JURNAL ECONOMINA
e-ISSN: 2963-1181
Volume 5, Number 10, October 2026
Homepage: ejournal.45mataram.ac.id/index.php/economina

Cash Management Agility in Banking: Balance Management and Predictive Forecasting

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Article History

Received: 01-10-2026
Revised: 07-10-2026
Published: 30-10-2026

Keywords: Cash Management, Balance Management, Banking, Predictive Forecasting, Organizational Agility

ABSTRACT

Cash management in banking must keep enough cash for service while limiting idle funds, and transaction patterns keep shifting across units and time. This study examines how cash management staff at a national bank in Indonesia, anonymized as Bank X, run predictive forecasting, deviation monitoring, corrective action, and balance management, and how information technology supports these decisions. The study uses a qualitative case design with in-depth interviews of nine informants in cash management functions. The case covers the Malang, Kediri, and Jember area. The researcher checked interview accounts against daily balance records, which are confidential and not reported. The records matched the accounts. Informants described short- and long-horizon forecasts, daily monitoring, balance consolidation across locations, and technology support such as dashboards, machine learning for ATM cash, and robotic process automation. The head office sets balance limits as monthly average balances, and units manage balances against those limits. Informants perceived that technology speeds up their response, and they check exceptions with their own judgment. The units do not use one common measure of deviation, and staff do not always record corrective actions in one standard way. The study proposes organizational agility in cash management as a repeating forecast-monitor-correct-rebalance cycle. Banks can set common deviation limits, record the cause and size of each correction, and review recurring forecast errors without giving up operational flexibility.

INTRODUCTION

Liquidity keeps a bank able to pay withdrawals and payments on time, and it supports public trust in the bank. A study of Indonesian Islamic banks from 2004 to 2022 found that liquidity and credit risk shape financial stability in the long run, and its author recommends that banks monitor liquidity (Fakhrunnas, 2026). Research on bank sustainability treats risk management and adaptation as conditions for long-term performance (Oktaviani et al., 2023; Yanti et al., 2025), and Razak et al. (2023) relate firm capabilities and reputation risk to firm performance. Cash provision at the operating level therefore deserves close study.

Cash management at the operating level involves a trade-off. Too little cash puts service at risk, and too much cash sits idle. Salas-Molina et al. (2023) review the cash management problem and its models, and they describe the motives for holding cash. Studies of Indonesian listed firms examine what determines cash holdings, including leverage, profitability, capital expenditure, firm size, and growth opportunity (Ariel & Susanti, 2024). Research on working capital connects the efficient use of resources with firm profitability (Cosima et al., 2025). These studies address corporate and non-financial firms, so they say little about how bank staff hold this balance each day.

Cash needs also change by location, channel, holiday, and local event. Reviews of government cash management stress visibility of cash positions, consolidation of balances, and forecasting (Harjowiryono & Sigit, 2022; OECD, 2025). Banks add statistical and machine learning models to this work, such as those compared for ATM cash demand (Cedolin et al., 2024). Do et al. (2026) compare machine learning models for early warning of liquidity risk in Vietnamese commercial banks. A forecast helps when staff can compare it with actual cash and act on the gap.

Agility research addresses that step. Agility describes how an organization changes its processes and decisions as new information arrives. In Indonesian banking, Rani et al. (2024) draw on interviews with bank practitioners and argue that agility needs stable routines. Yuliani et al. (2026) test information technology capability as a mediator of agility at a state-owned bank. Alzghoul (2025) links HR analytics to bank competitiveness through data-driven decision making, with agility as a moderator. Issa et al. (2024) surveyed staff of a Nigerian bank and found that a performance-based reward system affects organizational agility.

Technology adds a control question. Automated outputs need validation, authorization, and tracing, and internal control research on cash management systems makes this point (Zakirova et al., 2021).

The studies above remain separate. Cash holding research examines the level of cash, agility research examines responsiveness and capabilities, and internal control research examines reliability. None of them follows one bank through the daily sequence of forecasting, monitoring deviations, correcting them, and managing balances. Work on bank cash flow forecasting with machine learning also leaves open how to turn accurate predictions into managerial decisions (Kochorba & Kolomiiets, 2025).

This study fills that gap with a case study of Bank X. It asks three questions. How do staff prepare and update cash forecasts when actual cash differs from the forecast? How do staff manage balances against head office limits to keep enough cash and limit idle cash? How does information technology support and limit these decisions? The study proposes that cash management agility emerges from a repeating cycle of forecast, monitor, correct, and rebalance. Forecasts set an expected cash position, monitoring compares it with actual cash, correction responds to material deviations, and rebalancing returns cash to a workable position across units. Technology can shorten the time between steps, and internal control and staff judgment

keep the cycle reliable. The study contributes a process view of cash management agility in a bank, based on the accounts of staff who run this cycle.

RESEARCH METHODS

Research Design and Context

This study uses a qualitative case study design to examine how cash management decisions are made when forecasts, actual cash, and operating conditions do not match. The case is the cash management process of a national bank in Indonesia, anonymized as Bank X to protect the bank and its operations. The case covers the Malang, Kediri, and Jember area. The research ran from January 2025 to June 2026 and covered preparation, data collection, analysis, and manuscript writing. The study covers cash forecasting, daily balance monitoring, correction of deviations, balance consolidation, management of idle cash, and the use of information technology in these decisions. The bank gave written permission for the research and its publication.

The first author works at Bank X. This position gave access to informants and to daily balance records, and it may shape how informants answer and how the author reads their answers. To reduce this risk, the author coded informants by number, compared informant accounts with one another and with the records, and marked the case illustration as the author's own work experience.

Informants and Data Collection

The author selected informants by purposive sampling, based on direct involvement in cash planning, monitoring, distribution, or supervision. Nine informants took part: two in operational cash monitoring, three in supervisory roles, and four cash management staff. The study reports informants by codes I1 to I9 and does not report names. Table 1 shows their roles.

Table 1. Informant roles

No.	Code	Role
1	I1	Cash monitoring staff
2	I2	Cash monitoring staff
3	I3	Cash management supervisor
4	I4	Cash management supervisor
5	I5	Cash management supervisor
6	I6	Cash management staff
7	I7	Cash management staff
8	I8	Cash management staff
9	I9	Cash management staff

The main data come from in-depth interviews guided by a structured interview guide. The guide covered short- and long-term cash projections, monitoring of forecast deviations, the cash levels that operations require, treatment of idle cash, information system support, and corrective actions when actual cash differed from projections. The interviews took place between March

and April 2026, and each lasted about 25 to 45 minutes. The interviews ran in Indonesian, and the author translated the quotations into English.

The author also used daily balance and reconciliation records to check whether informant accounts of keeping daily balances matched practice. These records are confidential, so the study does not report them. The case illustration in the results comes from the author's own work experience and not from the interviews.

Data Analysis

The author read the interview transcripts several times and coded recurring actions, decision factors, and points of variation. The codes formed three themes: cash flow forecasting, deviation monitoring, and corrective action; balance management and idle cash; and information technology support for cash decisions. The author then compared themes within and across informants to see how the activities connect as a process. Statements where informants disagreed received attention, because disagreement can show differences in practice, authority, or formalization.

Triangulation raised trust in the findings. Source triangulation compared the accounts of informants with different levels of responsibility. Technique triangulation compared interview accounts with the daily balance records. The author gave more weight to statements about repeated procedures when other informants or the records supported them. Informants gave forecast accuracy figures, and the study reports them as informant perceptions. The study did not calculate forecast error from a standard dataset.

The unit of analysis is the cash management process. Individual remarks serve as evidence of how Bank X organizes forecasting, monitoring, correction, rebalancing, and technology. The study aims for analytical understanding of one bank and makes no claim of statistical generalization.

RESULTS AND DISCUSSION

Forecasting, Deviation Monitoring, and Corrective Action

Informants described forecasting as a routine at Bank X. They separated short-horizon forecasts for daily operating needs from long-horizon projections for monthly or annual planning and reporting. Daily forecasting is part of cash monitoring work (I1 to I3), and supervisors reported longer projections that anticipate upcoming events and larger cash needs. One informant said:

"Yes, we make long-term and short-term ones routinely, short-term every day, and for the long term, reporting to Bank Indonesia covers at least one month."

Two informants put forecast accuracy at about 75 to 80 percent and above 85 percent for particular processes. These figures are informant perceptions, and the study did not validate them. Informants named four reasons why actual cash differs from forecasts: variation in customer transactions, exceptional events, operational constraints, and local conditions. One informant explained that head office projections rely on older data, so events without precedent, such as the pandemic or a presidential election, make projections miss.

Staff monitor deviations through routine observation of balances, periodic reporting, and coordination between units and regions. Informants did not describe one formal deviation measure that all cash management activities use. Staff read deviations against historical data, current balance patterns, and the context of the event. This allows fast action, and it means that the decision to start a formal correction depends on the unit and on the people involved.

Corrective action follows the same pattern. Informants act when an operational obstacle appears, when actual demand changes materially, or when a monthly target is exceeded. Some corrections happen at once, such as adjusting a deposit, a transfer, or a later target, and others shape the next planning period. One informant described the timing this way:

"Because cash is basically operational for us, corrective action is not taken when we see that the deviation is already high. It is taken when a constraint appears, and we try to act right then, so that it does not roll into the next projection."

Bank X does not record the time between a deviation and the action that follows, so this study cannot measure response time. Informants also said that the reason for a correction, the size of the deviation, and the lessons from repeated deviations do not always enter one standard record.

Balance Management and Idle Cash

Informants described two goals that staff balance at the same time: enough liquidity to support operations and no excess idle balance. The head office sets annual and monthly targets as average balances, and units manage their balances against these limits. An excess in one month puts pressure on the following months. One informant said:

"At […], we look at the average cash balance achieved over the year. There is no corrective target as such, but we set monthly targets. If a monthly target is exceeded, it becomes a burden in the following month, and we must press the balance down again until the annual average is reached."

Informants split the cash balance into an operational balance and an ATM balance. Another informant said the operational target is a share of the national average balance.

Consolidation and reconciliation give staff a view of cash across locations. Operating needs differ between locations, so an excess in one place does not mean the whole area has excess liquidity. Consolidation lets staff move cash before a local surplus turns into idle cash or a local shortfall interrupts service. Informants also said that surplus cash goes to a higher-level unit, returns through later deposits, and in some cases enters market-related instruments. Not every unit may make final placement decisions, so the speed of coordination between the unit that sees the cash and the unit that may place it decides how long cash stays idle. Informants added that high idle cash in one place creates operational risk.

The study has no data on how much idle cash the bank held, so it does not judge whether these practices reduced it.

Information Technology and Human Judgment

Informants named internal applications, dashboards, automated reporting, machine learning for ATM projections (when to unload and when to replenish), and robotic process

automation. One informant said the bank builds most of its technology in house, with data flowing end to end between units. Technology supports prediction, monitoring, and the preparation of information, and it goes beyond recording transactions.

Informants did not describe full automation of cash decisions. Analysts check machine outputs when transaction patterns change or when a system output contradicts field information. One informant said:

"We need to check the accuracy of the machine learning regularly, because transaction patterns keep changing. We need to check the data retention and update the period again for the long term. That is where the human side still comes in, the intervention."

Informants also named controls around the technology: management approval for access rights, monitoring of who holds which access, a security team, training, and simulation exercises.

Case Illustration

Illustration from the author's work experience. This section describes a recurring situation that the first author knows from working at Bank X. It is not interview data, and it does not show that the same pattern holds in other units.

The forecast concerns whether the cash balance will be adequate. Staff must predict cash inflows and outflows by midday, and the real figures are not yet visible at that time. The actual data arrive the next day. The forecast therefore rests on partial information, and staff can compare it with actual cash only after the decision window has passed.

Two levels share the decision. Staff decide on the daily forecast and act on it. The head office sets the ideal monthly balance, and staff must keep the balance at that level.

The forecast often differs from the actual balance, and many factors explain the difference. The requirement to keep the ideal balance stays the same. In the author's experience, staff can keep the balance at the ideal level in the end. The situation shows the tension that the cycle must manage: staff forecast before the data exist, the data arrive after the decision, and the limit does not move.

The illustration does not show which correction staff make after a forecast misses. The interviews cover that step.

Synthesis of the Cycle

The three themes show one sequence. Forecasts set an expected cash need, daily monitoring finds gaps between expectation and actual cash, staff explain material deviations and correct them, and consolidation or redistribution returns cash to a workable position. Technology supports each step, and judgment matters most when conditions leave historical patterns. Table 2 summarizes the evidence and the control issue at each step.

Table 2. Empirical evidence and control issues by stage of the cycle

Stage	Empirical evidence	Main control issue	Implication

Forecast	Daily and longer-term projections	Historical data may miss new conditions	Update and validate forecasts on a schedule
Monitor	Balances and actual cash are checked routinely	Deviation measures differ between units	Use comparable tolerance bands
Correct	Adjustments follow obstacles or material differences	Corrections are not always recorded in one way	Record cause, size, and action
Rebalance	Cash is consolidated or redistributed	Placement authority sits apart from monitoring	Clarify escalation and coordination
Technology and control	Applications, machine learning, automation, and access controls support decisions	Automation cannot capture every exception	Keep human validation for exceptions

Discussion: Cash Management as an Adaptive Cycle

Bank X does not manage cash against one fixed target level. Staff work against a monthly average limit from the head office, and an excess in one month becomes pressure in the next. The cash management literature describes cash management as decisions about how much cash to hold and how to place the rest over time (Salas-Molina et al., 2023). The Bank X case shows one form of this in practice: forecasts, checks, corrections, and moves between units repeat daily and monthly. Fakhrunnas (2026) recommends that Islamic banks monitor liquidity, and the daily monitoring at Bank X is a comparable practice in operation.

Agility and Standardization

Staff at Bank X react fast because they use judgment, and the same judgment makes practice differ between units. Rani et al. (2024) argue from interviews with Indonesian bank practitioners that agility needs stable routines. The Bank X case points the same way. A minimum standard can keep the speed and add consistency: for each correction, record the size of the deviation, its source, the action taken, and whether the event should change later forecast assumptions. Staff can then act freely inside agreed tolerance bands, and the bank reviews repeated exceptions to update assumptions or limits. This is a suggestion from one case and not a tested design.

Technology and Human Judgment

Yuliani et al. (2026) examine information technology capability as a mediator of agility at a state-owned bank. Informants at Bank X perceive that technology speeds their response, but this study did not measure speed, so it cannot confirm that link. The case illustration also shows a limit on response speed: staff forecast at midday, and the actual data arrive the next day. Cedolin et al. (2024) compare statistical and machine learning models for ATM cash demand. Bank X uses machine learning for ATM projections, and its analysts check the models regularly because transaction patterns change. Zakirova et al. (2021) address internal control in

cash management systems, and the access approvals and permission monitoring at Bank X fit that concern. Faster information helps only when the bank can also trace who may view, change, and approve it.

Managerial Implications

The results suggest three steps for Bank X. First, set comparable ranges of acceptable deviation so that units judge deviations in the same way. Second, record corrective actions so that repeated forecast errors feed later forecasts. Third, coordinate the units that monitor cash with the units that may place surplus cash, so that idle cash spends less time unplaced.

CONCLUSION AND SUGGESTIONS

Cash management at Bank X works as a repeating cycle of forecasting, monitoring, correction, and rebalancing. Staff prepare daily and longer-term forecasts, watch actual balances, explain material deviations, and move cash between units to stay within the monthly average balance limits that the head office sets. Technology supports each step through internal applications, dashboards, machine learning for ATM cash, and robotic process automation. Analysts still check exceptions with their own judgment, and access controls keep the information reliable.

The study answers its three questions as follows. Staff update forecasts by comparing actual cash with expected cash each day, and they act when a constraint or a material difference appears. Staff manage balances against head office limits, and consolidation moves surplus cash toward units that may place it. Technology improves visibility and the preparation of information, and it needs human validation when transaction patterns leave historical experience.

The study contributes a process view of cash management agility in banking. It joins three streams that earlier work treats apart: cash holding and liquidity, organizational agility, and internal control over cash systems.

For practice, Bank X can gain consistency without losing flexibility. It can set comparable ranges of acceptable deviation, record the cause, size, and action of each correction, review repeated forecast errors on a schedule, and align the units that monitor cash with the units that may place surplus cash.

The study has limits. It covers one bank and nine informants in cash management functions, so its findings support analytical generalization and not statistical generalization. Forecast accuracy figures are informant perceptions, and the study did not calculate forecast error. Bank X does not record the time between a deviation and the action that follows, so the study cannot measure response time, and the view that technology speeds response rests on informant perception. The study has no data on idle cash, so it cannot judge whether current practice reduces it. Daily balance records are confidential and served only to check informant accounts. The case illustration comes from the first author's work experience and is not interview data. The first author works at Bank X, which may shape how informants answered

and how the author read the answers. The author translated informant quotations from Indonesian, and some nuance may change in translation.

Future research can compare several banks or regions. It can add time stamps for the interval between detection and action, forecast error measures, correction counts, and the monthly average balance against the head office limit. These measures would test whether tighter control of the cycle changes cash efficiency and response time.

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