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StockValuation Pro: A Professional-Grade Web Application for Discounted Cash Flow Analysis and Portfolio Tracking

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Abstract: Fin Tech innovations are increasingly shaping investment technology by combining advanced valuation models with accessible, web-based financial applications. StockValuation Pro[1] is designed to bridge this gap by equipping investors, financial advisors, and investment clubs with professional-grade Discounted Cash Flow (DCF) analysis, equity analysis, and portfolio management tools. The platform supports multiple valuation methodologies—such as P/E, P/S, EV/EBITDA, and P/FCF ratios—alongside customizable five-year revenue and margin projections for bull, base, and bear scenarios. Unlike conventional spreadsheets or static portfolio trackers, StockValuation Pro emphasizes fundamental financial modeling, realtime data integration, and clear valuation metrics to guide disciplined investment decisions. Developed as a modern webbased financial application using React, TypeScript, and Tailwind CSS for the frontend, and Supabase with PostgreSQL for secure backend infrastructure, it incorporates the Finnhub API for live market data and Recharts for interactive analytics. This paper outlines the platform's features, valuation methodology, technical architecture, and potential role in democratizing access to professional-grade investment analysis within the broader FinTech ecosystem.

Keywords: *FinTech, Investment Technology, Discounted Cash Flow (DCF), Stock Valuation, Equity Analysis, Portfolio Management, Investment Analysis, Web-Based Financial Application, Financial Modeling, Real-Time Data, Valuation Metrics, API Integration.*

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I. INTRODUCTION

Over the past decade, individual investors have gained unprecedented access to financial markets. However, with the proliferation of investment tools, data sources, and platforms, making informed and disciplined investment decisions has become both more critical and more complex. The rise of algorithmic trading, speculative retail activity, and real-time news cycles has created an environment in which long-term, value-driven investing often gets overshadowed by short-term noise.

In response to this complexity, there has been a growing demand for platforms that can offer structured, data-driven frameworks to guide investment decisions based on fundamental principles. Among the most widely accepted frameworks is Discounted Cash Flow (DCF) analysis, which helps investors assess a company's intrinsic value by forecasting future cash flows and discounting them to present value. Despite its importance, performing DCF calculations has traditionally required either spreadsheets or expensive enterprise software, making it inaccessible to many.

StockValuation Pro addresses this gap by providing an intuitive, yet analytically rigorous, web-based application that enables users to perform DCF analysis, maintain watchlists, and monitor portfolio performance in real time. The platform is built with a user-centric interface and leverages real-time data feeds to empower investors to make decisions aligned with long-term value investing philosophies. The purpose of this paper is to outline the features, technical architecture, and intended audience of StockValuation Pro, while emphasizing its contribution toward democratizing financial modeling and portfolio management.

➢ *Demo Access*

A working version of StockValuation Pro is available at: https://ubiquitous-medovik-3395a4.netlify.app The platform supports real-time usage of all described features and is regularly updated via CI/CD pipelines connected to GitHub.

II. LITERATURE REVIEW

The evolution of digital investment tools has fundamentally transformed how retail investors engage with the stock market. Early systems, such as Yahoo Finance,

[1] https://ubiquitous-medovik-3395a4.netlify.app

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Bloomberg terminals, and Morningstar platforms, have long offered access to stock price data and basic analytics. However, these tools are often tailored for institutional investors or require subscriptions, limiting access for everyday users.

Numerous academic studies highlight the significance of fundamental analysis in generating long-term returns. Damodaran's seminal work on valuation [1] outlines the centrality of discounted cash flow (DCF) as a method to determine intrinsic stock value. In parallel, Fama and French's threefactor model [2] underpins much of modern portfolio theory by explaining asset returns using risk factors. Yet, translating these robust academic models into tools that are usable by everyday investors remains a gap in the market.

Recent developments in fintech platforms have introduced robo-advisors, which offer automatic portfolio construction based on user-defined risk profiles. Studies such as [3] explore adoption patterns and highlight the need for transparency and customization. Robo-advisors, while convenient, typically function as black boxes, offering limited control or insights into stock-level valuation.

Spreadsheet models still dominate among professionals and financial analysts for performing DCF calculations. However, these are not collaborative, not mobile-friendly, and often introduce errors due to manual handling. Tools like TIKR and Finbox aim to simplify analysis, but their steep pricing or limited customization restrict wide adoption.

There is limited academic literature around web-native financial modeling tools designed specifically for value investing. StockValuation Pro fills this void by merging academic valuation rigor with practical implementation. Its intuitive interface allows users to simulate projections, evaluate scenarios, and assess investment quality at scale—contributing to the democratization of advanced investment research.

III. KEY FEATURES

StockValuation Pro provides a comprehensive suite of tools to support all stages of equity investment—from evaluation to tracking. The platform's three main modules are designed to integrate seamlessly into an investor's workflow: valuation modeling, idea tracking, and performance analysis.

➢ *DCF Valuation Calculator*

The core functionality centers around a robust and customizable DCF valuation tool.

- Supports multiple valuation frameworks: P/E ratio, P/S ratio, EV/EBITDA, P/FCF, and terminal value modeling.
- Customizable 5-year revenue and margin projections under Bull, Base, and Bear cases.
- Calculates intrinsic value per share based on user-defined discount rates and growth scenarios.
- Displays compound annual growth rate (CAGR), total return potential, and recommended buy prices.
- Integrates real-time market prices using the Finnhub API, enabling dynamic valuation recalculations.
- Built-in warning system for unrealistic inputs (e.g., growth rate ¿ 40%, negative margins).
- Visual feedback through line charts showing future price paths and valuation gaps.

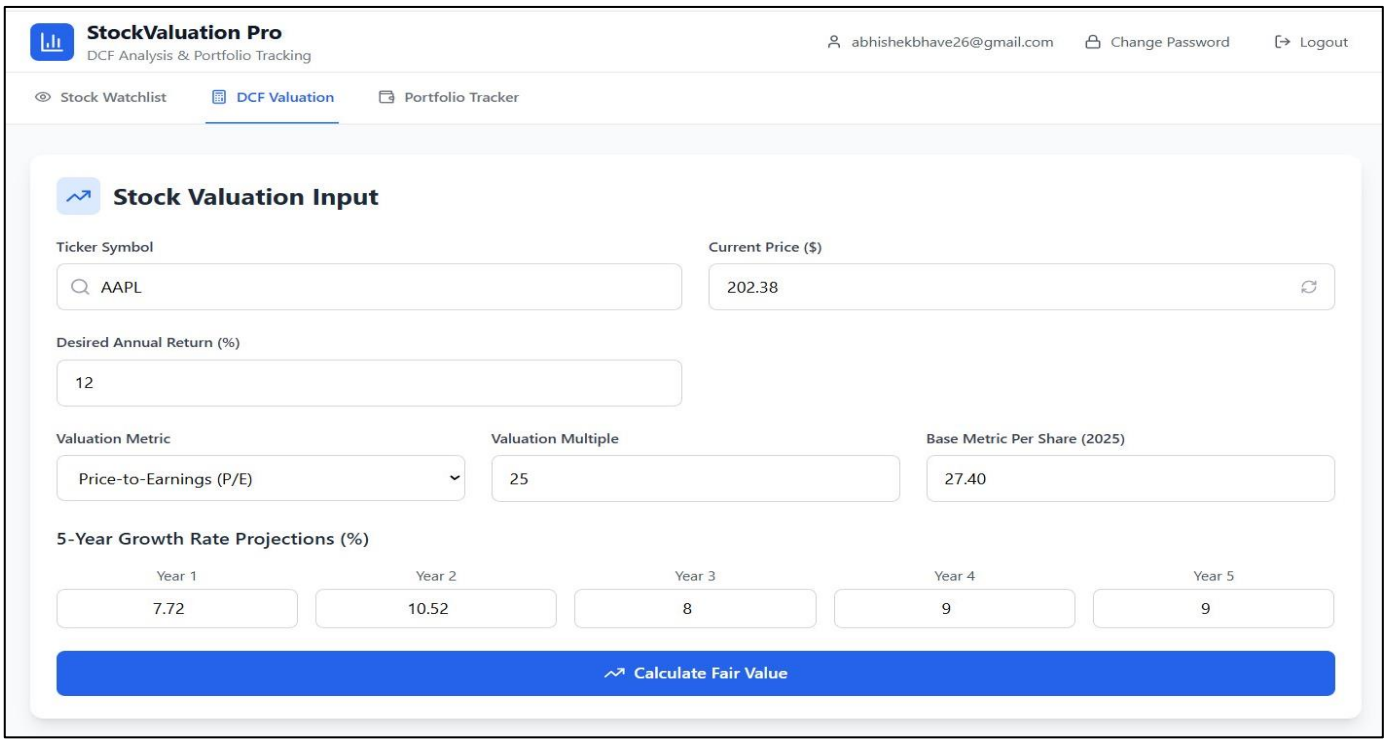

Fig 1 DCF Valuation Input Example.

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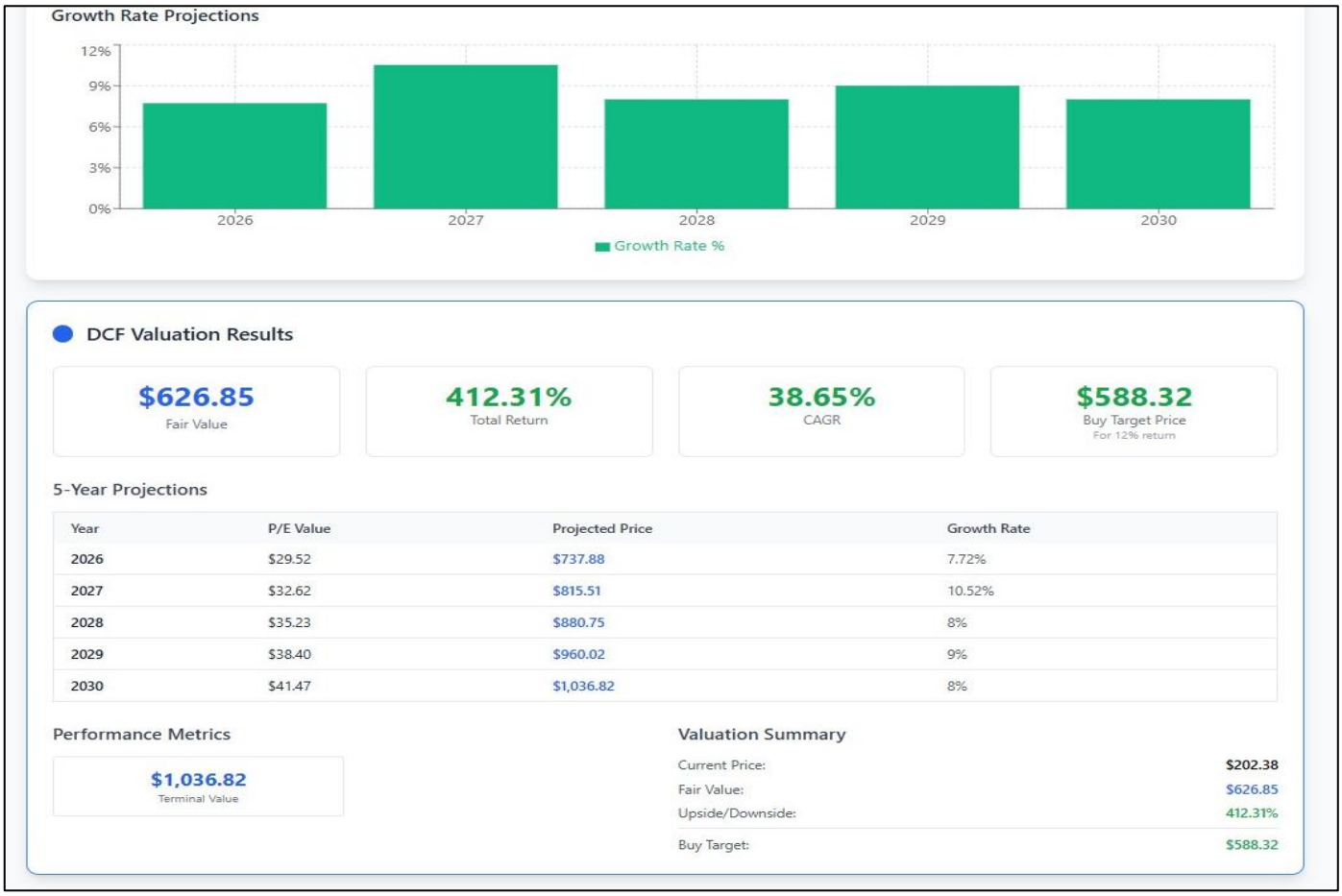

Fig 2 DCF Valuation Output Example.

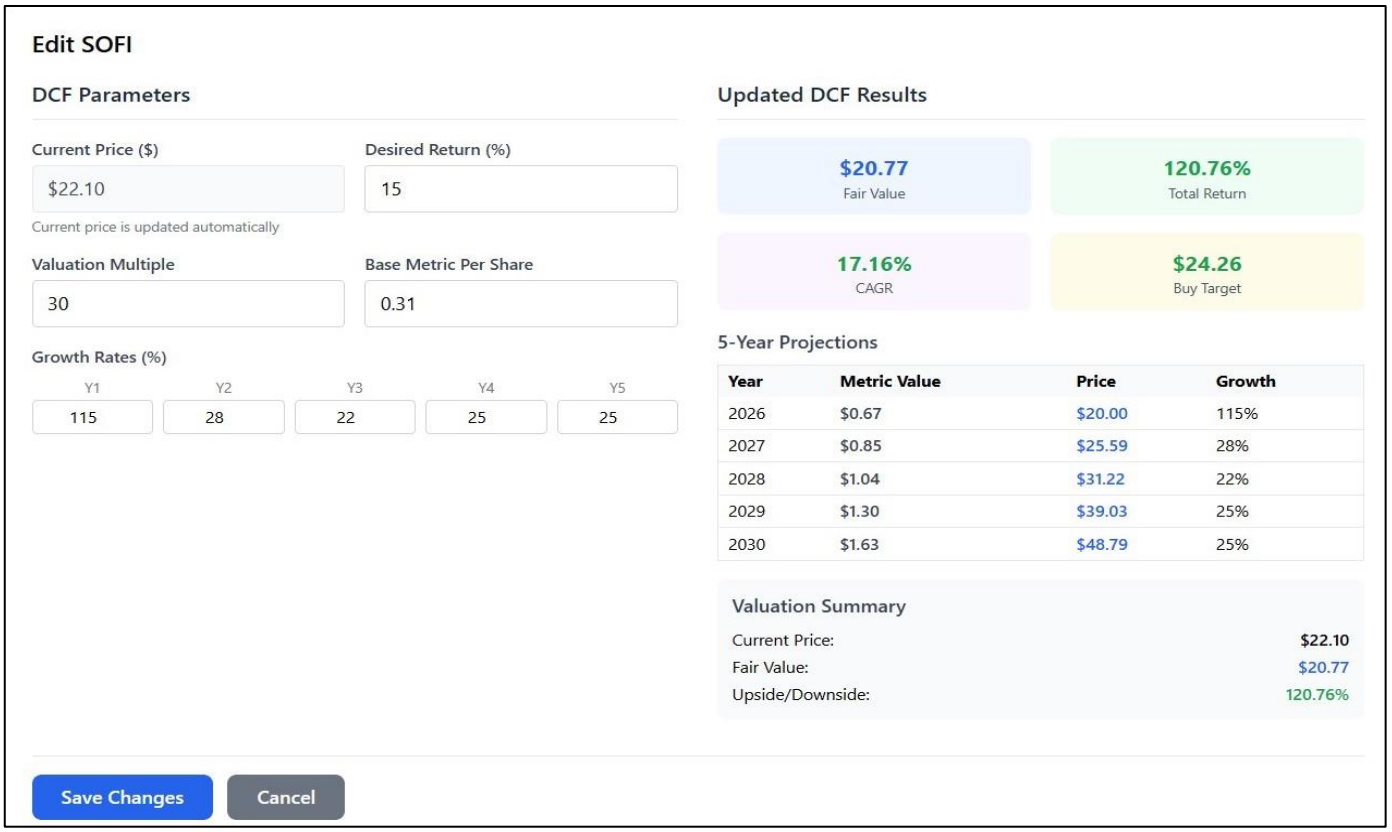

Fig 3 DCF Valuation Stock Edit Example.

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➢ *Stock Watchlist*

A personalized dashboard for monitoring stocks under consideration.

- Save and categorize up to 200 stocks for comparison and analysis.
- Display valuation status (e.g., Undervalued, Fair, Overvalued) based on current price vs. fair value.
- Include metrics like expected return, CAGR, valuation method used, and margin of safety.
- Sort and filter stocks based on valuation gaps, projected returns, or CAGR.
- One-click bulk price refresh from API to update watchlist valuations instantly.
- Conditional formatting highlights buying opportunities and red flags.

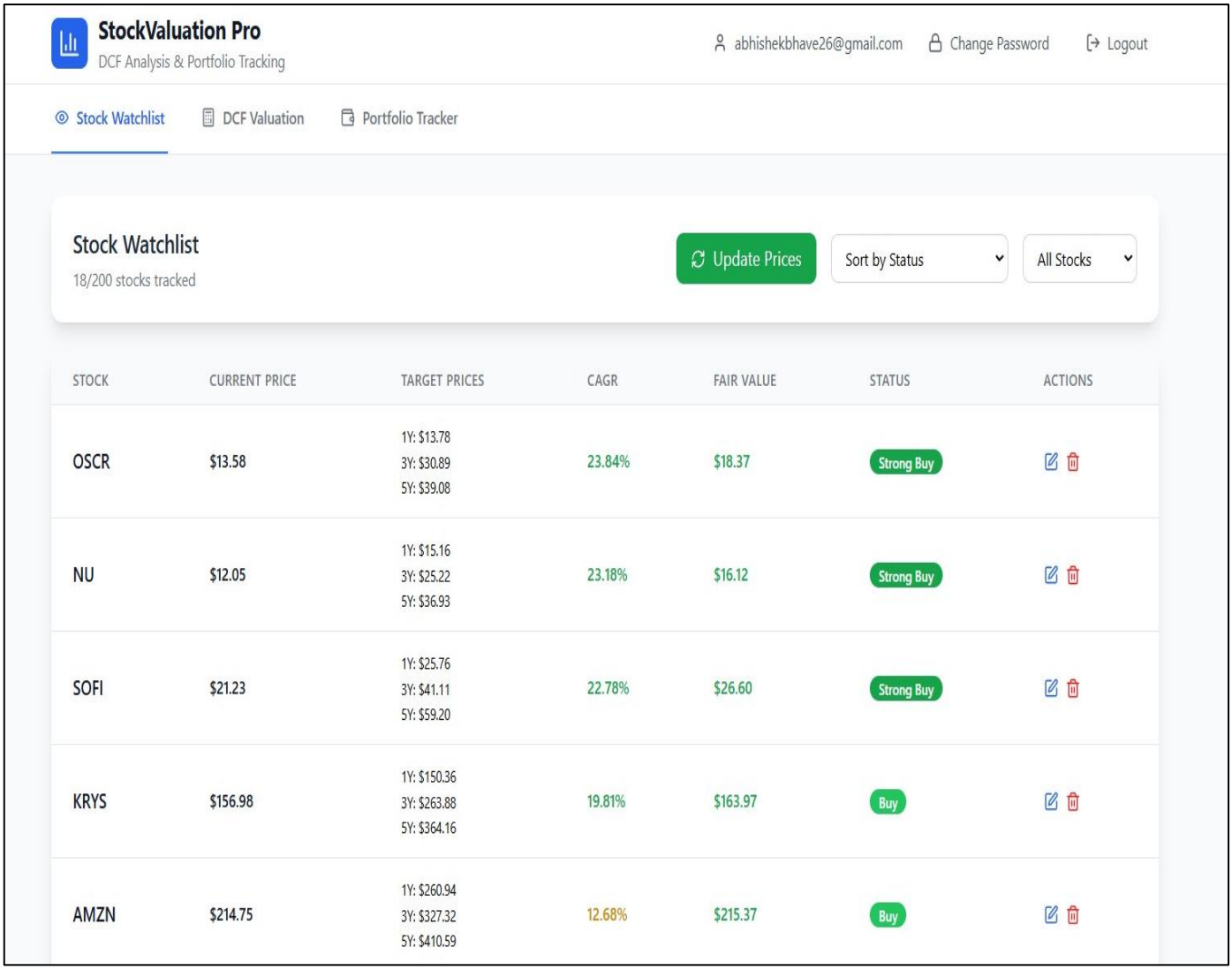

Fig 4 Watchlist with Valuation Metrics and Status Tags.

➢ *Portfolio Tracker*

A live tracker that provides insights into real investment positions.

- Monitor up to 100 portfolio positions with real-time value tracking.
- Tracks metrics such as realized/unrealized gains, cost basis, and total value.
- Calculates portfolio-level CAGR and total return from inception.
- Visual dashboard with pie charts for sector diversification and position sizing.
- Shows individual stock performance and valuation against buy thresholds.
- Automatically updates current market price via API and recalculates value.
- Export feature for downloading portfolio performance summary.

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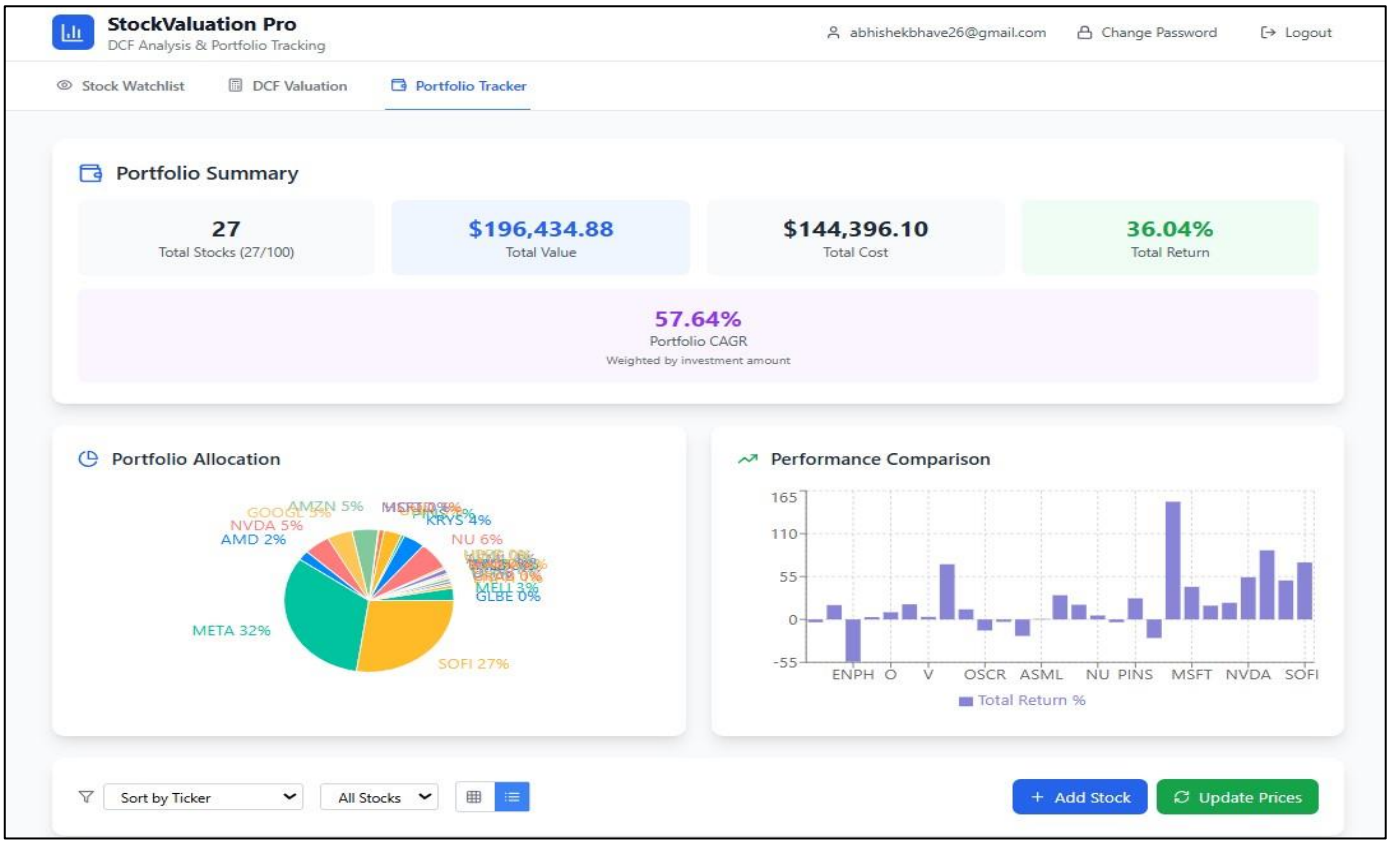

Fig 5 Portfolio Tracker Dashboard with Performance Visualization.

IV. METHODOLOGY

➢ *Notation*

Table 1 Key Symbols Used in the Valuation Framework.

Symbol	Description
FCF_t	Free cash flow in year t
r	Discount rate (WACC or user-defined)
g	Perpetual growth rate for terminal value
N	Projection horizon (years) Terminal value at year N
TV_N	Enterprise value
EV	Equity value
E	Total debt
D	Cash and cash equivalents
C	Diluted shares outstanding
S	

➢ *DCF With Terminal Value*

We compute the present value (PV) of projected cash flows plus a terminal value:

$$PV = \sum_{t=1}^{N} \frac{FCF_t}{(1+r)^t} + \frac{TV_N}{(1+r)^N}, \quad (1)$$

With

$$TV_N = \frac{FCF_{N+1}}{(r-g)} \text{ and } FCF_{N+1} = FCF_N \cdot (1+g). \quad (2)$$

Enterprise value is $EV = PV$. Equity value is

$$E = EV - D + C, \quad (3)$$

And intrinsic value per share is

$$V_{\text{per share}} = \frac{E}{S}. \quad (4)$$

➢ *Multiple-Based Valuation (P/E, P/S, EV/EBITDA, P/FCF)*

Given a forward fundamental X_t (e.g., EPS, Sales, EBITDA, FCF) and an assumed multiple M,

$$\hat{P}_t = M \cdot X_t. \quad (5)$$

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We compute bull/base/bear trajectories by parameterizing X_t with case-specific growth/margins.

➢ *Expected Return and CAGR*

Let P_0 be current price and $\hat{P}_N$ the forecast price at year N (including dividends if modeled). The expected CAGR is

$$\text{CAGR} = \left(\frac{\hat{P}_N}{P_0}\right)^{\frac{1}{N}} - 1 \quad (6)$$

➢ *System Architecture*

StockValuation Pro follows a modular, layered architecture with a clear separation of concerns between the presentation layer, business logic, data management, and external services. Figure 6 illustrates the high-level system design.

➢ *Technology Stack*

- Frontend: React 18 with TypeScript for type safety, Vite for build and development, Tailwind CSS for responsive UI, Lucide React for icons, and Recharts for interactive data visualization.
- Backend and Database: Supabase Backend-as-a-Service (BaaS) with PostgreSQL database, Row Level Security (RLS), built-in authentication, real-time subscriptions, and edge functions.
- External APIs: Finnhub API for real-time stock price data, integrated with intelligent caching and rate limiting.

➢ *Layered Architecture*

- *Authentication Layer:*

✓ Implements email/password authentication via Supabase Auth.
✓ Session management using secure JWT tokens.
✓ Password reset functionality.
✓ Protected routes and conditional rendering for authenticated users.

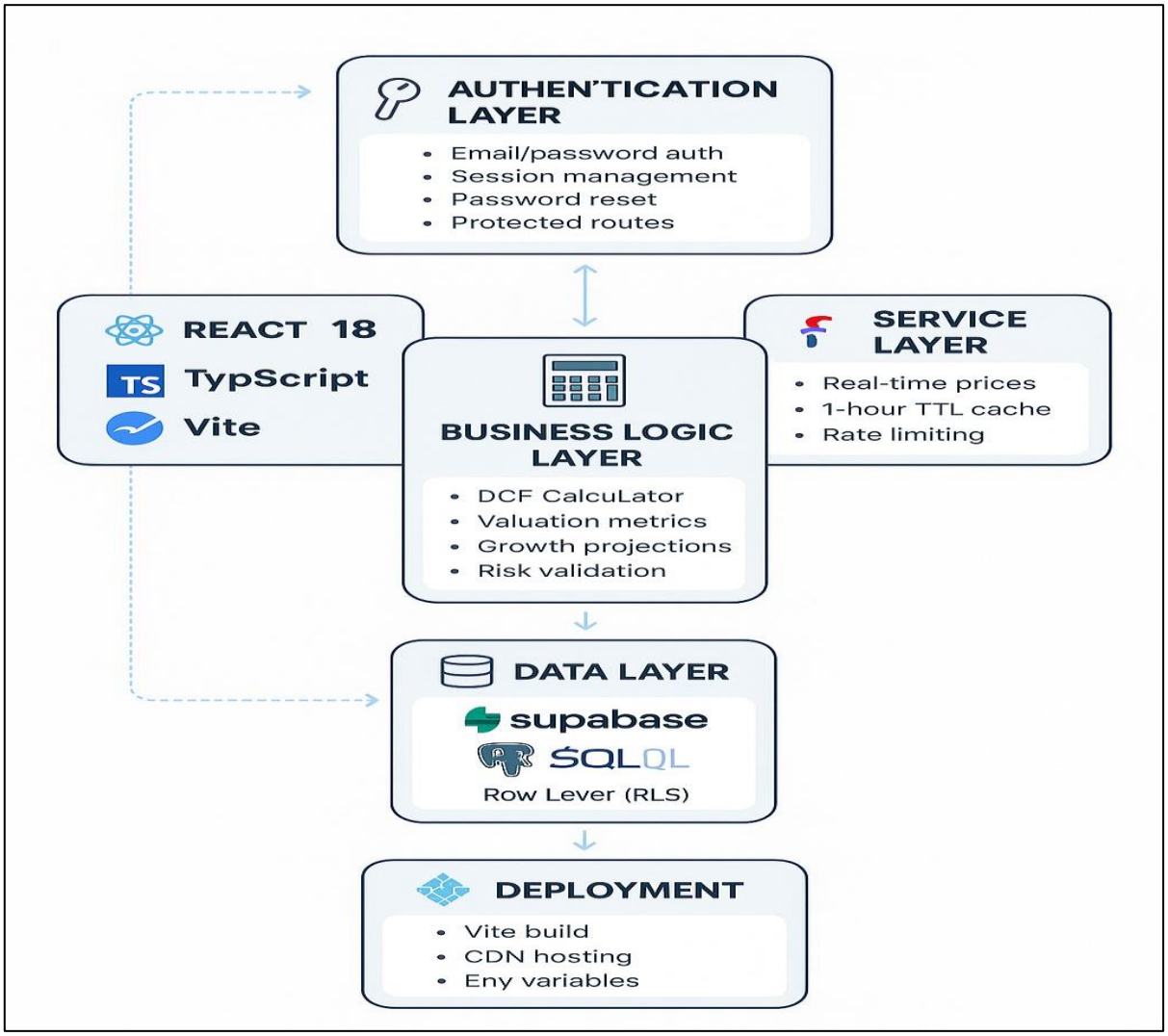

Fig 6 High-Level Architecture: React/TypeScript UI, Valuation Engine, API Service Layer (Finnhub), and Supabase Backend with PostgreSQL and Authentication.

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- *Data Layer:*

✓ Components interact with Supabase Client to fetch and store data.
✓ Database schema:

- saved_stocks: User's watchlist and saved DCF analyses.
- portfolio_stocks: Actual holdings for portfolio tracking.

✓ Row Level Security ensures strict data isolation per user.

- *Business Logic Layer:*

✓ DCF Calculator (utils/dcf. ts) implements professional-grade valuation methods.
✓ Supports multiple valuation metrics: P/S, P/E, P/FCF, EV/EBITDA.
✓ Handles 5-year growth projections, terminal value estimation, and CAGR calculation.
✓ Built-in risk validation (e.g., flagging unrealistic growth rates).

- *Service Layer:*

✓ Stock Price Service (services/stockPriceService.ts) fetches live prices from Finnhub.
✓ Implements a 1-hour TTL cache to reduce API calls.
✓ Rate limiting compliance with fallback to cached data on quota exhaustion.

- *Data Flow*

✓ DCF Analysis Flow: User inputs → DCF Calculator → Validation → Results Visualization → Optional Save to Watchlist.
✓ Portfolio Management Flow: User adds stock → Price Fetching → Performance Metrics Calculation → Visualization in portfolio charts.
✓ Real-Time Updates Flow: User action → Supabase database update → Automatic UI refresh via subscriptions.

- *Security Architecture*

✓ Authentication: JWT-based secure sessions via Supabase.
✓ Data Security: RLS policies restrict data access to owning user.
✓ API Security: Finnhub API keys stored in environment variables; never exposed client-side.
✓ Transport Security: All communication over HTTPS.

- *Performance Optimizations*

✓ Browser caching for stock prices (localStorage, 1hour TTL).
✓ Memoization for repeated DCF calculations.
✓ Database indexing for frequently queried columns.
✓ Component-level code splitting and lazy loading in React.

- *Deployment Architecture*

✓ Build process: Vite → Static assets → Deployed to Netlify CDN.
✓ Environment variables for API keys and database URLs.
✓ Separate environments for development and production.

- Algorithm 1 Valuation Engine (Base Case)

- Require: ticker, N, r, g, growth schedule, margin schedule

✓ fundamentals ← FETCHDATA (ticker) W
✓ FCF_1 ← SEEDFCF (*fundamentals*)
✓ for $t = 1$ to N do 4: $FCF_t \leftarrow FCF_{t-1} \cdot (1+ \text{growth}_t)$

✓ end for

$$PV \leftarrow \sum_{t=1} \frac{t}{(1+r)^t} + \frac{N(1+g)}{(r-g)(1+r)^N}$$

$N\,FCF \qquad FCF$

✓

7: $E \leftarrow PV - D + C$; $\qquad V_{\text{per share}} \leftarrow E/S$

✓ return $V_{\text{per share}}$

➢ *Security, Privacy, And Compliance*

- Secrets Management: API keys stored server-side or in Netlify env vars; never exposed client-side in plaintext.
- Auth & Storage: Supabase RLS enforces per-user row access for watchlists and portfolios.
- PII Minimization: Store only necessary profile data; document retention policy and export/delete paths.
- Compliance: Note data vendor ToS; caching adheres to rate limits and re-distribution constraints.

➢ *Accessibility And UX Considerations*

- WCAG color contrast checks for charts and tags.
- Keyboard navigation for all interactive controls.
- Alt text for figures; descriptive chart captions.

V. LIMITATIONS

➢ Dependence on user assumptions (growth, margins, multiples).

➢ Vendor API outages and stale data risk.

➢ DCF sensitivity to r and g; model risk for high-volatility names.

➢ *Technical Implementation*

The development of StockValuation Pro adheres to modern full-stack web architecture principles, enabling scalability, responsiveness, and maintainability.

➢ *Frontend*

The frontend is implemented using React, a widely adopted JavaScript library for building user interfaces. TypeScript enhances the development process by adding type safety and reducing runtime bugs. Tailwind CSS is used to streamline the styling process, making the interface both responsive and consistent across devices. The user interface supports dynamic updates and chart rendering without page reloads.

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➢ *Backend and Database*

The backend is powered by Supabase, an open-source alternative to Firebase. Supabase provides a hosted PostgreSQL database that stores user profiles, watchlist data, and portfolio transactions. It also handles user authentication via secure JWT-based sessions. This serverless approach allows for rapid development while maintaining data reliability and user privacy.

➢ *Real-Time Data Integration*

Real-time stock prices and financial data are fetched from the Finnhub API. The application periodically synchronizes this data to ensure that valuation models and portfolio returns remain current. This also allows the DCF models to reflect live market movements.

➢ *Visualization and Analytics*

To help users interpret financial metrics visually, the platform uses Recharts, a React-based charting library. Recharts supports dynamic graphing of DCF output, valuation ranges, and portfolio allocation trends. The result is a visually rich experience that enhances decision-making.

➢ *Deployment and CI/CD*

StockValuation Pro is deployed via Netlify, which offers automatic builds from GitHub, continuous integration (CI), HTTPS, and CDN distribution. This ensures fast page loads and reliable performance regardless of user geography.

➢ *Target Users*

StockValuation Pro is crafted to serve a broad spectrum of users who value long-term investment strategies based on financial fundamentals:

➢ Individual Investors: Retail investors looking to apply structured valuation methodologies like DCF to guide their buy/sell decisions.

➢ Financial Advisors: Professionals managing multiple portfolios who need a lightweight tool for quick and consistent valuation assessments.

➢ Investment Clubs: Groups of investors seeking to collaboratively analyze stocks and compare opinions using shared watchlists and valuation outputs.

➢ Finance Students and Educators: Learners who wish to explore real-world investing techniques and visualize the effect of growth projections and discount rates.

➢ *Challenges*

Developing StockValuation Pro came with several practical and technical challenges. First, integrating real-time stock market data using APIs like Finnhub introduced issues such as rate-limiting, latency, and synchronization of historical versus live data feeds.

Second, balancing usability with analytical depth was nontrivial. Many users are unfamiliar with financial terms like WACC, terminal value, or margin of safety, so the interface had to be both educational and flexible without sacrificing precision.

Third, scalability and data privacy were key backend concerns. With Supabase as the backend and PostgreSQL as the database layer, the team had to ensure secure user authentication and separation of portfolio data while maintaining responsiveness in a serverless environment.

Lastly, visualizing financial data required meaningful chart interactions. Using Recharts effectively for projecting multiple valuation paths and visualizing CAGR required optimization for both mobile and desktop views.

VI. CONCLUSION

StockValuation Pro combines financial theory with the power of web-based technology to deliver an intelligent investment assistant. It is not merely a data viewer, but a full-featured valuation and portfolio management system that supports real-time data, analytical rigor, and user-friendly interfaces. By embedding principles of fundamental analysis such as DCF into a live, interactive platform, it helps investors focus on intrinsic value, expected returns, and long-term performance.

The modularity of the platform also paves the way for future enhancements such as Monte Carlo simulations, taxloss harvesting, or ESG screening. In an age where retail investing is booming but also growing more chaotic, tools like StockValuation Pro offer the clarity and discipline needed to stay grounded in sound investment principles.

FUTURE SCOPE

While StockValuation Pro provides a solid foundation for intrinsic stock analysis and portfolio tracking, several future enhancements can significantly broaden its utility:

➢ Multi-currency and Global Market Support: Incorporate data for international exchanges, enabling investors to evaluate foreign stocks using local valuation benchmarks.

➢ Scenario Modeling: Add sensitivity analysis features to project best-case, base-case, and worst-case valuation outcomes, assisting users in managing risk.

➢ Collaborative Features: Enable team-based workspaces for investment clubs or advisor-client relationships, including shared watchlists and discussion threads.

➢ AI-based Suggestions: Integrate LLMs or ML models to provide valuation commentary, flag unrealistic growth assumptions, or auto-suggest peer comparisons.

➢ Mobile App Deployment: Extend accessibility with native mobile apps for iOS and Android with offline capabilities for watchlist tracking.

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- Tax Impact Simulation: Incorporate capital gains tax modeling to help users understand post-tax returns and optimize exit strategies.

These features would further position StockValuation Pro as a comprehensive and intelligent investment analysis platform, adaptable for both retail and semi-professional users.

- *Ethical And Disclosure Statement*

This tool is for educational/informational purposes and does not constitute investment advice. Past performance is not indicative of future results. Users are responsible for their own decisions.

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