Lecture 1: Motivation + Stylized Facts

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Intro

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Inaccurate, incomplete, sloppy, but useful:

- Asset Pricing: why do different assets have different prices? How do investors make choices?
- Corporate Finance and Banking: how do non-financial firms and banks allocate their resources and make choices?
- Market Microstructure: how do markets *actually* operate?
- Financial Econometrics: specialized tools to handle financial data;

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- This separation is artificial and just pedagogical. It's all Economics.
- I will focus on Asset Pricing topics. Reason: that's what I know best.

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- Felipe will probably navigate across Asset Pricing and Corporate Finance;
- Lars teaches a cool class in Banking and Financial Intermediation;
- Rodrigo Leite usually teaches a class in Behavioral Finance at COPPEAD;
- Fernando Mendo teaches a Macro-heavy Macro-Finance class at PUC;
- EMAp is full of Financial Math classes for you too;

What is *Asset Pricing?*

In terms of questions:

- Asset Pricing is the study of how financial assets are *priced*;
- Why do different stocks have different expected returns?
- Why do bonds with different maturities have different yields?
- Why are prices moving around all the time?
- How do people allocate money across assets? How *should* they do it?
- Why don't we all invest in a single country or concentrate trading in a single currency?
- Why do we have certain types of insurance contracts but not *all* types of contracts?
- ...

What are the top journals?

- The usual top 5 in Economics;
- The top 3 in Finance: Journal of Finance, Journal of Financial Economics, Review of Financial Studies;
- Other great sources: Journal of Financial and Quantitative Analysis, Management Science, Review of Finance;
- If Econometrics-oriented: Journal of Econometrics, Journal of Business & Economic Statistics, Journal of Applied Econometrics, Journal of Financial Econometrics, ...
- Great surveys: Journal of Economic Literature, Journal of Economic Perspectives, Annual Review of Financial Economics;

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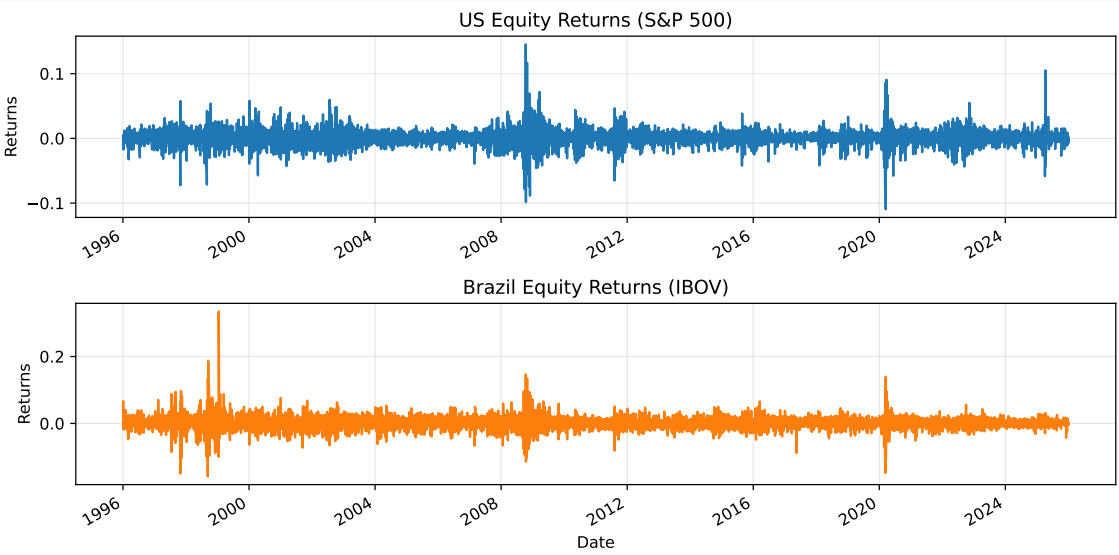
You should start going through latest editions of these journals and check what seems to interest you!

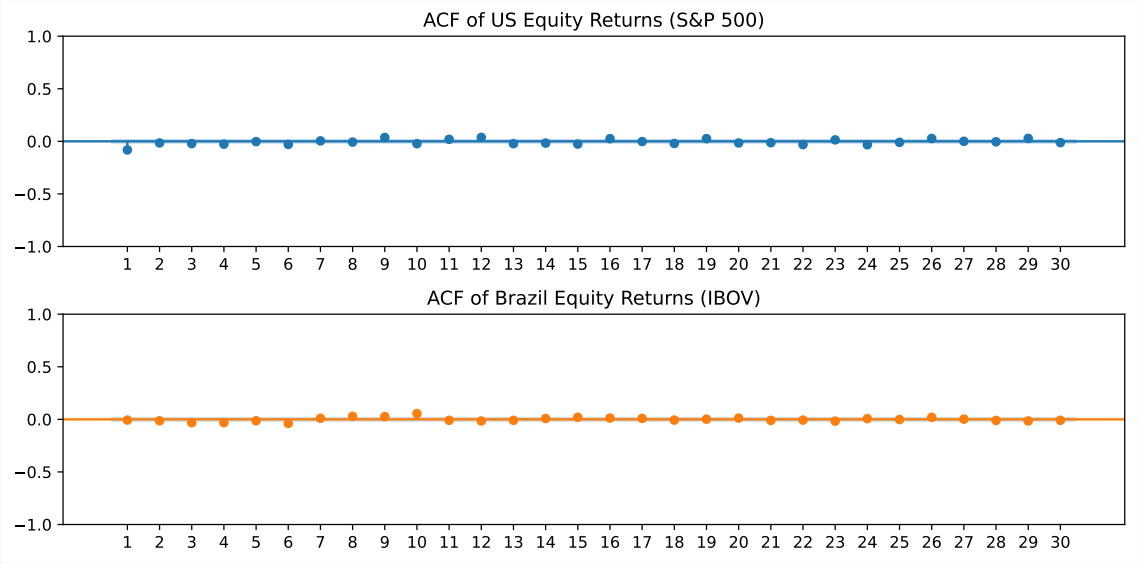
Questions?

Stylized Facts

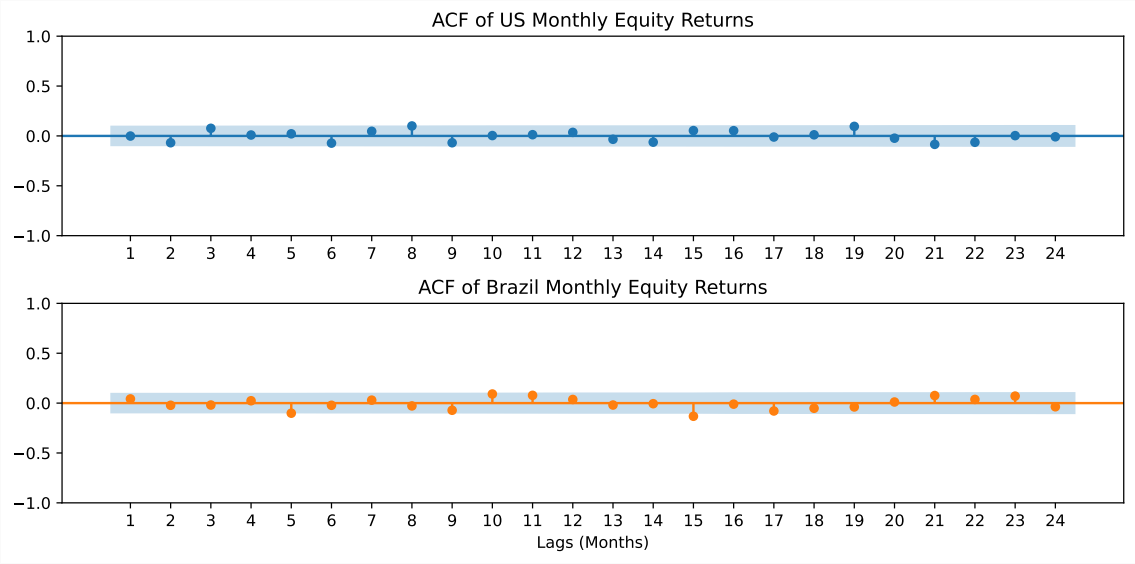
Equity Returns



(Daily) Equity Returns Are Not Very Persistent



(Monthly) Equity Returns Are Not Persistent Either



Realized Volatility

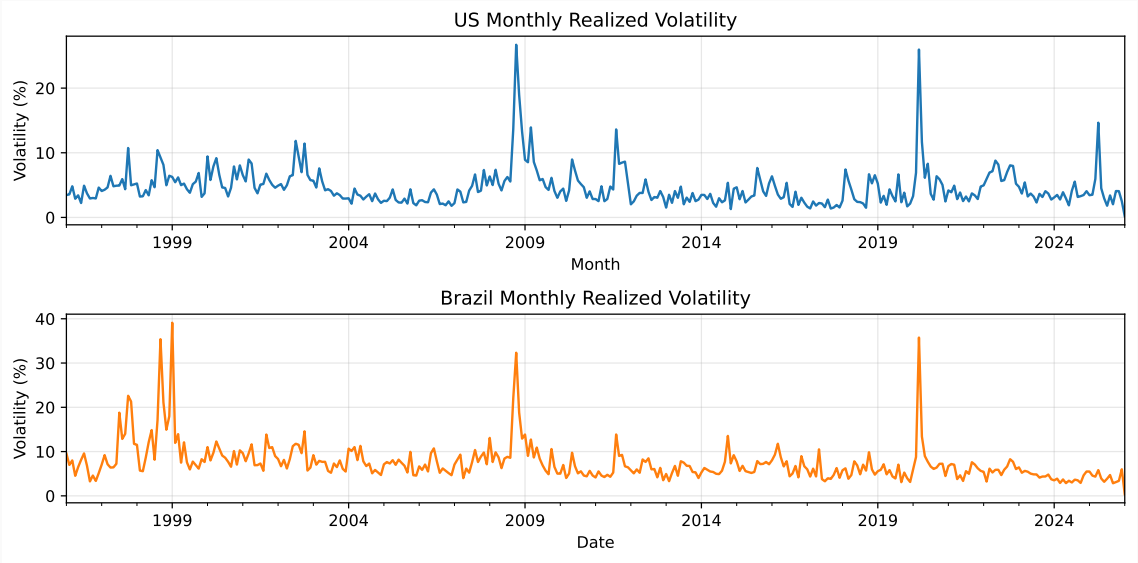
- How volatile are equity returns?
- One measure: the realized volatility, computed as squared returns over a certain period (e.g., daily, monthly);

The monthly realized volatility, in a month with N_t trading days is:

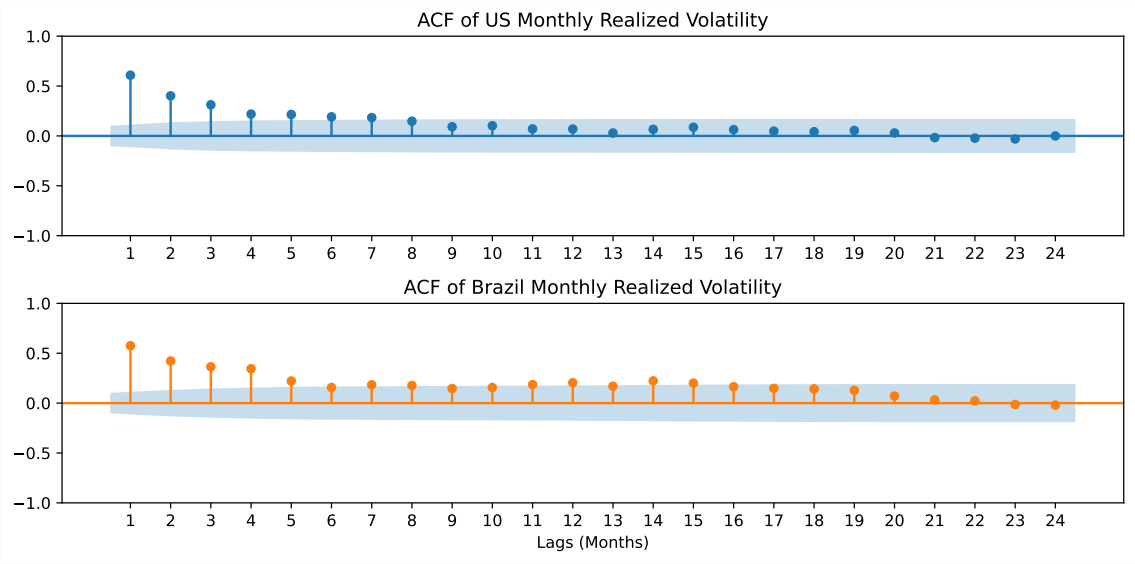
$$RV_t = \sqrt{\sum_{i=1}^{N_t} r_{t,i}^2}$$

- Think about it as how jagged the returns were;

Realized Volatility



(Monthly) Realized Volatility Is Way More Persistent

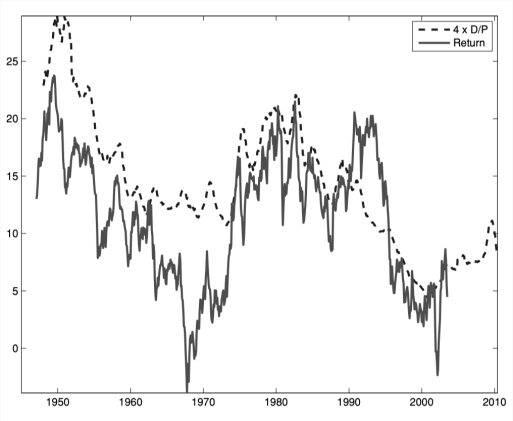


But long-horizon returns have some predictability

Table 1: $R_{t+h|t} = \alpha + \beta \cdot CAPE_t + u_t$, 1982-2023

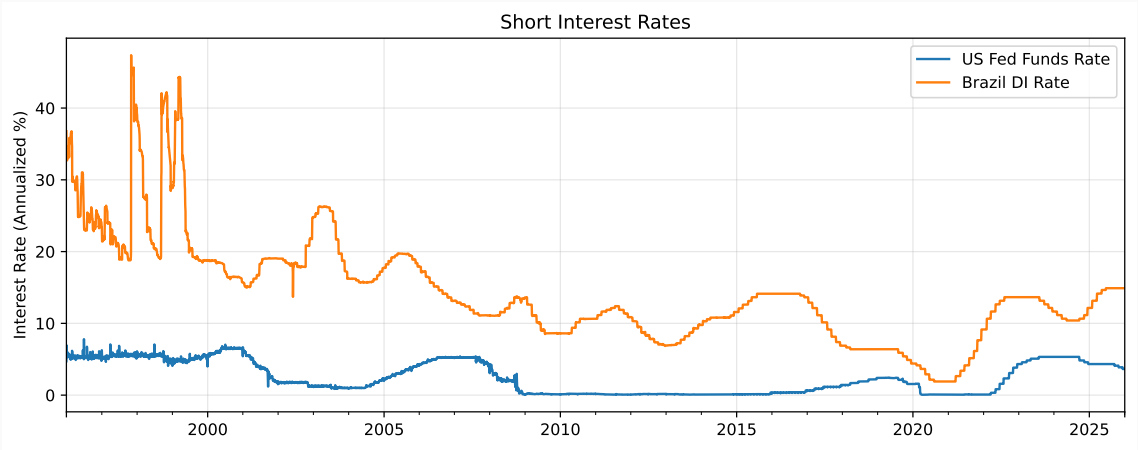
	R_6	R_{12}	R_{36}	R_{60}
$CAPE_t$	-0.25*	-0.36*	-0.56***	-0.68***
	(-1.88)	(-1.78)	(-2.65)	(-5.69)
N	487	481	457	433
R^2	0.061	0.127	0.290	0.422

- Still: predicting short-term returns is very hard;



DP Ratio vs 7-year SP500 Returns

Interest Rates and Equity Risk Premium



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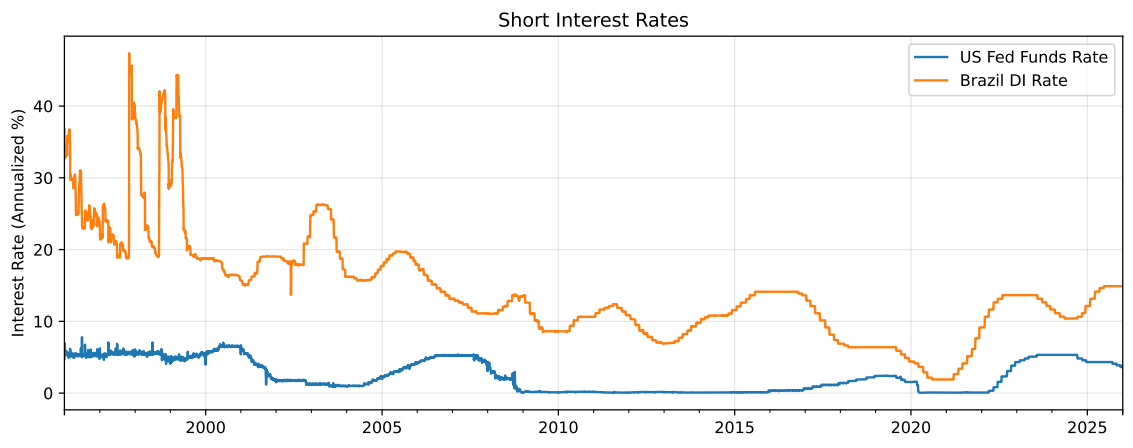
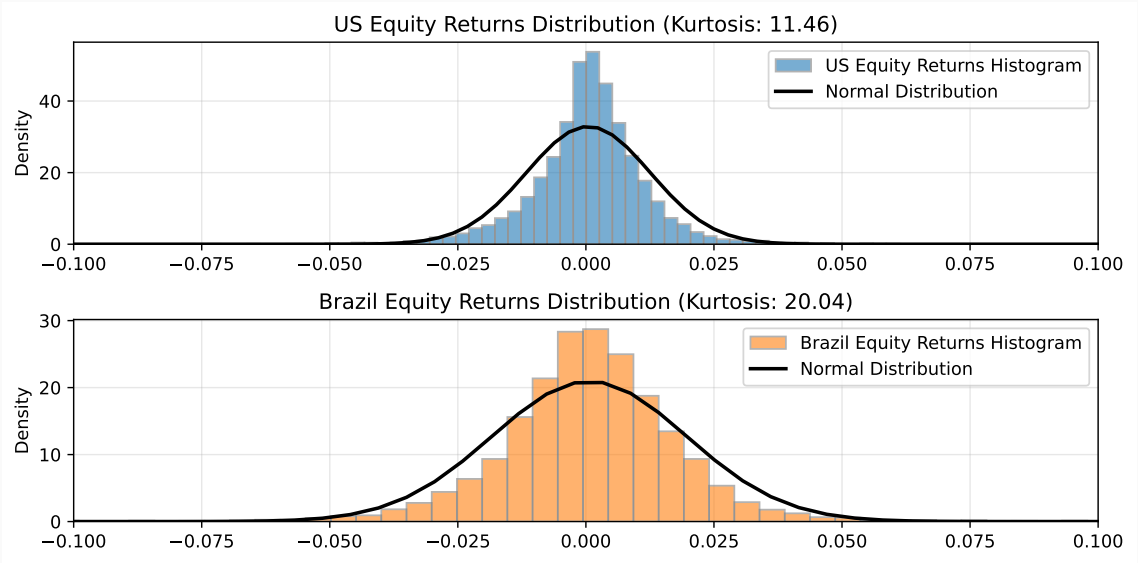


- Equity risk premium for US 9.45% per year, with volatility around 19.25% per year;
- Equity risk premium for Brazil 3.75% per year, with volatility around 30.22% per year;

Fat Tails


US Equity Returns Distribution (Kurtosis: 11.46)
US Equity Returns Histogram
Normal Distribution
Density
0
20
40
−0.100
−0.075
−0.050
−0.025
0.000
0.025
0.050
0.075
0.100
Brazil Equity Returns Distribution (Kurtosis: 20.04)
Brazil Equity Returns Histogram
Normal Distribution
Density
0
10
20
30
−0.100
−0.075
−0.050
−0.025
0.000
0.025
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0.100

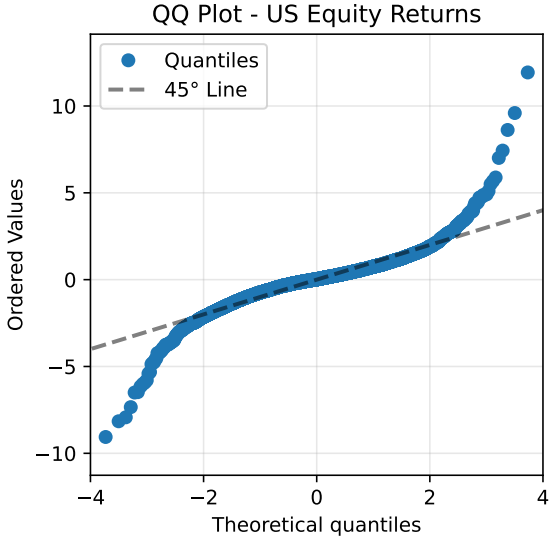
Extreme Days

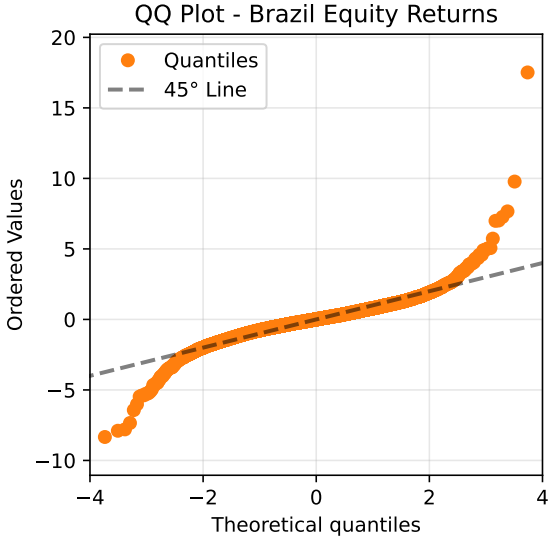
Table 2: Percentage of days with absolute returns greater than the threshold

Threshold	US (Obs.)	Brazil (Obs.)	Gaussian Benchmark
1 σ	21.16	21.96	31.73
2 σ	4.73	4.21	4.55
3 σ	1.46	1.32	0.27
4 σ	0.6	0.61	0.01
5 σ	0.29	0.31	0

- Quiet days are more frequent than predicted by normal distribution;
- Extreme days are way more frequent than predicted by normal distribution;
- How can that be possible?

QQ Plots - Fat Tails





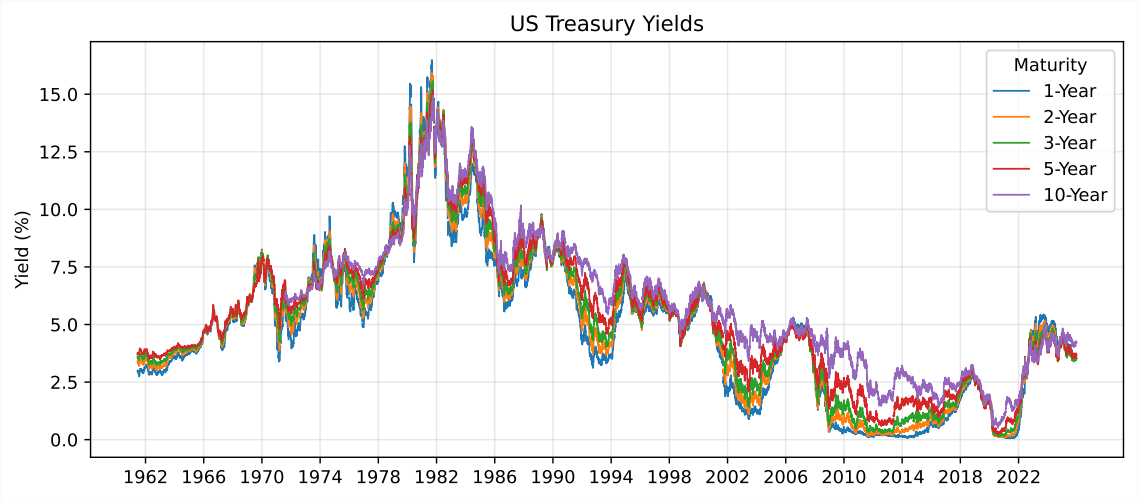
Yield Curves

- The yield on a bond is the constant interest rate that makes the present value of the bond's cash flows equal to its price;
- For a zero-coupon bond at time t with face value F paid at $t+n$:

$$y_t^{(n)} \equiv -\frac{1}{n}\log\left(\frac{P_t^{(n)}}{F}\right) = \frac{1}{n}\log\left(\frac{F}{P_t^{(n)}}\right)$$

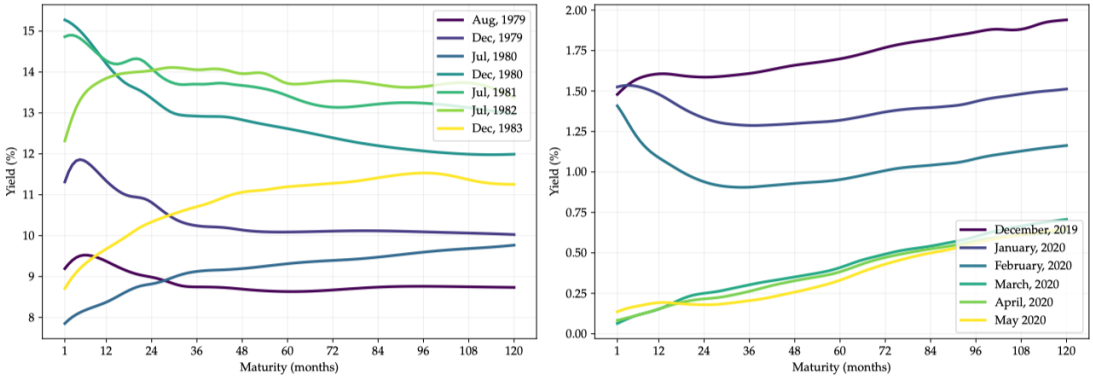
- Different bonds with different maturities have different yields;
- Two central types of bonds: government bonds (issued by the government) and corporate bonds (issued by firms);

Secular Decline of Interest Rates



And Yet It Moves

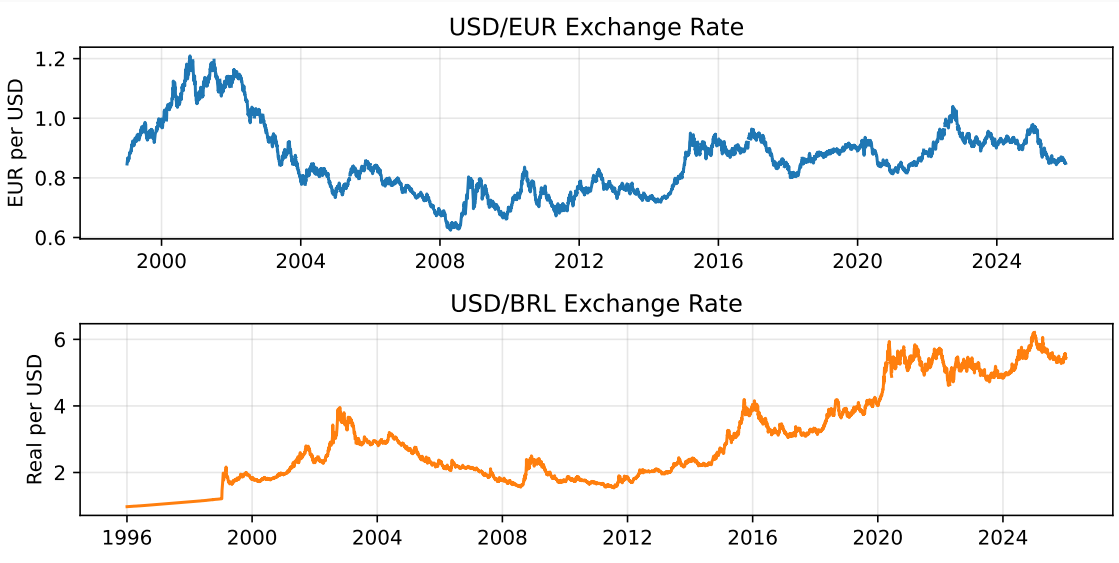
Figure 3: End-of-month yield curves at different salient moments: great inflation and early Volcker years (left) and late 2019/early 2020 close to the coronavirus pandemic (right). All yields are annualized.



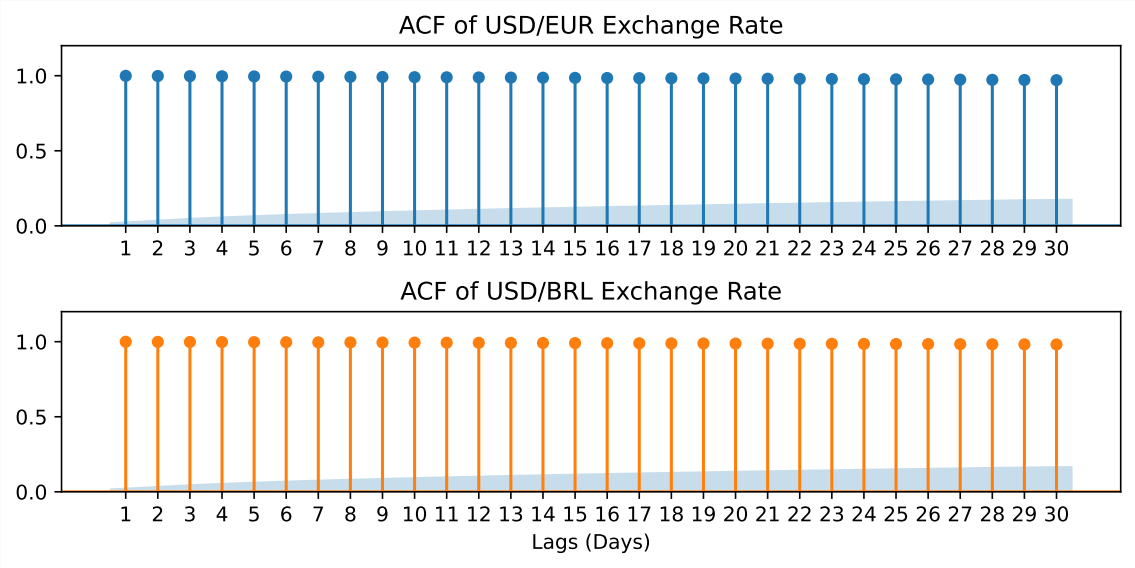
Different Shapes - Click on Links

- The 3D American Yield Curve from New York Times;
- Another cool visualization from Dow Jones;
- The 3D Brazilian Yield Curve from Werley Cordeiro;

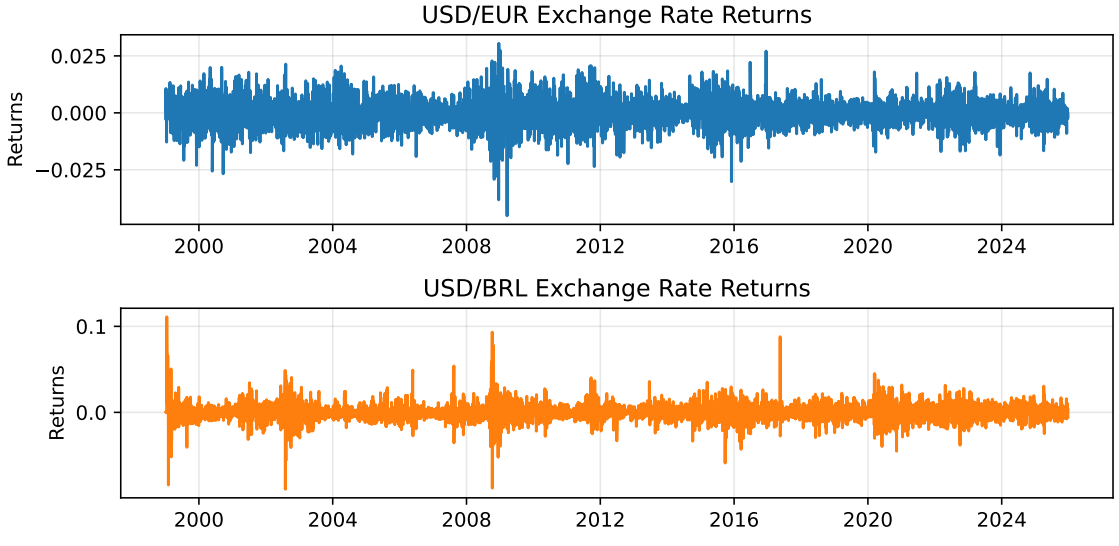
Exchange Rates



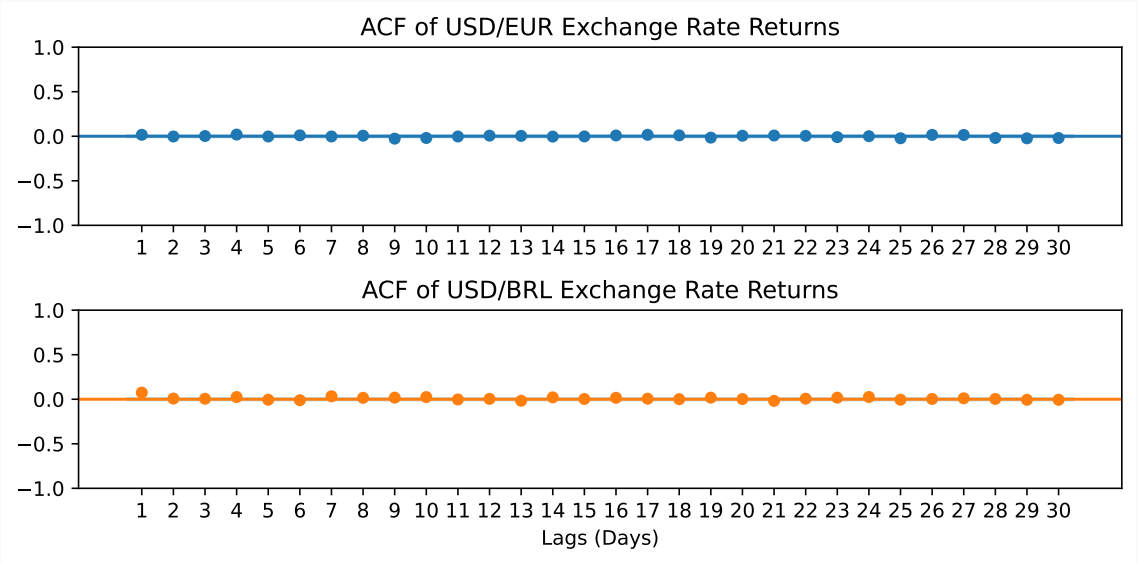
ACF of Daily Exchange Rates



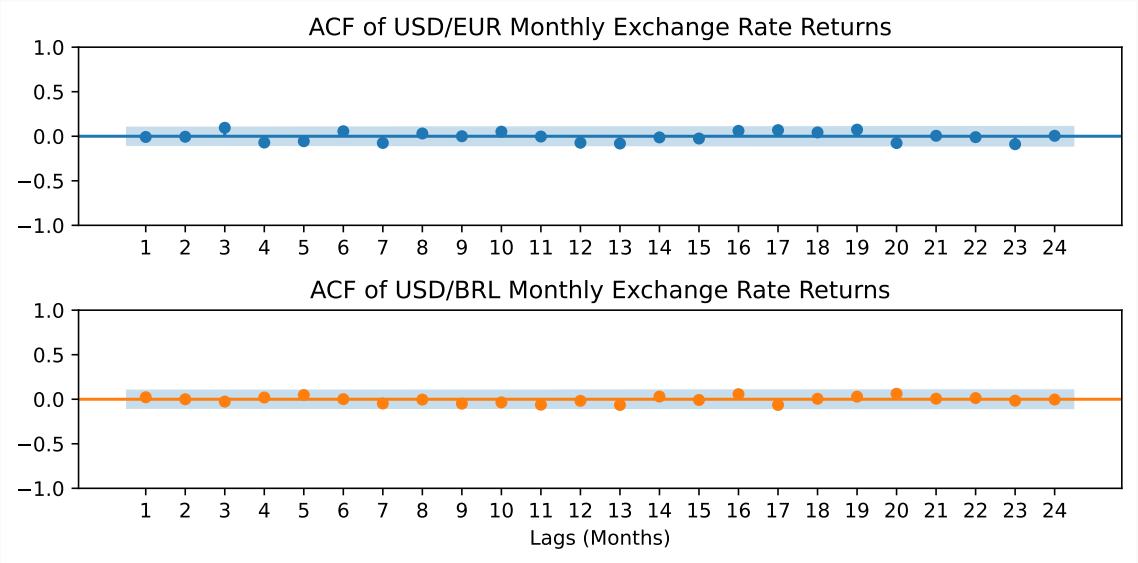
Exchange Rate Percentage Changes



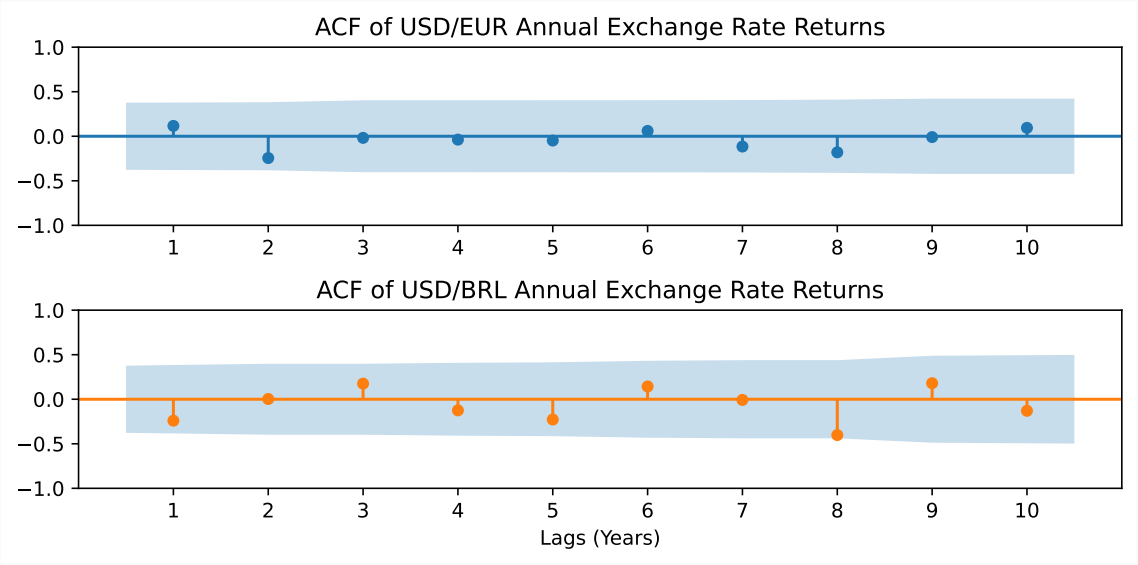
Daily Exchange Rate Movements Are Not Persistent



Monthly Exchange Rate Movements Are Not Persistent Either



Annual Exchange Rate Movements Are Somewhat Persistent



Are Exchange Rates Integrated?

Table 3: AR(1) estimation results for daily exchange rates

	USD/EUR	USD/BRL
AR(1) Coefficient	0.9989	0.9997
NW Standard Error	0.0008	0.0004
R^2	0.9979	0.9993

Table 4: ADF test results for daily exchange rates

	USD/EUR	USD/BRL
ADF p-value (no trend)	0.3766	0.9059
ADF p-value (with trend)	0.692	0.8055

Wrap-Up

- Returns seem to be stationary. Levels are not;
- Volatility is persistent, and apparently it is time-varying;
- Returns have fat tails, with more extreme events than predicted by normal distribution;
- Interest rates have been declining for decades, but they still move a lot;
- Exchange rates are very persistent and consistent with a random walk;

The big questions:

- Where does all of that come from?
- Where do prices come from in the first place?

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Stay tuned for more fun!

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