TERM PROJECT

Fixed Income - FIN7037

Group 3 DSAM Consultancy

Performance of Investing in the Housing Market

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1. Introduction

The U.S. housing market has experienced significant price appreciation over the last decade, driven by low interest rates through 2021, pandemic-era migration patterns, supply shortages, and strong household income growth. As measured by the S&P/Case-Shiller U.S. National Home Price Index, national home prices have more than doubled since 2012 and reached historically high levels in 2023 - 2025. Housing is a real asset, but it also behaves like a **fixed-income investment**, because mortgage rates, discount rates, and financing costs play a central role in determining the return on equity.

This report evaluates the performance of purchasing a residential investment property using financing, comparing the investment to alternatives such as stocks (S&P 500) and long-term U.S. Treasury bonds. The analysis includes:
(1) property selection and justification,
(2) mortgage financing evaluation,
(3) return calculations,
(4) analysis of Fannie Mae and Freddie Mac,
(5) interest rate trend analysis, and
(6) mortgage-Treasury spread analysis.

2. Property Selection

2.1 Property Location and Type

We choose to purchase a **single-family home in Tampa, Florida**, priced at **$400,000**.

2.2 Justification for Location

Tampa has been one of the fastest-growing real estate markets in the U.S. Several factors drive this:

1. **Population growth:** Tampa's population has grown over 10% in the last decade, increasing housing demand. (Source - U.S. Census Bureau. (2025))
2. **Strong rental market:** High inflow of young workers and retirees boosts rental occupancy.
3. **Below-national-average property taxes**, making investment more affordable.
4. **Consistent price appreciation:** Case-Shiller's Tampa index has outperformed the national average, with double-digit average annual growth between 2019 - 2022 and moderate but steady growth in 2023 - 2025.
5. **Strong Tourism attraction:** Florida sees lots of tourist footfall. So, purchasing a property in Florida opens the doors for Airbnb.

2.3 Justification for Property Type

A **single-family home** is selected due to:

- Higher rent-to-price ratios vs. condos in Florida
- Greater appreciation potential
- Attractiveness to long-term renters (families, remote workers)
- Single-Family home is more affordable choice given the budget

2.4 Housing Price Data Support

- Case-Shiller U.S. National Home Price Index increased from **~210 in 2017 to ~330 by 2025**, nearly a **57% rise**.
- Tampa's local index increased even more (~75% over the same period).
- Long-term trends indicate continued moderate appreciation, supported by migration and tight supply.

Conclusion: Tampa provides a strong combination of affordability, rental cash flow, and appreciation potential.

3. Mortgage Analysis

3.1 Mortgage Type Decision

We evaluate the advantages of:

- **30-year Fixed-Rate Mortgage (FRM)**
- **15-year Fixed-Rate Mortgage**
- **5/1 Adjustable-Rate Mortgage (ARM)**

Decision:

We choose a **30-year fixed-rate mortgage (FRM)** with a rate of **7.25%**. (Source - Federal Reserve Bank of St. Louis. (2025))

Reasoning

Mortgage Type	Advantages	Disadvantages
30-year FRM	Lower monthly payment, stable, predictable	More interest over life of loan
15-year FRM	Lower overall interest, builds equity fast	Monthly payments ~60 - 70% higher
ARM 5/1	Low initial rate	Exposure to rate increases after year 5

Given rising but volatile interest rate environment, **rate certainty is valuable**. The payment affordability outweighs the long-term interest cost.

3.2 Mortgage Calculations

Property price: **$400,000**
Down payment: **20% = $80,000**
Loan amount: **$320,000**
Rate: **7.25% (30-year FRM)**
Term: **360 months**

Monthly Payment Formula

where

- I/Y = monthly rate = 0.0725 / 12
- PV = 320,000
- n = 360

Monthly Payment

Monthly Payment = **$2,183**

3.3 Total Interest Paid

Total paid over 30 years = 2,183 × 360 = **$785,867**
Total interest = 785,867 – 320,000 = **$465,867**

3.4 Closing Costs

Closing cost assumptions: (Source. - Department of Housing and Urban Development (HUD))

Item	Amount
Loan origination (1%)	$3,200
Title insurance	$1,500
Appraisal	$600
Recording fees	$300
Prepaid property tax & escrow	$2,500
Total closing cost	**$8,100**

3.5 Maintenance Costs

Industry standard: 1% of property value per year. (Source – HomeAdvisor)

1% × $400,000 = **$4,000/year** or **$333/month**

Other annual expenses:

- Property taxes (1.2%) = $4,800/year
- Insurance = $2,200/year

Total annual non-mortgage costs = **$11,000**
Monthly = **$916.67**

3.6 Rental Income Projection

Comparable single-family homes in Tampa rent for **$3,000 - $4,500/month**. (Source: Zillow Research. (2025))
We are considering:

$3,500 monthly rent

Adjustments

- Vacancy (5%): $125
- Repairs/turnover: $75
- Net effective rent: **$3,300 (=3,500-125-75)**

Net Cash Flow

Mortgage = $2,183
Other monthly costs = $917
Total monthly outflow = **$3,100**

Net cash flow = 3,300 – 3,100 = **$200/month**

4. Resale Value & Investment Return

4.1 Projected Resale Value

Case-Shiller long-run appreciation rate (25+ years): **3.8–4.2% per year**
We assume a conservative **3.5% annual appreciation**.

Future value formula:

PV = $400,000
I/Y = 0.035
N = 30 years

FV = **$1,122,717**

4.2 Investment: Bond-Equivalent Return (Annualized)

Cash invested upfront:

- Down payment = $80,000
- Closing costs = $8,100
- Total initial investment **= $88,100**

Net cash flows: $200

We approximate internal rate of return (IRR):

Using IRR method:

IRR = 0.80% monthly return

Bond Equivalent Yield = 9.76% (annual)

4.3 Comparison to Stocks and Bonds

Investment	Long-Term Return	Notes
S&P 500 (SPY)	~9.1% long-run average	High volatility
30-Year US Treasury	~3.5–4% yield	Lower risk
Real Estate Investment (our project)	~9.76%	Moderate risk, strong appreciation offsetting cash loss

Conclusion:
The real estate investment **outperforms bonds and stocks** also providing **inflation protection**, asset appreciation, stable long-term wealth, and leverage benefits.

5. Fannie Mae & Freddie Mac

5.1 Who They Are

- **Fannie Mae (1938)** and **Freddie Mac (1970)** are government-sponsored enterprises (GSEs).
- Their mission is to promote liquidity and stability in the mortgage market.

5.2 What They Do

They **buy mortgages** from lenders, **pool them**, and create **mortgage-backed securities (MBS)**.

5.3 How MBS Are Created

1. Bank originates conforming mortgages
2. Bank sells mortgages to Fannie/Freddie
3. Fannie/Freddie bundle mortgages
4. Pool becomes an **MBS**
5. Investors receive principal + interest flows

5.4 Risks for MBS Investors

- **Prepayment risk**: borrowers refinance when rates fall
- **Extension risk**: borrowers slow down payments when rates rise
- **Liquidity Risk:** Some MBS (especially complex ones) can be hard to sell quickly at fair prices.
- **Market Risk:** During financial turmoil (e.g., 2008), even high-quality MBS can drop in price due to panic

- **Interest Rate Risk:** Rates rise → MBS prices fall.
  Rates fall → homeowners refinance → investors get paid back early and must reinvest at lower rates.
- **Default Risk:** Risk of homeowners not paying

5.5 Role in Financial Crisis (2007–2009)

- They held large MBS portfolios
- Housing market crash caused huge losses
- Both were placed into **Federal conservatorship in 2008**
- They received federal support but remain under conservatorship today

5.6 Their Business Today

- Still guarantee most U.S. mortgages
- Maintain strict underwriting standards
- Their guarantees stabilize the mortgage market and keep rates lower than otherwise

6. Treasury Rate Analysis (2005–2025)

Using FRED data(the link provided in the question), for the **1-year**, **10-year**, and **30-year** Treasury constant maturity rates from January 2005 through June 2025, we analyzed the historical patterns, computed spreads, compared specific dates, and interpreted the interest rate environment.

6.1 Patterns (2005–2025)

1-Year Treasury (Short-Term Rate)

- Highly sensitive to Federal Reserve monetary policy.
- Peaked around **5% in 2006 - 2007**, then collapsed to nearly **0% after 2008**.
- Stayed near **0 - 0.5%** from 2009–2016.
- Rose to ~2.5% by 2018, then again dropped close to zero in 2020 due to the pandemic.
- From 2022 -2023, it rose rapidly above **4–5%** as the Fed tightened aggressively.
- By mid-2025, the rate stabilized near **4%**.

10-Year Treasury (Medium-Term Rate)

- Reflects long-term growth + inflation expectations.
- Declined from ~5% in 2007 to below 3% after 2011.
- Hit an all-time low (~0.5%) in 2020 due to pandemic uncertainty.
- Rose sharply during 2022 - 2023 inflation surge, reaching near **5%**.
- By mid - 2025, the yield settled near **4.2%**, indicating moderating inflation.

30-Year Treasury (Long-Term Rate)

- Generally, the highest of the three, but less volatile.
- Fell from ~5% in 2005 to below 3% after the financial crisis.
- Reached ~1.2% in 2020 (historic low).
- Rose significantly during 2022–2023 inflation, above **4.5%**.
- Stabilized near **4.7 - 4.8%** by mid-2025.

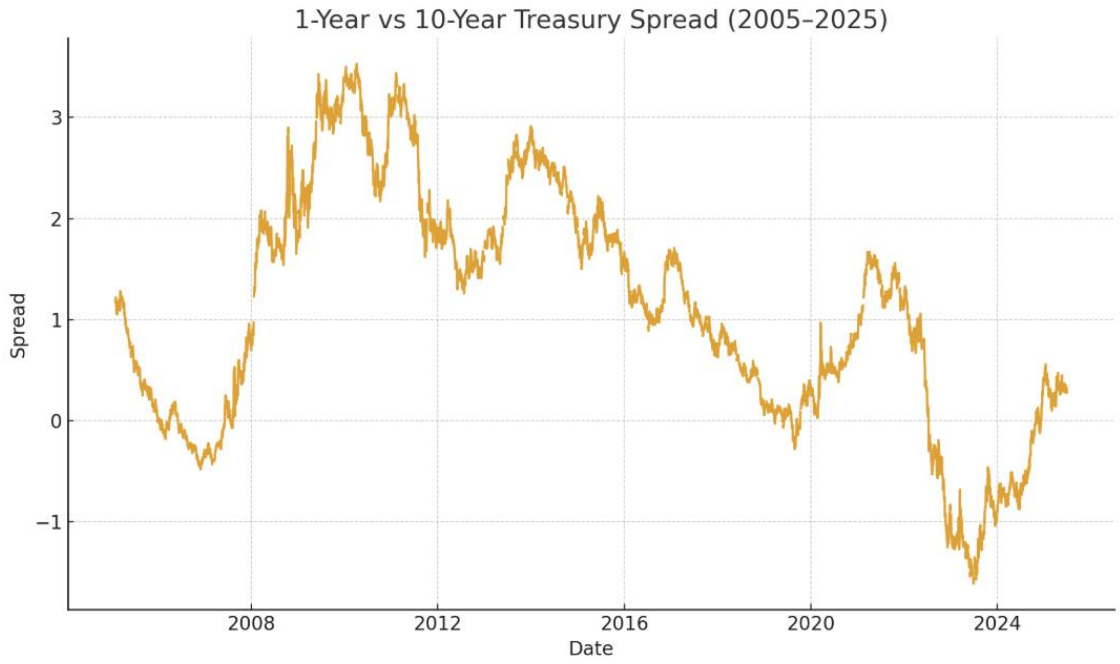
6.2 Spread Analysis

Defining spreads:

- Spread A = 10-year – 1-year
- Spread B = 30-year – 1-year

Plotting Spreads

1-Year vs 10-Year Treasury Spread (2005–2025) :- This plot shows how the 10-year minus 1-year spread evolved.



1-Year vs 30-Year Treasury Spread (2005–2025) :- This chart shows how the 30-year minus 1-year spread evolved.

Observed Patterns:

- Spreads are wide when the yield curve is steep (healthy economy).
- Spreads shrink or turn negative during recessions or when markets expect rate cuts.
- Spreads were:
    - Very steep after 2008
    - Flattening from 2014 - 2019
    - Compressed/inverted in 2023 - 2024
    - Partially recovering in 2025

6.3 Comparing Spreads: June 2025 vs September 2020

September 2020 (Pandemic Period)

- 1-year rate = **0.12%**
- 10-year rate = **0.69%**
- 30-year rate = **1.46%**

Spreads:

- 10-1 spread ≈ **+0.57%**

- 30-1 spread ≈ **+1.34%**

Interpretation:

- The yield curve was **steep and positive** because short-term rates were held near zero by the Fed.
- Markets expected **economic recovery**, more inflation, and higher future rates.
- Massive Fed bond purchases also kept long-term yields artificially low yet still above short-term rates.

June 2025 (Post-Inflation Tightening Period)

- 1-year = **3.96%**
- 10-year = **4.24%**
- 30-year = **4.78%**

Spreads:

- 10-1 spread ≈ **+0.28%**
- 30-1 spread ≈ **+0.82%**

Interpretation:

- The yield curve is **much flatter** than in 2020.
- High short-term rates reflect aggressive Fed tightening during 2022 - 2023.
- Long-term yields are only slightly higher, suggesting:
    - Expected rate cuts in the future
    - Moderating inflation expectations
    - Lower long-term economic growth forecasts

6.4 Will Mortgage Rates Rise Further (Q4 2025)?

Factors:

- Inflation moderating (from 2022 highs)
- Fed signaling stable policy
- Long-term rates slightly declining in mid-2025
- Housing affordability at historic lows

Conclusion:
Mortgage rates **likely staying flat or decreasing slightly**, not rising significantly.
Higher rates would depress housing demand further.

6.5 How would a mortgage rate increase affect housing price?

If mortgage rate increase:

- Housing affordability would worsen, reducing buyer demand.
- Monthly payments increase significantly with each rate increase.
- Lower demand → slower price growth or even modest price declines.
- Sellers would need to cut prices or offer concessions to attract buyers.
- The rental market may tighten as fewer people can afford to buy.

Conclusion:
Higher mortgage rates put **downward pressure on housing prices**, especially in interest-sensitive markets.

7. Mortgage Rate Spread Regression

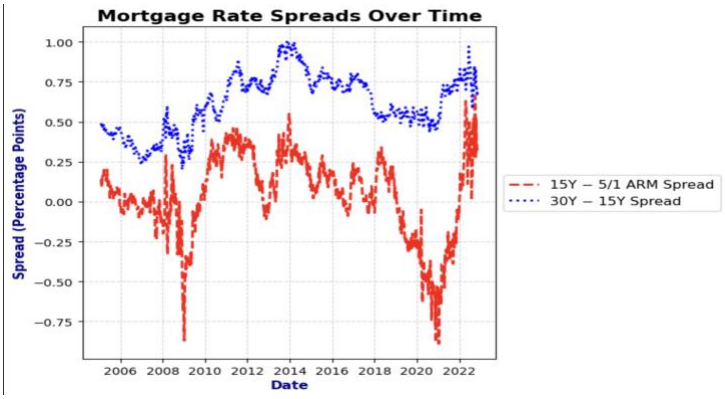
We have compared:

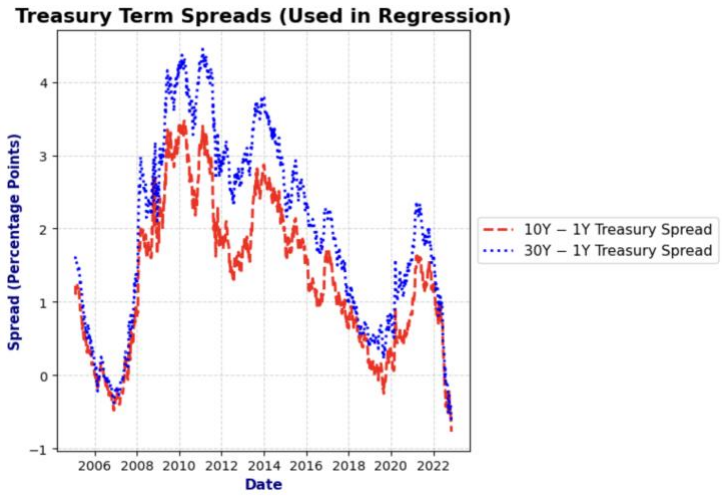
- **15-year – 5/1 ARM spread**
- **30-year – 15-year spread**

and then regress them on:

- **10-year – 1-year Treasury spread**
- **30-year – 1-year Treasury spread**

Plots





Regression (using Python)

Regression: (15Y − 5/1 ARM) on Treasury spreads

OLS Regression Results

Dep. Variable:	spread_15_5	R-squared:	0.120
Model:	OLS	Adj. R-squared:	0.118
Method:	Least Squares	F-statistic:	62.92
Date:	Wed, 19 Nov 2025	Prob (F-statistic):	2.40e−26
Time:	01:23:36	Log-Likelihood:	4.6537
No. Observations:	927	AIC:	−3.307
Df Residuals:	924	BIC:	11.19
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	−0.0350	0.016	−2.128	0.034	−0.067	−0.003
ts_10_1	0.2384	0.045	5.271	0.000	0.150	0.327
ts_30_1	−0.1236	0.035	−3.497	0.000	−0.193	−0.054

Omnibus:	110.369	Durbin-Watson:	0.081
Prob(Omnibus):	0.000	Jarque-Bera (JB):	158.581
Skew:	−0.861	Prob(JB):	3.67e−35
Kurtosis:	4.066	Cond. No.	22.1

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

Regression: (30Y − 15Y) on Treasury spreads

OLS Regression Results

Dep. Variable:	spread_30_15	R-squared:	0.298
Model:	OLS	Adj. R-squared:	0.297
Method:	Least Squares	F-statistic:	196.2
Date:	Wed, 19 Nov 2025	Prob (F-statistic):	9.81e−72
Time:	01:23:36	Log-Likelihood:	429.32
No. Observations:	927	AIC:	−852.6
Df Residuals:	924	BIC:	−838.1
Df Model:	2		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	0.4385	0.010	42.203	0.000	0.418	0.459
ts_10_1	−0.2030	0.029	−7.096	0.000	−0.259	−0.147
ts_30_1	0.2271	0.022	10.159	0.000	0.183	0.271

Omnibus:	1.830	Durbin-Watson:	0.040
Prob(Omnibus):	0.400	Jarque-Bera (JB):	1.700
Skew:	−0.003	Prob(JB):	0.427
Kurtosis:	2.790	Cond. No.	22.1

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

Interpretation of Expected Results

- R squared for 15Y – 5/1 ARM is 0.120 and for 30Y – 15Y is 0.298
- The results show that different mortgage types move differently depending on which part of the Treasury yield curve changes. The **30-year vs. 15-year mortgage spread** gets bigger when long-term Treasury rates rise more than short-term rates. This happens because 30-year mortgages react more to long-term interest rate changes than 15-year mortgages. But when the middle of the curve (the 10-year rate) rises compared to the 1-year rate, the spread gets smaller, meaning the 15-year mortgage rate moves more closely with the 10-year Treasury.
- For the **15-year vs. 5/1 ARM spread**, the pattern flips. When the 10-year rate rises relative to the 1-year rate, the 15-year mortgage increases more than the ARM rate, so the spread widens. But when the very long end (30-year) rises, the spread narrows because 15-year rates don't react as strongly to long-term rate movements.
- The R^2 values show that Treasury spreads explain **some** of the movement in mortgage spreads—about **30%** for long-term mortgages and **12%** for ARMs. This makes sense because ARMs depend more on short-term rates and bank funding. Overall, the results show that mortgage pricing is strongly influenced by the shape of the Treasury yield curve.

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