



White Paper

Leveraging Artificial Intelligence in Cash Forecasting



Applying Artificial Intelligence to Cash Forecasting

Cash use and demand are always changing and difficult to predict. Typically, automatic cash forecasting tools rely on comparative statistics, which use linear regression techniques that depend on repeating patterns within data. But linear modeling often leads to ineffective assumptions in predicting cash needs. That has opened the door for more intuitive cash forecasting methods through advances in artificial intelligence. Neural network technologies more closely replicate the way people think. Unlike linear methods, neural networks identify complex cash-use patterns and automatically adapt and learn to adjust.

Traditional linear regression forecasting works on the assumption that past patterns should be replicated. To the extent the assumption holds true, the method works quite well. We also know that unforeseen things happen. A circus could come to town, an ATM could break or a road could be rerouted. What happens when unexpected events occur that make historical demand irrelevant?

Forecasts relying on past demand patterns can underestimate use and create problems for financial institutions when they can't keep up with consumers' needs. That happens often in cash operations when forecasting systems lack the intelligence to adjust to changes in use patterns. Neural networks, though, emulate the learning ability of the human mind through dynamic modification.

People often think in nonlinear ways that reference sequential thoughts and memories as well as impulses and knowledge of exceptions. Using forward-looking reasoning and knowledge based on past experience, the brain learns by modifying how it prioritizes and weighs choices. We learn by keeping track of the combinations of factors that result in a behavior that is likely to provide an intended result.

Complexities of Predicting Cash Demand

The goal of cash forecasting is to understand the complex relationships between the date and characteristics of deposit and withdrawal transactions. In terms of time, events must be considered by time of day, day of the week, day of the month, day of the year, week of the month and month of the year. The event timing then must be considered side by side with amounts and types of transactions. It takes giant matrices covering all possible combinations of space, time and value to accurately predict future need.

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Over time, that approach to forecasting can weigh multiple factors and scenarios to more accurately predict patterns for cash use. For example, bimonthly paydays on Fridays may produce increased need for cash. Seasonality creates an even more complex pattern when a payday on Friday occurs in tandem with holidays. As more data accumulates, artificial intelligence technology uses the information to adjust patterns and predictions.

Forecasting With Artificial Intelligence in Integrated Currency Manager

With advances in machine learning, Fiserv created a proprietary forecasting engine with a nonlinear, highly dynamic methodology built specifically to recognize complex cash-use patterns and adapt to volatile and unexpected demand.

The artificial intelligence-based cash forecasting engine is a radical departure from traditional systems. Its

methodology has been tested and proven to quickly and more accurately forecast cash need and use.

Integrated Currency Manager from Fiserv automates forecasting by detecting expected peaks in demand, such as on paydays, for each cash point. Known holidays and special events can be specified to further automate forecasting so users can be worry-free when cash planning.

Building a Smarter Cash Forecasting Engine That Learns

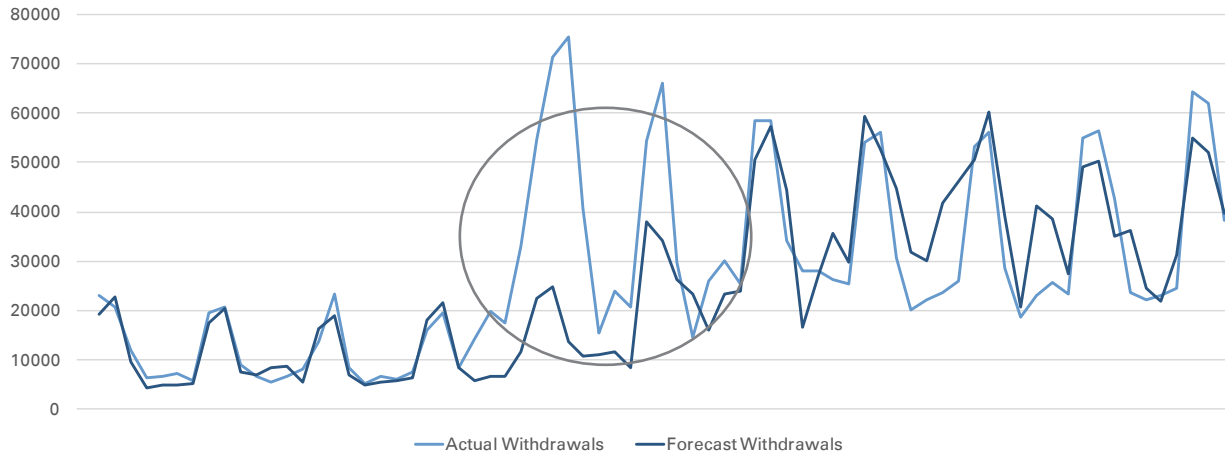
For many institutions, cash demand data is not perfect. It often includes incorrect or extreme values. The artificial intelligence-based cash forecasting engine, though, can use machine learning capabilities to distinguish between normal and abnormal data. These examples show how nimble the engine can be:

Example of an Out-of-Service ATM



If an ATM is temporarily out of service and does not dispense cash for a day, the system can detect and ignore

A New Business Opens Near an ATM or Branch



Certain events, such as new business opening near a branch or ATM, can permanently change cash use. In that case, the system can pick up the significant change and adjust forecasts accordingly.

The engine can learn from its past predictive mistakes. It also can monitor actual and potential problems to alert operations to take action. Consider a tour bus that goes outside its normal route and drops off passengers in front of an ATM, creating a spike in withdrawals and a low or out-of-cash situation. With early warning alerts from the system, the negative effect on consumers can be avoided.

The artificial intelligence-based forecasting engine behind Integrated Currency Manager keeps learning and adapting its algorithms to provide institutions with a considerable operational advantage.

Connect With Us

Cash and Logistics at Fiserv is a global leader in cash forecasting technology and consulting, with top financial institutions and service providers relying on our solutions to optimize cash supply chains for more than 20 years. For more information about cash forecasting with artificial intelligence technology, call 800-872-7882, email getsolutions@fiserv.com or visit www.fiserv.com.

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