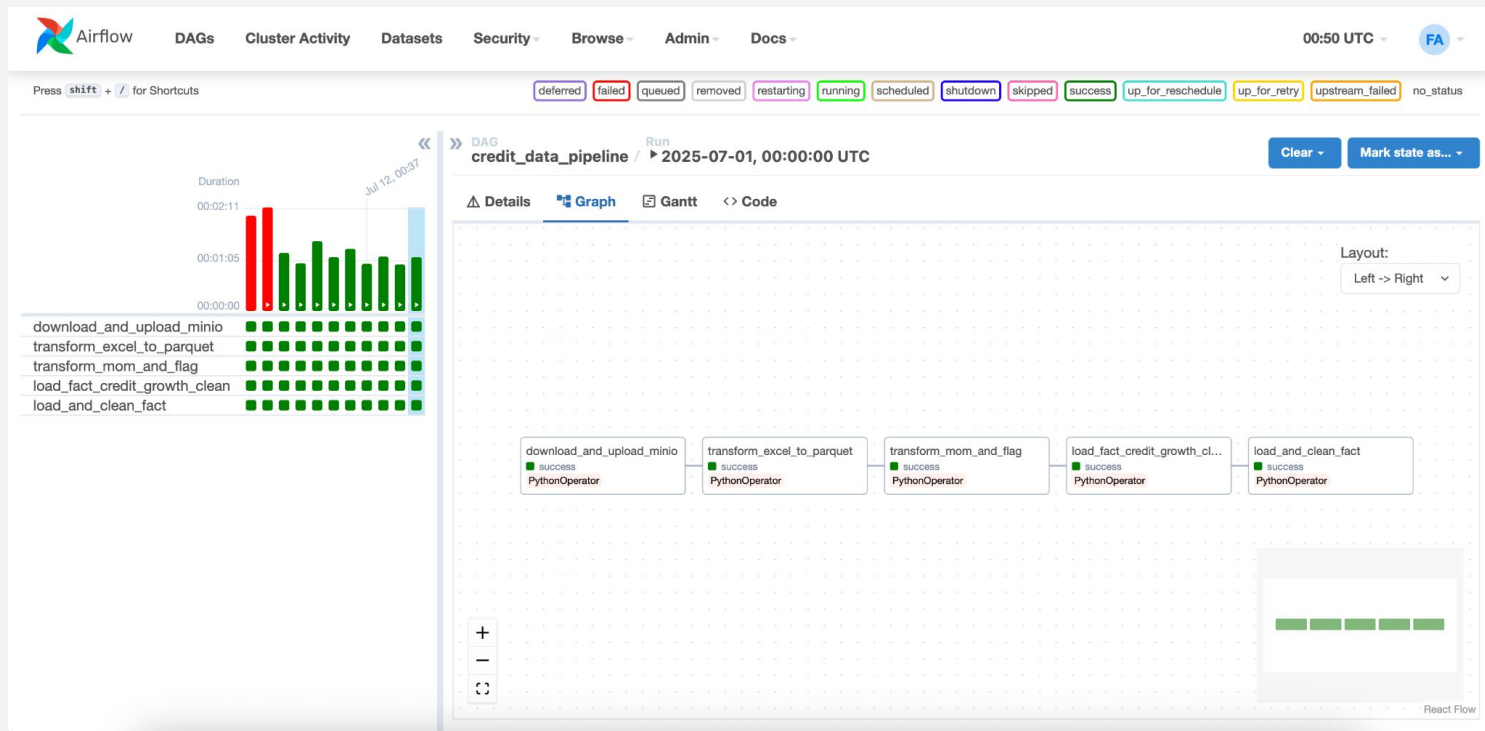
Data Modeling (Business)



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Transformation Process

Airflow <http://localhost:8086>



MinIO <http://localhost:9001>

MINIO

OBJECT STORE

Community Edition

+ Create Bucket

Q Filter Buckets

Buckets

- kredit-data

Documentation

License

Sign Out

Object Browser

Q Start typing to filter objects in the bucket

?

⚙

kredit-data

Created on: Fri, Jul 11 2025 21:21:10 (GMT+7) Access: PRIVATE 1.1 MiB - 4 Objects

Rewind ↶ Refresh ↺ Upload ↗

< kredit-data

Create new path ↗

| <input type="checkbox"/> | Name | Last Modified | Size |
|--------------------------|-----------|---------------|------|
| <input type="checkbox"/> | processed | | - |
| <input type="checkbox"/> | raw | | - |

Postgres

dm_fact_credit_growth_long 1 X

select * from public.dm_fact_credit_gro | Enter a SQL expression to filter results (use Ctrl+Space)

| | 123 no | 123 kode_sektor | AZ sector | AZ bank_type | 123 kode_bank | date | AZ mor |
|----|--------|-----------------|--|-------------------------|---------------|------------|--------|
| 8 | 7 | | 12 Jasa Keuangan dan Asuransi | Bank Persero | 1 | 2025-07-18 | jan |
| 9 | 8 | | 11 Informasi dan Komunikasi | Bank Persero | 1 | 2025-07-18 | jan |
| 10 | 9 | | 24 Lainnya | Bank Swasta Nasional | 3 | 2025-07-18 | jan |
| 11 | 10 | | 6 Pengadaan Air, Pengelolaan Sampah, Limbah dan T | Bank Persero | 1 | 2025-07-18 | jan |
| 12 | 11 | | 7 Konstruksi | Bank Persero | 1 | 2025-07-18 | jan |
| 13 | 12 | | 8 Perdagangan Besar dan Eceran, Reparasi Mobil dan | Bank Persero | 1 | 2025-07-18 | jan |
| 14 | 13 | | 5 Pengadaan Listrik dan Gas | Bank Persero | 1 | 2025-07-18 | jan |
| 15 | 14 | | 20 Rumah Tinggal | Bank Perkreditan Rakyat | 5 | 2025-07-18 | jan |
| 16 | 15 | | 21 Flat dan Apartemen | Bank Perkreditan Rakyat | 5 | 2025-07-18 | jan |
| 17 | 16 | | 22 Rumah Toko (Ruko) dan Rumah Kantor (Rukan) | Bank Perkreditan Rakyat | 5 | 2025-07-18 | jan |
| 18 | 17 | | 23 Kendaraan Bermotor | Bank Perkreditan Rakyat | 5 | 2025-07-18 | jan |
| 19 | 18 | | 19 Pinjaman Kepada Bukan Lapangan Usaha (Konsum | Bank Persero | 1 | 2025-07-18 | jan |
| 20 | 19 | | 18 Jasa Lainnya | Bank Swasta Nasional | 3 | 2025-07-18 | jan |
| 21 | 20 | | 19 Pinjaman Kepada Bukan Lapangan Usaha (Konsum | Bank Swasta Nasional | 3 | 2025-07-18 | jan |
| 22 | 21 | | 22 Rumah Toko (Ruko) dan Rumah Kantor (Rukan) | Bank Swasta Nasional | 3 | 2025-07-18 | jan |
| 23 | 22 | | 11 Informasi dan Komunikasi | Bank Swasta Nasional | 3 | 2025-07-18 | jan |
| 24 | 23 | | 5 Pengadaan Listrik dan Gas | Bank Swasta Nasional | 3 | 2025-07-18 | jan |
| 25 | 24 | | 20 Rumah Tinggal | Bank Swasta Nasional | 3 | 2025-07-18 | jan |
| 26 | 25 | | 8 Perdagangan Besar dan Eceran, Reparasi Mobil dan | Bank Swasta Nasional | 3 | 2025-07-18 | jan |
| 27 | 26 | | 23 Kendaraan Bermotor | Bank Swasta Nasional | 3 | 2025-07-18 | jan |

Postgres (Abnormal)

| dm_fact_credit_growth_long 1 X | | | | | | | | | |
|---|-----------------|-------------------------|---------------|------------|-----------|-------------------|---------|---|--|
| select * from public.dm_fact_credit_gro Enter a SQL expression to filter results (use Ctrl+Space) | | | | | | | | | |
| | | A-Z bank_type | 123 kode_bank | 🕒 date | A-Z month | 123 credit_growth | 123 mom | <input checked="" type="checkbox"/> is_abnormal | |
| 7 | | Bank Persero | 1 | 2025-07-18 | jan | 65,245.8767 | [NULL] | [] | |
| 8 | | Bank Persero | 1 | 2025-07-18 | jan | 96,566.3128 | [NULL] | [] | |
| 9 | | Bank Persero | 1 | 2025-07-18 | jan | 66,264.9979 | [NULL] | [] | |
| 10 | | Bank Swasta Nasional | 3 | 2025-07-18 | jan | 370,803.2221 | [NULL] | [] | |
| 11 | Limbah dan | Bank Persero | 1 | 2025-07-18 | jan | 2,460.907 | [NULL] | [] | |
| 12 | | Bank Persero | 1 | 2025-07-18 | jan | 184,063.9134 | [NULL] | [] | |
| 13 | arasi Mobil dan | Bank Persero | 1 | 2025-07-18 | jan | 549,853.898 | [NULL] | [] | |
| 14 | | Bank Persero | 1 | 2025-07-18 | jan | 42,525.0642 | [NULL] | [] | |
| 15 | | Bank Perkreditan Rakyat | 5 | 2025-07-18 | jan | 0 | [NULL] | [] | |
| 16 | | Bank Perkreditan Rakyat | 5 | 2025-07-18 | jan | 0 | [NULL] | [] | |
| 17 | or (Rukan) | Bank Perkreditan Rakyat | 5 | 2025-07-18 | jan | 0 | [NULL] | [] | |
| 18 | | Bank Perkreditan Rakyat | 5 | 2025-07-18 | jan | 0 | [NULL] | [] | |
| 19 | saha (Konsum | Bank Persero | 1 | 2025-07-18 | jan | 924,594.7544 | [NULL] | [] | |
| 20 | | Bank Swasta Nasional | 3 | 2025-07-18 | jan | 24,954.8374 | [NULL] | [] | |
| 21 | saha (Konsum | Bank Swasta Nasional | 3 | 2025-07-18 | jan | 779,273.4099 | [NULL] | [] | |
| 22 | or (Rukan) | Bank Swasta Nasional | 3 | 2025-07-18 | jan | 19,061.1359 | [NULL] | [] | |
| 23 | | Bank Swasta Nasional | 3 | 2025-07-18 | jan | 100,808.4001 | [NULL] | [] | |
| 24 | | Bank Swasta Nasional | 3 | 2025-07-18 | jan | 49,956.8337 | [NULL] | [] | |
| 25 | | Bank Swasta Nasional | 3 | 2025-07-18 | jan | 264,113.6502 | [NULL] | [] | |
| 26 | arasi Mobil dan | Bank Swasta Nasional | 3 | 2025-07-18 | jan | 478,188.5316 | [NULL] | [] | |

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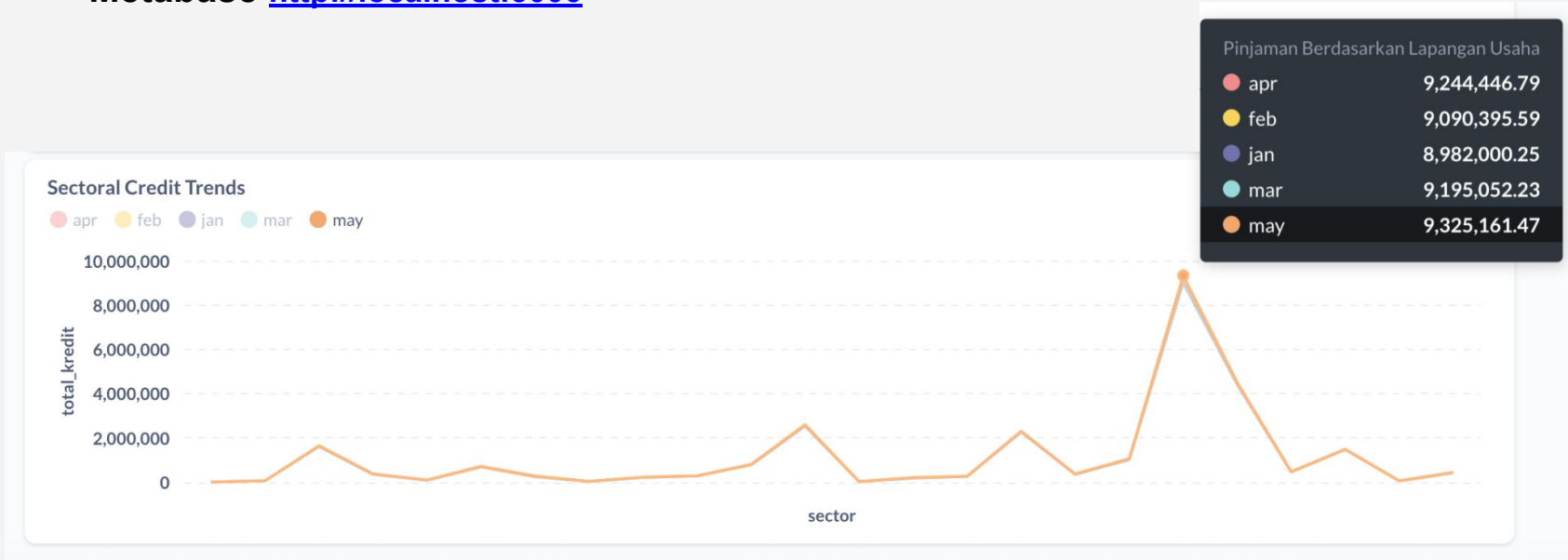
Code Review

<https://colab.research.google.com/drive/14klsMlsTGEbwUEdOpf3HjXY23GhMv5e2?usp=sharing>

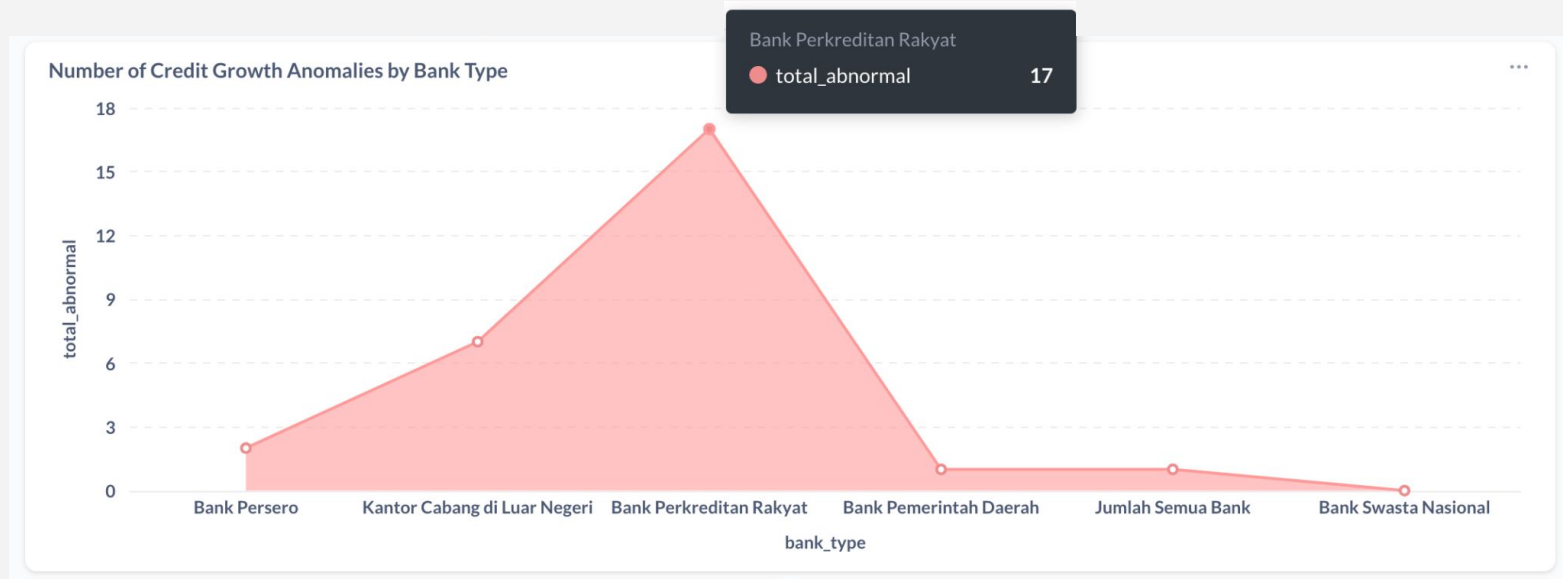
A large black parallelogram is positioned on the left side of the slide. Below it, two overlapping parallelograms in shades of orange and yellow are also positioned on the left, creating a layered, geometric effect.

Project Showcase

Metabase <http://localhost:3006>

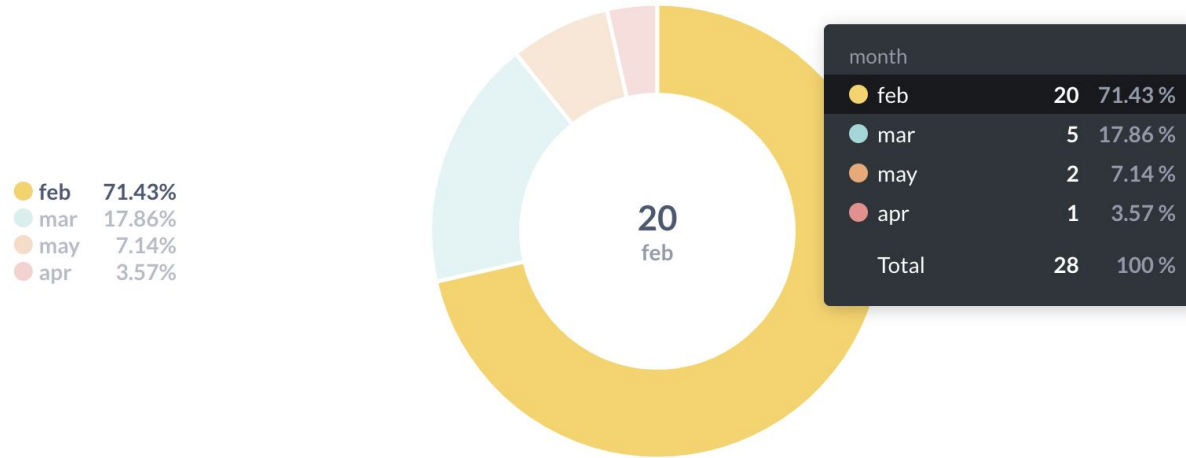


A noticeable surge occurred in **May**, where total credit jumped from **9.2 million in April** to **9.3 million**, particularly in the sector labeled **"Pinjaman Berdasarkan Lapangan Usaha"** — commonly interpreted as **UMKM loan**



It may indicate risk exposure in specific bank type and helps direct further risk management investigation. 17 of abnormal mom value on **Bank Perkreditan Rakyat**.

Monthly Distribution of Credit Anomalies



This chart illustrates the proportion of credit anomalies detected each month. A significant spike is observed in **February**, accounting for **71.43%** of total anomalies, which may indicate unusual credit activities or reporting shifts during that period and warrant further investigation.

A large, stylized graphic on the left side of the slide. It consists of a blue outline of a person's head and shoulders. Inside the head is a large orange circle with a smaller orange circle in the center. Inside the shoulders is a large orange circle with a smaller orange circle in the center.

Thank You.