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European Central Bank: Fine-Tuning Operations

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Abstract

Credit in the European interbank market tightened in August 2007 as banks sustained losses in mortgage-backed securities markets. On August 9, the European Central Bank (ECB) announced a EUR 95 billion fine-tuning operation (FTO). The Eurosystem continued providing FTOs carrying overnight maturities through the next three business days. Two more bouts of interbank funding stress—in March and September 2008—caused the ECB to deploy more FTOs. The ECB provided liquidity through 12 emergency, overnight FTOs, all but one at least EUR 25 billion in size. All operations, except the first and last, used variable-rate, fixed-allotment auctions. The first and last operations used a procedure known as fixed-rate, full-allotment, which saw the ECB provide as much liquidity as banks requested at the central bank's policy rate. In October 2008, the ECB tendered its last emergency FTO in favor of its longer-term refinancing operations, which would comprise most of its broad-based liquidity support for the duration of the crisis. However, FTOs were not a tool designed to fight financial crises. They were a technical measure—in other words, the ECB typically used them to tweak reserves to keep interest rates within its monetary policy target range. Crisis usage of FTOs often preceded introductions and expansions of crisis-fighting tools. This sequencing led some scholars to characterize the FTOs as the central bank's first line of defense during the Global Financial Crisis. Though FTOs seemed to halt the spikes in interbank funding spreads, they were ineffective at relieving stress in those markets, a task they were not designed to address.

Keywords: emergency liquidity, European Central Bank, European Union, fixed-rate, full allotment, Global Financial Crisis, LTROs, SLTROs, TROs

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Overview

On August 9, 2007, spreads between secured and unsecured overnight funding spiked, stressing Europe's interbank funding market. Underregulated and opaque financial relationships obscured the immediate cause for this spike, and the European Central Bank (ECB) used a EUR 95 billion fine-tuning operation (FTO) to provide euro area banks with quick liquidity (Trichet 2010). FTOs generally carried overnight maturities and could be deployed the same day they were announced. They were usually technical operations, that is, the ECB used them to keep interest rates within its target range. Their size was dictated by the reserve position of banks with respect to the ECB and other national central banks in the eurozone.

However, this jolt of financial distress proved to be only the first of many during the Global Financial Crisis (GFC). The ECB then provided EUR 61 billion in an FTO on August 10, EUR 48 billion on August 13, and EUR 8 billion on August 14 (ECB 2021). Throughout the crisis, FTOs were used as a crisis-fighting tool despite their original design.

Eligible participants were selected by their national central banks from the set of institutions eligible for other monetary policy operations. Successful participants secured funding within a day's notice (ECB 2006b). Accepted collateral was initially limited to euro-denominated marketable securities rated at least A- and nonmarketable debt from highly rated issuers. Haircuts were adjusted according to several factors (see Figures 8 and 9 in the Appendix). Successful banks paid the interest rates they bid. The ECB used this variable-rate, fixed-allotment regime for almost all FTOs after the August 9 operation.

Key Terms

Purpose: "To assure orderly functioning of the euro money market" (ECB 2020)

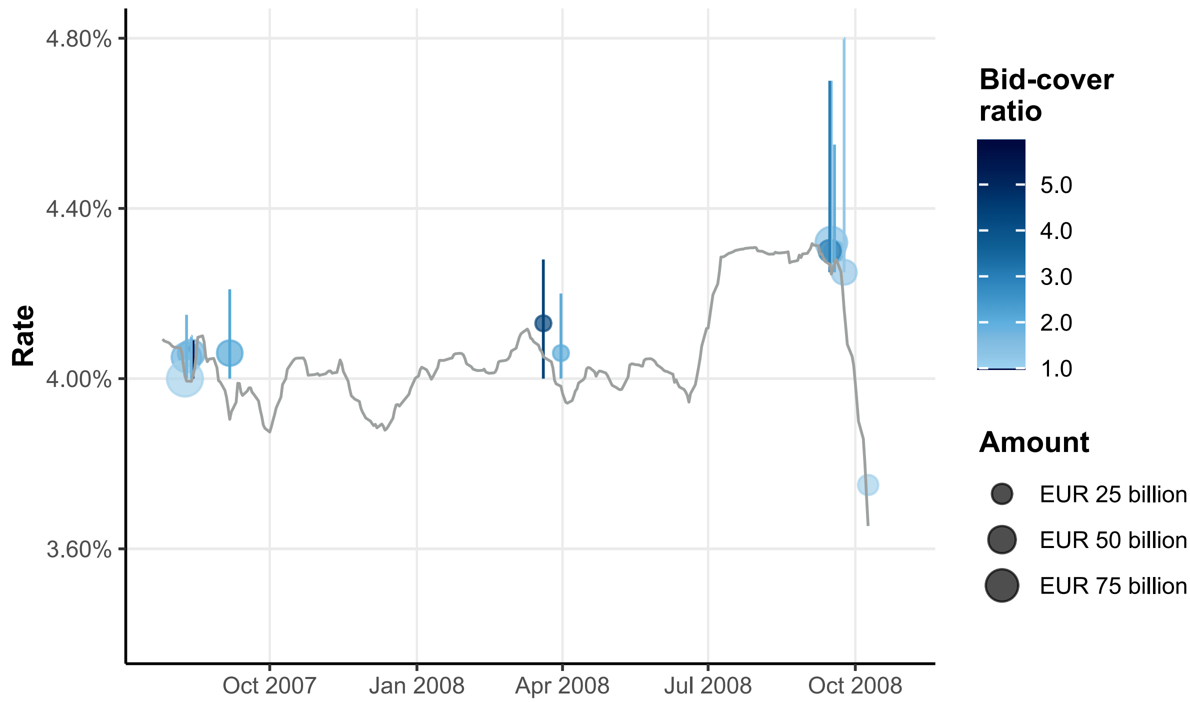
Launch Dates	Announcement: August 9, 2007 First settlement: August 9, 2007
Expiration Dates	Last announcement: October 9, 2010 Last maturity: October 15, 2010
Legal Authority	ESCB Treaty, article 18.1
Peak Outstanding	EUR 95 billion on August 9, 2007
Participants	Eurozone banks chosen by national central banks from financially sound counterparties
Rate	Auction between August 10, 2007, and October 8, 2008. Fixed-rate, full-allotment for first and last operations
Collateral	Schedule of marketable and nonmarketable debt (see Figures 8 and 9)
Loan Duration	Overnight (though actual terms lasted up to six days)
Notable Features	Announced, allotted, and settled within four hours
Outcomes	Support repaid 100%, no fiscal costs

Later that month, the ECB announced it would supplement its monthly longer-term refinancing operations (LTROs) with another three-month-maturity tender each month. It would later expand these TROs to include monthly tenders of one-, six-, 12-, and 36-month funding (ECB 2020). The use of FTOs to quickly soothe markets before the ECB expanded LTROs became a recurring feature of its crisis response.

Late March 2008 saw the interbank funding market flare up again following the bankruptcy and sale of Bear Stearns, a large American investment bank. The ECB injected EUR 30 billion in two FTOs on March 20 and 31 before introducing six-month LTROs (ECB 2021; ECB 2020).

The ECB engaged in its final burst of FTO activity in September 2008, after the bankruptcy of Lehman Brothers, another large American investment bank, triggered the highest spreads between the three-month Euro Interbank Offered Rate (EURIBOR) and the Euro Overnight Index Average (EONIA). The ECB pumped in liquidity with five EUR 20 billion–EUR 70 billion FTOs between September 15 and 24. These, like all prior FTO operations, were conducted using the variable-rate allotment process. However, the ECB then shifted from FTOs to open-market operations conducted at a fixed rate with full allotment, meaning that banks received as much funding as they requested at a rate set by the ECB. The rate used was the Main Refinancing Rate, which the ECB had long set for its weekly Main Refinancing Operations (ECB 2008a). The last FTO, on October 9, used this allotment procedure and an expanded set of eligible collateral. See Figure 1 for a depiction of liquidity-providing FTOs during the GFC.

Figure 1: Liquidity-Providing Fine-Tuning Operations during the GFC



Note: The gray line indicates a 14-day moving average of the EONIA, and the bars above and below operations show banks' minimum and maximum bids, an indicator of bank stress levels.

Source: Bank of France 2021; ECB 2021.

Summary Evaluation

"Increasing the frequency and gross size of discretionary operations was the first, common line of defence" for large central banks responding to the GFC (Borio and Nelson 2008). However, the FTOs were not designed to fight crises, and little has been written on the impact of liquidity-providing FTOs; scholars have focused more on their technical function, the frontloading policy of liquidity-absorbing FTOs (see, for instance, Cassola and Huetl 2010). After FTOs were conducted, interbank funding spreads neither climbed nor fell significantly. Additionally, each FTO was oversubscribed, and seven FTOs received more than twice the amount bid than was available. That the ECB also paired them during the GFC with LTROs suggests that FTOs had limited efficacy, though Trichet (2010) and Aucremanne et al. (2007) suggest that they were effective stopgaps.

Context: Eurozone 2008–2009	
GDP (SAAR, nominal GDP in LCU converted to USD)	\$14,099.1 billion in 2008 \$12,885.8 billion in 2009
GDP per capita (SAAR, nominal GDP in LCU converted to USD)	\$42,178 in 2008 \$38,424 in 2009
Sovereign credit rating (five-year senior debt)	Not applicable; ratings applied to each country's debt
Size of banking system	\$19,181.7 billion in 2008 \$18,225.6 billion in 2009
Size of banking system as a percentage of GDP	129% of 2008 GDP 149% of 2009 GDP
Size of banking system as a percentage of financial system	71% of financial system assets in 2008 68% of financial system assets in 2009
Five-bank concentration of banking system	88.2% of assets in 2008 84.3% of assets in 2009
Foreign involvement in banking system	18.0% of assets in 2008 19.1% of assets in 2009
Government ownership of banking system	Data not available in 2008 Data not available in 2009
Existence of deposit insurance	Country-level insurance, but none EU-wide in 2008 Country-level insurance, but none EU-wide in 2009
Sources: Federal Reserve Economic Data; World Bank Global Financial Development Database.	

Key Design Decisions

1. **Purpose: FTOs, which had long been used to respond to unexpected liquidity fluctuations, took on a new scale during the GFC so that they could "assure the orderly functioning of the euro money market."**

During the GFC, the ECB used liquidity-providing FTOs as a crisis-fighting measure to relieve cash-strapped banks (Trichet 2009). FTOs could be announced, allotted, and settled on the same day, in contrast to the ECB's other types of open-market operations (ECB 2006b). The ECB most often used FTOs to counteract imbalances in reserve accounts that built up during each four-week reserve maintenance period, though the central bank did not exclude FTOs from the possibility of fighting crises.[3]

Normally, FTOs provided or absorbed reserves so that short-term interest rates remained near their target. The ECB set the size of each FTO according to the reserves position of the Eurosystem, which it measured constantly. For instance, on July 10, 2007, "The ECB's liquidity forecasts show[ed] a liquidity imbalance of EUR 2.5 billion today, the last day of the reserve maintenance period." As a result, the ECB "launch[ed] a liquidity providing fine-tuning operation today at 10:00 a.m. with a view to counter this imbalance" (ECB 2020). Normally, each imbalance triggered an equally sized response. During the GFC, however, the way the ECB allotted FTOs demonstrated that it could not confidently estimate the reserve imbalance. Instead of offering a fixed amount of liquidity, the ECB in two instances satisfied all requests from banks for liquidity, letting demand drive the size of the FTO and prefiguring the ECB's crisis-era changes to term refinancing operations (TROs) (Trichet 2010). Even when the ECB did set FTO sizes, it often followed up the first FTO with more operations on successive days. These deviations from normal procedure distinguished crisis-era liquidity-providing FTOs from other FTOs.

All operations considered in this study also followed spikes in interbank funding spreads, and three FTOs followed the default or bankruptcy of a large bank (see

[3] Indeed, the ECB placed few restrictions on FTOs, noting that "their frequency is not standardised; their maturity is not standardised; liquidity-providing fine-tuning reverse operations are normally executed through quick tenders, although the possibility of using bilateral tenders is not excluded" (ECB 2006b).

Figure 2) (ECB 2021).

2. Legal Authority: Article 18.1 of the Statute of the European System of Central Banks (ESCB) authorized the ECB to conduct FTOs.

The 1992 Treaty on European Union included several annexes related to the functioning of the Union. Member States that also adopted the euro as their official currency devolved many powers of financial regulation to the EU through these annexes. In the realm of monetary policy, the EU permitted the ECB and the national central banks to:

- "operate in the financial markets by buying and selling outright (spot and forward) or under repurchase agreement and by lending or borrowing claims and marketable instruments, whether in Community or in non-Community currencies, as well as precious metals;

- "conduct credit operations with credit institutions and other market participants, with lending being based on adequate collateral" (European Union 1992).

The Statute of the ESCB also vested in the ECB Governing Council the responsibility to formulate monetary policy and guidelines for the Bank's functioning (European Union 1992). In turn, the Governing Council allowed itself to "change the instruments, conditions, criteria and procedures for the execution of Eurosystem monetary policy operations" (ECB 2006b). The power to change such instruments and conditions would become important as the ECB expanded eligible collateral and participants for its FTOs.

3. Part of a Package: The ECB often reacted to market events with FTOs before expanding its LTROs.

FTOs were the ECB's first line of defense in the early stages of the Global Financial Crisis, before the ECB institutionalized changes to its monetary policy (Borio and Nelson 2008). When interbank funding spreads spiked, as in August 2007, the ECB filled demand with FTOs before it expanded LTRO size, frequency, or terms.

Figure 2 links each liquidity-providing FTO with its associated trigger and a subsequent LTRO expansion. As the crisis wore on, the ECB did not unwind its LTRO policies, providing it with more capacity to calm markets than when the crisis began. The expansions in LTRO policy before October 2008 prefigured the ECB’s shift from relying on FTOs to LTROs as crisis-fighting tools. FTOs were then relegated to tools for cushioning and monitoring interbank funding demand when large LTROs matured (Runkel 2022). See Figure 10 in the Appendix to compare maturing LTROs, FTOs, and Allotted LTROs.

Figure 2: Market Events, FTOs, and LTROs

	Market Trigger		FTO			LTRO Change	
	Date	Event	Date	Allotment	Bids	Date	Change
2007	8/9	BNP Paribas freezes two hedge funds with large positions in subprime mortgages	8/9	EUR 95 billion*	EUR 95 billion	8/22	First SLTRO
			8/10	EUR 61 billion	EUR 110 billion		
			8/13	EUR 48 billion	EUR 84 billion		
			8/14	EUR 8 billion	EUR 46 billion		
	9/6	"Volatility in the euro money market"	9/11	EUR 42 billion	EUR 91 billion	9/6	Second SLTRO
2008		_Not an emergency measure**_	3/11	EUR 9 billion	EUR 45 billion		
	3/20	Bear Stearns	3/20	EUR 15 billion	EUR 66 billion	3/28	6-month LTRO
		No significant market event identified	3/31	EUR 15 billion	EUR 31 billion		
	9/15	Lehman Brothers bankruptcy, sale of Merrill Lynch, and takeover of American International Group	9/15	EUR 30 billion	EUR 90 billion	10/15	Expanded collateral and introduced fixed-rate, full-allotment; one-month LTROs
			9/16	EUR 70 billion	EUR 102 billion		
			9/18	EUR 25 billion	EUR 49 billion		
	9/24	Washington Mutual bank run	9/24	EUR 40 billion	EUR 50 billion		
	NA	_No significant market event identified_	10/9	EUR 25 billion*	EUR 25 billion		

* The ECB conducted these operations using fixed-rate, full-allotment procedures.
** The ECB conducted this operation on the last day of the maintenance period to offset low take-up of liquidity earlier in the maintenance period. It is therefore not an emergency measure.

Source: ECB 2020; ECB 2021.

4. Management: The ECB managed the facility along with the national central banks.

The Statute of the ESCB gave to the ECB Executive Board—composed of its president, vice-president, and four appointees—responsibility to implement the monetary policy decided by the Governing Council. To the extent that the Governing Council deliberated and adopted new policies and interest rates during the Global Financial Crisis, it also managed the EU's main and longer-term refinancing operations. The Governing Council consisted of the Executive Board and the governor of each national central bank (European Union 1992). The Governing Council met twice a month, with monetary policy decisions made every four weeks until December 2014 and every six weeks subsequently. Additionally, each national central bank retained certain rights relating to downstream tender procedures, including the right to impose sanctions on, refuse the collateral of, and require more collateral from any counterparty (ECB 2006b).

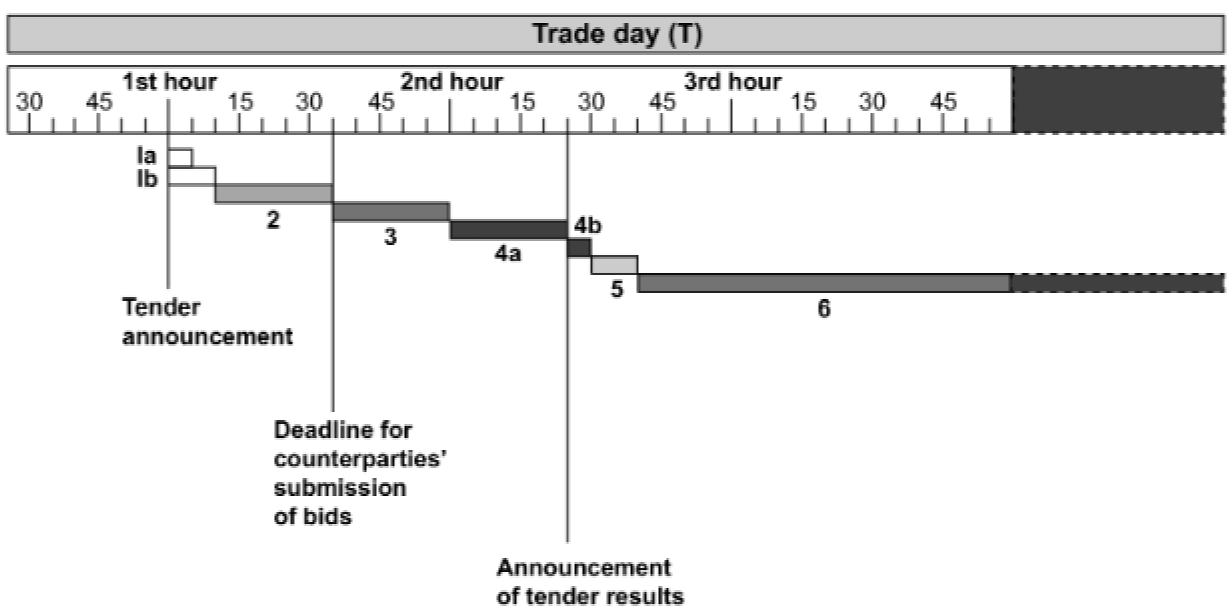
5. Administration: FTOs were unscheduled, irregular, and could be deployed within a day; the ECB used multi-rate auctions for all but two FTOs.

The ECB conducted all FTOs according to its “quick tender” procedures. Unlike its “standard tender” procedures, quick tenders were announced, allotted, and settled on the same day. Most FTOs followed a multi-rate, or “American,” auction:

- First, the ECB announced the tender through wire services (see segment 1a and 1b in Figure 3).
- Counterparties then submitted bids through their respective national central bank (segment 2). Requesting banks could submit up to 10 bids, each requesting a particular amount of liquidity and offering to pay a particular interest rate (ECB 2006b).
- Next, the Eurosystem compiled bids from the national central banks and accepted bidders (segment 3), starting with the highest interest rates offered until the aggregate amount of liquidity offered had been allotted (segment 4a).
- Last, the ECB announced tender results (segment 4b) and settled FTOs with counterparties through the Trans-European Automated Real-time Gross Settlement Express Transfer (TARGET) System (segment 5) (ECB 2006b).

The Eurosystem and counterparties completed these auctions in about three hours, as shown in Figure 3.

Figure 3: Normal Time Frame for Quick Tenders



Source: ECB 2006b.

The ECB conducted two FTOs using a fixed-rate, full-allotment procedure: one on August 9, 2007, and the other on October 9, 2008. The August 9 FTO was the first open-market operation using fixed-rate, full-allotment since two FTOs conducted after the September 11, 2001, attacks in the US (ECB 2021). That is, the ECB still received bids through the national central banks, still formally announced tenders 10 minutes before receiving bids (informally at irregular intervals), and still settled an hour after the bid deadline. Only the announcement and the allotment changed. The ECB ceased to announce an amount to be allotted since counterparty demand determined allotment sizes. During allotment, it satisfied all amounts requested.

6. Eligible Participants: Until October 2008, national central banks selected institutions for FTO participation from the list of institutions eligible for all open-market operations, based on their activity in the money market. After that, any participant in open-market operations was eligible.

National central banks selected a limited set of eligible participants based, primarily, on that institution's activity in the money market. Central banks may also have taken into account "the efficiency of the trading desk and the bidding potential" (ECB 2006b). ECB guidelines required national central banks to select these participants from the set of institutions eligible for general open-market operations. To be eligible, institutions must have been:

- Subject to minimum reserve requirements; this requirement effectively limited participation to those banks located in the eurozone (ECB 2007b);
- Financially sound;[4] and
- In good standing with the regulations of the ECB and its national central bank.

ECB regulations anticipated that national central banks would deal exclusively with all of the counterparties they had selected for each FTO. If, for some reason, a national bank could not engage all selected counterparties in an operation, it was expected to engage the various counterparties on a rotational basis to ensure equitable access (ECB 2006b).

On October 3, 2008, the Governing Council expanded the set of eligible counterparties to include any participant in open-market operations (ECB 2008b). National central banks retained the right to require specific capabilities from counterparties. This change only affected the last emergency liquidity–providing FTO, which occurred on October 9, 2008. That operation attracted 99 bidders; earlier FTOs attracted from 25 to 62 bidders (ECB 2021).

7. Funding Source: The Eurosystem created reserves to fund FTOs.

FTO balances are difficult to track, since national central banks published financial statements at most once a week, while most FTOs carried maturities equal to one day. The

[4] National regulators enforced this criterion. Counterparties subject to both harmonized and non-harmonized EU/European Economic Area supervision were eligible (ECB 2006b).

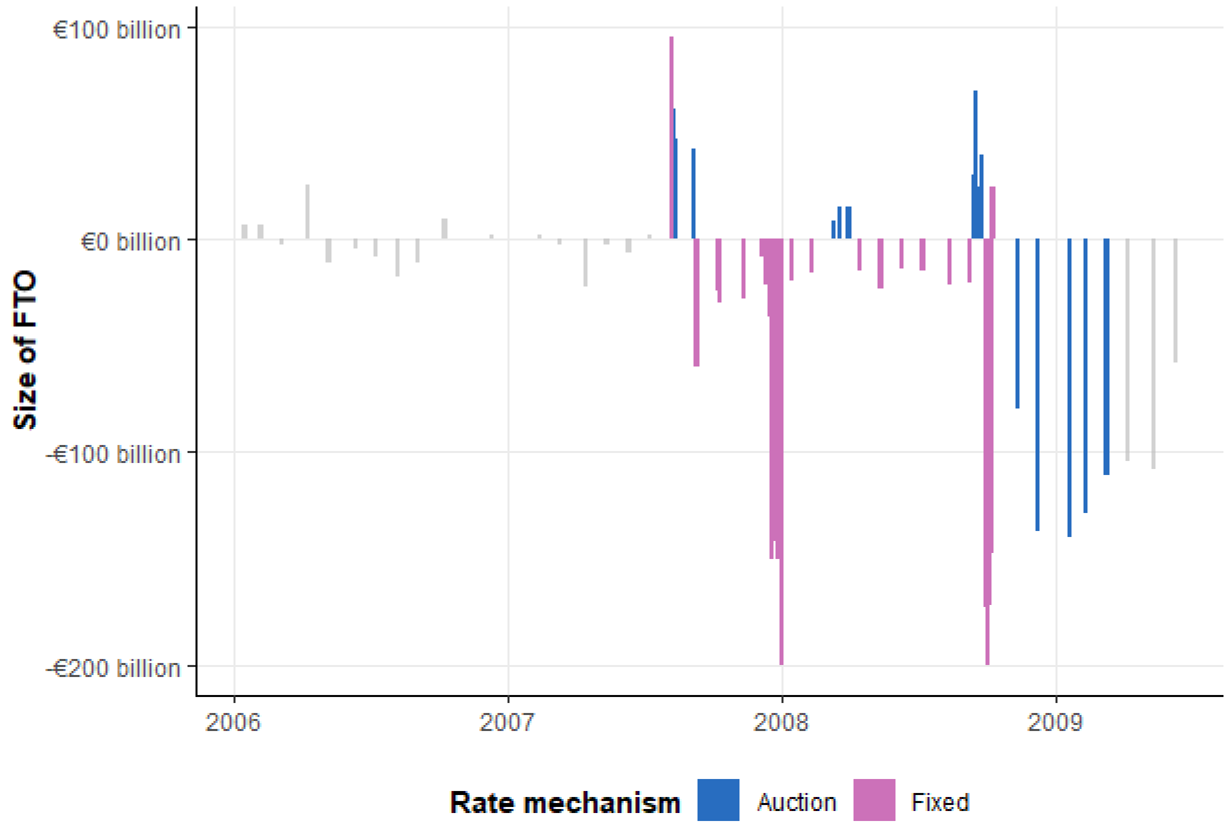
National Bank of Belgium's March 2008 balance sheet lists as an asset the March 3 FTO, implying that national central banks held the loans (National Bank of Belgium 2008).

8. Program Size: The ECB fixed the size of most FTOs.

The ECB's variable-rate FTOs allotted a predetermined amount, while its fixed-rate FTOs allotted the total amount bid (ECB 2021). Liquidity-providing FTOs during the GFC were unusually large compared with precrisis liquidity-providing FTOs, as Figure 4 highlights, but were not as large as some liquidity-absorbing FTOs—used to counter large injections by TROs (see Runkel 2022)—or the end-of-maintenance-period FTOs that implemented the ECB's frontloading policy (see Key Design Decision No. 14, Impact on Monetary Policy Transmission).

Funds awarded in FTO operations ranged from EUR 9 billion to EUR 95 billion, but bids ranged from EUR 25 billion to EUR 110 billion, with one operation being more than five times oversubscribed (ECB 2021). Figure 1 visualizes the relative bid-cover ratios of different auctions, while Figure 2 shows the allotment sizes and amounts bid. Since operations matured overnight, EUR 95 billion was also the largest FTO amount outstanding. Figure 2 also demonstrates how the ECB tapered allotments in the days following the EUR 95 billion FTO on August 9, 2007, despite an increase in bids to EUR 110 billion on August 10. The ECB did not comment on why it decreased allotment sizes. Adding up overnight allocations over 12 separate sessions between August 9, 2007—when BNP Paribas froze three funds invested in the mortgage-backed securities market—and October 15, 2008—when the ECB announced expanded policies as responses to the collapse of Lehman Brothers, the ECB allotted a total of EUR 482 billion through the FTOs (ECB 2021).

Figure 4: Liquidity-Providing and -Absorbing FTOs, with Crisis-Era FTOs Highlighted



Source: ECB 2021.

9. Individual Participation Limits: The ECB did not impose individual participation limits.

The ECB's guidelines added individual-debtor participation limits as a possible regulation after the adoption of fixed-rate, full-allotment facilities (ECB 2009). However, no documents suggest that the ECB enforced this guideline during the GFC.

10. Rate Charged: Rates varied for most FTOs.

All but the first and last operations used variable-rate, fixed-allotment auctions. Successful banks paid the interest rates they bid. The first and last operations used a procedure known as fixed-rate, full-allotment, which saw the ECB provide as much liquidity as banks requested at the central bank's policy rate. Later, the fixed-rate, full-allotment approach would signal the ECB's commitment to providing as much liquidity as banks needed (see Runkel 2022).

For the variable-rate auctions, FTO marginal interest rates—the rates of the lowest accepted bids—hovered between 4% and 4.3%, with spreads between maximum and minimum bids ranging from 10 to 15 basis points in 2007.[5] The spread widened to 75 basis points closer to October 2008. As in

[5] The ECB set minimum rates for variable-rate tenders; until the FTO that settled March 31, 2008, the minimum rate was 4%. From the four variable-rate FTOs starting September 15, the minimum rate was 4.25% (ECB 2021).

Figure 2, FTOs charged rates slightly above EONIA (ECB 2021; Bank of France 1999–2021). Since EONIA measures unsecured overnight liquidity, secured funding priced at or above it could be considered a penalty rate. However, the FTO rate could only be considered a small penalty, explaining why some FTOs were more than four times oversubscribed (ECB 2021). Borio and Nelson (2008) noted that emergency facilities followed classic rules of supply and demand:

> As the corresponding rates are set above (lending) and below (deposit) the policy rate, the extent to which such facilities are activated depends in part on the size of the penalty compared with this rate.

11. Eligible Collateral: The ECB expanded its eligible collateral as it adopted the fixed-rate, full-allotment framework.

The ECB (2006b) adopted a unified framework for Eurosystem open-market operations in 2007. Under this framework, the ECB accepted marketable debt instruments, such as government bonds, and nonmarketable assets, namely bank loans and retail mortgage-backed debt (RMBD; ECB 2006b). All assets—or their issuers—must have been rated at least A-. Only collateral denominated in euros was eligible. Additional criteria are summarized in

Figure 5.

Banks borrowing from a central bank in one EU country could deposit collateral held or issued in a different EU country (ECB 2006b).

When, in October 2008, the ECB adopted a fixed-rate, full-allotment regime for open-market operations, it also expanded its list of eligible collateral. Specifically, it added:

- marketable debt issued in the eurozone but denominated in dollars, pounds, and yen, subject to an additional 8% haircut;

- debt instruments issued by credit institutions traded on specific nonregulated markets, subject to an additional 5% haircut;

- subordinated debt instruments guaranteed by financially sound guarantors, subject to an additional 10-15% haircut;

- fixed-term deposits held with the Eurosystem; and

- marketable securities rated as low as BBB- except for asset-backed securities, subject to an additional 5% haircut for assets rated lower than A- (Regulation No 1053 2008).

Figure 5 reprints key eligibility criteria from before and after October 15.

The ECB's policy before and during the GFC mitigated risk by valuing collateral daily and applying haircuts. It did not change its general haircut policies during the Global Financial Crisis but did tweak their parameters. It used a schedule of haircuts across the Eurosystem that varied haircuts by credit rating, maturity, asset class, and type of coupons (ECB 2006b). Shortly after the ECB expanded eligible FTO collateral in October 2008, it ratcheted up haircuts on credit claims and asset-backed securities (ECB 2009). See Figures 8 and 9 in the Appendix for full pre- and post-October 2008 haircut schedules.

If on any day the value of collateral fell below what was required, national central banks applied margin calls to raise collateral. A counterparty could submit collateral issued or held in another eurozone country. To enforce these requirements, the ECB had at its disposal an array of possible sanctions, including expulsion from current and future open-market operations (ECB 2006b).

Figure 5: Key Eligibility Criteria on Collateral Posted for ECB Monetary Policy Operations

Eligibility Criterion	**ECB Guideline Enforced from January 1, 2007**	**Changes from October 15, 2008**
Type of asset	Marketable debt instruments Nonmarketable debt instruments such as bank loans and retail mortgage-backed debt (RMBD) • Bank loans could be governed by up to two sets of laws	+ securities in certain nonregulated markets + subordinated marketable debt instruments (provided a guarantee payable on first demand) + syndicated loans governed by three sets of laws (syndicated loans governed by English or Welsh law were briefly added)
Credit standard	High credit standard according to ECAF (in the case of marketable securities, those rated A- or higher)	+ At least BBB–
Issuer of marketable assets	Central banks; public sector; private sector; international institutions	*No change*
Debtor of nonmarketable assets	Public sector; nonfinancial corporations; international institutions; credit institutions	*No change*
Currency	EUR	+ JPY, GBP, USD for marketable debt

Source: ECB 2006b; Regulation No 1053 2008.

12. Loan Duration: The fine-tuning operations carried overnight maturities, except the final one.

The ECB designed fine-tuning operations with no fixed maturity (ECB 2006b). In practice, the 12 FTOs that provided emergency liquidity during the GFC carried overnight maturities—holidays did not count—with one exception ("Schedule of Public Holidays for

2008" 2006). The October 9, 2008, operation carried a six-day maturity (ECB 2021). These short maturities demanded that the ECB, national central banks, and counterparties ready themselves for successive FTOs during periods of high banking distress, but they also allowed the ECB to better monitor and respond to changes in interbank funding markets.

13. Other Conditions: The ECB imposed no other conditions besides its risk-avoidance measures.

No documents indicate that ECB liquidity support carried conditions besides its risk-control measures described in Key Design Decision Nos. **Error! Reference source not found.** and **Error! Reference source not found.**.

14. Impact on Monetary Policy Transmission: The ECB lessened liquidity at the end of the reserve maintenance period to offset injections from FTOs.

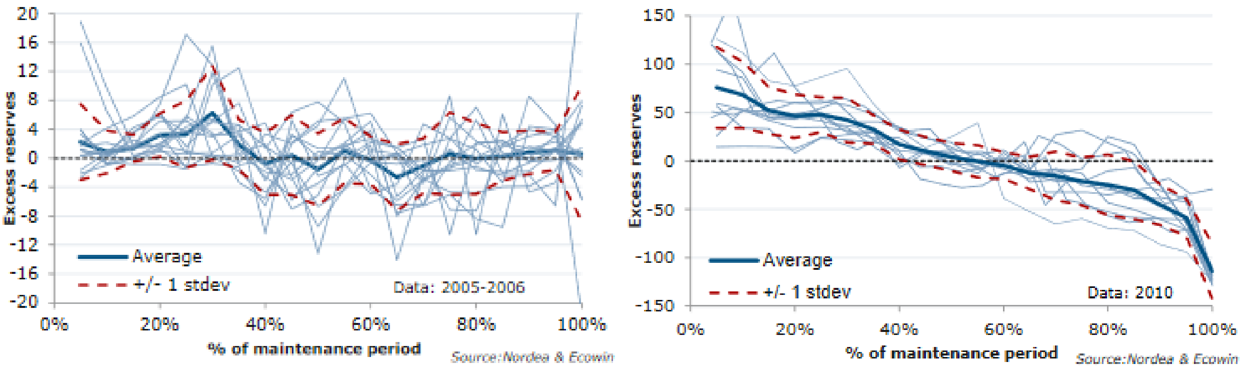
During the GFC FTOs, the ECB practiced "frontloading," which "provided larger amounts of credit at the beginning of each reserve maintenance period[6] and smaller amounts of credit at the end" (Trichet 2010). During the periods of high FTO usage, the bank would allot smaller main refinancing operations and longer-term refinancing operations. Over the course of the GFC, this frontloading evolved from using the ECB's refinancing operations to a single, large, liquidity-absorbing fine-tuning operation on the last day of the reserve maintenance period (Svendsen and Wojt 2014).

[6] The ECB enforced reserve requirements by supervising the average level of reserves during *reserve maintenance periods*, which lasted four to five weeks (ECB 2007a).

Figure 6 shows this evolution. Frontloading "provided banks with a greater degree of comfort in meeting their needs" because the ECB enforced reserve requirements as an average over the maintenance period (Borio and Nelson 2008). A bank could borrow cheap ECB liquidity to boost its liquidity position early in the maintenance period so that late in the maintenance period it wouldn't have to worry about violating the reserve requirements.

Throughout 2007, Borio and Nelson (2008) point out, excess reserves as a portion of total reserves decreased slightly, from 0.5% to 0.4%, despite the injection of some EUR 258 billion in FTOs and the introduction of SLTROs. The ECB conducted liquidity-absorbing FTOs at the end of each maintenance period in which an emergency FTO had previously been conducted (ECB 2021; ECB 2006a; ECB 2007a).

Figure 6: The Evolution of Frontloading from 2007 (left) to 2010 (right)



Source: Svendsen and Wojt 2014.

15. Other Options: The ECB conducted FTOs before implementing any other crisis-fighting measures.

The president of the ECB dated the start of the Global Financial Crisis to August 9, 2007, the date of the first FTO (Trichet 2010). FTOs were, until October 2008, the ECB's first line of defense to support financial stability in response to market shocks. No documents indicate any prior strategies.

16. Similar Programs in Other Countries: Other countries used similar operations during the crisis, though they were not coordinated.

Borio and Nelson (2008) show similar operations during 2007 and 2008 in Australia, Canada, Japan, Switzerland, the United Kingdom, and the United States. Their table is reprinted in Figure 7. They note that the Swiss National Bank even engaged in similar frontloading. Perhaps most significantly for financial stability, the Federal Reserve auctioned "nearly double the average outstanding amount of credit provided via repurchase agreements" on August 10, 2007. Sweden also carried out fine-tuning operations during the crisis (Sellin 2018). None of these operations featured coordination among central banks, unlike some longer-term operations and interest rate changes (see Runkel 2022).

Figure 7: Comparison of Crisis Policy Changes

	AU	CA	EA	JP	CH	GB	US
Exceptional fine-tuning (frequency, conditions)	✓	✓	✓	✓	✓	✓	✓
Exceptional long-term open market operations	✓	✓	✓	✓	✓	✓	✓
Change in the standing lending facility							✓
Broadening of eligible collateral	✓	✓			✓[1]	✓	✓[2]
Change in banks' reserve requirements/target balances	•	•				✓	
Broadening of counterparties						✓[3]	✓[2]

See Table 1 for the mnemonics.

[1] Entered into effect on 1 October, but not linked with the turmoil. [2] The collateral and counterparty rules did not change, but the discretionary operations under the Term Auction Facility utilise the broader lists pertaining to discount window credit compared to those for ordinary open market operations. [3] Only for four auctions of term funding for which, however, there were no bids.

Source: Central banks. Table 4

Note: The headers denote countries surveyed and are, from left to right, Australia, Canada, the Eurozone/euro area, Japan, Switzerland, the UK, and the US.

Source: Borio and Nelson 2008.

17. Communication: The ECB communicated FTO policy through two ad hoc communications and two press releases.

Per their name, ad hoc communications take several forms and purposes. Most ad hoc communications announce monetary policy operations, but some also describe policy changes, such as the communication on August 9, 2007. In this release, the ECB announced that it would satisfy all demand at the main refinancing rate (ECB 2020). This prefigured the ECB's move to supplying unlimited liquidity a year later (Trichet 2010).

The two press releases that communicated FTO policy were issued in October 2008, after all but one emergency liquidity–providing FTO had been conducted. First, on October 3, the ECB widened the set of eligible FTO participants to all institutions eligible for standard-tender monetary policy operations (ECB 2008b). Second, on October 8, the ECB changed the default tender procedure for the main refinancing operation to fixed-rate, full-allotment (ECB 2008c). The release did not specify that the change would apply to FTOs, but, in an ad hoc communication before the tender, the ECB announced that the "operation implement[ed] already today the decision of yesterday […] to satisfy all demand of counterparties, i.e., full allotment, for refinancing at the main refinancing rate" (ECB 2021).

18. Disclosure: The ECB reported aggregated FTO results the day after they settled.

ECB reporting guidelines did not change throughout the crisis. Since the nature of tenders changed from variable-rate to fixed-rate, full-allotment, reports changed accordingly. On the day of allotment, the day before tenders were settled, the ECB reported the total amount bid by counterparties (potential counterparties in the case of tenders without full allotment), the total amount allotted, and, in the case of variable-rate tenders, the marginal and maximum bid rates (ECB 2006b). The ECB did not report which counterparties bid for a tender, nor did the Governing Council report minutes of its meetings. Since the GFC, neither body has released such information.

19. Stigma Strategy: Liquidity was provided through standing facilities, and ECB guidelines already limited stigma.

Open-market operations used aggregate disclosures and high standards for participation to limit stigma. Aggregate disclosures limited the ability of market observers to identify which institutions borrowed from the facility. To participate in open-market operations, financial institutions must have been financially sound, which may have also contributed to the high participation (ECB 2006b). ECB press releases do not mention borrowing stigma, and it does not appear in the scholarly literature.

20. Exit Strategy: The Eurosystem shifted to providing support through its main and longer-term refinancing operations.

After the October 9, 2008, operation, the ECB did not conduct another liquidity-providing FTO until July 1, 2010 (ECB 2021). The October 15 expansions of LTROs, detailed in Runkel (2022), marked a shift in policy that afforded LTROs greater capacity to quell tumultuous markets. This shift away from overnight liquidity could be seen as consistent with the analysis of Bartolini and Prati (2003), which concluded that the ECB favored minimal fine-tuning over the Federal Reserves' daily operations. However, the ECB increased its liquidity-absorbing FTOs after October 2008 and, by May 2009, was siphoning liquidity from the European financial system every week (ECB 2021).

When liquidity-providing FTOs returned in 2010, they did so as accessories to the LTROs rather than as tools providing emergency liquidity. Large FTOs, detailed in Figure 10 in the Appendix, smoothed the maturities and allotments of one- and three-year LTRO maturities, when more than EUR 400 billion could be due back from bank balance sheets, and more than EUR 500 billion more could be allotted (ECB 2021).

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Appendix

Figure 8: Pre–October 2008 ECB Haircut Schedule

Liquidity categories for marketable assets ([1])

Category I	Category II	Category III	Category IV
Central government debt instruments	Local and regional government debt instruments	Traditional covered bank bonds	Asset-backed securities
Debt instruments issued by central banks ([2])	Jumbo covered bank bonds ([3])	Credit institution debt instruments	
	Agency debt instruments ([4])	Debt instruments issued by corporate and other issuers ([4])	
	Supranational debt instruments		

([1]) In general, the issuer classification determines the liquidity category. However, all asset-backed securities are included in category IV, regardless of the classification of the issuer, and Jumbo covered bank bonds are included in category II, in contrast to other debt instruments issued by credit institutions, which are included in category III.

([2]) Debt certificates issued by the ECB and debt instruments issued by the national central banks prior to the adoption of the euro in their respective Member State are included in liquidity category I.

([3]) Only instruments with an issuing volume of at least EUR 1 billion, for which at least three market-makers provide regular bid and ask quotes, fall into the asset class of Jumbo covered bank bonds.

([4]) Only marketable assets issued by issuers that have been classified as agencies by the ECB are included in liquidity category II. Marketable assets issued by other agencies are included in liquidity category III.

Levels of valuation haircuts applied to eligible marketable assets in relation to fixed coupon and zero coupon instruments

(percentages)

Residual maturity (years)	Liquidity categories							
	Category I		Category II		Category III		Category IV	
	fixed coupon	zero coupon	fixed coupon	zero coupon	fixed coupon	zero coupon	fixed coupon	zero coupon
0-1	0.5	0.5	1	1	1.5	1.5	2	2
1-3	1.5	1.5	2.5	2.5	3	3	3.5	3.5
3-5	2.5	3	3.5	4	4.5	5	5.5	6
5-7	3	3.5	4.5	5	5.5	6	6.5	7
7-10	4	4.5	5.5	6.5	6.5	8	8	10
>10	5.5	8.5	7.5	12	9	15	12	18

Source: ECB 2006b.

Figure 9: Post–October 2008 ECB Haircut Schedule

Liquidity categories for marketable assets (*)

Category I	Category II	Category III	Category IV	Category V
Central government debt instruments Debt instruments issued by central banks (1)	Local and regional government debt instruments Jumbo covered bank bonds (2) Agency debt instruments (3) Supranational debt instruments	Traditional covered bank bonds Debt instruments issued by corporate and other issuers (3)	Credit institution debt instruments (unsecured)	Asset-backed securities

(1) Debt certificates issued by the ECB and debt instruments issued by the NCBs prior to the adoption of the euro in their respective Member State are included in liquidity category I.
(2) Only instruments with an issuing volume of at least EUR 1 billion, for which at least three market-makers provide regular bid and ask quotes, fall into the asset class of jumbo covered bank bonds.
(3) Only marketable assets issued by issuers that have been classified as agencies by the ECB are included in liquidity category II. Marketable assets issued by other agencies are included in liquidity category III.

(*) In general, the issuer classification determines the liquidity category. However, all asset-backed securities are included in category V, regardless of the classification of the issuer, and jumbo covered bank bonds are included in category II, while traditional covered bank bonds and other debt instruments issued by credit institutions are included in categories III and IV.'

Levels of valuation haircuts applied to eligible marketable assets

(percentages)

	Liquidity categories								
Residual	Category I		Category II		Category III		Category IV		Category V
maturity (years)	fixed coupon	zero coupon	fixed coupon	zero coupon	fixed coupon	zero coupon	fixed coupon	zero coupon	
0-1	0,5	0,5	1	1	1,5	1,5	6,5	6,5	12 (1)
1-3	1,5	1,5	2,5	2,5	3	3	8	8	
3-5	2,5	3	3,5	4	4,5	5	9,5	10	
5-7	3	3,5	4,5	5	5,5	6	10,5	11	
7-10	4	4,5	5,5	6,5	6,5	8	11,5	13	
> 10	5,5	8,5	7,5	12	9	15	14	20	

(1) Individual debt instruments included in category V that are theoretically valued according to Section 6.5 are subject to an additional valuation haircut. This haircut is directly applied at the level of theoretical valuation of the individual debt instrument in the form of a valuation markdown of 5 %.';

Source: ECB 2009.

Figure 10: Non-Emergency GFC FTOs

	Maturing LTROs			FTO			Allotted LTROs		
	Date	*Maturity*	*Allotment (billions)*	*Date*	*Maturity*	*Allotment (billions)*	*Date*	*Maturity*	*Allotment (billions)*
2010	7/1	12 months	EUR 442	7/1	6 days	EUR 111	6/30	3 months	EUR 132
		3 months	EUR 2						
	9/30	12 months	EUR 75	9/30	6 days	EUR 29	9/29	3 months	EUR 104
		6 months	EUR 18						
		3 months	EUR 132						
	11/11	6 months	EUR 36	11/11	6 days	EUR 13	11/9	1 month	EUR 64
	12/23	3 months	EUR 19	12/23	13 days	EUR 21	12/22	3 months	EUR 149
2011	12/20	3 months	EUR 141	12/20	1 day	EUR 142	12/21	3 months	EUR 30
								3 years	EUR 489
2012	2/28	6 months	EUR 50	2/28	1 day	EUR 134	2/29	3 months	EUR 6
		3 months	EUR 39					3 years	EUR 530

Source: ECB 2021.