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Reflexivity

The AI Investment Analyst: Meet Your New Team Member

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May 14th 2025

The AI Investment Analyst: Meet Your New Team Member

What does it mean to 'research'

Research is a **complex** form of reasoning

It requires **creativity** and the ability to
retrace one's steps and learn from
mistakes

Applying this to financial research and capital markets

In order to solve advanced financial queries, we're developing LLM tech capable of

- Formulating a research hypothesis
- Laying down a plan to test the hypothesis
- Acknowledge dead ends and come up with alternative ways to proceed

The Paradigm Shift

Task Hierarchy

Task Example

Yesterday - hours

Today - seconds



Other examples include

- Wealth Managers answering customer queries about negative performance of their portfolios - "Why is my tech portfolio down?? Why did you make me invest there?"
- Asset managers seeking to explain sudden market performance - "Why is market up 3% pre-open?"
- Asset Managers and Wealth Managers seeking to test an idea on the fly - "find me stocks that sold off hard after tariff announcements, but have not rebounded yet"

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Example 1 - The relationship between Growth and P/E

What range of SPX EBITDA y/y growth rate is associated with the highest trailing SPX multiple?
Use data going back to 2004. Please plot a distribution of PE multiple across different levels of the EBITDA growth bands in a bar chart. Use bands like 0-2.5%, 2.5%-5%, 5-7.5% etc for EBITDA growth rate



Show process ▾

Research Report: Relationship Between SPX EBITDA Growth and Trailing P/E Multiples

Key Findings

- Correlation Insight:** The relationship between the S&P 500 (SPX) trailing Price-to-Earnings (P/E) multiple and forward 12-month EBITDA growth rates shows a weak positive correlation of 0.1. This suggests that while there is some alignment between higher growth expectations and higher valuations, the relationship is not strong.
- Valuation Distribution:** The average trailing P/E multiple varies across EBITDA growth rate bands. Notably:
 - The highest average P/E multiple (19.63) is observed in the 10-12.5% growth band.
 - Lower growth bands, such as 5-7.5%, exhibit lower average P/E multiples (16.28).
 - Growth bands below 0% (negative growth) still maintain relatively high P/E multiples (19.03), indicating market resilience or other valuation factors.
- Overall Metrics:**
 - The average trailing P/E multiple across all observations is 17.97.
 - The average forward EBITDA growth rate is 9.86%.
 - The analysis spans from January 15, 2004, to April 24, 2025, covering 5,520 observations.

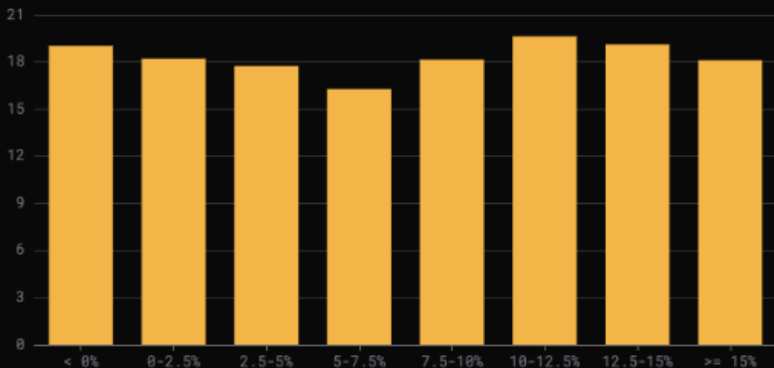
Evidence & Illustration

The following bar chart illustrates the distribution of average SPX trailing P/E multiples across different forward EBITDA growth rate bands:

Evidence & Illustration

The following bar chart illustrates the distribution of average SPX trailing P/E multiples across different forward EBITDA growth rate bands:

SPX Trailing PE Distribution by Forward EBITDA Growth Bands



The chart highlights:

- A peak in valuation at the 10-12.5% growth band.
- A relatively stable P/E multiple across most growth bands, with slight dips in the 5-7.5% band.

Context & Analysis

Data Preparation

The analysis utilized two key datasets:

- Trailing P/E multiples** (`spx.pe_ibes_trailing_12m`): Reflecting market valuation of the S&P 500 index.
- Forward EBITDA growth rates** (`spx.ibes_ebitda_forward_12m_growth`): Representing expected corporate earnings growth.

The data was filtered to include only observations from 2004 onwards, ensuring relevance to the user's request. Missing values were removed to maintain analytical integrity.

Example 2 - Using Montecarlo Simulations

Using Monte Carlo simulation, show how a 30bps rise in 10Y yields in a week would impact the front end of the curve, 2s and 5s

Using Monte carlo simulation, show how much a 30 bps rise in US 10 year yields in a week would impact the front end of the curve, US 2 and 5 year yields

Progress indicators

Show process

Research Report: Impact of a 30 bps Rise in US 10-Year Yields on US 2-Year Treasury Yields

Key Findings

- A Monte Carlo simulation was conducted to analyze the impact of a **30 basis points (bps)** rise in US 10-year Treasury yields on US 2-year Treasury yields over a **1-week horizon**.
- The simulation results indicate:
 - Average impact on 2-year yields:** +0.41 bps
 - Median impact on 2-year yields:** +0.26 bps
 - 5th percentile impact:** -17.95 bps (indicating potential downside risk)
 - 95th percentile impact:** +19.35 bps (indicating potential upside risk)
- The analysis focused on the **front end of the yield curve**, specifically the 2-year yield, as data for the 5-year yield was not available.

Evidence & Illustration

1. Summary Statistics of the Simulation:

- The simulation used **10,000 iterations** to model potential outcomes.
- The initial yields were:
 - 2-year yield:** 3.89%
 - 10-year yield:** 4.39%
- A **30 bps shock** was applied to the 10-year yield, simulating its rise to 4.69%.

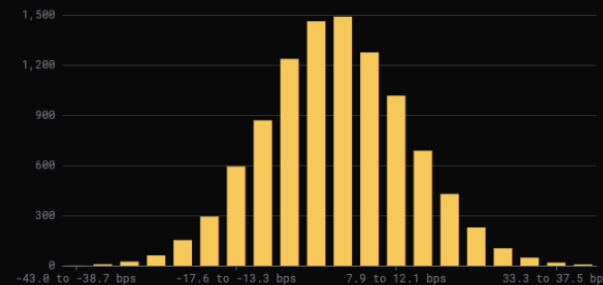
Monte Carlo Simulation Summary

Metric	Value
Average 2Y Impact (bps)	0.41
Median 2Y Impact (bps)	0.26
5th Percentile 2Y Impact (bps)	-17.95
95th Percentile 2Y Impact (bps)	19.35
Number of Simulations	10000
Simulation Horizon (days)	5
Initial 2Y Yield (%)	3.89
Initial 10Y Yield (%)	4.39
Shock to 10Y Yield (bps)	30

2. Distribution of Simulated Impacts:

- The histogram below shows the distribution of simulated 1-week impacts on the 2-year yield. Most outcomes are clustered around the average impact of +0.41 bps, with a long tail indicating both upside and downside risks.

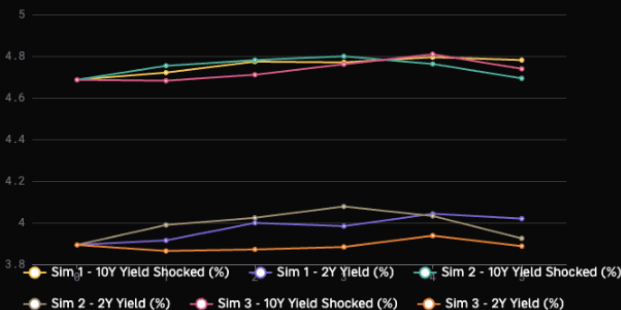
Distribution of 2Y Yield Impacts



3. Example Simulated Yield Paths:

- The line chart illustrates a few example paths for the 2-year and shocked 10-year yields over the 1-week horizon. It highlights the variability in potential outcomes.

Example Simulated Yield Paths



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Example 3 - Risk Analysis



I have a portfolio of EURUSD, GBPUSD, USDJPY, EURMXN, USDBRL and EURSEK. USDJPY is likely to drop 5% over the following month. Please calculate relevant correlations and run a Monte Carlo simulation to summarize the expect return on the overall portfolio, as well as the 95th percentile drawdown in that month

● ● ● ● ● Show process ▾

Portfolio Analysis Report: FX Portfolio (EURUSD, GBPUSD, USDJPY, EURMXN, USDBRL, EURSEK) Key Findings

1. Correlation Analysis:

- The correlation matrix reveals the relationships between the daily log returns of the six FX pairs. Notable observations include:
 - EURUSD and GBPUSD exhibit a strong positive correlation of **0.74**, indicating similar movement patterns.
 - USDJPY has a negative correlation with EURUSD (-0.45) and GBPUSD (-0.41), suggesting opposing trends.
 - EURMXN and USDBRL show a moderate positive correlation of **0.30**, reflecting some shared regional or economic influences.

2. Expected Portfolio Return (1-Month):

- The Monte Carlo simulation estimates the portfolio's expected return over the next month to be **-1.0%**. This reflects the impact of the assumed 5% drop in USDJPY and the historical dynamics of the other assets.

3. 95th Percentile Drawdown:

- The portfolio's 95th percentile drawdown over the next month is estimated at **3.0%**. This means there is only a 5% chance that the portfolio will experience a drawdown greater than this level.

Context & Analysis Analytical Approach

1. Data Preparation:

- Historical daily price data for the six FX pairs was retrieved, covering the most recent 5 years up to May 5, 2025.
- Daily log returns were calculated to normalize price changes and facilitate statistical modeling.

2. Correlation Analysis:

- The Pearson correlation matrix was computed to understand the linear relationships between the FX pairs. This helps identify diversification opportunities and potential hedging relationships within the portfolio.

3. Monte Carlo Simulation:

- A Monte Carlo simulation was conducted to estimate the portfolio's performance over the next month (21 trading days). Key steps included:
 - Using the historical mean and covariance of daily log returns as inputs.
 - Adjusting the mean return of USDJPY to reflect the expected 5% drop over the month.
 - Simulating 10,000 paths of daily returns for all assets, assuming an equally weighted portfolio.
 - Calculating cumulative returns and maximum drawdowns for each path.

4. Expected Return:

- The average cumulative return across all simulations was converted to a simple percentage return, yielding an expected portfolio return of **-1.0%**.

5. 95th Percentile Drawdown:

- For each simulation, the maximum drawdown was calculated as the largest peak-to-trough decline in portfolio value. The 95th percentile of these drawdowns was determined to be **3.0%**, representing a worst-case scenario with a 5% probability.

Key Assumptions

- The USDJPY shock (-5%) was incorporated by adjusting its mean return while keeping the covariance matrix unchanged.
- The portfolio was assumed to be equally weighted, which simplifies the analysis but may not reflect actual investment allocations.

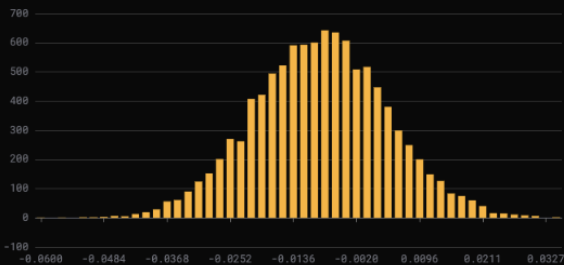
Limitations

- The analysis assumes that asset returns follow a multivariate normal distribution, which may not fully capture extreme market events or non-linear dependencies.

Simulated Portfolio Returns Distribution

The histogram of simulated 1-month portfolio returns shows a concentration around the mean return of **-1.0%**, with a slight skew due to the USDJPY shock.

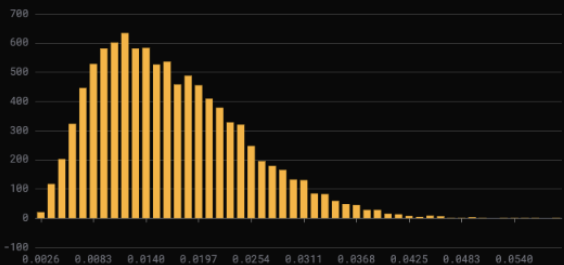
Simulated Portfolio Returns Distribution



Simulated Portfolio Max Drawdown Distribution

The histogram of maximum drawdowns highlights that most simulations result in drawdowns below **3.0%**, with only a small tail exceeding this threshold.

Simulated Portfolio Max Drawdown Distribution



Conclusion

AI opens new possibilities for integrating entire investment management processes



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