Finance Hub

https://financehub.bz/

Outline

- Who are we?
  - Finance Hub's key stakeholders
- Why are we here?
  - Introduction to [Finance Hub](#)
- Where do we want to go?
  - Quick overview of current research in finance
  - What parts of the frontier we want to explore and, potentially, advance
- Who do we expect to join?

Who are we?

Finance Hub's key stakeholders

Finance Hub

The Finance Hub is a community of investment professionals, academics and students in Brazil capable of fostering the research and technology that will help the Brazilian asset management industry cope with its new challenges

Why are we here?

Introducing Finance Hub

A new approach to investing

- There has been an [explosion of interest](#) in systematic investment approaches, particularly factor investing
- Systematic strategies, varying a lot in complexity, are now mainstream and part of any large institutional portfolio (in developed markets…)
- [Academic backgrounds](#) are quickly becoming the dominant profile among investment professionals hired by institutional investment firms
- The Brazilian industry has been late to this process with very few teams fully dedicated to a systematic approach to investing

[Academia-Professional](#) links

- Top hedge funds in the world are now:
  - running [conferences](#) and seminars
  - co-authoring [research](#) with academics
  - dedicating resources to [education](#)
  - creating new [technologies](#) and constructing publically available [data sets](#)
  - running [labs](#) in markets, data science, and technology
  - bringing [open source](#) technology to investing

Finance Hub

Investment

Research

Finance Hub

Technology

Education
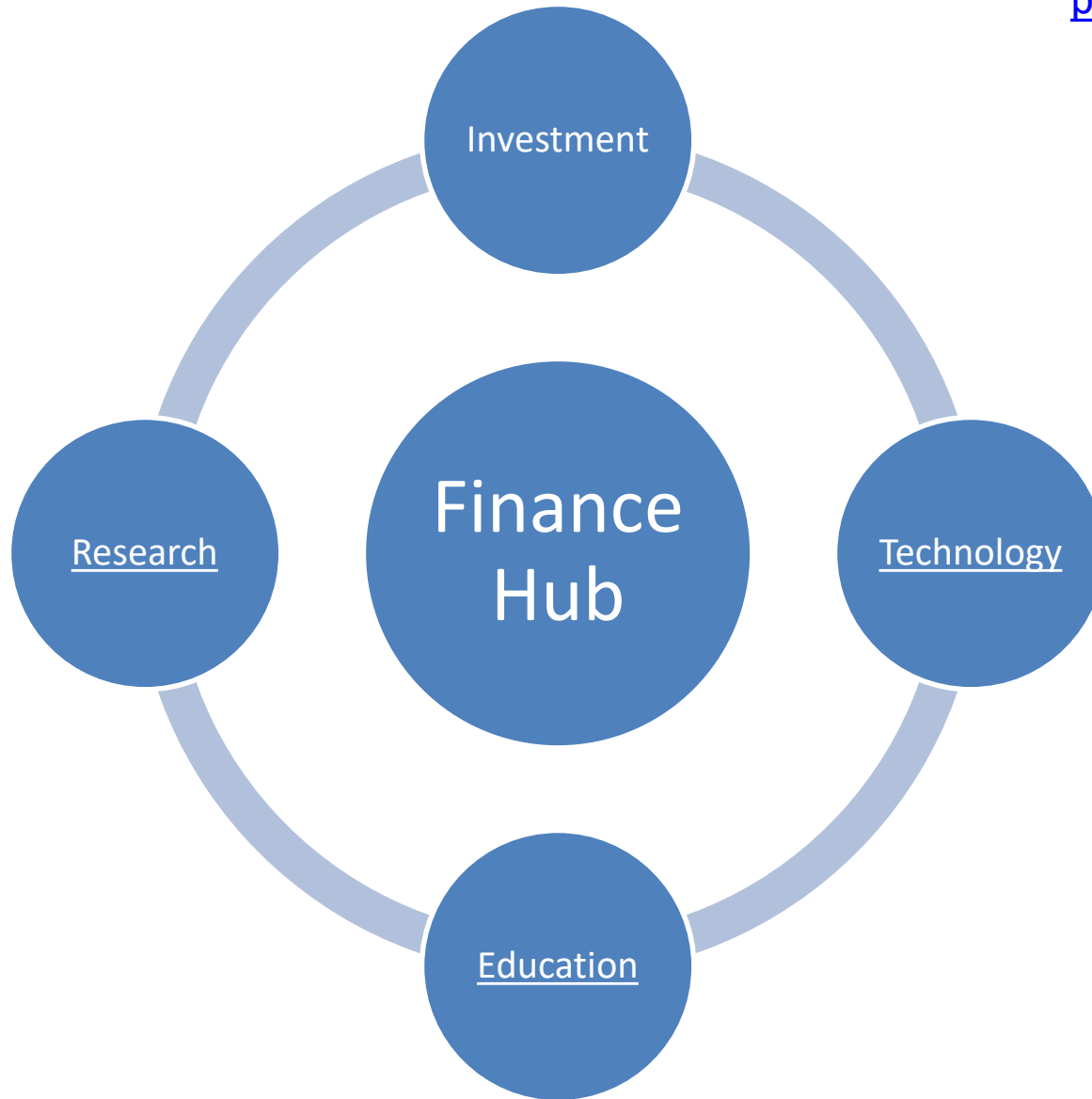
Factor investing is a product of this link
From Fama-French to AQR!

- [Factor investing](), now hugely [popular](), is a success story of this academia-investor connection:
  - Existence of factors has been well identified in the academic literature and given behavioral and/or rational fundamentals for their presence in the economy
  - Investors still need to continuously research the best ways to extract and risk manage factors in their portfolios
  - Investment firms need educated professionals to risk manage factor based portfolios
  - Sophisticated tools need to be developed and adopted by investment professionals in order to run and continuously do research in factor portfolios

Why does this matter for us?

- Our portfolios are becoming more international, multi-dimensional, and complex
- Traditional alpha is becoming beta and new alpha is becoming more technologically complex
- Systematization is a transparent and efficient way of institutional investors to deal with complexity
- Our professionals need to be trained in the sciences and technologies needed in this new type of institutional investment firm
- We need to start building a more symbiotic relationship with academia

Planting the first seed

We have ambitious goals, but we will start small:

- Create an [open source repository of code and data](#) to reduce the effort of conducting research in finance
- Set up [courses](#) covering the fundamental background in the sciences and technologies needed for the academic-investment firm relationship to flourish
- Set of [seminars](#) where academics and professionals can discuss research projects
- Curating a repository of academic research papers on the [Mendeley](#) platform to promote discussion

The repositories

- We created a [website](#) and a [repository of code on GitHub](#) where participants can openly collaborate with the development of technology

- The idea is to generate a more diverse scope of code design than any one institution is capable of developing and sustaining long term on its own

- While code is shared openly on GitHub, under the supervision of Finance Hub administrators, publicly available data is held with AWS server under the INSPER account

- We have also created [a repository of articles](#) for researchers to tag and share research ideas

Python Course

- Meets every Wed, at 11:30am, starting Oct, 17th
- Materials are [on GitHub](#) covering:
  - Introduction to Python
  - Data Handling (Structured Data)
  - Webscrapping and webcrawling (Unstructured Data)
  - Scientific Computations and Optimizations packages
  - Statistics, Econometrics and Machine Learning packages
  - Data Source APIs (Bloomberg, Quandl, Quantopian etc.)
  - Building and Evaluating Strategies (Backtesting)
  - Creating Custom Python Classes and Libraries
  - Data Visualization

Seminars

We are organizing academic [seminars](#) to promote an open discussion between investment professionals and academics branch. Below the schedule for

Dates / Themes	First Presentation	Second Presentation
3-out-18 **Introduction**	João Moreira Salles – Opening Session	Ruy Ribeiro – Planning Session
23-out-18 **Premia**	Gustavo Soares – Common Factors in Corporate Bond Returns	Paulo Costa – Yield Curve Premia
6-nov-18 **ERP and Options**	Ruy Ribeiro – Expected Return on the Market	Guido Chagas - Expected Return on a Stock
21-nov-18 **Low Beta/Risk Parity**	Presenter 1 - Betting Against Beta	Presenter 2 - Benchmarks as Limits to Arbitrage: Understanding the Low-Volatility Anomaly
4-dez-18 **Momentum and Financial Institutions**	Presenter 3 - An Institutional Theory of Momentum and Reversal	Presenter 4 - Flow-Based Explanation for Return Predictability
15-jan-19 **Crowded Trades, Momentum and Carry**	Presenter 5 - Comomentum	Presenter 6 - Crowds, Crashes, and the Carry Trade
29-jan-19 **Macro Announcements and Returns**	Presenter 7 - The Pre-FOMC Announcement Drift	Presenter 8 - Monetary Momentum

Where are we?

Current research in finance

The focus on Discount Rates

- In asset pricing, a key question is whether the equation below holds:

    ???? Prices = Expected Discounted Cash-Flows ????

- We used to focus on the word "expected" and think of market efficiency in those terms: "weak", "semi-strong" and "strong"

- We now focus on the word "discounted" because it seems to better describe empirical phenomena and to provide a "synthesis" for different theories

Efficiency vs. risk sharing

- [Definitions of efficiency](#) are about the diffusion of information and how quickly asset prices incorporate information about future cash flows

- Finance concluded that markets are "largely" efficient in the use of information, but "anomalies" persisted nonetheless

- Now we know that it is not enough for information to diffuse, there needs to be mechanisms for risk to be [shared across all market participants](#) for markets to complete so that "anomalies" vanish

- The average investor must hold the market portfolio. The so called "anomalies", are anomalies for the average investor

- However, if I work in a sector that is more/less sensitive to negative shocks of a particular factor, I have an incentive to short/buy that factor vs. the average investor

- Our theories and reduced form models should be built on [differences between people](#)

Risk sharing

- The reason why risk premia exists may be related to the fact that **we are all different from the average**
- The supply and demand of risk, which varies across investors and time, has (a poorly understood) relationship to risk premia
- We have multiple factors, varying over time and investors, with heterogeneous and time-varying access to leverage, form segmented markets and habitats. How? Why exactly?
- We will talk about the [Betting Against Beta](#) paper that builds on this idea, i.e., a factor premia that comes from leverage and margin constraints that vary across investors

Time-varying risk premia (TVRP)

- Risk premia are higher at business cycle troughs than at their peaks

- Empirical evidence shows that TVRP comes from time-varying expected returns, and that implies return predictability but not inefficiency

- But why do expectations vary? Risk aversion may vary with consumption shocks or with the consumption volatility

Stochastic Discount Factor (SDF)

- If the law of one price holds, one can always construct a SDF as a linear combination of portfolio returns with no assumptions about investor beliefs and preferences

- SDF does not necessarily provide a rational explanation of asset pricing "anomalies": it is compatible with "behavioral" models of asset prices as much as it is compatible with "rational" no-arbitrage models

- As such, SDF serves as an umbrella approach to understand both the empirical findings (how prices move?) as well as the possible explanations for them (why prices move?)

Macroeconomics and discount rates

- When consumers decide how much, ξ_t , to buy of an asset with random payoff x_{t+1} at price p_t:

$$\max_{\{\xi_t\}} u(c_t) + E_t[\beta u(c_{t+1})] \ s.t$$
$$c_t = e_t - p_t\xi_t \text{ and}$$
$$c_{t+1} = e_{t+1} + x_{t+1}\xi_t$$

- Discount rates arise naturally arise from FOC:

$$p_t = E_t\left[\underbrace{\frac{\beta u'(c_{t+1})}{u'(c_t)}}_{m_{t+1}} x_{t+1}\right]$$

Stochastic discount factor (SDF)

Finance and discount rates

- Defining $R_t^f = E_t[m_{t+1}]^{-1}$ and using some basic statistics, we arrive at the well known beta-representations:

- $E_t[R_t^i] = R_t^f + \underbrace{\frac{COV_t[m_{t+1}, R_t^i]}{VAR_t[m_{t+1}]}}_{\beta_t^{i,m}} \times \underbrace{\left[-\frac{VAR_t[m_{t+1}]}{E_t[m_{t+1}]}\right]}_{\lambda_t^m}$

- Factor models are just the particular case where $m_{t+1} = a + b' f_t$

- Sometimes f_t are portfolio returns (e.g., CAPM)

Treasury Term Premia example

Is the US yield curve flat because the ***market is predicting a recession*** or because the ***Fed has done a good job in reducing inflation volatility***? We don't know... unless we estimate the UST term premia

Estimating UST term premia using factor models:
- Decompose the yield curve in some factors
- Use those factors to model the SDF
- Use the modeled SDF to price assets under no-arbitrage
- Find how much of the yield is coming from risk premia, i.e., the price of risk

Ten-Year Treasury Term Premium and Yield Fit

Percent

ACM fitted yield

GSW yield

ACM term premium
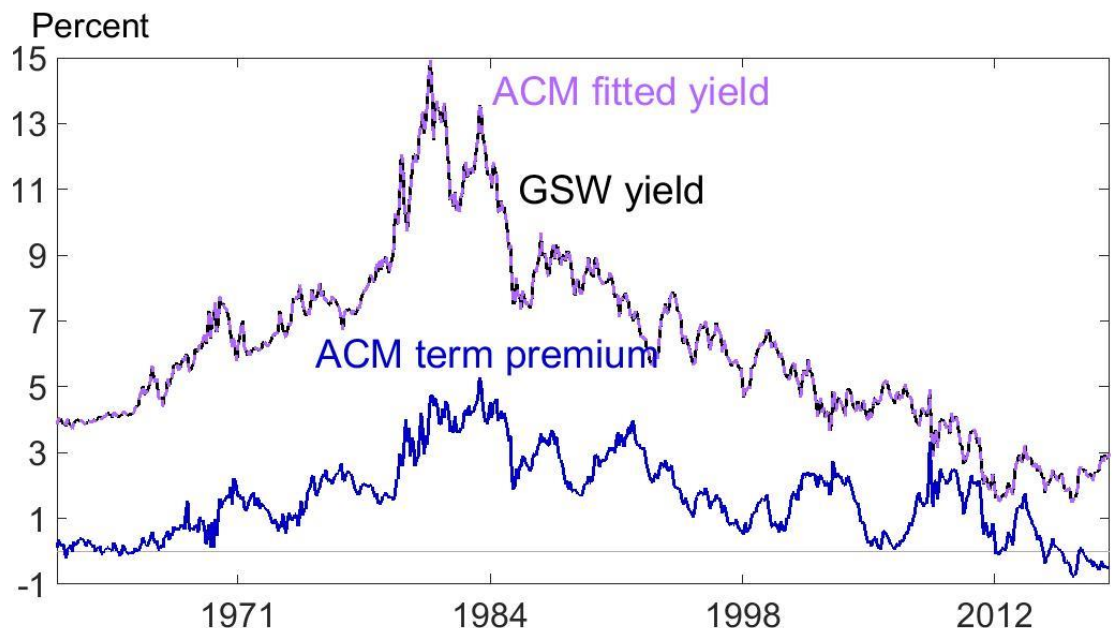
Sources: Federal Reserve Bank of New York: Federal Reserve Board.

Behavioral Finance and discount rates

- To the extent that we are "predictably irrational", behavioral models can often be described as SDF models with "distorted" probabilities and account for biases such as "overreaction"

- The rationality/behavioral debate is not producing much insight anymore as identification of one theory vs. the other may not even be possible given the type of data we collect

What's in the data?

- In the classic "efficient markets" view, stock prices are not predictable. The "random walk" view was largely empirically validated in the 70s and 80s
  - The old argument: if you could predict the stock market, you would buy and sell accordingly. Competition in an efficient/free-entry market would price this away
- In the 90s/00s, some [new empirical facts](#) challenged this view:
  - Some variables have predictive power in stocks, FX, bonds, credit, houses, etc.
  - Typically these variables are "yield" or "valuation" metrics and correlate with changes in expectations and do NOT predict future cash flows very well
  - The variability in asset prices is not coming from the changes in future cash flows, it's coming from changes in expectation
  - In "bad times", when C, Y, and I are low and U is high, we see "low" prices and expectation of future returns seem to be "high"
  - Several other asset "characteristics" provide information about portfolio returns that seem independent from "beta" and Fama-French factors

Predictability is about varying discount rate and not about efficiency

- Does predictability of returns mean that markets are inefficient?
  - There is rational variation in the equilibrium risk premium required by the market in time of abundance/stress. Guido Chagas for example will talk about a theoretical framework that implies considerable variation in stock expected returns over time and across stocks
  - The new argument: predictability does not mean arbitrage! After a shock, like 2008, everyone is scared and leaking their wounds, it is rational to require market equilibrium expected returns to be higher! Prices look cheap for everyone, but who has the dry powder to get in? Not many! This is what predictability of returns without arbitrage looks like in practice

Ruy Ribeiro will talk about how high equity premia available in times of stress largely reflect high expected returns over the very short run

In 2008, dividend yields are high and "predict" future market rally!

Where do we want to go?

Parts of the frontier we want to advance

Asset pricing and characteristics

- It is typical in academia to model returns as a panel:

$$R_{t+1}^i = \alpha + b' C_t^i + \varepsilon_{t+1}^i$$

where C_t^i is a vector of asset characteristics (e.g., size, momentum, carry, etc.)

- "Time-series" strategies that move in and out of a particular asset *i*

- "Cross-sectional" moves from asset *i* to asset *j*.
  - *Gustavo Soares will describe one of these strategies in* [credit markets](#) *and Paulo Costa will describe one of those in* [rates markets](#)

- The controversial topic of [timing factors](#) is about predicting C_t^i over time

The problem with regressions

- Tiny amounts of correlation, often statistically insignificant in regressions with daily/monthly data, can have large impact in time-series and cross-sectional portfolios

- We can get the functional form for *g, in*:

$$E_t\left[R_{t+1}^i \middle| C_t^i\right] = g\left(C_t^i\right)\lambda_t,$$

  wrong and have results depend on outliers or tiny/illiquid firms

- They often do not work out-of-sample

- Panel regressions on high-dimensional characteristics vector C_t^i can help us identify factors, but we still need to construct high-dimensional portfolios in practice (and in theory!!)

Did portfolio theory stop being a worthwhile topic?

Long-short portfolios are the same as a regression on a step function
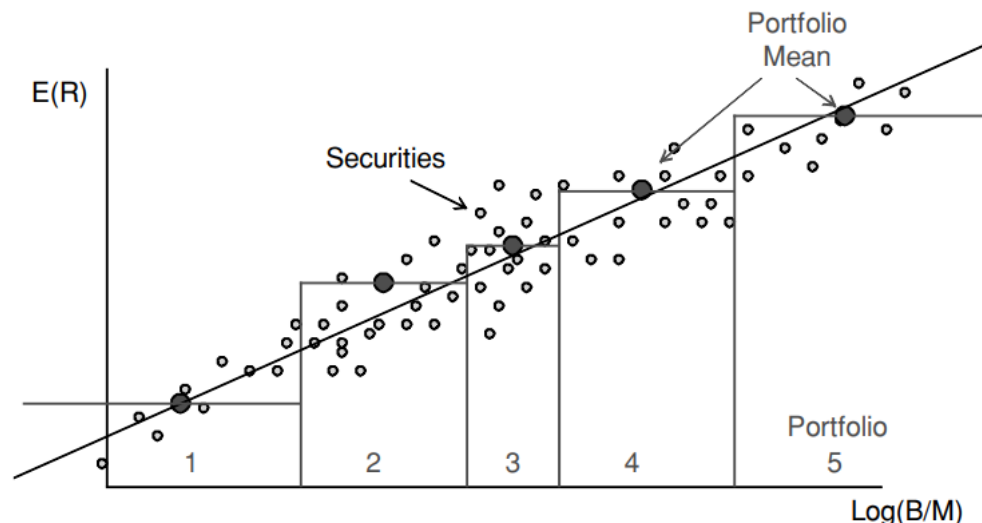
- In academia, the focus is on regressions to identify "anomalies". However, how should we build portfolios using multiple factors?
- Portfolios need to be state-dependent, time-varying and tailored to particular needs of investors
- Portfolio construction in a multi-factor, time-varying, state-dependent world is underappreciated in academia – and by many active managers –, but this could prove to be a significant mistake

The zoo of factors

- The SDF is likely to be a function of a few <u>dominant orthogonal factors</u> (e.g., the few largest PCAs of the return covariance matrix)

- We need to learn how to <u>select factors among the zoo of factors</u>

- <u>Machine learning</u> techniques are great at model selection and combination

- Why do asset returns, active and quant strategies have substantial commonality beyond well-known factors?

- As we will discuss in the seminars, we need to better understand <u>crowded trades</u> and whether factor investing can have a <u>destabilizing effect</u> on the market

Better understand asset management and the journey from alpha to beta

- The function of institutional investors is to bridge over market segmentation and intermediation, i.e., to make what are "fire sales" for some become "buying opportunities" for others

- How this works exactly is poorly understood and it is likely to depend on the definition of liquidity

- Investing in factor premia is in part about building this bridge, making asset management more about time-varying risk sharing than about chasing zero-sum alpha

- If clients of asset managers have costs of implementing complex portfolios, ARP is a type of "alpha" for them

- There is communality in HF alpha beyond best known factors

Better understand liquidity

- Factor exposure may look like "providing liquidity" to other markets participants
- But we do not know how to identify and measure liquidity very well and why we trade so much
- Is liquidity about:
  - How easily/cheaply I can trade an asset?
  - Is it about funding costs?
  - Is it about the price differential of semi-identical claims?
  - Maybe liquidity is systemic and not about the asset itself
  - Is it about information? Do assets become illiquid when traders think others have information that they do not?
  - How does liquidity relate to volatility?

Who will join?

You can play a key role in this community

A Finance Hub sort of story

Is the DI1 curve steep because the *market is predicting a fast pace of hikes* or is it because *market participants are concerned about inflation volatility*?

- A SDF model, described in the international literature, was applied to BRZ in an award winning INSPER thesis
- Next questions:
  - Can we relate the model to measures of value, momentum, and carry?
  - Can we use it for trading?
  - Can we use FOCUS survey expectations to anchor the model?
  - Can we apply it to credit?
  - What if there is a structural break at the end of the series?

Term Premium Series

Collaborate on [GitHub](#)!

- We need collaborators to help build databases to be used in research

- We need to create Excess Return time series for several domestic and international asset classes

- We need to generate code that creates and updates databases on several domestic markets

- We need to write code that handles calendars, calculates basic metrics (beta, duration, delta, implied volatility, etc.)

- This is an important expected outcome of our Python course and of the undergraduate summer projects

Build the bridge

- We need a forum for investment professionals to connect with rigorous academic research as professionals in the [US](US) and Europe currently do
- A bridge between research in quantitative finance and applications inside investment firms requires:
  - Time spent on applied issues such as portfolio construction, risk-management, signal combination, timing, in/out sample behavior, etc.
  - Build an academic research agenda with potential real life applications in investment firms
- This is an expected outcome of our seminars!