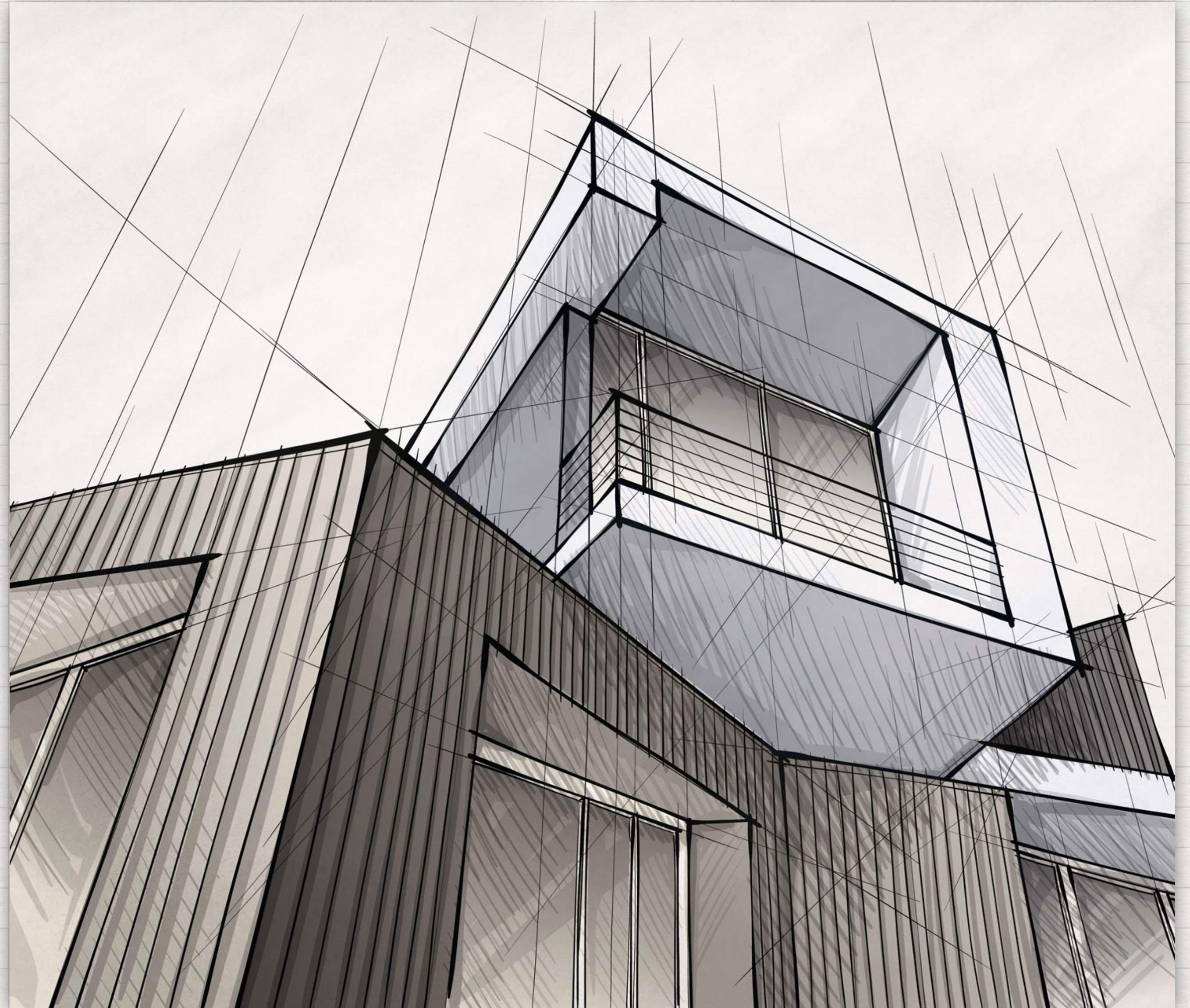


CS 007: SESSION 9

PERSONAL FINANCE FOR ENGINEERS



CS 007

REAL ESTATE



WHY DOES REAL ESTATE MATTER?

- People need a place to live
- The largest financial commitment that most households in the US make.
- It has a complicated & arcane purchase process
- For many it is the largest portion of their net worth.
- Significant portion of national (and international) wealth.



BUYING REAL ESTATE

why & how

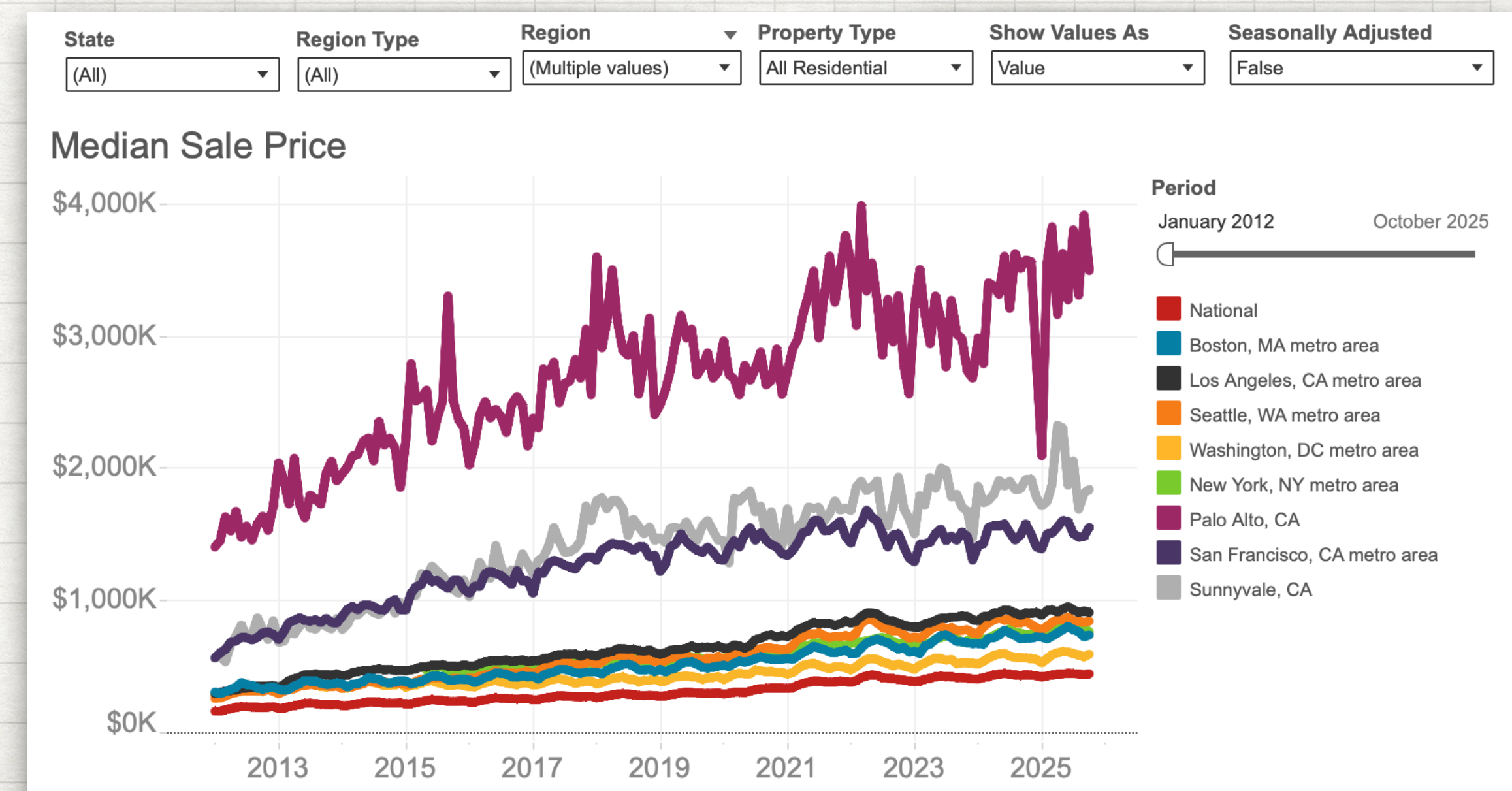
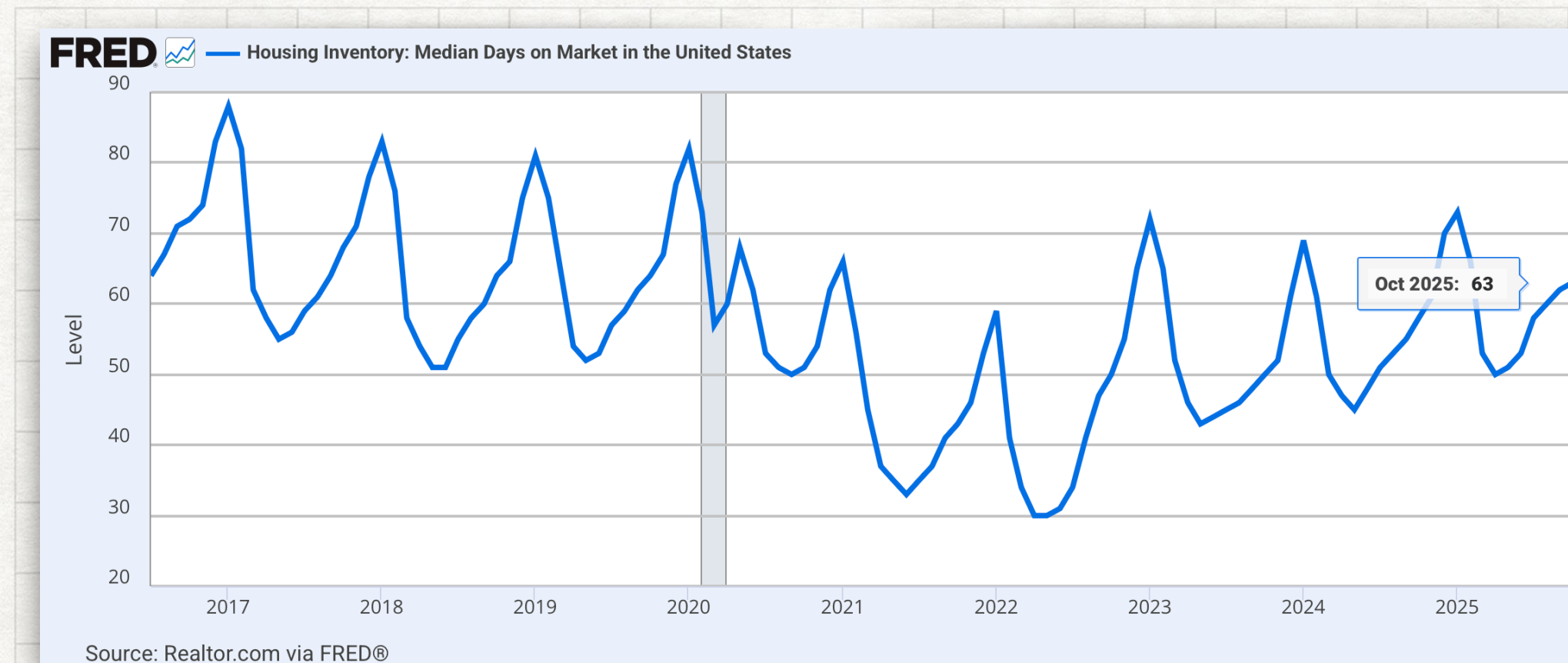
WHY DO PEOPLE BUY (VS. RENT) REAL ESTATE?

- Need a place to live
- They are looking for control over where they live for a long period of time.
- They have an emotional attachment to the idea of owning a place to live.
- They believe it is a good investment



HOW IS REAL ESTATE BOUGHT & SOLD?

- Typically a brokered transaction. US standard is 6% of the sales price is split between real estate agents.
- As of Oct 2025, the median home took 63 days to sell, up 46% from 43 days in Oct 2021.
- Significant costs involved, for both buyer & seller.
- Significant due diligence is required by all parties.
- Heavily regulated process.



* <https://fred.stlouisfed.org/series/MEDDAYONMARUS>

* <https://www.redfin.com/blog/data-center>

WHAT ARE THE IMMEDIATE COSTS FOR BUYERS?

Direct Costs

- **Down payment.** Typically 20% of the total purchase price. Otherwise, often need mortgage insurance.
- **Closing costs.** Average of 2-5% closing costs for buyers in the US (\$3,700)*

Implicit Costs

- **Opportunity cost.** There are alternate uses for that capital, for example, in a long-term diversified portfolio.
- **Liquidity cost.** Very difficult / expensive to access that capital once locked in.



* <https://www.zillow.com/mortgage-learning/closing-costs/>

WHAT ARE THE ONGOING COSTS FOR BUYERS?

- **Property Tax.** Varies by state / locality, typically ~1% of property value per yr.
- **Home Insurance.** Average of ~\$1000 per year in the US, varies with value of the home.
- **Mortgage.** While some of the payment is principal, interest is a significant expense.
- **Home Owners Association (HOA).** If a condo / community, a monthly payment for common services that can rise annually.
- **Maintenance.** Owners can easily spend 1% of the value of the house every year.



HOW DO YOU GET A MORTGAGE?

- Most banks base mortgage qualification on two factors.
 - Do you have access to the down payment? (assets)
 - Will your income cover the expected monthly expenses associated with a house (liabilities & income)
- Debt / income ratio of 43% is limit in the US for a qualified mortgage (higher in some parts of the country)
- Fixed vs. Adjustable Rate (ARM)
30-Year Fixed or 5/1 ARM
- Closing costs vs. interest rate
- 14 day period to shop to minimize impact to credit score, which can be significant.



RENTING

benefits & costs

WHY DO PEOPLE RENT (VS. BUY) REAL ESTATE?

- Need a **place to live**
- They are looking for **flexibility** in where they live.
- They have an **emotional fear** of the idea of committing to a long term location and/or large financial commitment.
- They lack the **financial resources** to purchase.
- Financial management of **cash flow** is much simpler.



WHAT DO YOU NEED TO RENT REAL ESTATE?

- Find a landlord with a property that meets your needs and is available for rent.
- Damage deposit, often equal to one month's rent.
- In some cases, 1-2 months rent up front.
- Landlords can require application process, credit score, references, criminal records, financials.
- Legal rights for tenants vary significantly by state & locality.
- Landlords must apply application standards uniformly without bias or discrimination.



WHAT ARE THE MAJOR COSTS FOR RENTERS?

Immediate Costs

- Application Fee
- Security Deposit. Typically 1-2 months of rent.
- First Month's Rent.
- Moving Costs.

Ongoing Costs

- Utilities. Electricity, Gas, Water, Cable.
- Renters Insurance. ~\$150 per year in US.
- Parking. In urban areas, there can be a separate charge.
- Yard Maintenance.
- Rent increases. Can vary unpredictably.



BUY VS. RENT

one of largest financial decisions

BIG DECISION, STRONG EMOTIONS

- Significant **non-financial** considerations.
- High transaction costs mean purchasing real estate is very risky over short periods of time.
- Fixed location can significantly limit career opportunities.
- Social connection of community & schools significant.
- For most people, it's the largest investment in their lifetime.
- Some people have strong political beliefs about renting vs. buying.



FINANCIAL BENEFITS OF RENTING

- **Liquidity.** Your capital is not tied up in a large down payment, and you are not forced to make large principal payments.
- **Location Flexibility.** You have significant flexibility to move to a new location as needed.
- **Diversification.** Concentrating most of your wealth in one asset has a number of concentrated risks.
- **Avoid Geographical Market Risk.** Buying a home in Silicon Valley turned out great in the past 50 years. Detroit didn't. Hard to predict the future.
- **Maintenance.** Most costs tied to the ownership of the property are pushed to the owner. No need to plan for large expenses (e.g. new roof)
- **Competitive Market.** In most cases, rents move with wage inflation. Ideally, you have competition between landlords in terms of quality & price.



FINANCIAL BENEFITS OF OWNING

- **Leveraged Investment.** Most of the investment is made with an inexpensive loan, with leverage of 5x (or more). Gains accrue to the owner, not the bank.
- **Tax Advantages.** Mortgage interest & property taxes are deductible. Capital improvements are included in the cost basis of the home.
- **Long term investment.** Real estate has, on average, had a positive return above inflation with relatively low volatility compared to other asset classes.
- **Financial Control.** Owners can control what investments they make in the property, and at what price, to increase long term return. (e.g. remodel a kitchen)
- **Optional Additional Income.** In many cases, there is a long term option to rent the property. Rental income rises with inflation.



RENT VS. BUY: EXAMPLE (MONTHLY COSTS)

2 BEDROOM APARTMENT IN MOUNTAIN VIEW 2025 (1099 SQ FT)

RENT

- Rent: \$5,900 / mo
- Renter's Ins: \$30 / mo

BUY

- Purchase Price: \$1.4M
- Down Payment: \$280K
- Mortgage: \$1.12M @ 5.375%
- Marginal Tax Rate: 44.3%

Monthly Costs (Before Tax)		Monthly Costs (After Tax)	
Mortgage Payment	\$ 6,271.68	Mortgage Payment	\$ 4,783.47
Property Tax	\$ 1,166.67	Property Tax	\$ 649.83
HOA Fee	\$ 300.00	HOA Fee	\$ 300.00
Homeowner Ins	\$ 125.00	Homeowner Ins	\$ 125.00
Maintenance	\$ 1,166.67	Maintenance	\$ 1,166.67
		Principal	(\$1,255.01)
Total	\$ 9,030.01		\$ 5,769.96

NOTE: DEDUCTIBILITY OF MORTGAGE
INTEREST & PROPERTY TAX MATTERS

* Mortgage interest is based off the first month's payment, and will decrease every month. Assumes 1% per year for maintenance, and cap of \$750K for mortgage interest deducibility.

RENT VS. BUY: EXAMPLE (LONG TERM VALUE)

NO ONE SHOULD EXPECT PALO ALTO REAL ESTATE TO BE THE NORM

- **Opportunity Cost.** Need to example what your return would have been on down payment if invested separately.
- **Long Term Costs.** There are significant investments that must be made periodically.
- **Transaction Costs.** Selling the property typically has costs of 6-8%.
- **Mortgage Drop Off.** Paid over time, potential interest rate risk if you don't get a 30 year loan.
- **Capital Gain.** Need to project likely sale price, which has significant uncertainty.



WHY DOES REAL ESTATE CREATE WEALTH FOR MOST PEOPLE?

- **Forced savings**
 - Down payment is locked away, cannot easily be spent.
 - Principal payments in mortgage are a form of forced savings.
 - Both amounts are significant relative to most buyers income.
- **Leveraged Investment.** Most of the investment is made with an inexpensive loan, with leverage of 5x (or more). Gains accrue to the owner, not the bank.
- **Positive long term investment.** Over the past 7 decades, real estate has had a positive return over inflation.
- **Long time frames.** The holding period for most investors is fairly short. People own homes for longer periods, on average, giving more time for value to compound.



INVESTING IN REAL ESTATE

historical data, approaches, pros & cons

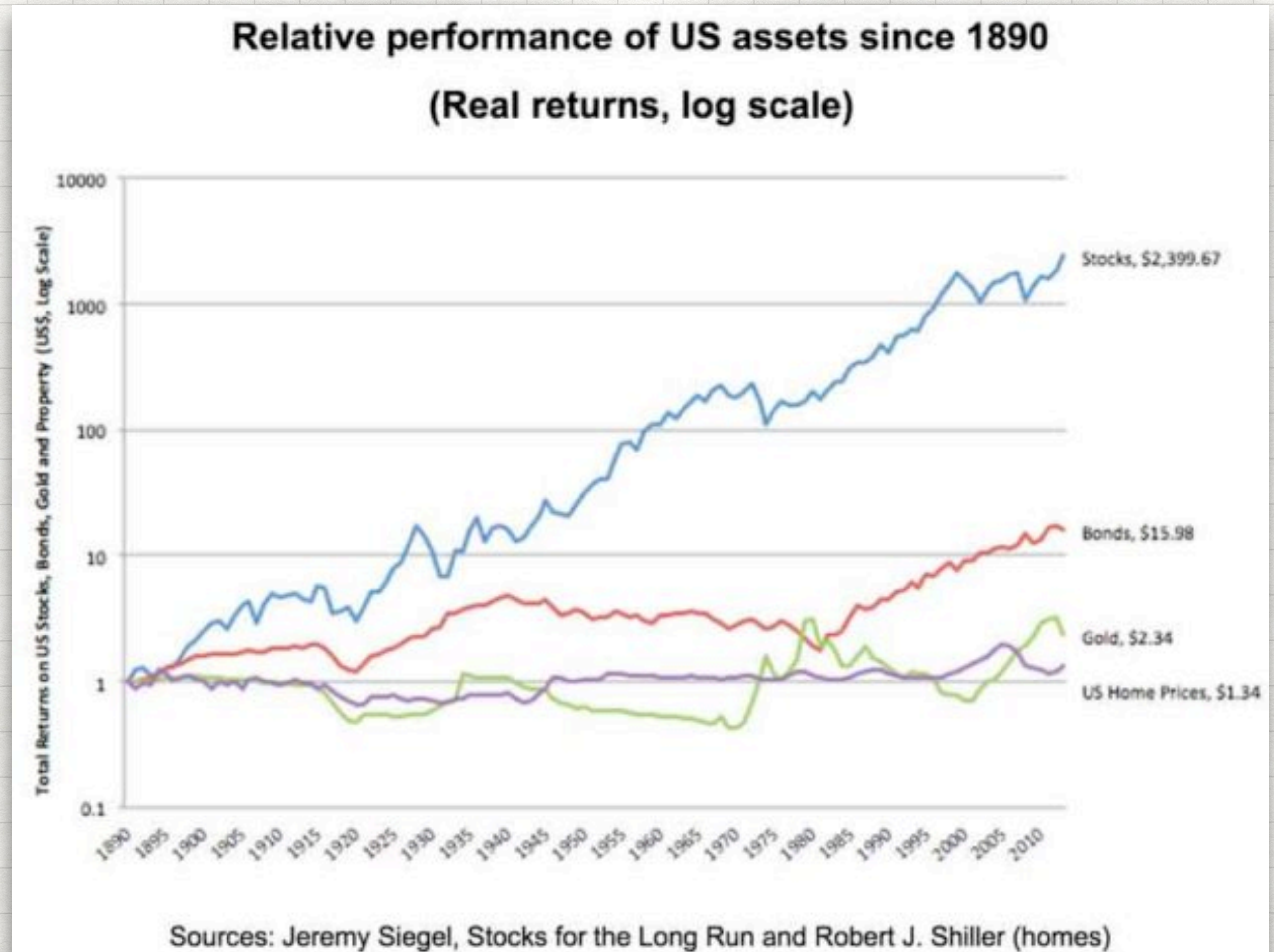
REAL ESTATE

- Real estate is a combination of land & facilities that occupy that land.
- Investment real estate typically excludes your primary residence.
- Returns based both on rental income & capital appreciation.
- Real Estate Investment Trusts (REITs) trade on the public markets.



COMMON WAYS TO INVEST

- With over 100 years of data, price trends on different asset classes are fairly clear.
- Real return is return net of inflation, which measures how money devalues over time. (in this chart, dollars)
- Stocks have the highest annualized return over long time periods, but also higher volatility.
- ... but are US Home Prices the best metric for real estate?



HISTORY OF REAL ESTATE VS. OTHER ASSET CLASSES

- Still significant debate in financial community, based on different time periods, geographies & sub-sectors of real estate.
- Return is based on both **capital appreciation** and **value from rent**.
- Based on recent paper (still actively debated), global real estate seems to have offered real returns comparable to equities, with lower volatility. US numbers appear lower than equities, but above bills & bonds.
- REITs seem to confirm this, as 1970-2015 return from US REITs is comparable to US Equities (less tax efficient, however)
- **Remember:** averages don't necessarily describe what any single investment will do!

<https://www.frbsf.org/economic-research/files/wp2017-25.pdf>

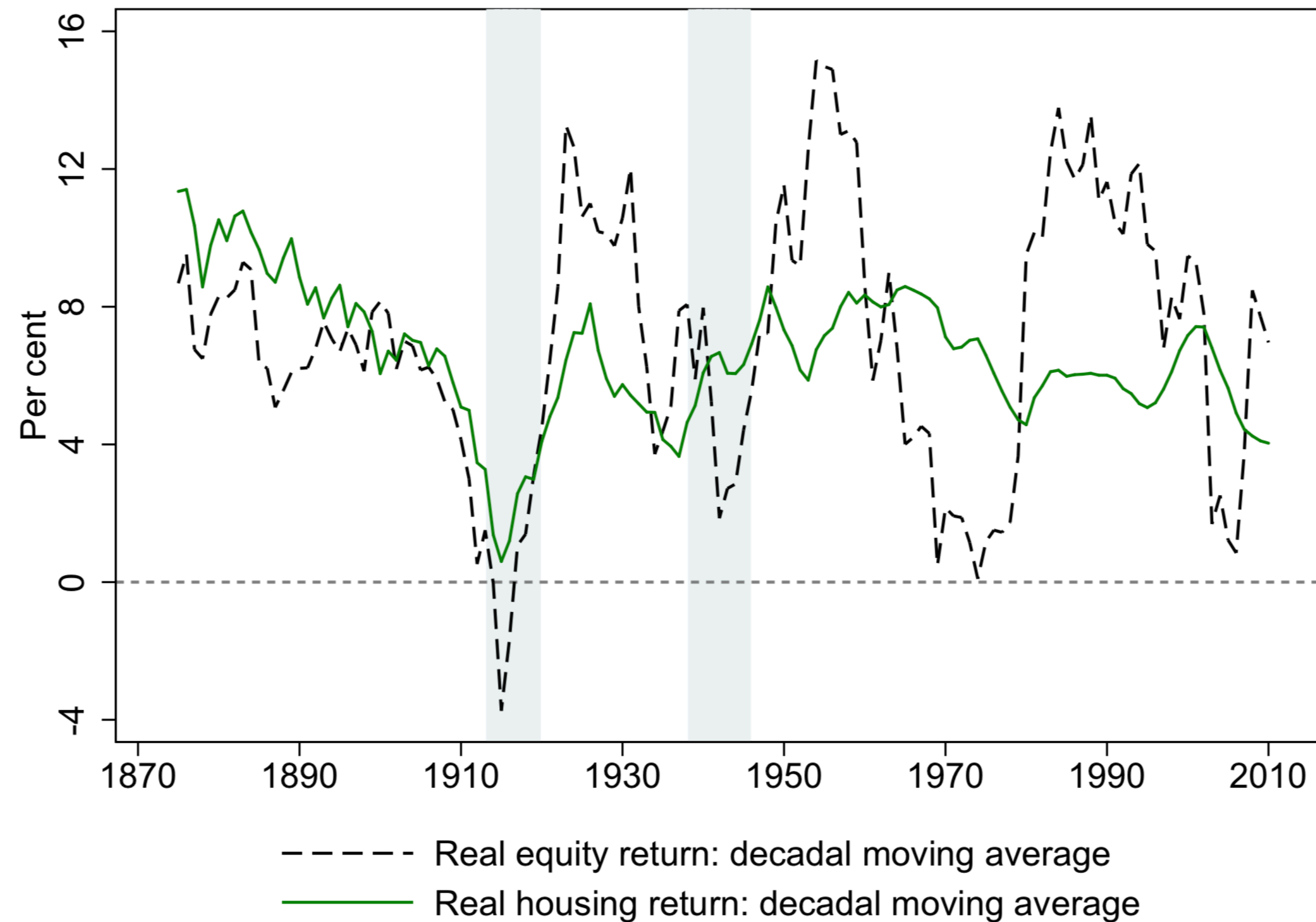
<https://www.investopedia.com/ask/answers/060415/what-average-annual-return-typical-long-term-investment-real-estate-sector.asp>

	Real returns				Nominal Returns			
	Bills	Bonds	Equity	Housing	Bills	Bonds	Equity	Housing
<i>Full sample:</i>								
Mean return p.a.	0.98	2.50	6.89	7.05	4.60	6.10	10.75	11.06
Std.dev.	6.01	10.74	21.94	9.98	3.33	8.91	22.78	10.70
Geometric mean	0.78	1.94	4.64	6.61	4.55	5.74	8.55	10.59
Mean excess return p.a.	.	1.53	5.91	6.07				
Std.dev.	.	8.38	21.43	9.86				
Geometric mean	.	1.19	3.81	5.64				
Observations	1739	1739	1739	1739	1739	1739	1739	1739
<i>Post-1950:</i>								
Mean return p.a.	0.87	2.77	8.28	7.44	5.40	7.31	12.99	12.31
Std.dev.	3.43	9.94	24.20	8.88	4.04	9.80	25.09	10.15
Geometric mean	0.81	2.30	5.54	7.10	5.33	6.89	10.28	11.90
Mean excess return p.a.	.	1.91	7.41	6.57				
Std.dev.	.	9.20	23.77	9.19				
Geometric mean	.	1.51	4.79	6.21				
Observations	1016	1016	1016	1016	1016	1016	1016	1016

Note: Annual global returns in 16 countries, equally weighted. Period coverage differs across countries. Consistent coverage within countries. Excess returns are computed relative to bills.

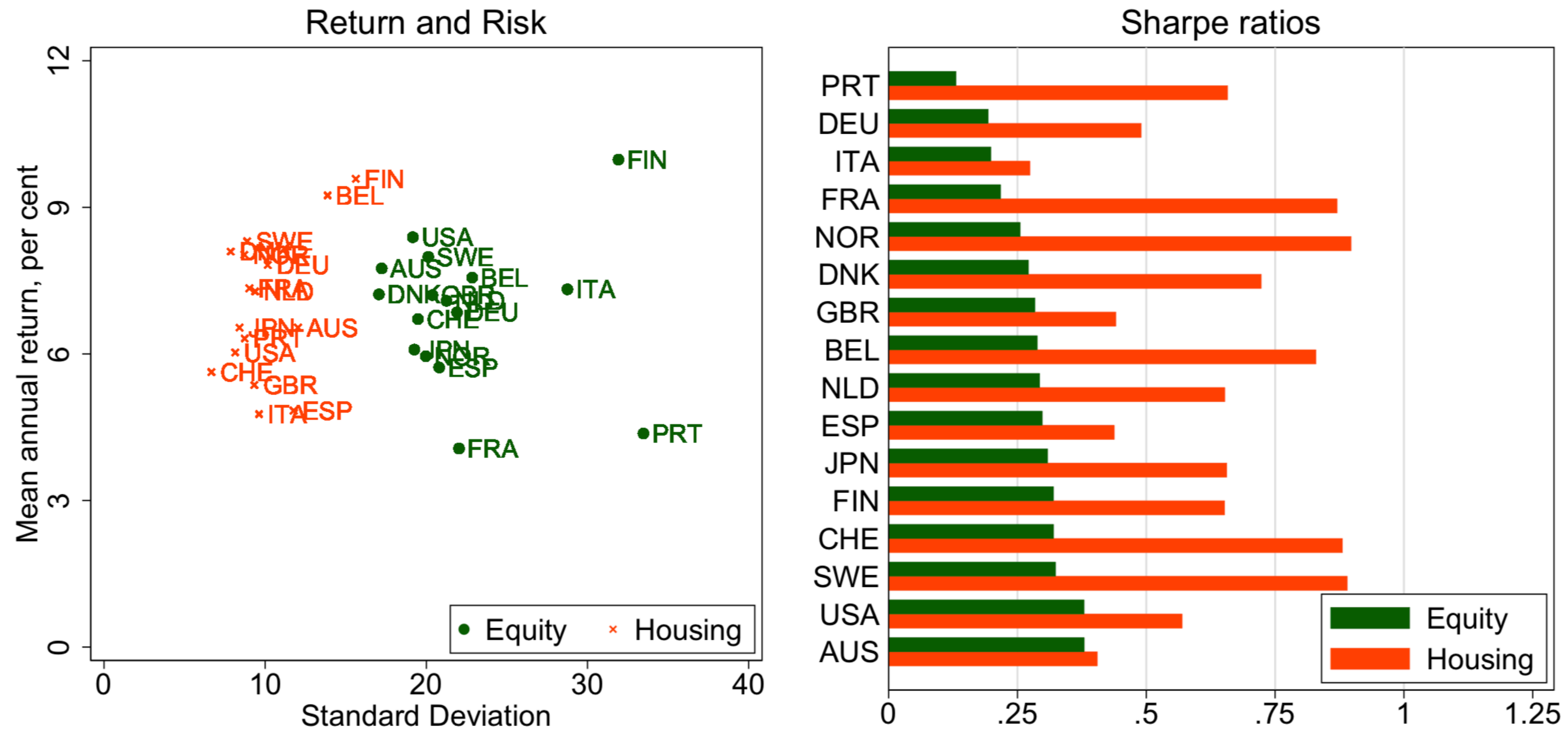
REAL RETURN OF EQUITIES VS. HOUSING (BY DECADE)

Figure 6: *Trends in real returns on equity and housing*



RISK / RETURN OF EQUITIES VS. HOUSING

Figure 8: *Risk and return of equity and housing*



RENTAL PROPERTIES

rationale, financial costs & benefits

WHAT IS A RENTAL PROPERTY?

- Any property owned with the purpose of leasing to a tenant for income.
- Wide variety of units, ranging from single family homes to apartments.
- Can be residential or commercial properties.



FINANCIAL DETAILS FOR RENTAL PROPERTIES

- Purchasing a rental property is similar to purchasing a property for occupancy.
- Mortgage qualification is different, and typically results in higher rates.
- Tax treatment is more like a business (depreciation, income, expenses)
- **Capitalization Rate:** Rate of return of income vs. market value

$$\text{cap rate} = \text{income} / \text{market value}$$



WHY DO PEOPLE LOVE RENTAL PROPERTIES?

- People are often very emotional about the benefits of owning rental properties.
- Most fixed costs for real estate are up front, while rental income grows with inflation over time.
- The process of paying off the mortgage can leave an asset that generates inflation-adjusted income.
- It typically evolves organically from owning property.
- Most people have direct experience with both the costs of ownership & the process of renting.
- Many people feel like it is more transparent & tangible vs. financial assets / markets.
- It has some of the psychological benefits (and costs) of owning your own business.



PROBLEMS WITH RENTAL PROPERTIES

- **Time.** This is another job. Unpredictable & significant commitment at times.
- **Cash flow.** Very easy to make an investment that will be profitable long term, but cash flow negative in short term.
- **Occupancy.** Vacancy can be expensive & unpredictable.
- **People.** Managing ongoing relationship with tenants, finding new tenants, etc.
- **Legal Issues.** Significant regulations & requirements around tenant rights. Eviction can be extremely difficult & expensive.



REAL ESTATE TAX ADVANTAGES

REAL ESTATE HAS SIGNIFICANT TAX ADVANTAGES

- **Primary Residence**
 - Mortgage Interest Deduction
 - Property Tax Deduction
 - \$250K Capital Gain Exclusion
- **Investment Properties**
 - Prop 13 (California)
 - Mortgage Interest
 - Property Tax
 - Depreciation
 - Expenses
- 1031 Exchanges
- Capital gains taxes only due on sale
- Step Up Cost Basis for Heirs



CS 007

QUESTIONS



WEEK 10: PEOPLE'S CHOICE

- Student Selected Topics
- Final Thoughts
- CS 007 Alumni

