

“Analysis of TLTRO Impacts on Loan Stocks of Eurozone's Five Largest Economies”

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- **Research Question:** How significantly did ECB's TLTRO program effect the five biggest Eurozone economies' loan stocks?
 - **Data Source:** European Central Bank (ECB), Statistical Data Warehouse
 - **Scope:** Germany, France, Italy, Spain, the Netherlands
 - **Time Period:** 1997-2025 (TLTRO I-II-III: 2014-2022)
 - **Main Metrics:** Loan Stock Volumes and Growth Rates
 - **Tools:** Microsoft Excel, SQL (MySQL), Tableau

Executive Summary

Project Objective

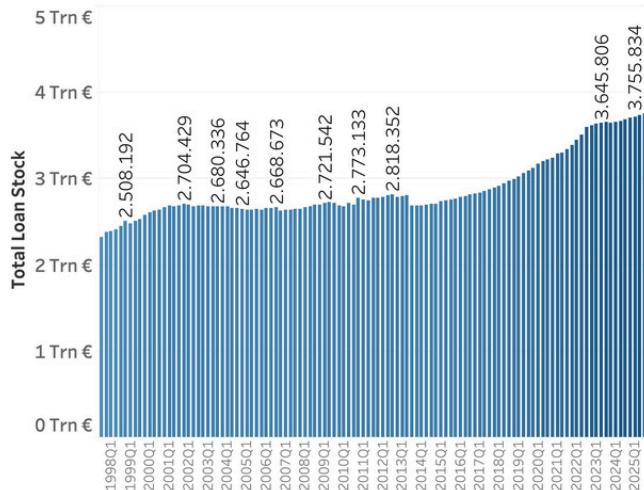
This analysis examines the impact of the European Central Bank's (ECB) Targeted Longer-Term Refinancing Operations (TLTRO) program on the loan stocks of the five largest economies in the Eurozone (Germany, France, Italy, Spain, and the Netherlands). The main objective is to analyze quarterly credit stocks from 1997 to 2025 to provide information on how the program differs in its impact across the five major European economies. The project focuses on three different TLTRO phases (I: 2014-2016, II: 2016-2019, III: 2019-2022).

Methodology

1. Obtaining quarterly total credit stock data from the ECB Statistical Data Warehouse for the period 1997Q3 to 2025Q3
2. Cleaning and structuring 560+ quarterly data points using SQL
3. Calculating quarter-over-quarter growth rates, absolute changes and period comparisons by using window functions, CTE (Common Table Expression) in SQL
4. Creating 14 graphs/charts which show country-level trends, aggregate patterns, and comparative metrics across the five economies by using Tableau

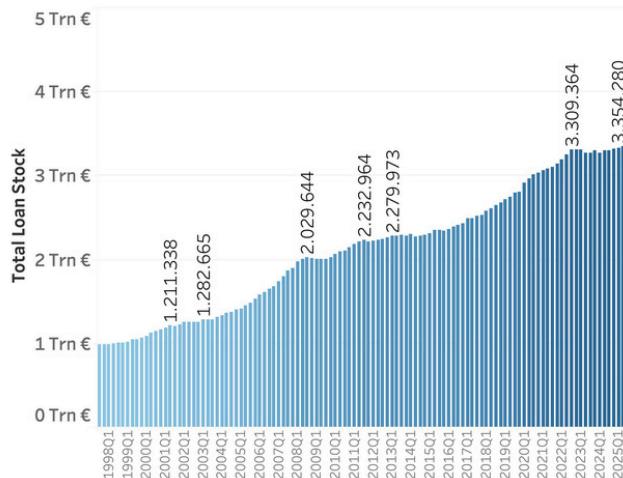
Key Findings

- Germany and France experienced strong credit expansion during TLTRO periods (+34.8% and +45.1% respectively, 2014-2022), while Italy and Spain contracted (-8.3% and -18.2%).
- The Netherlands did not experience any noticeable change,
- TLTRO-III (2019-2022) showed the strongest correlation with credit growth across all countries.

Figure 1: Quarterly total loan stock of Germany (Trillion €)

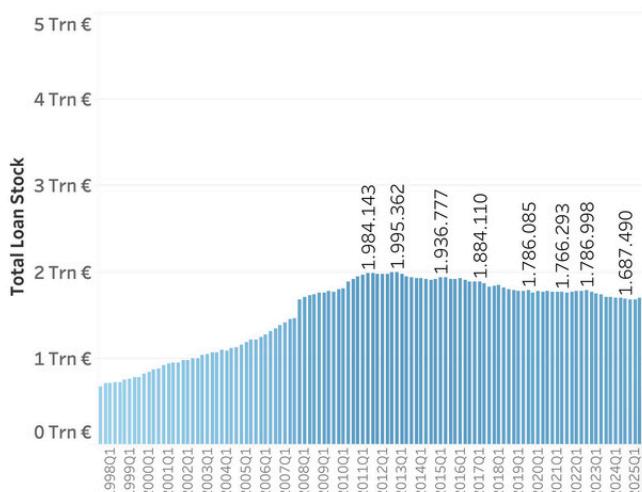
Source: ECB Data Warehouse (BSI.Q.DE.N.A.A20.A.1.U6.2000.Z01.E)

Germany experienced a period of stagnation in its loan stock following the impact of the crisis after 2010. With the launch of the program (TLTRO-I), the stock, which was €2.7 trillion in 2014, reached €2.8 trillion in 2016. Growth gained momentum with TLTRO-II. The stock increased by €322 billion, reaching €3.12 trillion between 2014 and 2016. However, the most rapid growth was recorded in TLTRO-III. The stock, which was €3.17 trillion in 2020, rose to €3.6 trillion in 2022 in just two years. This shows that there was a total increase of approximately €1.1 trillion throughout the program.

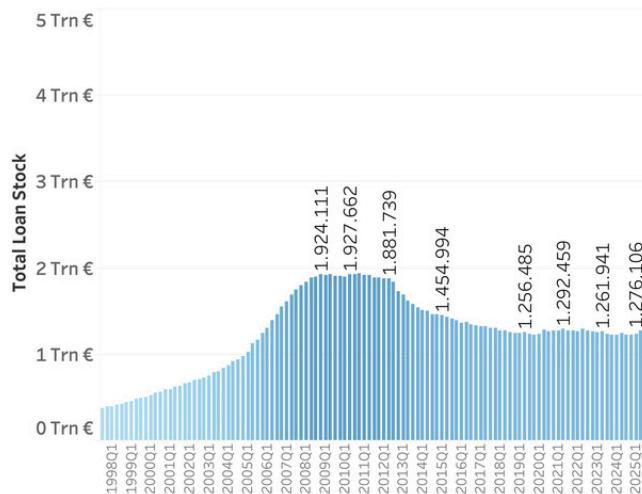
Figure 2: Quarterly total loan stock of France (Trillion €)

Source: ECB Data Warehouse (BSI.Q.FR.N.A.A20.A.1.U6.2000.Z01.E)

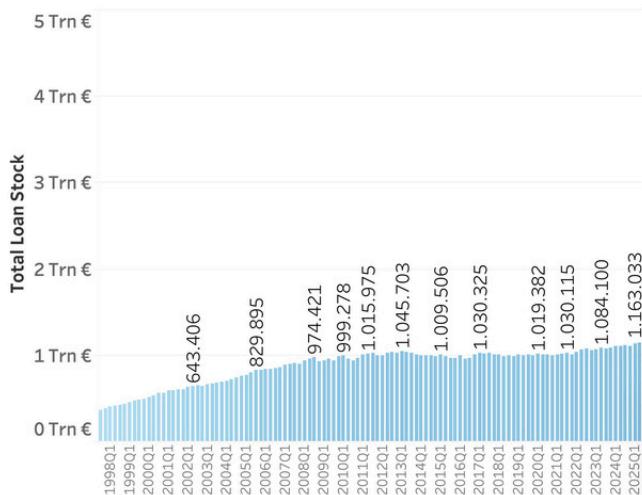
France recorded significant growth of 240% by increasing its loan stock from €984 billion in 1997 to €3.34 trillion in the third quarter of 2025. With the TLTRO-I program, it rose from €2.30 trillion to €2.36 trillion between 2014 and 2016, showing a 2.6% growth. TLTRO-II had a stronger impact on France's credit stock. Loans, which stood at €2.36 trillion at the beginning of 2016, reached €2.81 trillion at the end of TLTRO-II, resulting in an increase of €450 billion. This represents a 19% increase in loan stocks. However, it peaked during the TLTRO-III period. The stock, which was €2.92 trillion in 2020, reached €3.31 trillion in 2022, recording significant growth.

Figure 3: Quarterly total loan stock of Italy (Trillion €)

Source: ECB Data Warehouse (BSI.Q.IT.N.A.A20.A.1.U6.2000.Z01.E)

Figure 4: Quarterly total loan stock of Spain (Trillion €)

Source: ECB Data Warehouse (BSI.Q.ES.N.A.A20.A.1.U6.2000.Z01.E)

Figure 5: Quarterly total loan stock of the Netherlands (Trillion €)

Source: ECB Data Warehouse (BSI.Q.NL.N.A.A20.A.1.U6.2000.Z01.E)

Although Italy followed a successful growth trend until the end of 2012, it failed to maintain it and it experienced a steady decline after 2012. Italian banks' credit stock, which stood at €676 billion in 1997, managed to reach €2 trillion in 2012 with a steady increase over 15 years. Although the downward trend slowed with the start of TLTRO programs, no growth was recorded. The stock, which was €1.8 trillion in 2014, remained stable in TLTRO-I. TLTRO-II and TLTRO-III were also insufficient to cause a jump in Italy's credit stock, and at the end of the program, it remained in the €1.8 trillion range, showing no increase over the previous level. This indicates that there may be a positive correlation between the stability of Italian credit stocks, which had the potential to begin a downward trend, and TLTROs.

Spain showed a similar growth to Italy until 2008, but experienced a major decline in the period after 2008. It reached the historical peak by raising its credit stock from €377 billion in 1999 to €1.9 trillion in 2008. As of 2013, it entered a serious contraction process and decreased to €1.5 trillion in the fourth quarter. With the TLTRO-I program, the rate of decline between 2014-2016 slowed down and the stock stabilised around €1.4 trillion. However, while other countries showed growth or remained stable in TLTRO-II and TLTRO-III, at the end of the program, the stock, which stood at €1.28 trillion, returned to its 2005 level. This outcome may suggest that the TLTRO program did not meet expectations in Spain and that Spanish banks did not use the credit channel as intended.

The Netherlands has much lower credit stocks compared to other countries. From €368 billion in 1997, it steadily increased its credit stock to €1.45 trillion by 2013. At the start of the program, Dutch credit stocks hovered around €1 trillion, but failed to achieve significant growth under TLTRO-II and TLTRO-III. Between 2014 and 2022, they increased by only approximately €100 billion, rising to €1.1 trillion. It may be concluded that the TLTRO program had no significant impact on Dutch credit stocks.

Figure 6: Quarterly total loan stock in selected euro area countries (Trillion €)

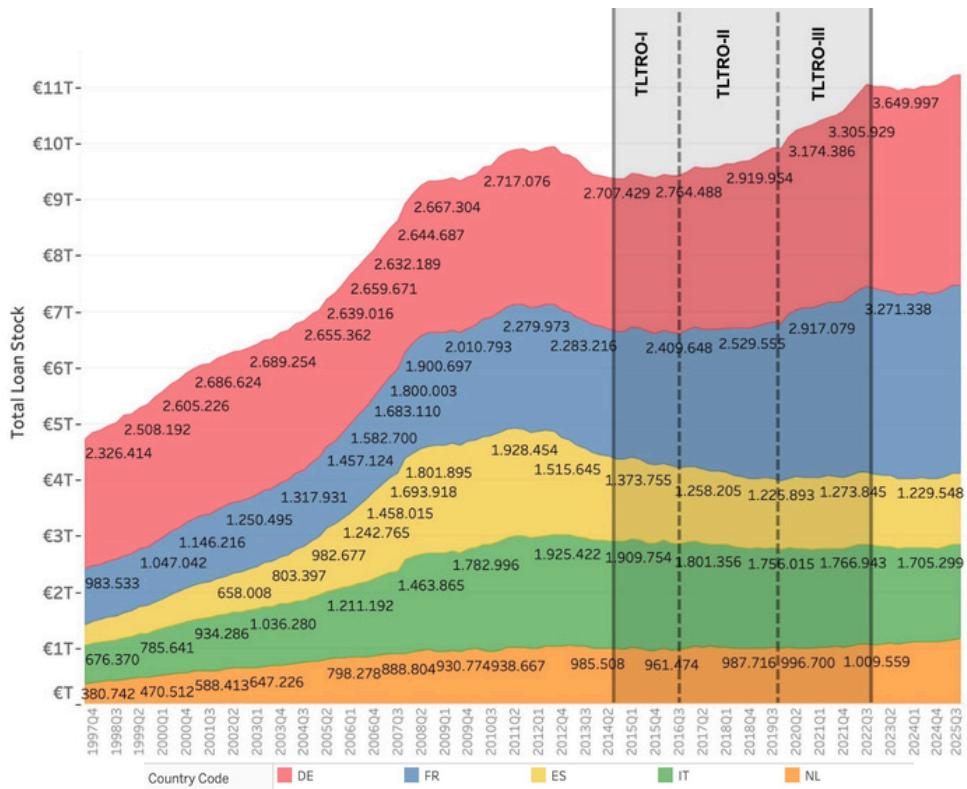
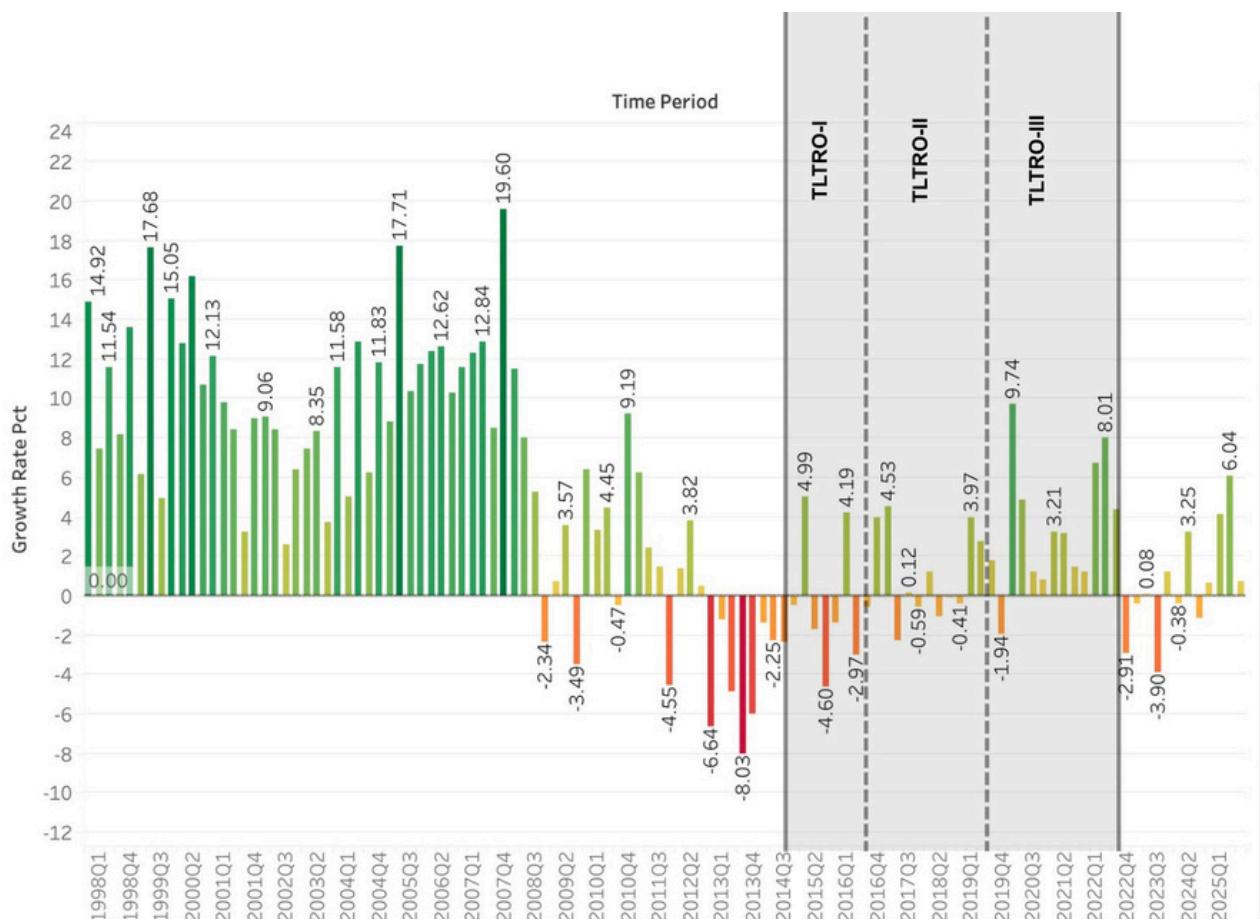


Figure 7: Quarterly growth rates of total loan stocks in selected euro area countries (%)

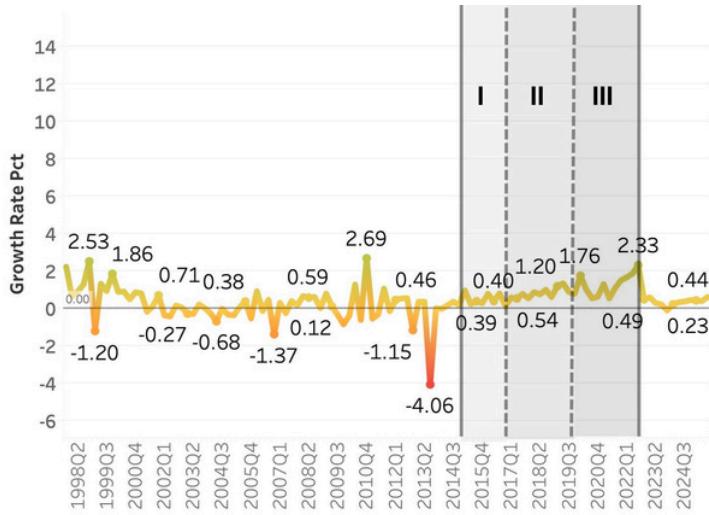
(Note: This bar chart shows the quarterly growth rates of total loan stocks in Germany, France, Italy, Spain, and the Netherlands (1997Q4 - 2025Q3). Green bars indicate positive growth, while red bars indicate negative growth.)

Calculation: Quarterly growth rate = $(\text{Aggregate Loan Stock}_t - \text{Aggregate Loan Stock}_{t-1}) / \text{Aggregate Loan Stock}_{t-1} \times 100$

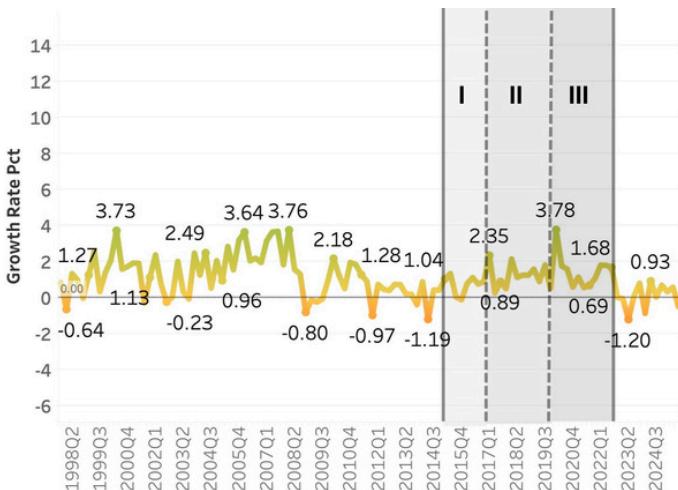
Data Source: ECB Statistical Data Warehouse

This graph shows the quarterly growth rate of the total credit stock of selected five countries in Eurozone. Prior to the TLTRO period, a consistent positive trend of up to 19.6% was observed until 2008. This indicates continuous growth in the total credit stock of these five countries between 1997 and 2008. However, a consistently negative trend was observed from 2008 until the TLTRO period. In fact, in the third quarter of 2013, this negative trend fell to -8%. This downward trend can be considered to be related to the stagnation caused by the 2008 financial crisis and the 2010 eurozone debt crisis. With the launch of the TLTRO program in 2014, this downward trend was broken, and positive growth was observed during the TLTRO-I period. However, stability for growth could not be achieved. TLTRO-II created a stable and minimal growth period. With TLTRO-III, the trend turned completely positive, showing 9.74% growth in 2020 and 8% growth in 2022.

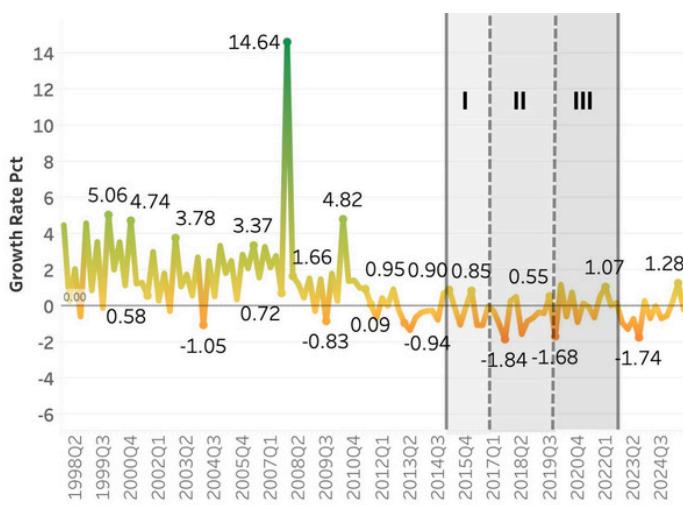
This also shows that we can reach this conclusion: total credit stock growth rates, which were also in a declining trend before the TLTRO program, changed their downward trajectory with TLTRO-I and became partially positive. This implies that the first phase was effective in increasing credit stocks but insufficient in terms of stability. The stability that could not be achieved with TLTRO-I was achieved with TLTRO-II, and there was nearly consistent positive growth during this period. This suggests that TLTRO-II was effective in ensuring that the growth rates of increasing stocks followed a steady trend. Growth peaked during TLTRO-III and then regained momentum by experiencing a positive trend. This means that the most significant impact was achieved during this period and that growth was most rapid during this period.

Figure 8: Quarterly loan stock growth rates of Germany (%)

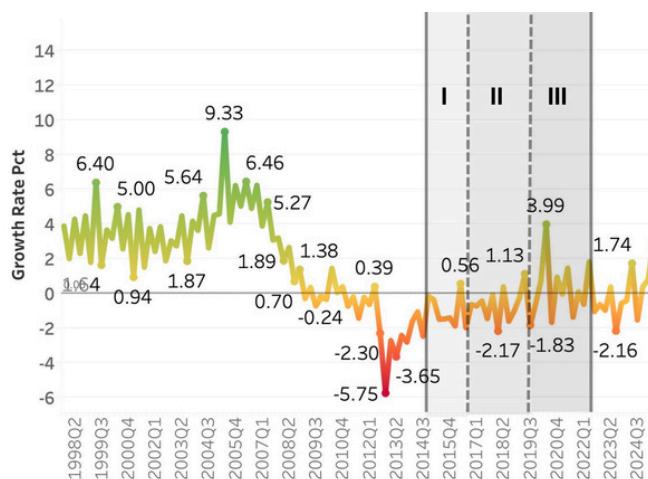
Germany's credit stock generally follows a stable line within a narrow band (-1% to +2.5%), mostly showing positive growth. From 2002 to 2007, Germany's credit stock growth rates, which showed negative growth in certain periods, fell to -4.06% in 2013. It then progressed positively again with TLTRO-I. With TLTRO-II, it entered a minimal upward trend. In 2018 and 2019, it frequently exceeded 1%. However, the most significant upward trend was seen in TLTRO-III. It reached 1.76% in Q1 2020 and peaked at 2.33% in Q3 2022. With the increase in interest rates, growth was negatively affected after 2022 and fell back to zero levels. It is possible to conclude that the TLTRO program has been an effective factor in the increase in Germany's credit stock and that German banks have successfully converted liquidity into credit by taking sufficient advantage of this program.

Figure 9: Quarterly loan stock growth rates of France (%)

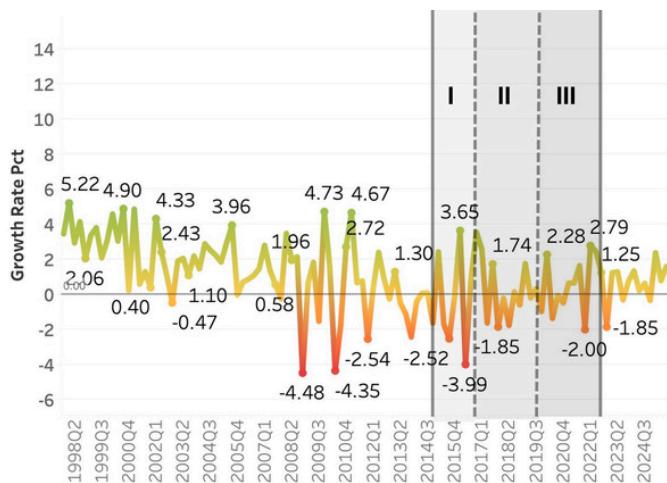
France also shows a mostly positive profile, similar to Germany. However, fluctuations occur within a wider range (-1.2% to +4%). French credit stocks, which experienced a significant upward trend between 2003 and 2008, declined to -0.80% in 2008. It is debatable whether the reason for this is the 2008 financial crisis. Then, it showed an up-and-down trend until 2014. In 2014, the negative trend turned positive with the TLTRO-I program. A positive stability was achieved with TLTRO-II. It rose further with TLTRO-III and reached its highest peak of 3.76% during this period. However, France, similar to Germany, was negatively affected by the interest rate hike, and its growth rate fell to -1.20% in 2023. Considering the growth during the TLTRO period, this graph may suggest that France has achieved the TLTRO program's target of increasing credit stocks and has successfully utilized the liquidity provided by TLTRO funds as loans. In other words, the program has successfully led to an increase in credit stocks in France.

Figure 10: Quarterly loan stock growth rates of Italy (%)

Italy's chart paints a problematic picture in terms of increasing its stocks. Until 2011, it fluctuates between +5% and -1%, mostly following a positive trend. Between 2011 and 2014, it remains consistently negative or close to zero. With the TLTRO-I program, the line never crosses into a positive trend. Although minimal increases are observed between 2016 and 2018, it continues to follow a negative trend. The most striking point is Italy's weak response to TLTRO-III. During the pandemic, Germany's credit stock growth rate with TLTRO-III was 2.33%, France's was 3.78%, but Italy's growth peak during the same period remained at only 1.19%. From this perspective, it can be interpreted that either Italian banks had weak demand for the TLTRO program or Italian banks were unsuccessful in converting the funds obtained from TLTROs into loans. Because the program has not led to a noticeable increase in Italian credit stocks.

Figure 11: Quarterly loan stock growth rates of Spain (%)

Spain is the country with the widest fluctuations in growth rates among these five countries. It has a volatile profile, ranging from peaks close to 10% to troughs reaching -6%. It maintained continuous positive growth until 2008, even reaching a peak of 9.33% in 2005. However, it entered a negative trend until 2014, even falling tragically to -5.75% in 2012. With the effect of TLTROs, it emerged from the negative zone at the beginning of 2014 and approached zero. Although there was no positive growth, the deep negative trend was broken. It experienced minimal increases with TLTRO-III but failed to make a positive leap and fluctuated constantly around the zero line. Positive quarters were immediately followed by negative quarters. From this, it may be interpreted that, as in Italy, the TLTRO program did not have a significant impact on increasing credit stocks in Spain.

Figure 12: Quarterly loan stock growth rates of the Netherlands (%)

The Dutch graph shows sharp increases of up to 5% (Q1 2001: 4.88%) and sharp declines of up to 4.5% (Q4 2008: -4.48%). Similar to other countries, it followed a positive trend until 2008, but then lost this growth trend and experienced deep declines in 2008 and 2010. The TLTRO-III program did not bring about any major changes, and it continued its own fluctuations. Negative growth rates decreased and reached zero levels in TLTRO-III. However, positive growth rates were immediately followed by negative growth rates. Therefore, it may be concluded that the TLTRO program did not lead to any noticeable change in Dutch credit stocks.

Figure 13: Changes of five countries' loan stocks before and after TLTROs period

Country ..	Pre-Post TLTROs	Absolute Change (€)	Change (%)
DE	2,693,198.00€ → 3,634,888.00€	941690	34,97
FR	2,280,381.00€ → 3,308,321.00€	1027940	45,08
IT	1,930,714.00€ → 1,747,739.00€	-182975	-9,48
ES	1,540,420.00€ → 1,257,105.00€	-283315	-18,39
NL	1,004,046.00€ → 1,070,158.00€	66112	6,58

This table highlights the differing effects of TLTROs on five countries. While Germany and France experienced noticeable growth in their lending volumes during the program period, Italy and Spain experienced a decline.

Germany has experienced significant growth in its stock, with an absolute change of €942 billion and a percentage change of 34.97%. This confirms the claim that TLTROs have been used effectively in Germany and have significantly supported credit stock growth. France, on the other hand, has experienced the highest growth among these countries, with the highest percentage change of 45.08% and the highest change of €1.03 trillion.

On the other hand, Italy and Spain have recorded absolute and percentage declines in their credit stocks. Compared to before the program, there has been a decrease of €183 billion in Italy's credit stocks and €283 billion in Spain's credit stocks. This translates to a decline of -9.48% in Italian volumes and -18.39% in Spanish volumes. The Netherlands, on the other hand, has seen a modest increase of only 66 billion euros, representing an initial growth of 6.58%.

Figure 14: Growth rates of loan stocks in each TLTRO period (%)

Country ..	TLTRO-I (2014-2016)	Tltro Period		
		TLTRO-II (2016-2019)	TLTRO-III (2019-2022)	
DE	0,425	0,717	1,179	
FR	0,433	1,185	1,347	
ES	-1,082	-0,906	0,085	
IT	-0,088	-0,618	-0,02	
NL	-0,411	0,421	0,385	

TLTRO-I (2014-2016): While only Germany and France showed modest positive growth, Spain, Italy, and the Netherlands experienced negative growth. This indicates that the effects of the first program were limited and insufficient to alleviate credit stagnation.

TLTRO-II (2016-2019): While growth accelerated in Germany and France, the Netherlands moved into the positive zone. This may be interpreted as meaning that the improved conditions of the program supported growth in credit stocks. However, Italy and Spain still maintained their negative trend and were unable to achieve positive growth in this period.

TLTRO-III (2019-2022): Growth reached its highest levels in all countries. Spain and Italy, which generally follow a negative trend, are showing growth, rising to positive or near-zero levels. Germany and France are accelerating their upward trend, both exceeding 1%. This suggests that the noticeable progress in the TLTRO III program may be correlated with improved conditions such as negative interest rates and longer maturities during the TLTRO III period, as well as the liquidity needs brought about by the pandemic.

```

1      -- Creating and selecting the database
2 • CREATE DATABASE IF NOT EXISTS ecb_tltro_analysis;
3 • USE ecb_tltro_analysis;
4
5      -- Creating the "countries" table for storing country information
6 • ⊖ CREATE TABLE countries (
7          country_code VARCHAR(5) PRIMARY KEY,
8          country_name VARCHAR(50) NOT NULL,
9          is_euro_area TINYINT(1) DEFAULT 1,
10         created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP
11     );
12
13      -- Creating the main "loan_stocks" table for storing quarterly loan data
14 • ⊖ CREATE TABLE loan_stocks (
15          id INT PRIMARY KEY AUTO_INCREMENT,
16          country_code VARCHAR(5) NOT NULL,
17          date DATE NOT NULL,
18          time_period VARCHAR(10),
19          loan_value DECIMAL(15,2),
20          created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
21          FOREIGN KEY (country_code) REFERENCES countries(country_code),
22          INDEX idx_country_date (country_code, date),
23          INDEX idx_time_period (time_period)
24      );
25
26      -- Creating the aggregated "countries_eurozone" table for Eurozone-wide analysis
27 • ⊖ CREATE TABLE countries_eurozone (
28          id INT AUTO_INCREMENT PRIMARY KEY,
29          country_code VARCHAR(2) DEFAULT 'EZ' COMMENT 'Euro Zone',
30          time_period VARCHAR(6) NOT NULL,
31          quarter_date DATE NOT NULL,
32          total_loan DECIMAL(18,2) NOT NULL,
33          prev_quarter_loan DECIMAL(18,2),
34          growth_rate_pct DECIMAL(5,2),
35          created_at TIMESTAMP DEFAULT CURRENT_TIMESTAMP,
36          UNIQUE KEY idx_unique_ez_period (country_code, time_period),
37          INDEX idx_quarter_date (quarter_date)
38      );
39
40      -- Checking data integrity by checking for duplicate entries
41      -- where multiple loan stock values exist for the same country on the same date
42 • SELECT
43          country_code,
44          date,
45          COUNT(*) as record_count
46      FROM loan_stocks
47      GROUP BY country_code, date
48      HAVING COUNT(*) > 1
49      ORDER BY record_count DESC;
50

```

```

50
51    -- Grouping the total loan stocks data by country and quarter
52 • SELECT
53     country_code,
54     time_period,
55     SUM(loan_value) as quarterly_total,
56     COUNT(*) as data_point_count
57 FROM loan_stocks
58 WHERE country_code IN ('DE', 'FR', 'IT', 'ES', 'NL')
59 GROUP BY country_code, time_period
60 ORDER BY country_code, time_period;
61
62    -- Extracting the total loan stock for the entire Eurozone per quarter
63 • SELECT
64     time_period,
65     quarter_date,
66     total_loan
67 FROM countries_eurozone
68 ORDER BY quarter_date;
69
70    -- Calculating quarter-over-quarter growth percentages for Eurozone by using window functions
71 • SELECT
72     time_period,
73     quarter_date,
74     total_loan,
75     LAG(total_loan) OVER (ORDER BY quarter_date) as previous_quarter_loan,
76     ROUND(((total_loan / LAG(total_loan) OVER (ORDER BY quarter_date)) - 1) * 100, 2) as growth_rate_pct
77 FROM countries_eurozone
78 ORDER BY quarter_date;
79
80    -- Calculating country-level growth rates by using Common Table Expression (CTE)
81 • WITH quarterly_data AS (
82     SELECT
83         country_code,
84         time_period,
85         SUM(loan_value) as quarterly_total,
86         LAG(SUM(loan_value)) OVER (PARTITION BY country_code ORDER BY MIN(date)) as prev_quarter_total
87     FROM loan_stocks
88     GROUP BY country_code, time_period
89 )
90     SELECT
91         country_code,
92         time_period,
93         quarterly_total,
94         prev_quarter_total,
95         ROUND(((quarterly_total - prev_quarter_total) / prev_quarter_total) * 100, 2) as growth_rate
96     FROM quarterly_data
97     WHERE prev_quarter_total IS NOT NULL
98     ORDER BY country_code, time_period;

```