

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

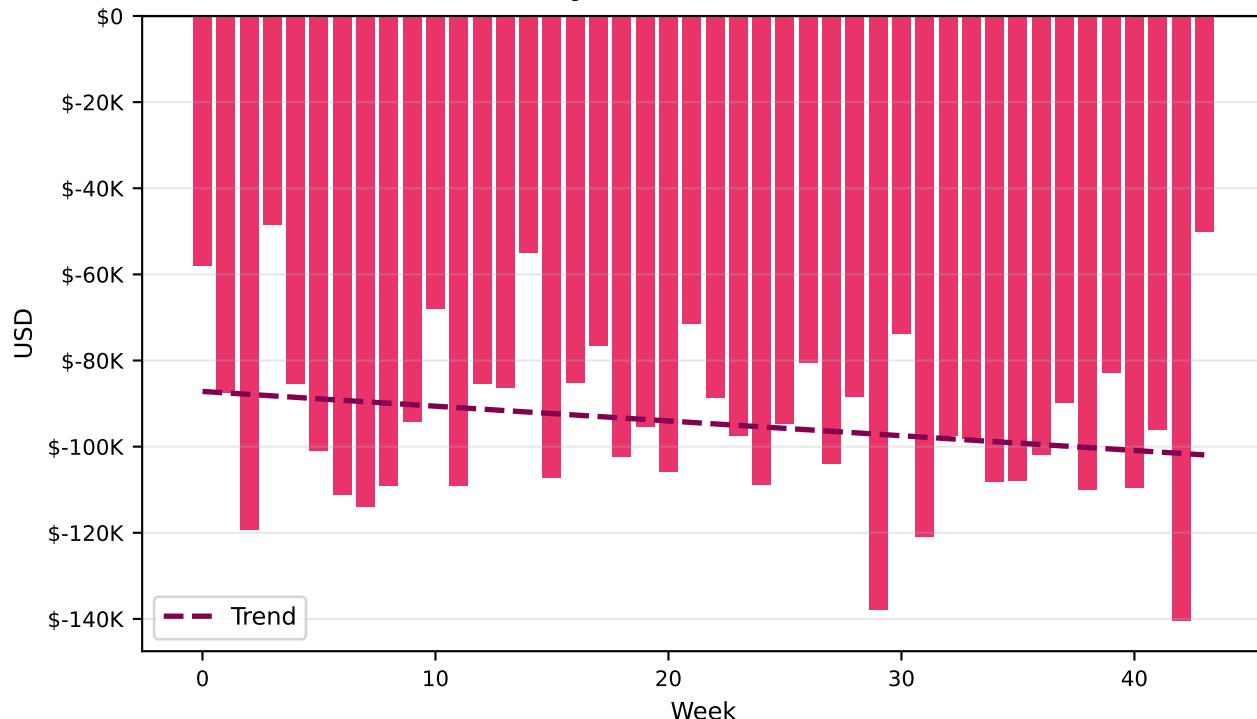
Avg MAPE: 58.1%

Best: ID (12.8%)

Structural Anomalies: 16

Transaction Anomalies: 1,869

Weekly Net Cash Flow Trend



PROJECT SUMMARY

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

METHODOLOGY & DATA PIPELINE

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

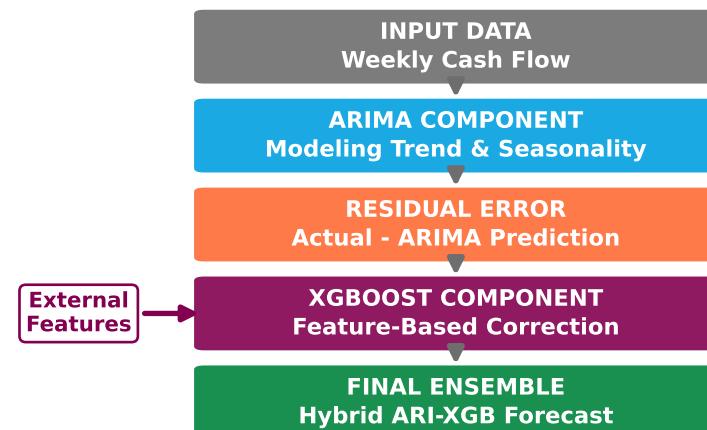


Phase	Task	Output	Details
Phase 1	Data Preprocessing	84,528 txns → 352 weekly	44 weeks 8 countries
Phase 2	Feature Engineering	6 features created	Lag 1,2,4 Roll Mean/Std
Phase 3	Hybrid Training	ARIMA(1,1,1) + XGBoost	4-week validation holdout
Phase 4	Anomaly Detection	Z-score + Isolation Forest	16 struct 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



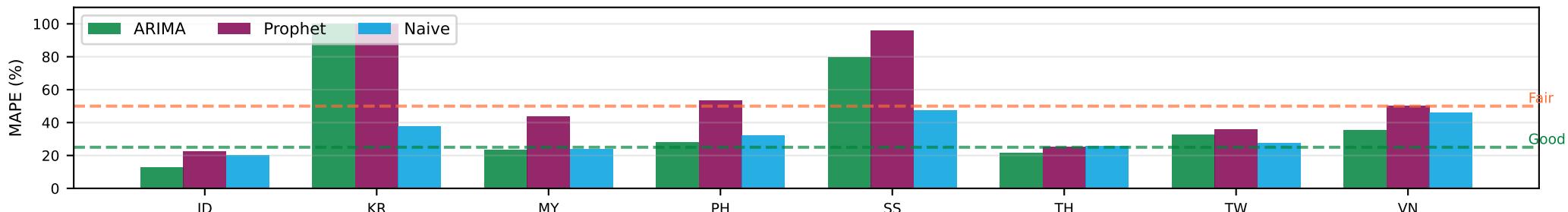
MODEL SELECTION RATIONALE & COMPARISON

Why Hybrid ARIMA Was Chosen | 4-Week Backtesting Validation

MODEL RECOMMENDATION BY COUNTRY

Country	ARIMA	Prophet	Recommend	Risk
ID	12.8%	22.3%	ARIMA	Low
KR	231.6%	107.1%	Prophet	High
MY	23.5%	43.8%	ARIMA	Low
PH	28.2%	53.5%	ARIMA	Low
SS	79.5%	96.0%	ARIMA	High
TH	21.5%	25.2%	ARIMA	Low
TW	32.7%	35.7%	ARIMA	Medium
VN	35.3%	49.9%	ARIMA	Medium

MAPE COMPARISON BY COUNTRY



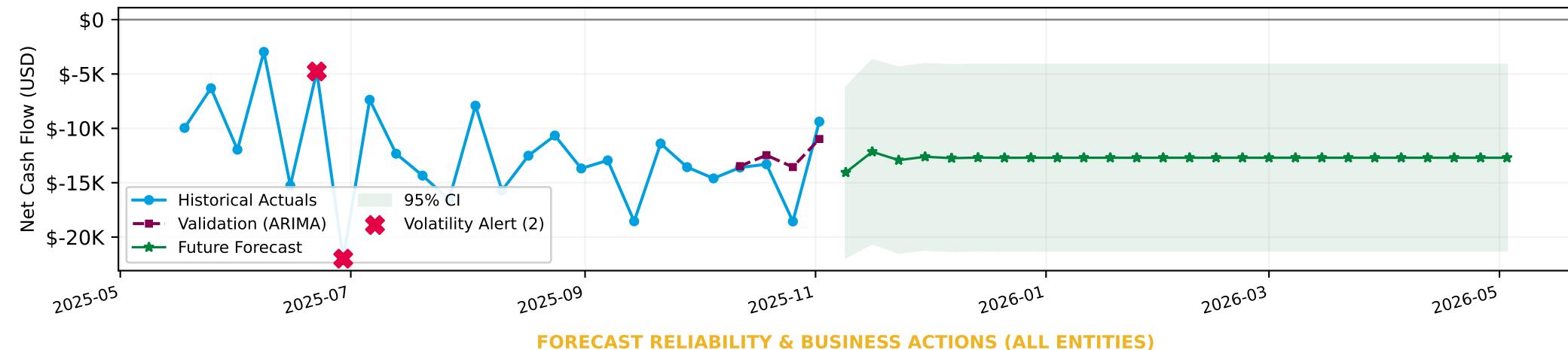
DETAILED MODEL PERFORMANCE METRICS

Country	RMSE	MAE	ARIMA	Prophet	Naive	Winner	Status
ID	\$2,660	\$1,890	12.8%	22.3%	20.1%	ARIMA	Good
KR	\$6,554	\$6,015	231.6%	107.1%	37.9%	Naive	Review
MY	\$1,923	\$1,646	23.5%	43.8%	23.9%	ARIMA	Good
PH	\$3,411	\$3,064	28.2%	53.5%	32.1%	ARIMA	Good
SS	\$881	\$723	79.5%	96.0%	47.1%	Naive	Review
TH	\$2,102	\$1,610	21.5%	25.2%	25.8%	ARIMA	Good
TW	\$8,100	\$6,988	32.7%	35.7%	27.5%	Naive	Fair
VN	\$6,281	\$5,099	35.3%	49.9%	45.8%	ARIMA	Fair

FORECAST RESULTS & SPOTLIGHT: ID (INDONESIA)

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

ID (INDONESIA) - TREASURY FLOW PERFORMANCE SPOTLIGHT



Country	MAPE	Confidence	Action Protocol	Status
ID	12.8%	HIGH	Full Planning	Forecast OK
KR	231.6%	LOW	Ad-hoc Review	Use Carefully
MY	23.5%	HIGH	Full Planning	Forecast OK
PH	28.2%	HIGH	Full Planning	Forecast OK
SS	79.5%	LOW	Ad-hoc Review	Use Carefully
TH	21.5%	HIGH	Full Planning	Forecast OK
TW	32.7%	MEDIUM	Buffer Required	Forecast OK
VN	35.3%	MEDIUM	Buffer Required	Forecast OK

GLOBAL FORECAST PROJECTIONS

Entity	1-Month	6-Month	Avg/Wk
ID	\$-51.7K	\$-331.2K	\$-12.7K
KR	\$-59.9K	\$-369.0K	\$-14.2K
MY	\$-34.8K	\$-222.4K	\$-8.6K
PH	\$-50.3K	\$-325.9K	\$-12.5K
SS	\$-8.2K	\$-52.2K	\$-2.0K
TH	\$-42.0K	\$-265.8K	\$-10.2K
TW	\$-99.0K	\$-631.2K	\$-24.3K
VN	\$-49.3K	\$-313.6K	\$-12.1K

VALIDATION TRACK RECORD

Entity	Actual	Pred	Accuracy
ID	\$-54.8K	\$-50.5K	87.2%
KR	\$-60.6K	\$-52.3K	0.0%
MY	\$-33.4K	\$-35.3K	76.5%
PH	\$-45.6K	\$-47.9K	71.8%
SS	\$-7.2K	\$-8.7K	20.5%
TH	\$-38.7K	\$-40.4K	78.5%
TW	\$-99.0K	\$-97.5K	67.3%
VN	\$-56.5K	\$-41.4K	64.7%

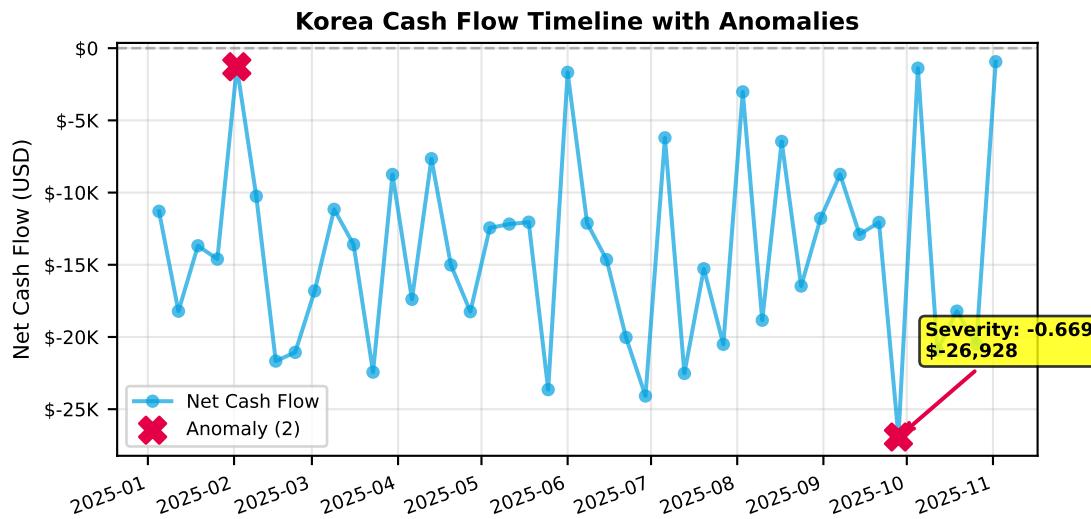
ANOMALY DETECTION & KOREA DEEP DIVE

High-Volatility Focus | Manual Review Required | Anomaly-Based Analysis

ANOMALY DETECTION METHODOLOGY

Scope	Method	Detected	Purpose
Transaction-Level	Z-Score ($ Z > 3.5$)	1,869 flagged	Micro anomalies
Structural-Level	Isolation Forest (5%)	16 flagged	Macro patterns

KOREA (KR) - HIGH VOLATILITY ENTITY REQUIRING MANUAL REVIEW



Metric	Value	Status	Interpretation
MAPE (Accuracy)	231.6%	UNUSABLE	Model forecasting fails
Struct. Anomalies	2 weeks	HIGH	21% weeks anomalous
CF Volatility	\$6.7K	HIGH	Unpredictable swings
Avg Weekly CF	-\$14.1K	NEGATIVE	Consistent outflows
Recommendation	MANUAL REVIEW	CRITICAL	No model forecasts
Action Required	Weekly monitor	IMMEDIATE	Manual oversight
Root Cause	Investigate	ANALYSIS	Find volatility drivers
Alternative	Scenario plan	STRATEGIC	Range-based planning

PRIORITIZED ACTIONS

Priority	Action	Timeline
CRITICAL	Do NOT use KR forecasts	Immediate
CRITICAL	Deploy forecasts: MY/PH/TH	Immediate
HIGH	Weekly KR manual review	Ongoing
HIGH	Set alerts: $ Z > 5$	Week 1
MEDIUM	Investigate KR volatility	Month 1
MEDIUM	Build scenario models	Month 2
LOW	Add FX regressors	Month 3+

KEY INSIGHTS

Category	Finding	Status
Best Model	ID (12.8%)	High confidence
Worst Model	KR (231.6%)	Do not use
Risk: High	KR, SS	Manual review only
Risk: Medium	TW, VN	Use with caution
Risk: Low	MY, PH, TH, ID	Full automation OK
Data Quality	44 weeks, 84K txns	Complete coverage
Anomaly Rate	16/352 weeks	4.5% flagged