MANIPAL UNIVERSITY JAIPUR

Stock Price Forecasting & Mutual Fund Dynamics

An Advanced Machine Learning Approach to Risk-Adjusted Portfolio Optimization

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Outline

Introduction

1. **Core Investment Theory and Risk**
   - Aims to maximise returns, primarily managing risk through diversification.
   - The classical definition of risk uses variance or standard deviation (σ), which is often criticized as being "not the best measure" for risk.
2. **Advanced Stock Price Forecasting (SPF)**
   - Accurate prediction is vital for portfolio success.
   - Traditional statistical models (**ARIMA**) are efficient for short-term, linear data but fail to capture the market's complex, dynamic, and non-linear patterns.

Literature Review: Foundational Theories & Advanced Models

- **Risk Management and Market Dynamics**
  - Overcoming simple metrics via **risk-adjusted weighting** (e.g., Risk Parity for equal risk contribution).
  - Goal: Maximize the **Sharpe Ratio (SR)**:

$$\text{SR} = \frac{\text{Return} - \text{Risk-Free Rate}}{\text{Portfolio Volatility}}$$

  - Quantitative finance requires continuous observation and verification (not purely mechanical).
- **SPF Methodologies**
  - Traditional Models (**ARIMA**) lack utility for complex, non-linear market patterns.
  - **DL/ML Models** (CNN, LSTM, Bi-LSTM) excel at capturing spatial and temporal dependencies.
  - **Hybrid Models** leverage the combined strengths of various approaches for enhanced robustness.

Central Problem Statement

The Core Issue

The central problem is bridging the gap between the **theoretical sophistication** of advanced predictive models (ML/DL) and the **practical execution** in portfolio management, especially in dynamic, highly volatile, and inefficient **emerging financial markets**.

Consequence

Despite accurate stock price forecasts, existing investment systems struggle to deliver superior, risk-adjusted returns in this challenging environment.

Core Predictive Engine

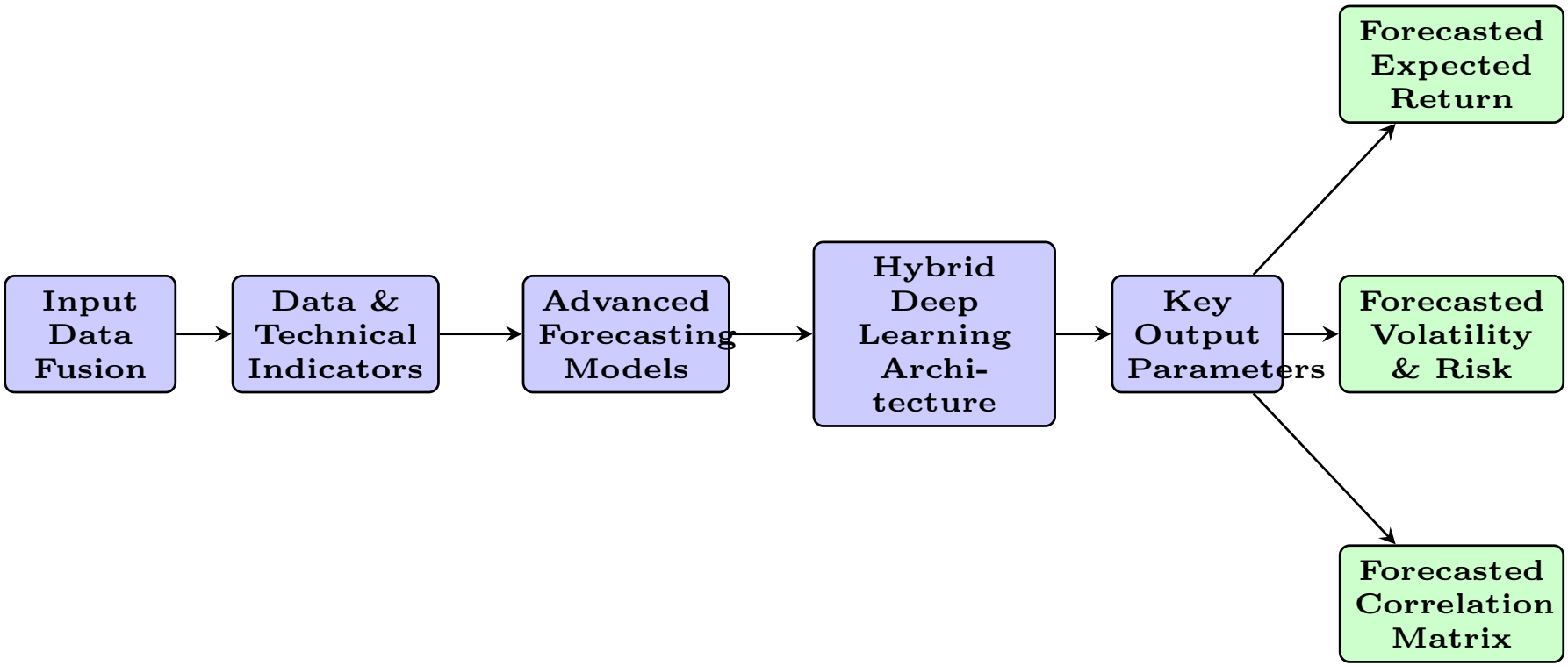

Fig 1. Core Predictive Engine Flow

- **Data Ingestion:** Blends historical/technical data with **sentiment data**.
- **Prediction:** Uses Hybrid **DL/ML architectures** for superior time-series forecasting.
- **Output:** Generates key risk/return metrics for Dynamic Optimization.

Dynamic Portfolio Optimization

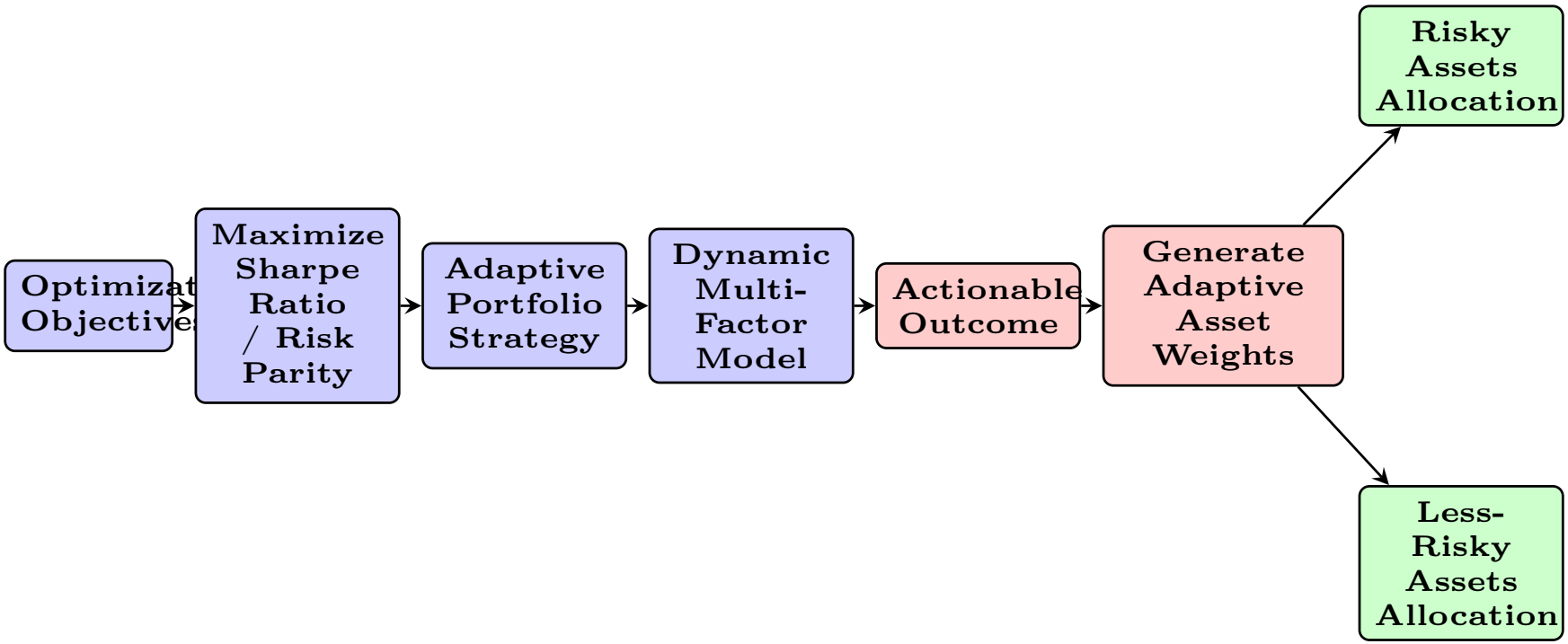

Fig 2. Dynamic Portfolio Optimization Flow

- **Strategy:** Uses multiple objectives (**Sharpe Ratio** and **Risk Parity**) to guide the adaptive portfolio strategy.
- **Modeling:** Incorporates dynamic risk metrics into a multi-factor model for real-time portfolio adjustments.
- **Allocation:** Produces separate, adaptive allocation weights for high-risk and low-risk asset classes.

Emerging Market Adoption Platform

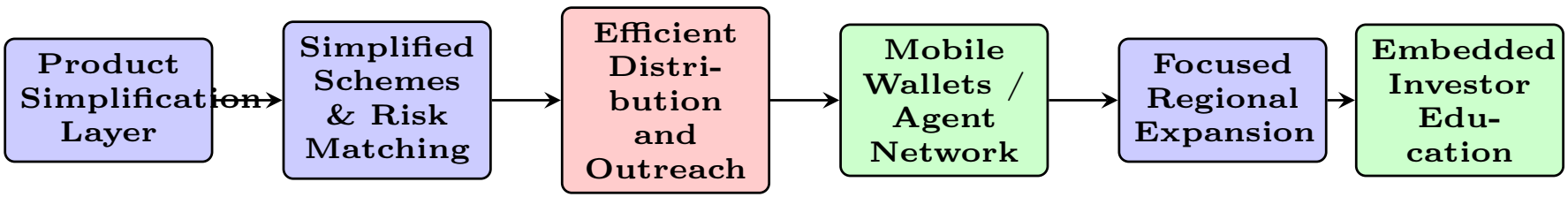

Fig 3. Emerging Market Adoption Platform Flow

- **Accessibility:** Simplifies complex financial products and matches them to individual **risk profiles**.
- **Outreach:** Utilizes both digital (Mobile/ATM) and human (Agent Network) channels for broad market penetration.
- **Education:** Integrates **investor education** to build trust, improve financial literacy, and ensure sustainable adoption.

Objectives

- **Superior Forecasting:** Generate consistent **abnormal returns (Alpha)** through superior predictive capabilities.
- **Robust Portfolio Management:** Implement a robust, forward-looking **risk-adjusted portfolio optimization** system (Fig. 2: Dynamic Optimization).
- **Emerging Market Penetration:** Increase mutual fund penetration and adoption in underserved **emerging market segments** (Fig. 3: Adoption Platform).

References

- Portfolio Management (YouTube channel, MIT OpenCourseWare).
- A bibliometric literature review of stock price forecasting: From statistical models to deep learning approach.
- Penetration of Mutual Funds in India: Opportunities and Challenges (SEBI Development Research Group Studies).
- Evaluation of Mutual Fund Performance of Asian Markets: Factors that Matter to Financial Advisors.
- Measuring Performance of ASEAN Stocks.

Thank You Questions?