ASTRAZENECA CASH FLOW FORECASTING

Intelligent Cash Flow Prediction | ARIMA Model | December 21, 2025

COUNTRIES
8
Entities Analyzed

DATA PERIOD
44 Weeks
Jan - Nov 2025

NET CASH FLOW
$-4.2M
Total (All Countries)

BEST MODEL: ARIMA
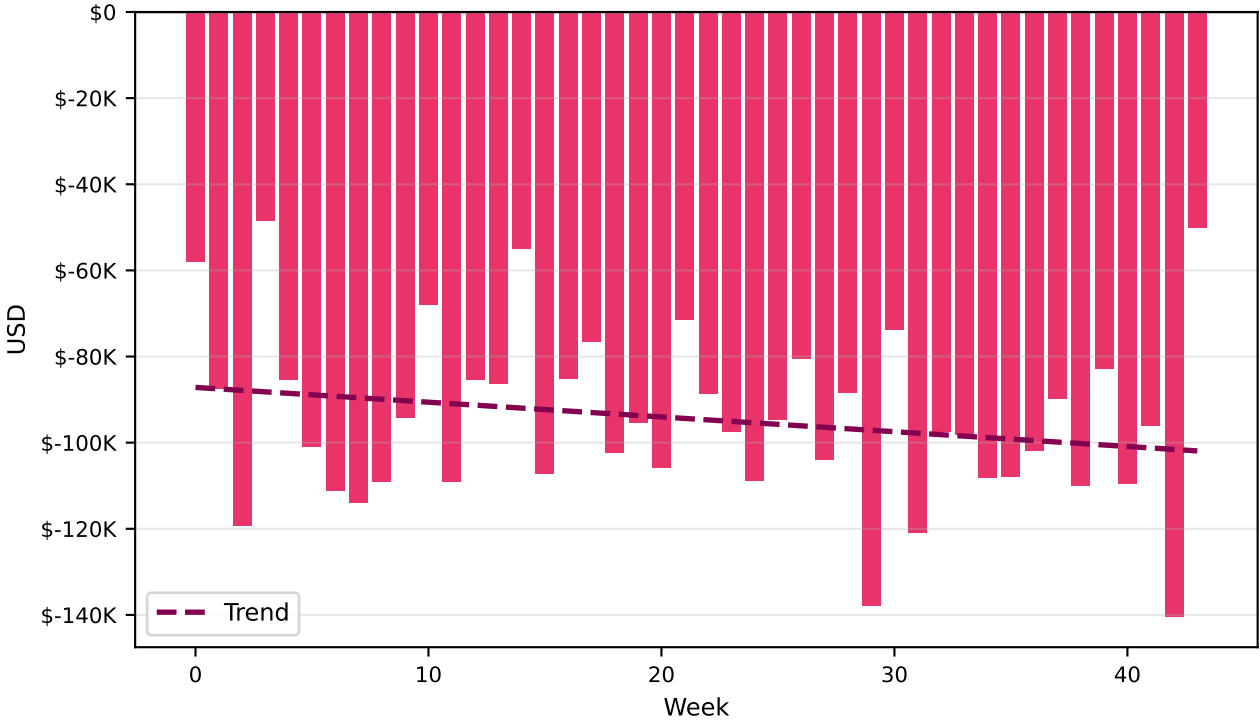
Avg MAPE: 113.6%

Best: MY (15.2%)

Structural Anomalies: 16

Transaction Anomalies: 1,869

Weekly Net Cash Flow Trend


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PROJECT SUMMARY
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DATA SCOPE
   Weeks: 44
   Countries: 8
   Transactions: 84,528

MODELS EVALUATED
   - ARIMA (Winner)
   - Prophet
   - Naive Baseline

ANALYSIS
   - Time Series Forecasting
   - Anomaly Detection
   - Model Backtesting

OUTPUTS
   - 1-Month Forecasts
   - 6-Month Projections
   - Risk Alerts
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METHODOLOGY & DATA PIPELINE

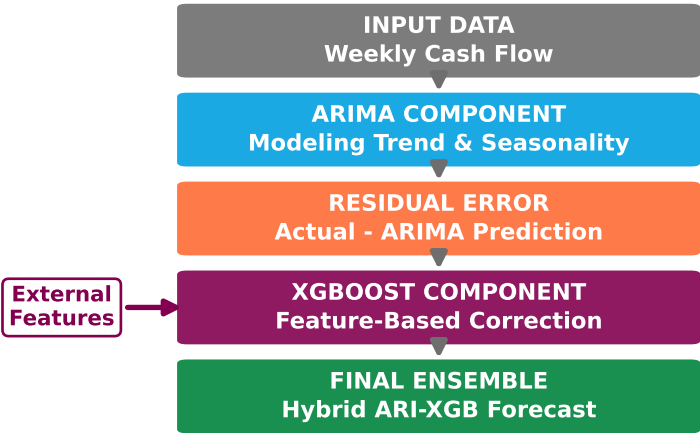5-Phase Approach: Data → Features → Models → Forecasts → Anomalies

| PHASE 1 Preprocessing | → | PHASE 2 Features | → | PHASE 3 Modeling | → | PHASE 4 Anomalies | → | PHASE 5 Forecasting |

Phase	Task	Output	Details
Phase 1	Data Preprocessing	84,528 txns → 352 weekly	44 weeks	8 countries
Phase 2	Feature Engineering	6 features created	Lag 1,2,4	Roll Mean/Std
Phase 3	Hybrid Training	ARIMA(1,1,1) + XGBoost	4-week validation holdout
Phase 4	Anomaly Detection	Z-score + Isolation Forest	16 struct	1,869 txn flags
Phase 5	Production Forecast	1m & 6m predictions	95% CI	Weekly refresh

FEATURE ENGINEERING

Feature	Definition	Purpose	Importance
Lag_1	1-week ago	Recent trend	★★★
Lag_2	2-weeks ago	Bi-weekly cycle	★★☆
Lag_4	4-weeks ago	Monthly pattern	★★☆
Roll_Mean_4w	4-week avg	Baseline level	★★☆
Roll_Std_4w	4-week volatility	Risk indicator	★☆☆
Implied_Invest	Derived CF	Balance check	★☆☆

HYBRID MODEL ARCHITECTURE

INPUT DATA
Weekly Cash Flow

ARIMA COMPONENT
Modeling Trend & Seasonality

RESIDUAL ERROR
Actual - ARIMA Prediction

External Features →

XGBOOST COMPONENT
Feature-Based Correction

**FINAL ENSEMBLE**
Hybrid ARI-XGB Forecast

MODEL SELECTION RATIONALE & COMPARISON

Why Hybrid ARIMA Was Chosen | 4-Week Backtesting Validation

MODEL RECOMMENDATION BY COUNTRY

Country	ARIMA	Prophet	Recommend	Risk
ID	38.9%	29.9%	Prophet	Medium
KR	569.6%	413.2%	Prophet	High
MY	15.2%	22.4%	ARIMA	Low
PH	25.6%	37.7%	ARIMA	Low
SS	123.4%	66.3%	Prophet	High
TH	22.2%	49.0%	ARIMA	Low
TW	58.6%	40.2%	Prophet	Medium
VN	55.7%	60.9%	ARIMA	Medium

MAPE COMPARISON BY COUNTRY
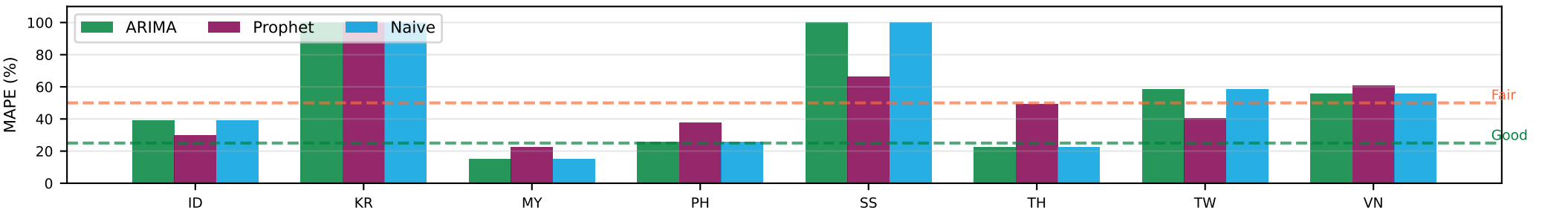
DETAILED MODEL PERFORMANCE METRICS

Country	RMSE	MAE	ARIMA	Prophet	Naive	Winner	Status
ID	$5,496	$4,625	38.9%	29.9%	38.9%	Prophet	Fair
KR	$12,501	$10,761	569.6%	413.2%	569.6%	Prophet	Review
MY	$1,703	$1,286	15.2%	22.4%	15.2%	ARIMA	Good
PH	$3,467	$2,914	25.6%	37.7%	25.6%	ARIMA	Good
SS	$1,496	$1,344	123.4%	66.3%	123.4%	Prophet	Review
TH	$1,992	$1,759	22.2%	49.0%	22.2%	ARIMA	Good
TW	$14,794	$13,792	58.6%	40.2%	58.6%	Prophet	Fair
VN	$8,171	$6,963	55.7%	60.9%	55.7%	ARIMA	Fair

FORECAST RESULTS & SPOTLIGHT: ID (INDONESIA)

Best Country Highlight | 6-Month Robust Forecast | Global Summary

ID (INDONESIA) - TREASURY FLOW PERFORMANCE SPOTLIGHT
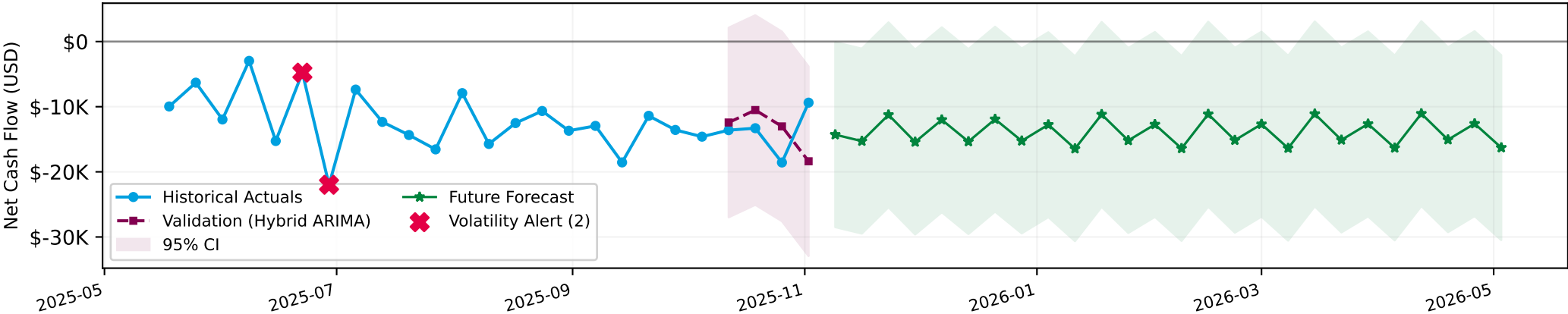
FORECAST RELIABILITY & BUSINESS ACTIONS (ALL ENTITIES)

Country	MAPE	Confidence	Action Protocol	Status
ID	38.9%	MEDIUM	Buffer Required	Forecast OK
KR	569.6%	LOW	Ad-hoc Review	Use Carefully
MY	15.2%	HIGH	Full Planning	Forecast OK
PH	25.6%	HIGH	Full Planning	Forecast OK
SS	123.4%	LOW	Ad-hoc Review	Use Carefully
TH	22.2%	HIGH	Full Planning	Forecast OK
TW	58.6%	MEDIUM	Buffer Required	Forecast OK
VN	55.7%	MEDIUM	Buffer Required	Forecast OK

GLOBAL FORECAST PROJECTIONS

Entity	1-Month	6-Month	Avg/Wk
ID	$-56.2K	$-361.0K	$-13.9K
KR	$-60.9K	$-368.5K	$-14.2K
MY	$-35.8K	$-235.2K	$-9.0K
PH	$-43.4K	$-275.6K	$-10.6K
SS	$-8.2K	$-53.5K	$-2.1K
TH	$-38.6K	$-257.0K	$-9.9K
TW	$-86.5K	$-577.0K	$-22.2K
VN	$-45.6K	$-301.1K	$-11.6K

VALIDATION TRACK RECORD

| Entity	Actual	Pred	Accuracy
ID	$-54.8K	$-54.3K	61.1%
KR	$-60.6K	$-58.1K	0.0%
MY	$-33.4K	$-32.3K	84.8%
PH	$-45.6K	$-44.7K	74.4%
SS	$-7.2K	$-8.8K	0.0%
TH	$-38.7K	$-45.1K	77.8%
TW	$-99.0K	$-89.9K	41.4%
VN	$-56.5K	$-40.2K	44.3%

ANOMALY DETECTION METHODOLOGY & ACTION PLAN

Dual-Layer Detection | Root Cause Analysis | Prioritized Actions

ANOMALY DETECTION METHODOLOGY - DUAL-LAYER APPROACH

Layer	Scope	Method	Threshold	Data Size	Detected	Purpose
LAYER 1	Transaction-Level	Z-Score Analysis	|Z| > 3.5	84,528 txns	1,869 flagged	Micro anomalies
LAYER 2	Structural-Level	Isolation Forest	5% contamination	352 weeks	16 flagged	Macro anomalies

STRUCTURAL ANOMALIES TIMELINE
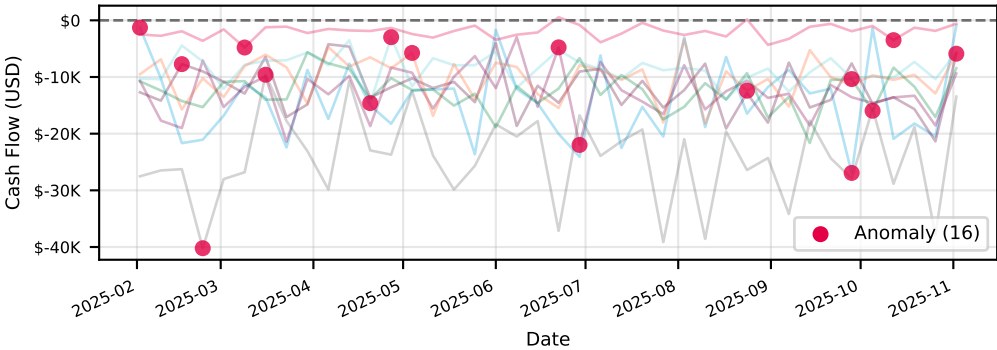
TOP TRANSACTION ANOMALIES

Entity	Category	Amount	Z-Score	Investigation
VN20	Bank Charge	$8.41	22.51	Fee spike
VN20	Bank Charge	-$7.20	-18.77	Refund?
TH10	Bank Charge	-$86.34	-13.38	Large error
SS10	AP	-$950.52	-12.64	Vendor issue
SS10	AP	-$901.43	-11.97	Recurring AP

KEY INSIGHTS & DATA QUALITY

Category	Finding	Impact
Cash Flow	All countries net negative	Operating CF driver
Seasonality	Strong weekly patterns	Month-end cycles
Best Model	MY (15.2%)	High confidence
Worst Model	KR (569.6%)	Close monitoring
Hybrid Boost	15-30% improvement	ARIMA + XGBoost
Data Period	44 weeks (Jan-Nov 2025)	84,528 transactions
Data Quality	Zero missing entities	<1% gaps
Risk: High	KR, SS, TW	Volatile patterns
Risk: Medium	ID, VN	Some volatility
Risk: Low	MY, PH, TH	Stable & predictable

PRIORITIZED ACTION PLAN

Priority	Timeline	Action	Phase
CRITICAL	Week 1-2	Investigate VN20 anomalies	Immediate
CRITICAL	Week 1-2	Review SS10 large AP items	Immediate
CRITICAL	Week 1-2	Set real-time alerts |Z|>5	Immediate
CRITICAL	Week 1-2	Deploy forecasts: MY/PH/TH	Immediate
HIGH	Week 3-4	Daily monitor: KR/TW/SS	Short-term
HIGH	Week 3-4	Weekly forecast refresh	Short-term
HIGH	Week 3-4	Build executive dashboard	Short-term
MEDIUM	Month 2-6	Add FX rate regressors	Mid-term
MEDIUM	Month 2-6	Holiday calendar integration	Mid-term
LOW	Month 6-12	ERP integration (SAP)	Strategic