College of Continuing & Professional Studies
UNIVERSITY OF MINNESOTA

Bond Market Masterclass

Venue:

Osher Lifelong Learning Institute
U of M St. Paul Campus, Magrath Library

March 27, 2024

Instructor:

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Introduction

Purpose

Course discussion material is intended for general financial education only. Class discussion seeks to confirm and challenge your understanding of how financial markets work.

Important Notice

Course material has not been prepared as investment, tax, or legal advice, nor is not intended as a solicitation to buy or sell any securities.

Course attendees are reminded that:

- **Investing in bonds involves the risk of loss. Bonds are distinguished by type, quality and maturity. Some bonds are riskier than others.**
- **Risks in bond investing include default risk, interest rate risk, inflation risk, liquidity risk, early prepayment risk, and reinvestment risk.**
- **Publicly-offered corporate bonds are securities that must be registered with the Securities and Exchange Commission (SEC). The registration of corporate bonds can be verified using the SEC's EDGAR system. Be wary of any solicitation to buy non-registered corporate bonds.**

Use Limitations

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Agenda

Course Outline

1.	Bond Market Overview	10 min
2.	US Treasury Bonds	10 min
3.	Corporate Bonds	10 min
4.	The Basics of Bond Investing	10 min
5.	Active Investing in Bonds	15 min
6.	Passive Investing in Bonds	35 min
	A. Creating Structured Bond Ladders	

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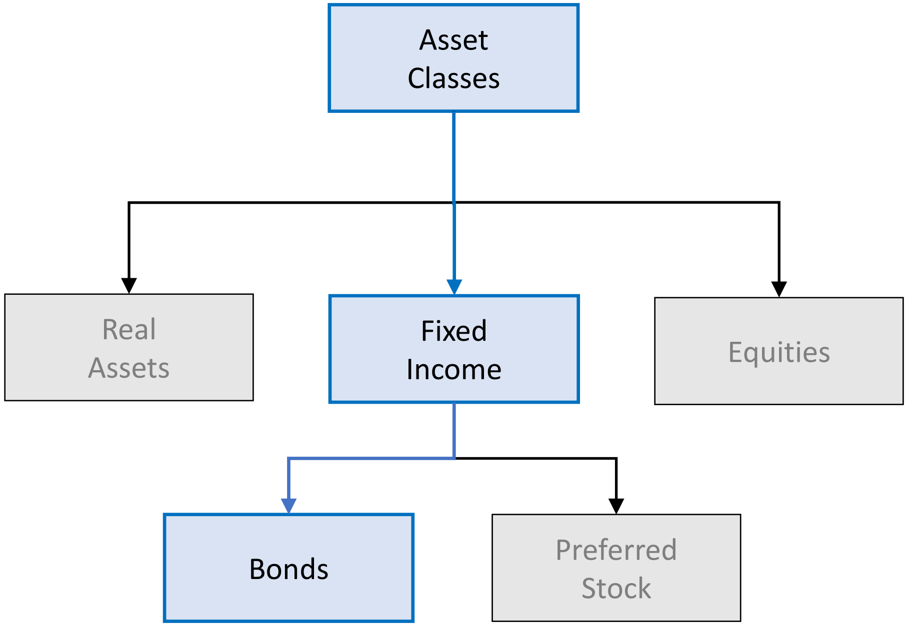
Part 1

Bond Market Overview

Asset Classes



Bonds as Store of Value

When held to maturity, bonds have little to no realized price risk.

For this reason, bonds are unique among risk assets and serve as *the* primary store of value.

Fiat currencies, gold, bitcoin, equities, and real estate also serve to store value. However, many question their role as stores of value given significant price or tail risk.

Bonds Defined

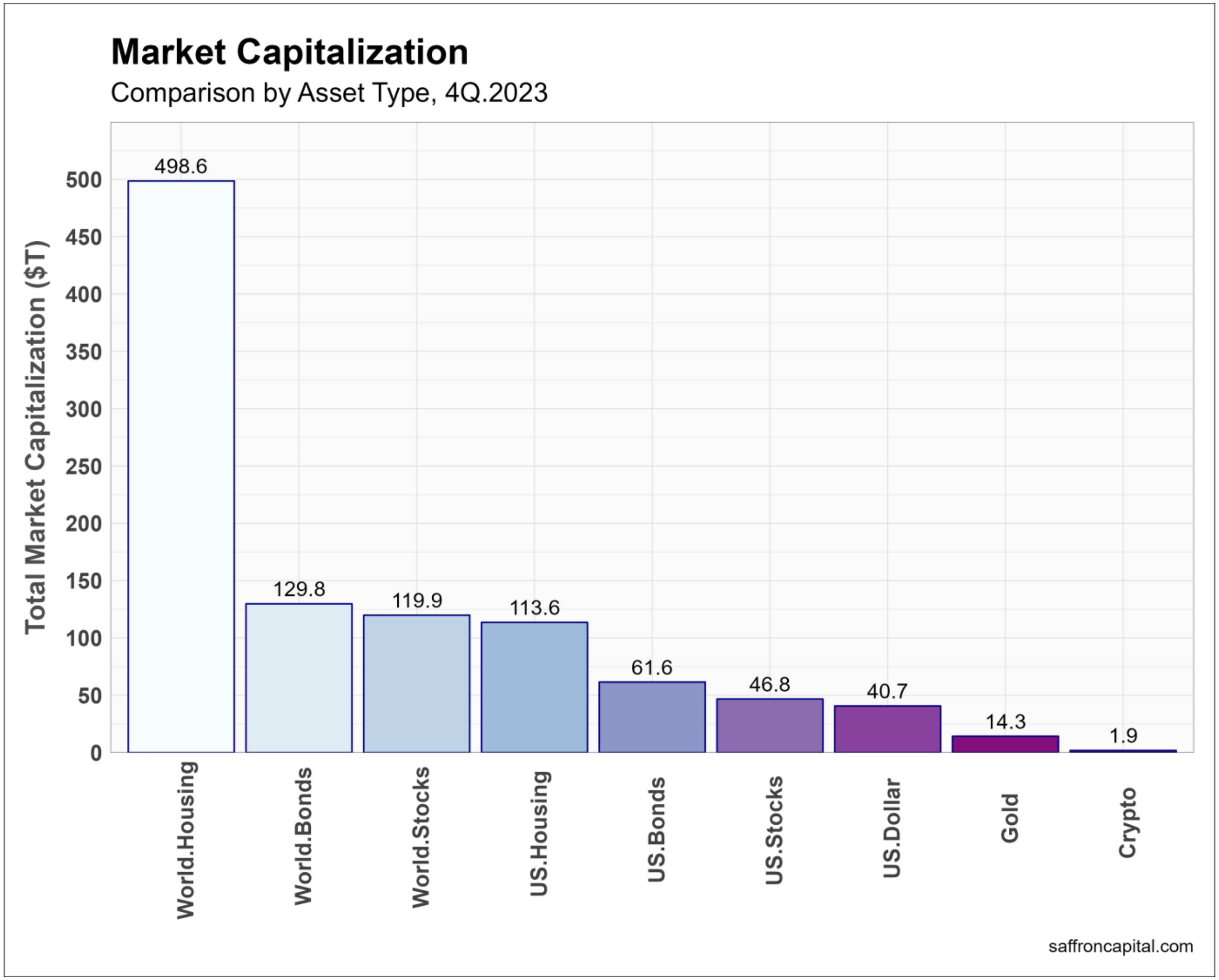
Bonds are loans. They offer no ownership rights, unlike equities.

Bonds have a fixed par or loan value, and they provide a promise for the full repayment of the loan. Cash flows include periodic interest payments and the return of principal.

Cash flow obligations are enforceable by contract law and in bankruptcy. Bonds have a rank (superior vs subordinate), which determines the order in which claims are paid in bankruptcy.. Bond owners always have a higher rank than equity owners.

Bonds held to maturity may have little to np price risk, but they are exposed to other risks, including default risk, among others. Bonds are not risk-free.

Asset Class Benchmarking



Data source: Bank of International Settlement (BIS), Securities Industry and Financial Markets Association (SIFMA), Statista Market Forecasts, US Geological Survey, World Gold Council, CoinMetrics.

Capital Market Benchmarking

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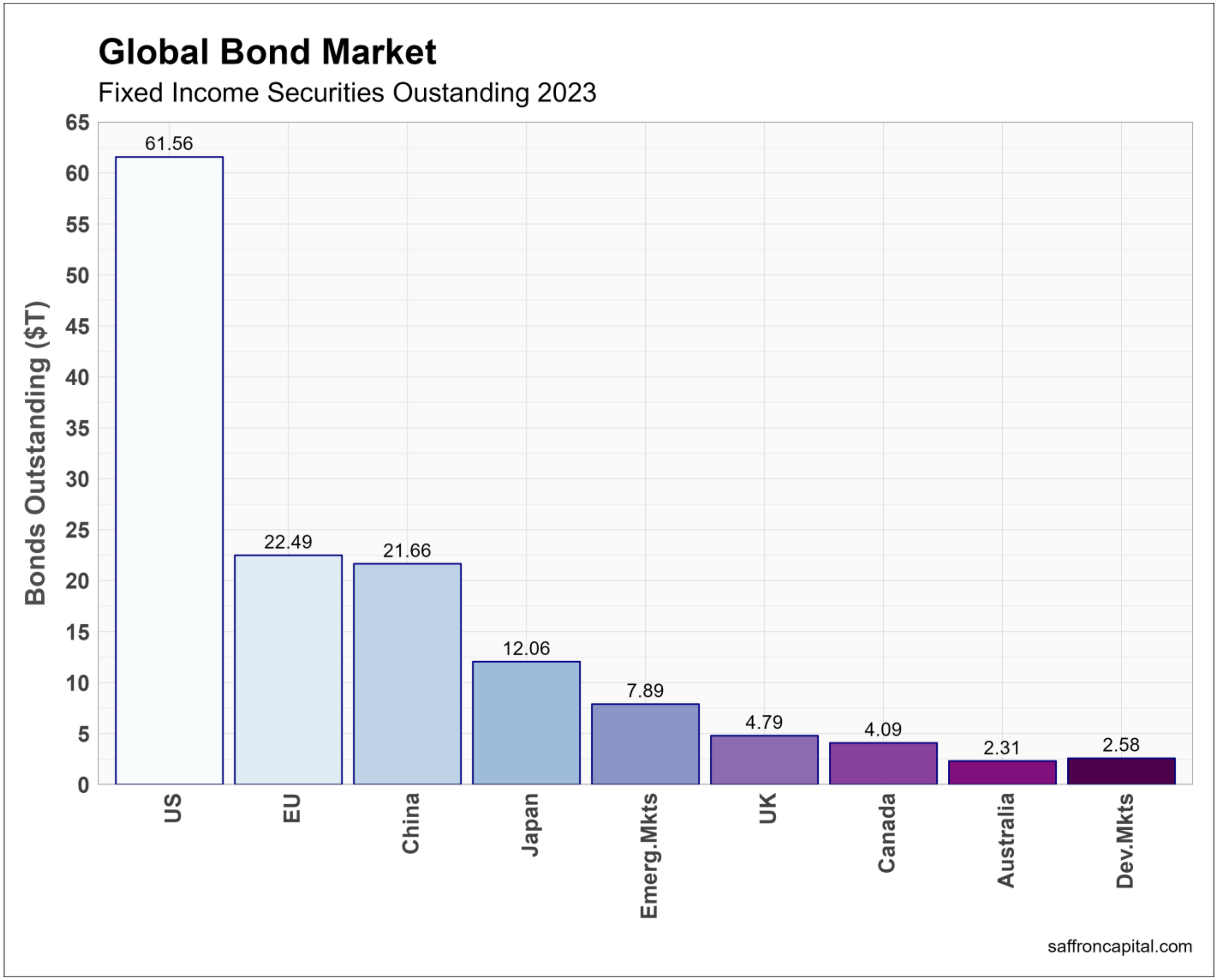
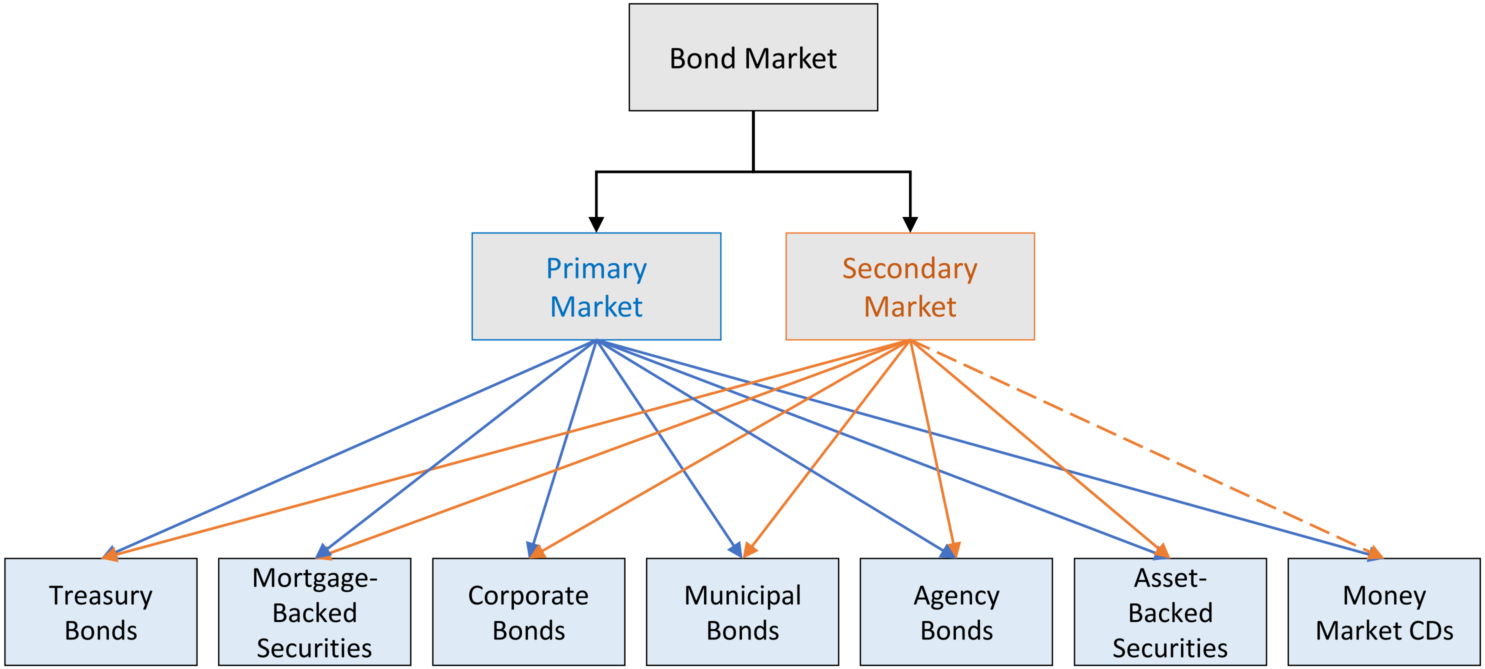


Data source: Bank of International Settlements (BIS), Reuters, and the Securities Industry and Financial Markets Association (SIFMA).

Primary vs Secondary Bond Markets



The bond market is a marketplace to:

- Issue new debt (primary market), and
- Trade debt securities (secondary market).

The bond market is based on structured debt securities organized by:

- Type,
- Quality, and
- Maturity.

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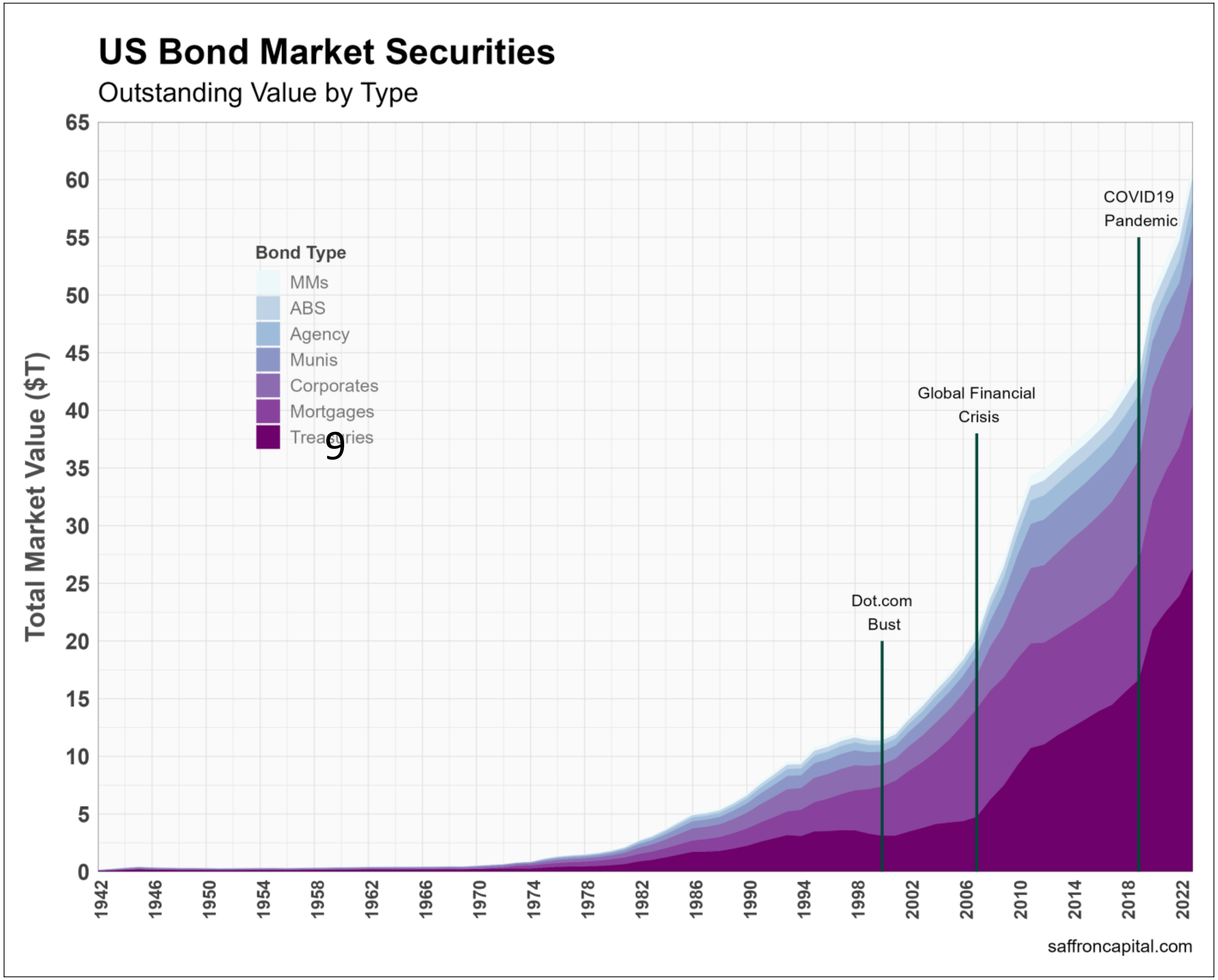
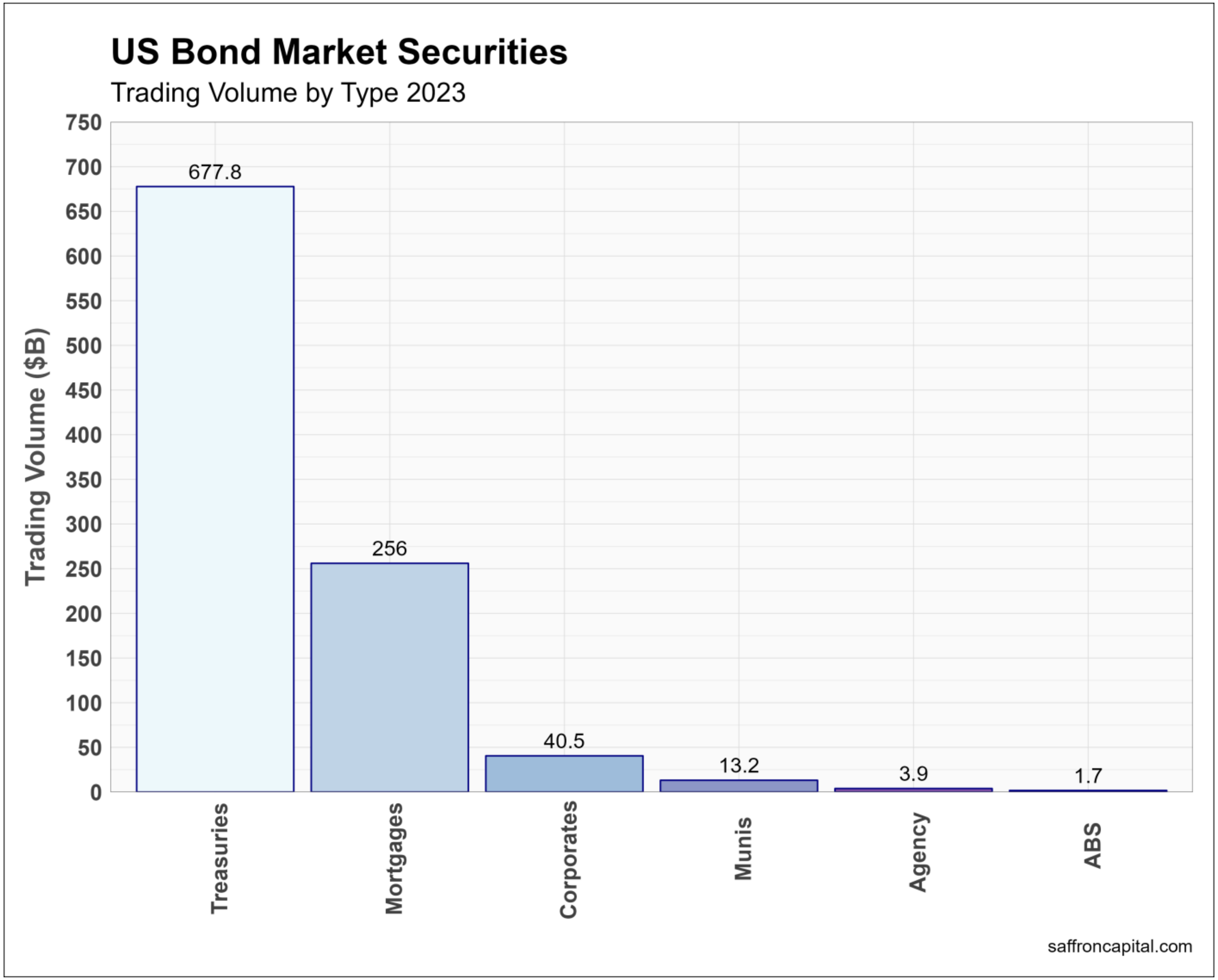
Primary Market - US Bond Market



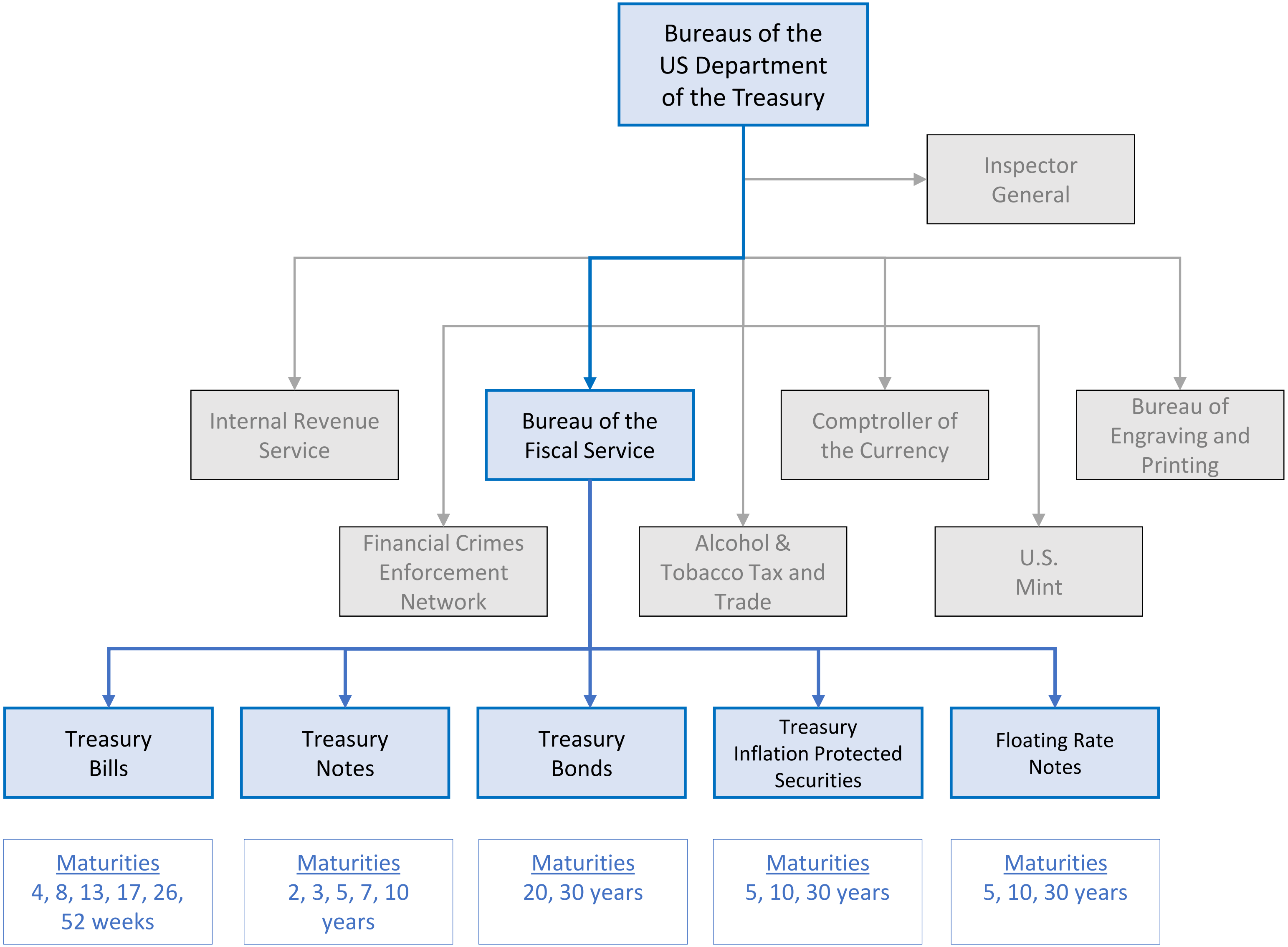
Secondary Market - US Bond Market



Part 2

US Treasury Bonds

US Treasury Bond Market



The world market for credit securities is dominated by the debt auctions of the US Department of the Treasury.

Treasury debt are digital securities offered by *TreasuryDirect* in minimum quantites of $100. Paper certificates are no longer available.

The maturity profile of US debt securities varies by type.

Source: US Department of the Treasury.

TreasuryDirect – Upcoming Auctions

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Tentative Auction Schedule of U.S. Treasury Securities					
Security Type			Announcement Date	Auction Date	Settlement Date
13-Week BILL			Thursday, April 11, 2024	Monday, April 15, 2024	Thursday, April 18, 2024
26-Week BILL			Thursday, April 11, 2024	Monday, April 15, 2024	Thursday, April 18, 2024
52-Week BILL			Thursday, April 11, 2024	Tuesday, April 16, 2024	Thursday, April 18, 2024
20-Year BOND	R		Thursday, April 11, 2024	Wednesday, April 17, 2024	Tuesday, April 30, 2024
5-Year TIPS		T	Thursday, April 11, 2024	Thursday, April 18, 2024	Tuesday, April 30, 2024
17-Week BILL			Tuesday, April 16, 2024	Wednesday, April 17, 2024	Tuesday, April 23, 2024
4-Week BILL			Tuesday, April 16, 2024	Thursday, April 18, 2024	Tuesday, April 23, 2024
8-Week BILL			Tuesday, April 16, 2024	Thursday, April 18, 2024	Tuesday, April 23, 2024
13-Week BILL			Thursday, April 18, 2024	Monday, April 22, 2024	Thursday, April 25, 2024
26-Week BILL			Thursday, April 18, 2024	Monday, April 22, 2024	Thursday, April 25, 2024
2-Year NOTE			Thursday, April 18, 2024	Tuesday, April 23, 2024	Tuesday, April 30, 2024
2-Year FRN			Thursday, April 18, 2024	Wednesday, April 24, 2024	Tuesday, April 30, 2024
5-Year NOTE			Thursday, April 18, 2024	Wednesday, April 24, 2024	Tuesday, April 30, 2024
7-Year NOTE			Thursday, April 18, 2024	Thursday, April 25, 2024	Tuesday, April 30, 2024
17-Week BILL			Tuesday, April 23, 2024	Wednesday, April 24, 2024	Tuesday, April 30, 2024
4-Week BILL			Tuesday, April 23, 2024	Thursday, April 25, 2024	Tuesday, April 30, 2024
8-Week BILL			Tuesday, April 23, 2024	Thursday, April 25, 2024	Tuesday, April 30, 2024
13-Week BILL			Thursday, April 25, 2024	Monday, April 29, 2024	Thursday, May 02, 2024
26-Week BILL			Thursday, April 25, 2024	Monday, April 29, 2024	Thursday, May 02, 2024
17-Week BILL			Tuesday, April 30, 2024	Wednesday, May 01, 2024	Tuesday, May 07, 2024
4-Week BILL			Tuesday, April 30, 2024	Thursday, May 02, 2024	Tuesday, May 07, 2024
8-Week BILL			Tuesday, April 30, 2024	Thursday, May 02, 2024	Tuesday, May 07, 2024
3-Year NOTE			Wednesday, May 01, 2024	Tuesday, May 07, 2024	Wednesday, May 15, 2024
10-Year NOTE			Wednesday, May 01, 2024	Wednesday, May 08, 2024	Wednesday, May 15, 2024
30-Year BOND			Wednesday, May 01, 2024	Thursday, May 09, 2024	Wednesday, May 15, 2024
13-Week BILL			Thursday, May 02, 2024	Monday, May 06, 2024	Thursday, May 09, 2024
26-Week BILL			Thursday, May 02, 2024	Monday, May 06, 2024	Thursday, May 09, 2024
17-Week BILL			Tuesday, May 07, 2024	Wednesday, May 08, 2024	Tuesday, May 14, 2024
4-Week BILL			Tuesday, May 07, 2024	Thursday, May 09, 2024	Tuesday, May 14, 2024
8-Week BILL			Tuesday, May 07, 2024	Thursday, May 09, 2024	Tuesday, May 14, 2024
13-Week BILL			Thursday, May 09, 2024	Monday, May 13, 2024	Thursday, May 16, 2024
26-Week BILL			Thursday, May 09, 2024	Monday, May 13, 2024	Thursday, May 16, 2024
52-Week BILL			Thursday, May 09, 2024	Tuesday, May 14, 2024	Thursday, May 16, 2024
17-Week BILL			Tuesday, May 14, 2024	Wednesday, May 15, 2024	Tuesday, May 21, 2024
4-Week BILL			Tuesday, May 14, 2024	Thursday, May 16, 2024	Tuesday, May 21, 2024
8-Week BILL			Tuesday, May 14, 2024	Thursday, May 16, 2024	Tuesday, May 21, 2024
13-Week BILL			Thursday, May 16, 2024	Monday, May 20, 2024	Thursday, May 23, 2024
26-Week BILL			Thursday, May 16, 2024	Monday, May 20, 2024	Thursday, May 23, 2024
20-Year BOND			Thursday, May 16, 2024	Wednesday, May 22, 2024	Friday, May 31, 2024
10-Year TIPS	R	T	Thursday, May 16, 2024	Thursday, May 23, 2024	Friday, May 31, 2024
17-Week BILL			Tuesday, May 21, 2024	Wednesday, May 22, 2024	Tuesday, May 28, 2024
4-Week BILL			Tuesday, May 21, 2024	Thursday, May 23, 2024	Tuesday, May 28, 2024
8-Week BILL			Tuesday, May 21, 2024	Thursday, May 23, 2024	Tuesday, May 28, 2024
13-Week BILL			Thursday, May 23, 2024	Tuesday, May 28, 2024	Thursday, May 30, 2024
26-Week BILL			Thursday, May 23, 2024	Tuesday, May 28, 2024	Thursday, May 30, 2024
2-Year NOTE			Thursday, May 23, 2024	Tuesday, May 28, 2024	Friday, May 31, 2024
5-Year NOTE			Thursday, May 23, 2024	Tuesday, May 28, 2024	Friday, May 31, 2024
2-Year FRN	R		Thursday, May 23, 2024	Wednesday, May 29, 2024	Friday, May 31, 2024
7-Year NOTE			Thursday, May 23, 2024	Wednesday, May 29, 2024	Friday, May 31, 2024
Holiday - Monday, May 27, 2024 - Memorial Day					

An example of auction listings by the Treasury Department

See https://www.treasury.gov/resource-center/data-chart-center/quarterly-refunding/Documents/auctions.pdf.

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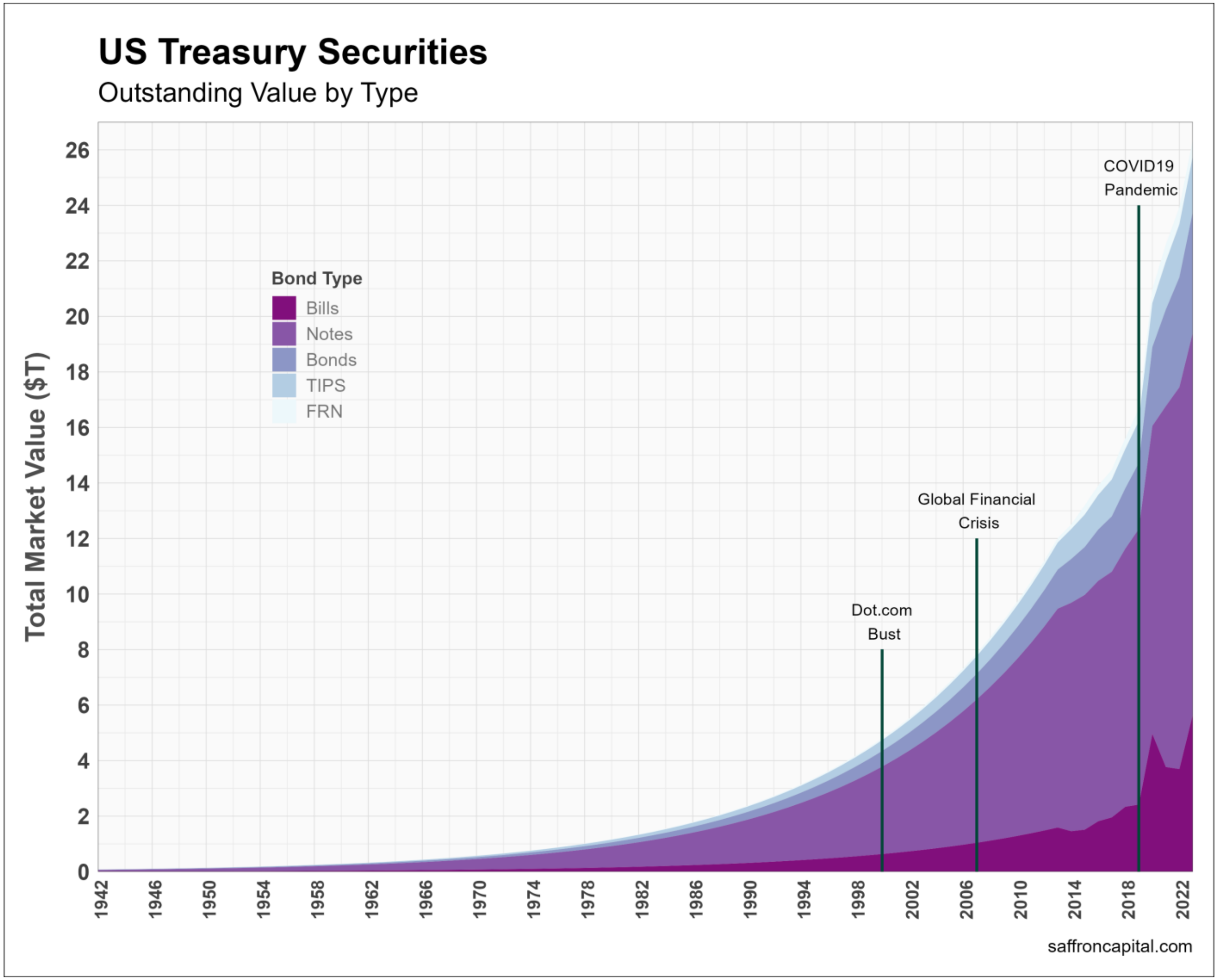
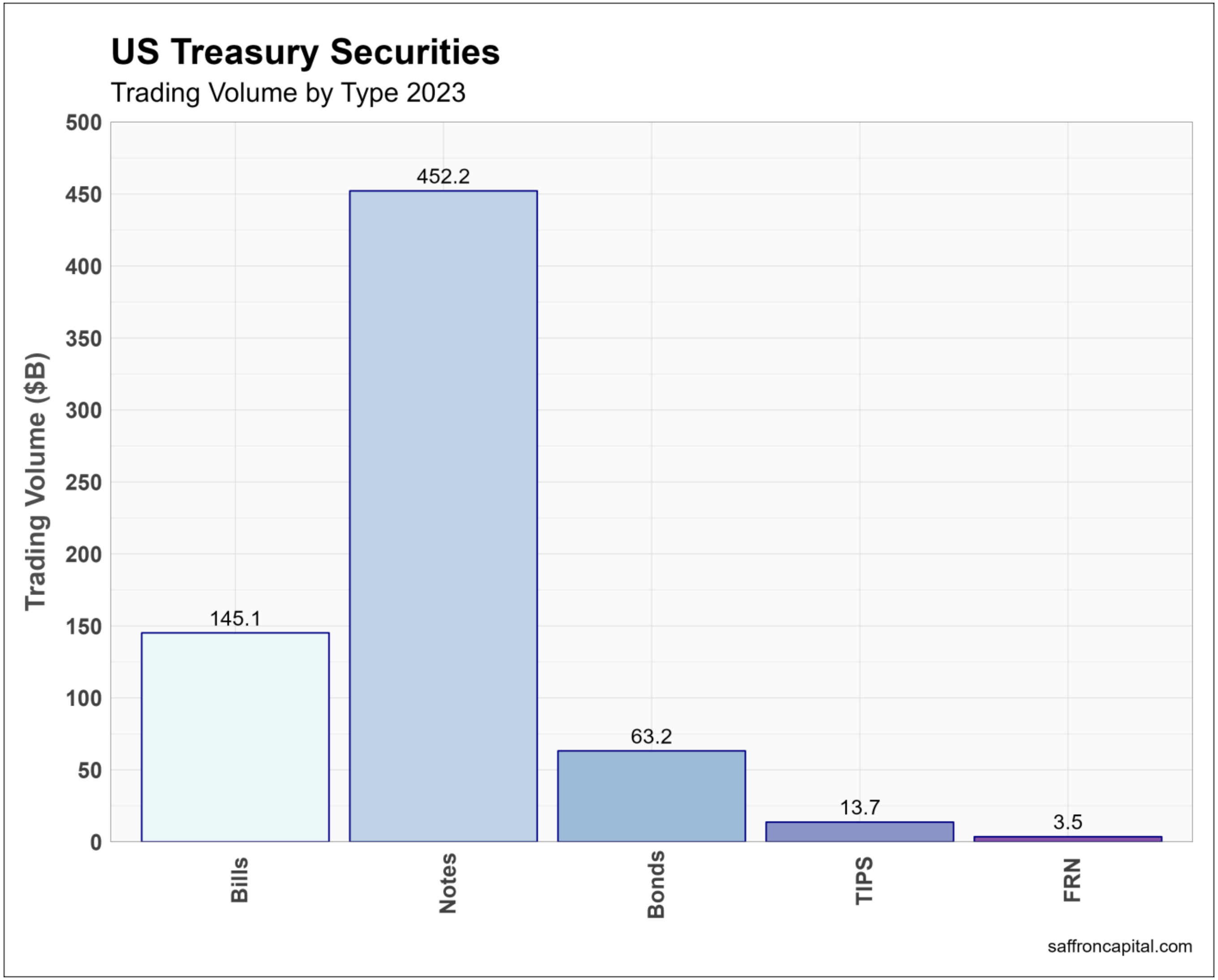
Primary Market - US Treasuries



Data source: Securities Industry and Financial Markets Association (SIFMA).

Secondary Market - US Treasuries



Data source: Securities Industry and Financial Markets Association (SIFMA).

Part 3

Corporate Bonds

Bond quality

Agency Credit Ratings

Class	Quality	Moody's	S&P	Fitch
		Credit Rating Scales by Agency		
Investment Grade	Prime	Aaa	AAA	AAA
	High grade	Aa1	AA+	AA+
		Aa2	AA	AA
		Aa3	AA-	AA-
	Upper medium grade	A1	A+	A+
		A2	A	A
		A3	A-	A-
	Lower medium grade	Baa1	BBB+	BBB+
		Baa2	BBB	BBB
		Baa3	BBB-	BBB-
Junk Bonds	Non-investment grade specualtive	Ba1	BB+	BB+
		Ba2	BB	BB
		Ba3	BB-	BB-
	Highly speculative	B1	B+	B+
		B2	B	B
		B3	B-	B-
	Substantial risk	Caa1	CCC+	CCC
	Extremely speculative	Caa2	CCC	
	Default imminent with little chance of recovery	Caa3	CCC-	
		Ca	CC	
			C	
	IN DEFAULT	C	D	DDD
				DD
				D

A bond's credit rating represents the credit worthiness of the bond.

The ratings are published by the rating agencies and used by investment professionals to assess the likelihood the debt will be repaid.

US Treasury bonds were just downgraded by Fitch to AA+.

Ratings for corporate bonds cover the entire spectrum.

Bond default risk

Default Probabilities by Credit Rating and Time Horizon

Class	Quality	S&P	Global Average Cumulative Default Rates (1980-2020)									
			1	2	3	4	5	6	7	8	9	10
Investment Grade	Prime	AAA	0.0%	0.0%	0.1%	0.2%	0.4%	0.5%	0.5%	0.6%	0.7%	0.7%
	High grade	AA+	0.0%	0.1%	0.1%	0.1%	0.2%	0.2%	0.3%	0.3%	0.4%	0.5%
		AA	0.0%	0.1%	0.1%	0.2%	0.4%	0.5%	0.6%	0.7%	0.8%	0.9%
		AA-	0.0%	0.1%	0.2%	0.3%	0.3%	0.5%	0.5%	0.6%	0.6%	0.7%
	Upper medium grade	A+	0.1%	0.1%	0.2%	0.3%	0.5%	0.6%	0.7%	0.8%	0.9%	1.1%
		A	0.1%	0.2%	0.2%	0.4%	0.5%	0.7%	0.9%	1.0%	1.2%	1.5%
		A-	0.1%	0.2%	0.3%	0.4%	0.6%	0.7%	1.0%	1.2%	1.3%	1.4%
	Lower medium grade	BBB+	0.1%	0.3%	0.5%	0.8%	1.0%	1.3%	1.5%	1.8%	2.0%	2.3%
		BBB	0.2%	0.4%	0.7%	1.1%	1.4%	1.8%	2.2%	2.5%	2.9%	3.2%
		BBB-	0.3%	0.8%	1.4%	2.1%	2.8%	3.5%	4.1%	4.7%	5.1%	5.5%
Junk Bonds	Non-investment grade specualtive	BB+	0.3%	1.1%	2.0%	2.9%	3.9%	4.7%	5.5%	6.1%	6.7%	7.3%
		BB	0.6%	1.7%	3.4%	4.9%	6.5%	7.8%	8.9%	9.9%	10.8%	11.5%
		BB-	1.0%	3.1%	5.4%	7.7%	9.7%	11.6%	13.2%	1.5%	1.6%	17.1%
	Highly speculative	B+	2.1%	5.7%	9.2%	12.2%	14.5%	16.3%	18.0%	19.4%	20.8%	22.0%
		B	3.6%	8.3%	12.3%	15.5%	17.9%	20.2%	21.7%	22.8%	23.8%	24.8%
		B-	7.2%	14.3%	19.6%	23.4%	26.2%	28.3%	30.0%	31.1%	31.8%	32.4%
	Substantial risk	CCC+										
	Extremely speculative	CCC	26.8%	36.0%	41.0%	44.0%	46.2%	47.1%	48.3%	49.2%	50.1%	50.7%
	Default imminent with little chance of recovery	CCC-										
		CC	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%	95.0%
		C										
	IN DEFAULT	D	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

The probability of default varies as a function of the bond's credit rating and time to maturity.

Investors are compensated for taking on default risk with higher yields.

- Yields increase as time increases
- Yields increase as credit quality declines

Secondary Market - US Treasuries

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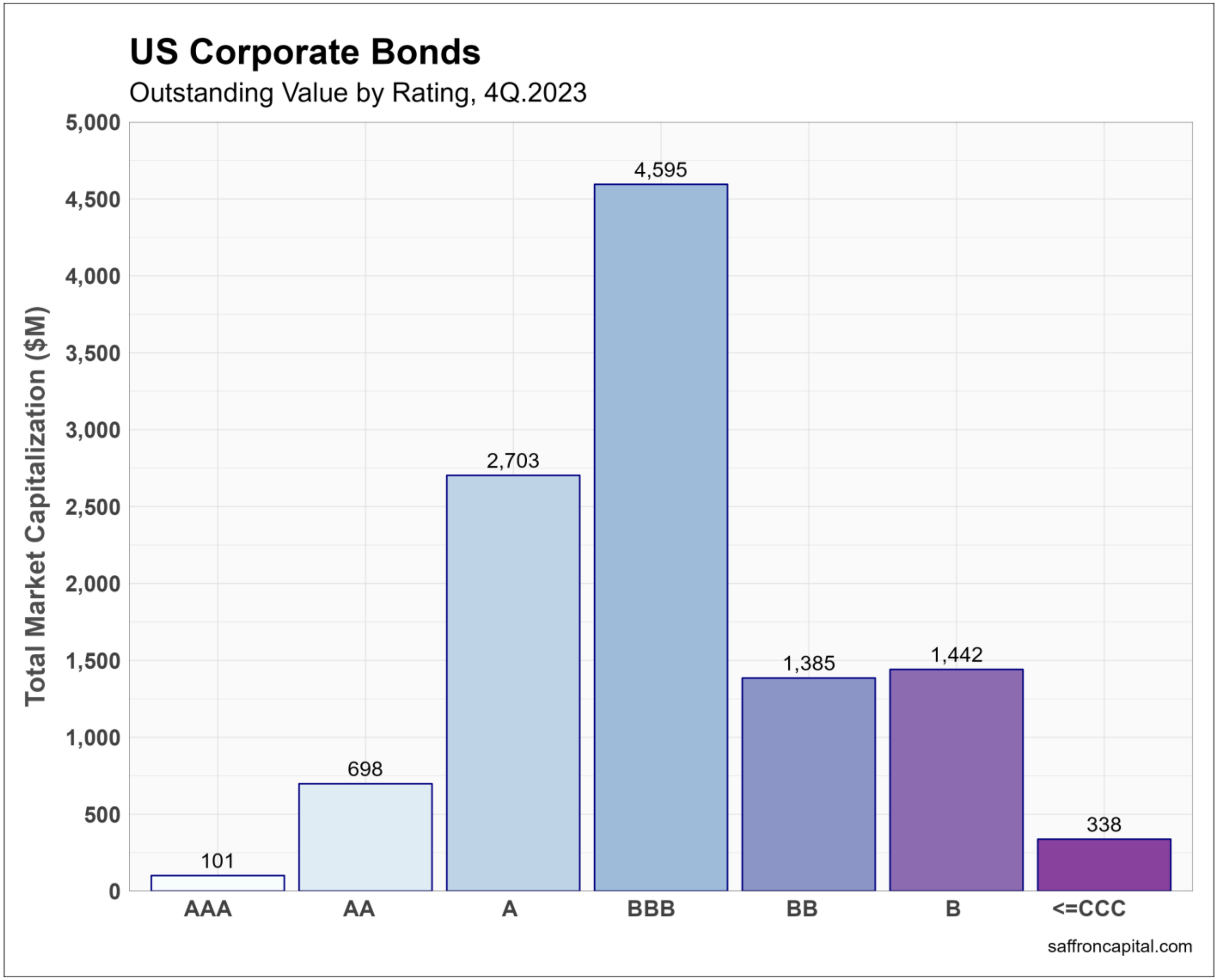


High Grade Bonds: 7.2%

Inv. Grade Bonds: 73.0%

Junk Bonds: 27.0%

Extremely Speculative: 3.0%

Part 4

The Basics of Bond Investing

Bonds – Issuers vs Investors

The bond market is a marketplace where the financial needs of participants are aligned and guaranteed by contract.

ISSUERS	TYPES OF BONDS	INVESTORS

• Governments
• Public corporations
• Private corporations
 	
Issuer Needs:
• Fund operating expenses
• Refinance old debt
• Fund capital investments
• Optimize debt/equity capital structure
	• Government bonds
	  • Developed Markets
	  • Emerging Markets
	• Municipal bonds
	• Corporate bonds
	• Mortgages bonds
	• Collateralized Loan Obligations
	• Private debt
		• Governments
		• Institutions, companies, trusts, individuals, traders
		
		Investor needs:
		• Return of capital
		• Guaranteed income
		• Diversify risk
		• Potential for capital gains

SECURED vs UNSECURED BONDS

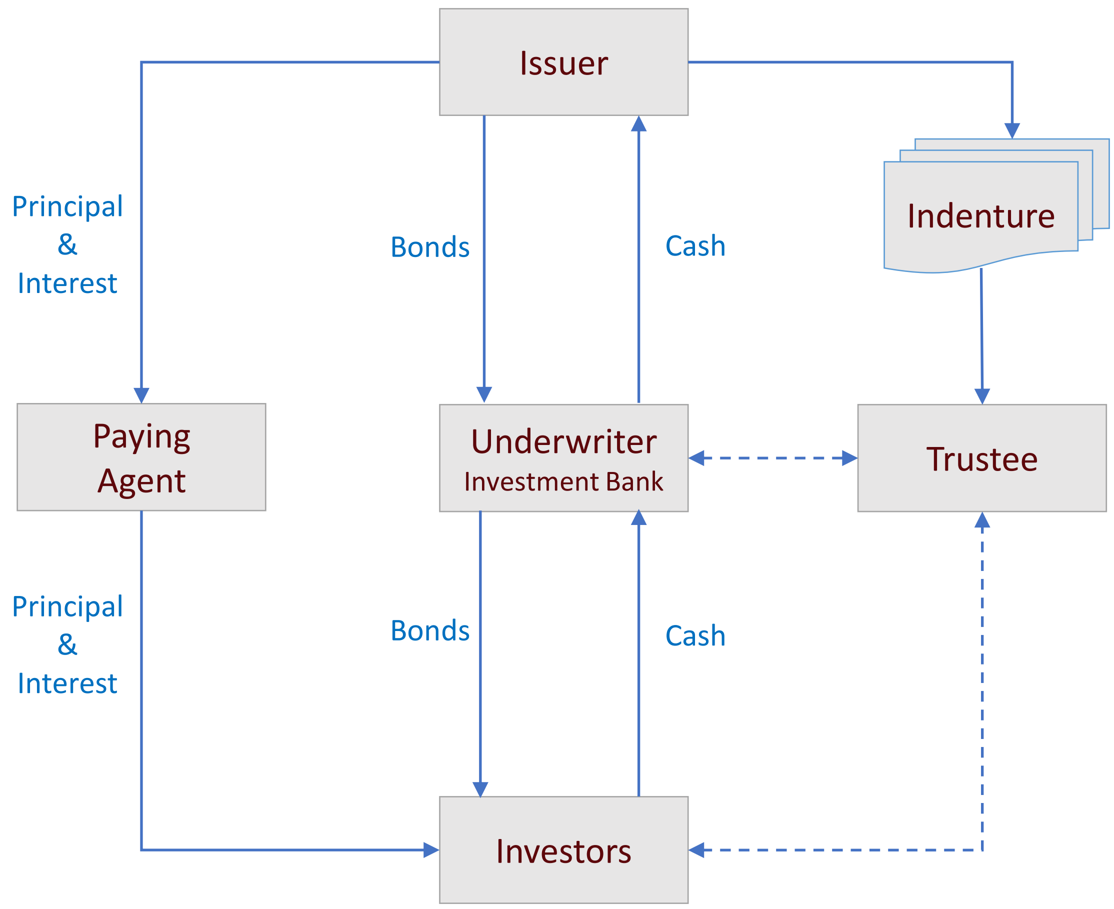
Secured

Backed by an asset or collateral (small issuers). Perfect for investors with low risk tolerance. Typically has a low interest rate given lower default risk

Unsecured

Backed by balance sheet borrowing capacity (large issuers). Potential for higher interest rate given a higher risk of default

Simplified Bond Transaction Diagram



The indenture is the contract between the issuer and investors of record. It is issued to a Trustee on behalf of investors and includes:

- Statement of purpose and intended use of funds
- Principal amount or face value of the bond
- Interest rate and calculations
- Payment dates
- Maturity date
- Call feature and protection period
- Conversion features
- Bond covenant and collateral
- Non-payment actions
- Risk and regulatory disclosures
- Contact information
- Information on bond certificate

Bonds – Investment Strategies

There are three general investment styles		
PASSIVE	**ACTIVE**	**HYBRID**
• **Buy-Hold-Expire** • Bonds are held to maturity for ordinary income and the basic *return of capital* • No market price risk	• **Buy-Hold-Sell** • Bonds are bought and sold before maturity for both ordinary income and *return on capital* • Market price risk	• **Multi-strategy** • Combines passive and active approaches • Market price risk

ADVANTAGES

- **Guaranteed Income** – Bonds provide a steady stream of income and predictable cash flows.
- **Low Relative Risk** – Bonds are a lower-risk investment than stocks. They deliver consistent interest payment and, when held to maturity, return principal in full.
- **Portfolio Diversification** – Bonds reduce the overall risk of a portfolio and help to customize a portfolio's risk profile to match the investor's risk appetite. Investing in bond funds also serves to diversify risk across bond issuers, mitigating the risk of company defaults.
- **Verified Ratings** – Credit rating agencies assign a credit quality rating to every bond based on the issuer's risk of default. Quality ratings help to quantify the probability of default.

DISADVANTAGES

- **Interest Rate Risk** – Active investing is exposed to changes in interest rates and bond prices. When rates rise, bond prices tend to fall. Long-term bonds are the most sensitive to rate risk.
- **Inflation Risk** –Bonds can lose value if government policies lead to inflation since returns are capped by the bond yield.
- **Prepayment Risk** – Callable bonds allow the issuer to call or prepay the bond in early, forcing investors to reinvest the proceeds at potentially lower yields.
- **Default Risk** – Risk that interest payment is late, not paid or the company enters bankruptcy

The buy hold strategy eliminates market price risk, but other risks remain, including default risk, early prepayment risk, reinvestment risk, and inflation risk. Passive investing does not eliminate risk..

Active Investing In Bonds

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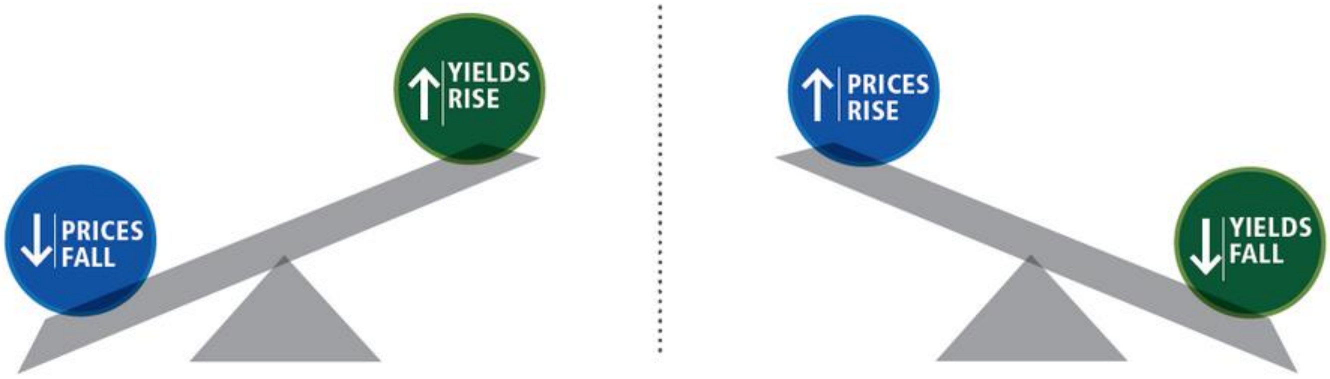

$$P = \frac{C_1}{(1+R)^1} + \frac{C_2}{(1+R)^2} + \cdots + \frac{C_n}{(1+R)^n} + \frac{PV}{(1+R)^n}$$

Basic Pricing

- A bond with a higher coupon (C) has a higher price (P)
- A bond with a higher par or principal value (PV) has a higher price (P)
- A bond with a more periods (n) to maturity has a higher price (P)
- A bond with a higher yield-to-maturity (R) will have a lower price (P)

Basic Trading

- As yields rise, the bond prices fall
- As yields fall, bond prices rise

Part 5

Active Investing in Bonds for Capital Gains

Buy-Hold-Sell

Active Investing In Bonds

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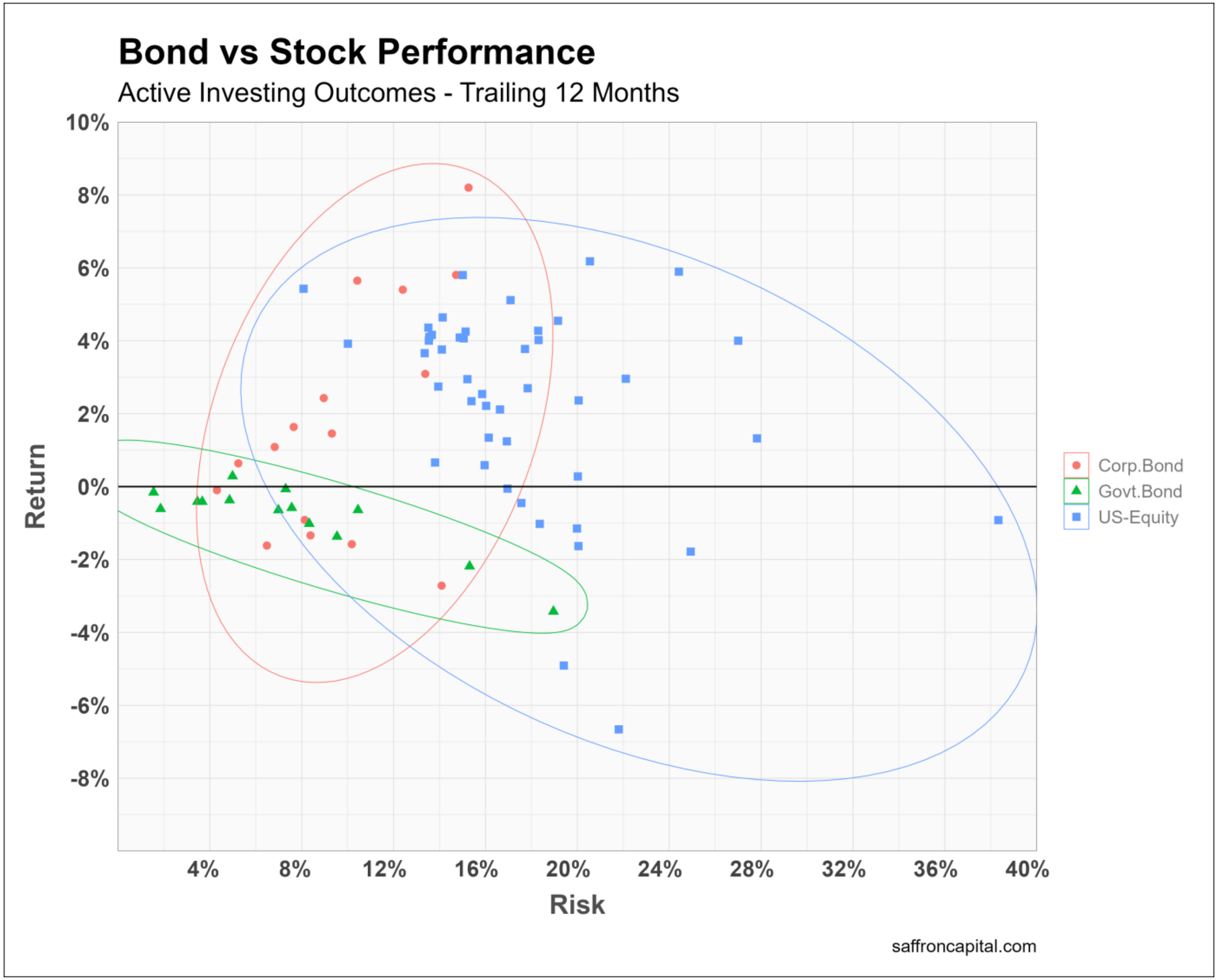


1-Year Performance

Security	Return	Risk
Corp.Bonds	1.70%	9.73%
Govt.Bonds	(0.83%)	7.48%
US.Equity	2.31%	17.72%

A portfolio that combined corporate and government bonds had attractive returns relative to stocks on a risk-adjusted basis.

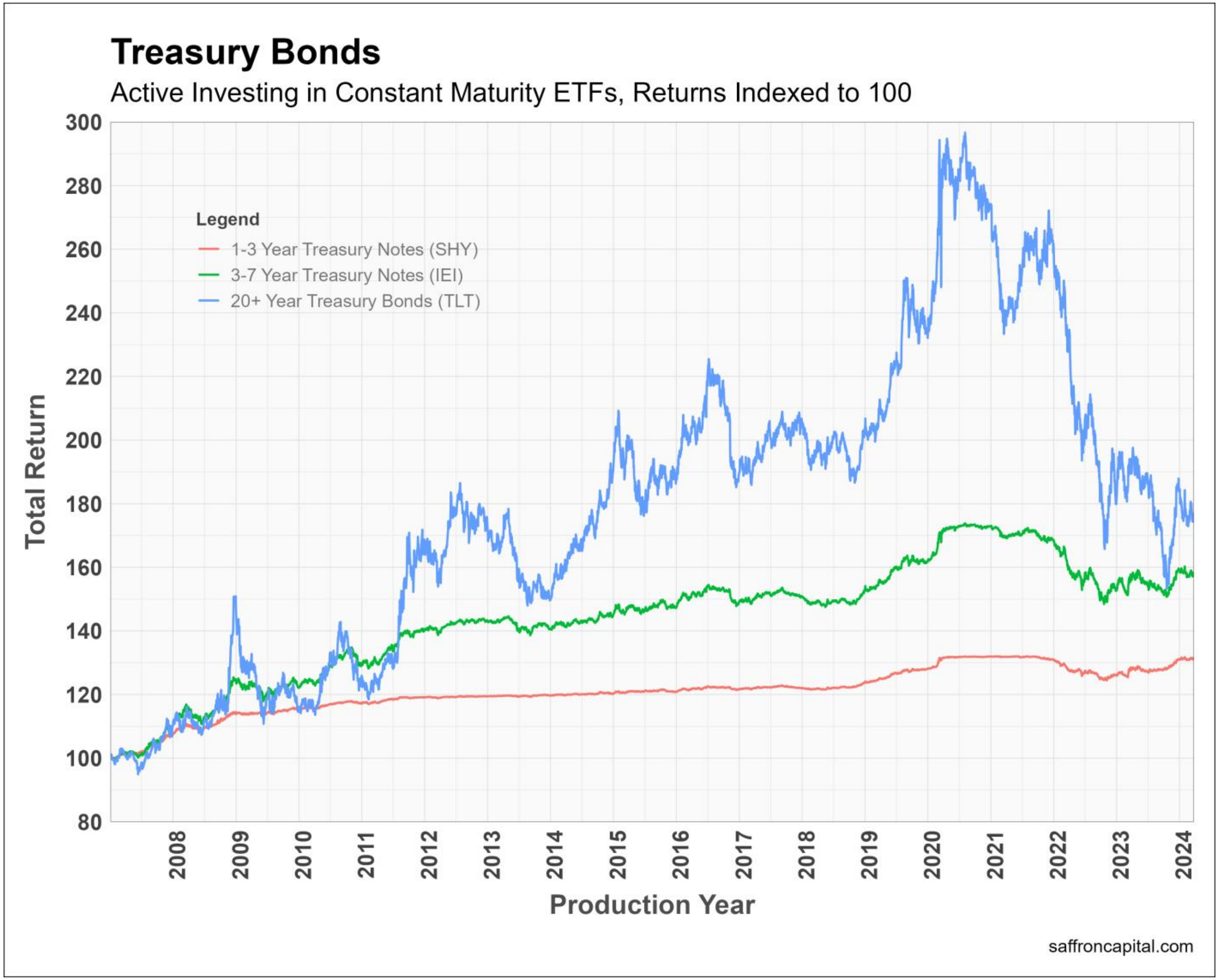
For every dollar of risk, bonds generated a return of 17.5 cents, while stocks generated a return of 13-cents (or 23.5% less)

Security	Risk-Adjusted Return
Bonds	0.175
Stocks	0.130

The advantages of active investing in bonds is lower relative risk and often higher risk adjusted returns. A disadvantage is lower absolute returns in many market environments.

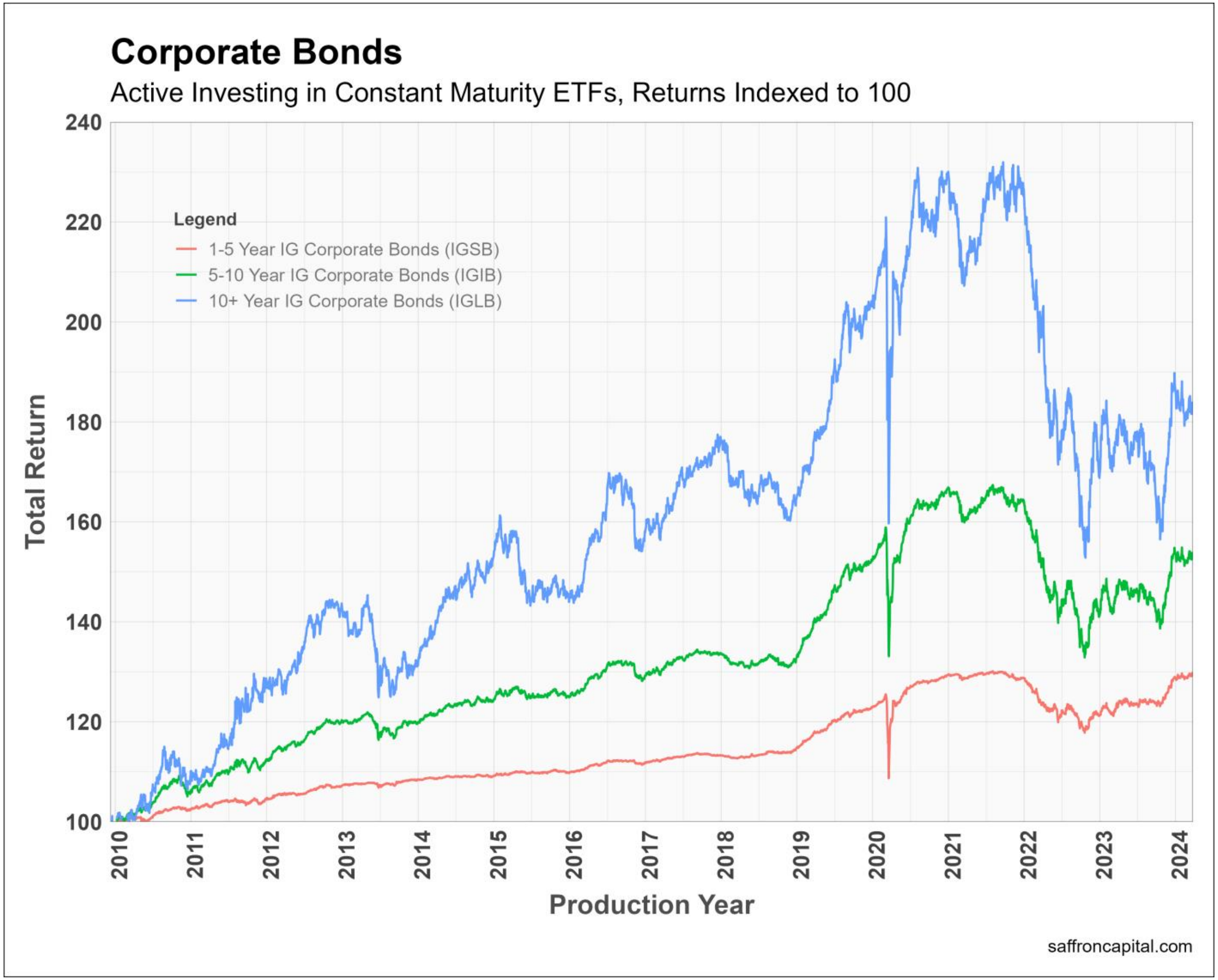
The return and risk numbers presented are an average of multiple indices for each asset class. Average results are indicative and do not represent any one index or security. Past returns do not guarantee future success.

Active Investing In Bonds



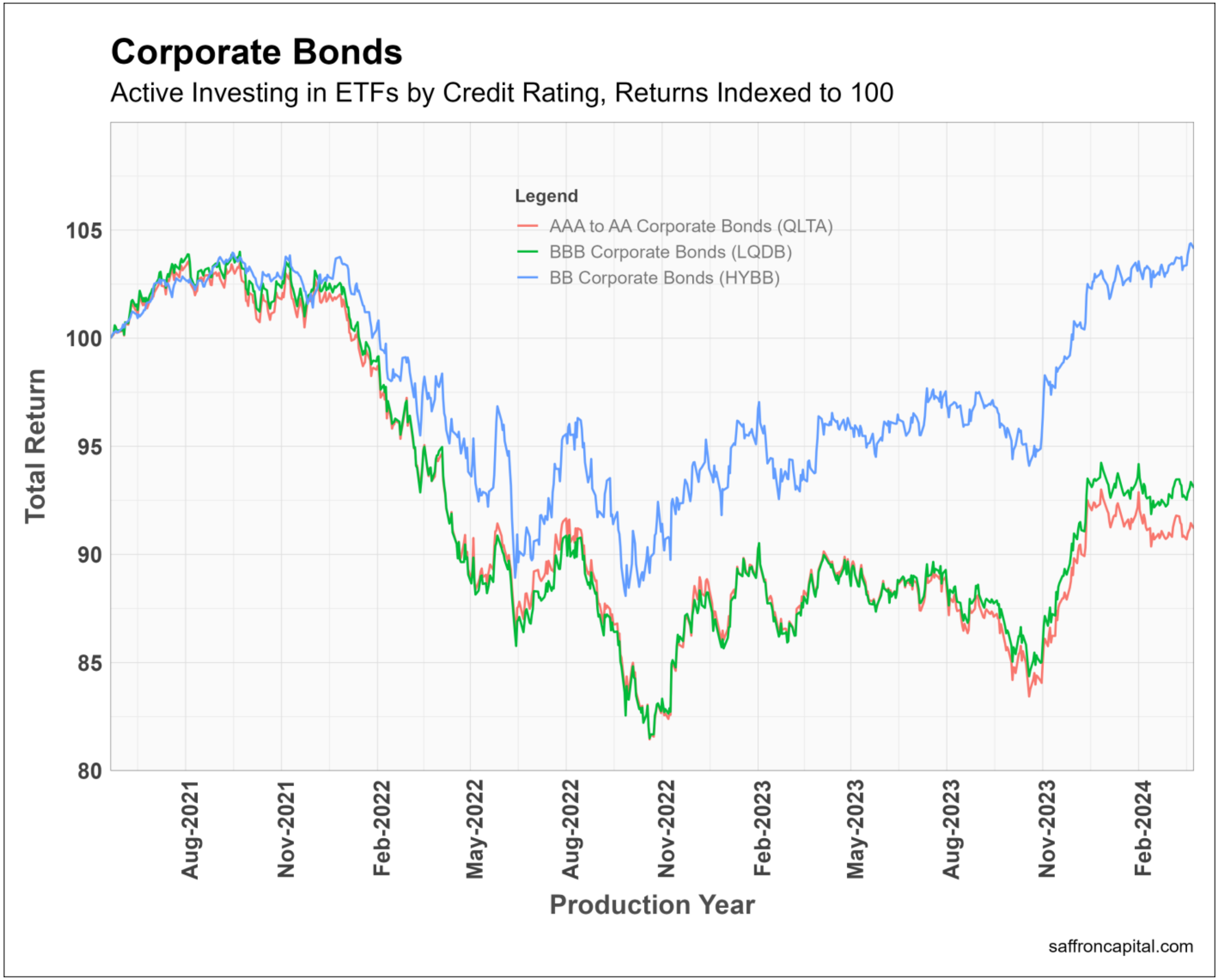
Total returns include coupon payments plus capital gains and losses

Active Investing In Bonds



Total returns include coupon payments plus capital gains and losses

Active Investing In Bonds



Total returns include coupon payments plus capital gains and losses

Active Investing In Bonds

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Yield on 10-Year Treasury Notes

Where will yields go ?

The case for higher yields short-term is based on a continuation of the existing uptrend, the resilience of the US economy, and a resurgence of inflation.

This bodes well for passive investors who seek to lock-in long-term yields prior to rate cuts by the Federal Reserve

Active Investing In Bonds

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Yield on 10-Year Corporate Bonds by Credit rating

Corporate Yields

Bond yields increase as credit quality declines.

Yield volatility also increases as we move from investment grade to non-investment grade

The trend in corporate yields spreads versus Treasuries has been down given an improving economy.

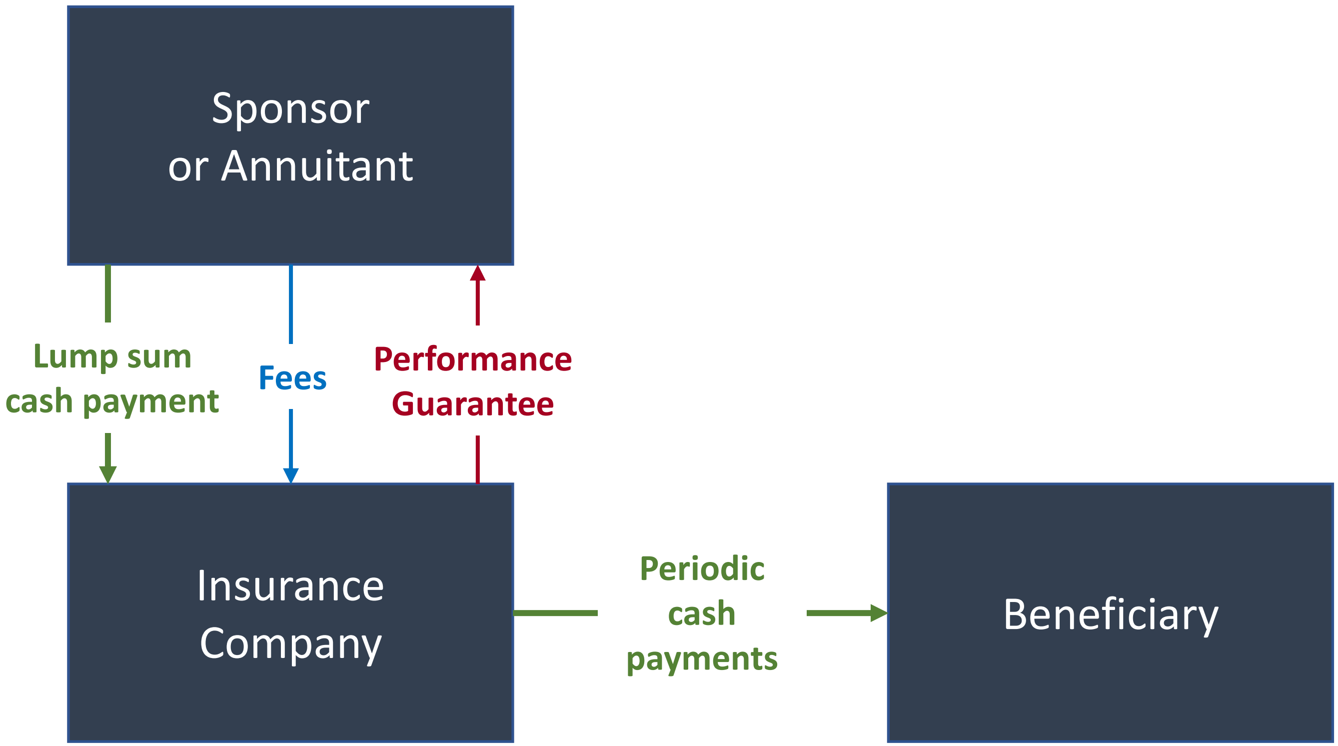
Part 6

Passive Investing in Bonds
for
Predictable Income

Buy-Hold-Expire

Passive Investing In Bonds

Justification for Structured Bond Ladders



Annuities are well suited as a retirement or estate planning tool where a sponsor seeks to provide guaranteed cash flows to a third-party beneficiary.

However, it makes no sense to be both the sponsor and the beneficiary.

- Why introduce a third-party with high fees to stand between you and yourself?
- Depending on the product, fees can be as high as 4-8% of funds invested

Solution

Passive bond investing and structured bond ladders to create predictable income for yourself or a beneficiary

Note: The creditworthiness of the insurance company is important to ensure the performance guarantee is fulfilled. The insurance company's credit rating helps to define the risk that the insurance company may default on its obligations. Over time, monitor changes in the credit rating of your insurance company.

Passive Investing In Bonds

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Intro to Structured Bond Ladders

Objective

- Lock-in attractive yields by purchasing a portfolio of bonds with *fixed maturities* expiring at regular intervals.
- Harvest monthly coupon payments and annual principal payouts for guaranteed income

Investment Strategy

- The ‘buy-hold-expire’ strategy aims to limit market price
- The purchase high-quality bonds reduces default risk
- Buying bonds issued by hundreds of companies mitigates concentration risk (e.g., exposure to a single issuer)

Portfolio Management Process

- Hold bonds to maturity.
- Once the nearest bond expires, the principal received is reinvested in new long-term bonds, extending the bond ladder for another year, repeating the cycle of income harvesting.

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Creating Structured Bond Ladders

The image below depicts the basic structure of the bond ladder. The image also shows how the bond ladder changes in Year2 and Year3 as the ladder is updated and extended in time:

10-Year Bond Land: Maturities by Year

	1	2	3	4	5	6	7	8	9	10	t+1	t+2
Year 1	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033		
Year 2		2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	
Year 3			2026	2027	2028	2029	2030	2031	2032	2033	2034	2035

For example:

- In Year1, a block of corporate bonds is bought for each year over the next 10 years
- After Year1, the 2024 bonds will expire (in the first week of December) and the principal received is reinvested into a new block of bonds expiring in 2034
- Each year, the rolling 10-year ladder is extended by one year as expiring principal is made available. Alternatively, the principal can be utilized for personal budget or other investments

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Bond Ladder Components

Bonds purchased in each time bucket are well defined portfolios

Portfolio Contents	**Example**
• All bonds have uniform expiration times	Dec-2026
• Specific bond type(s) and quality	Corporate BBB
• Multiple (corporate) issuers	100 to 600
• Funding scaled to any account level by year	$5k to $150k
• Funding by month/year sculpted as needed	Budget schedule

It’s becoming increasingly easy to buy structured funds with fixed bond maturities, common bond types, and quality. Hence, the building blocks for any bond ladder time bucket are individual bonds and/or exchange traded funded (ETFs).

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Yield Curve Assessment

3/26/2024

	US Treasury Bonds	Treasury Inflation Protected Securities (TIPS)	Tax Equivalent Municipal Bonds	Corporate Investment Grade Bonds (A-rated)	Blend: 50% A-rated + 50% BBB-rated Corp. Bonds	Corporate High Yield Bonds (BBB-rated)
2024	5.25	4.96	5.30	5.64	6.08	6.51
2025	4.90	4.70	4.84	5.40	6.39	7.38
2026	4.56	4.43	4.56	5.17	6.30	7.43
2027	4.39	4.41	4.32	5.05	6.26	7.46
2028	4.31	4.34	4.18	5.07	6.26	7.45
2029	4.26	4.25	3.98	5.07	6.28	7.49
2030	4.26	4.19	4.26	5.14	6.12	7.09
2031	4.23	4.18	4.23	5.26	5.26	5.26
2032	4.26	4.19	4.26	5.27	5.27	5.27
2033	4.26	4.21	4.26	5.30	5.30	5.30
TOTAL	**4.47**	**4.39**	**4.42**	**5.24**	**5.95**	**6.66**

Blue cells highlight liquidity constraints. Values replaced by yields from government of investment grade bonds

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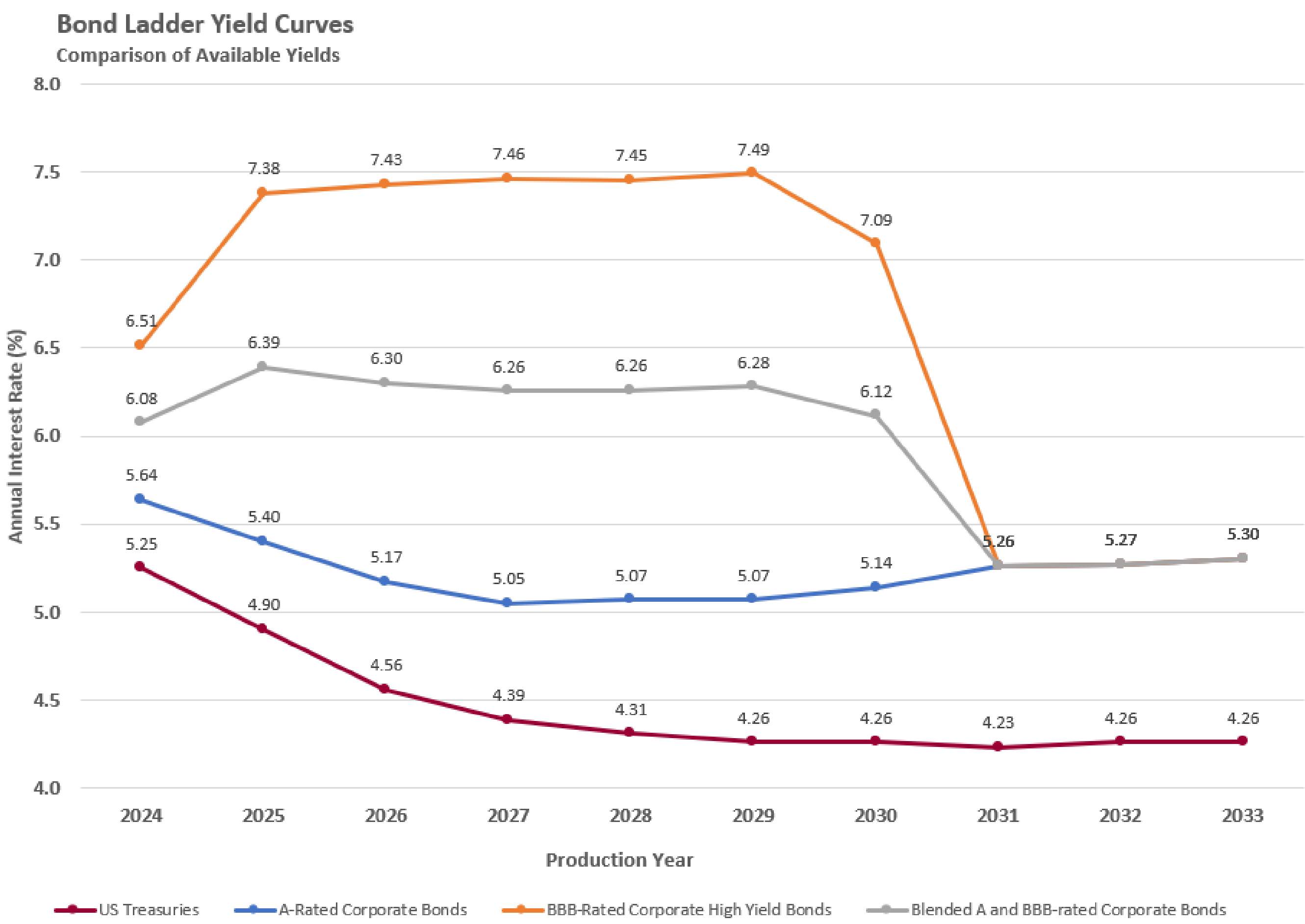
Yield Curve Assessment



Passive Investing In Bonds

Yield Curve Assessment

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Bond Ladder Summary

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Type	Yield to Maturities Mar 26, 2024 3 Year	5 Year	10 Year	Change in Yields Since Jan 19, 2024 3 Year	5 Year	10 Year
US Treasury Bonds	4.90	4.68	4.47	0.28	0.27	0.20
Treasury Inflation Protected Securities (TIPS)	4.70	4.57	4.39	0.30	0.28	0.21
Tax Equivalent Municipal Bonds	4.90	4.64	4.42	0.35	0.29	0.23
Corporate Investment Grade Bonds (A-rated)	5.40	5.27	5.24	0.20	0.21	0.19
Corporate High Yield Bonds (BBB-rated)	7.11	7.25	6.66	(0.15)	(0.11)	(0.01)

Type	3 Year	5 Year	10 Year	3 Year	5 Year	10 Year
Blend: 50% A-rated + 50% BBB-rated Corp. Bonds	6.26	6.26	5.95	0.03	0.05	0.09

The decision to do a 3-, 5-, or 10-year bond ladder will depend on:

- Total funds available
- Yield-to-maturity and annual income projected
- Liquidity needs
- Interest rate outlook

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Buy-Hold-Expire: Maturity Case Studies

The following tables summarize the performance history of bond portfolios by type as they expire. The case study presents total cash flows. The exercise serves to confirm that the 'buy-hold-expire' strategy of holding a portfolio of bonds to maturity behaves like a single bond issue while avoiding realized market price risk.

US Corporate Bonds

Maturity	2017	2018	2019	2020	2021	2022
Ticker	IBDJ	IBDH	IBDK	IBDL	IBDM	IBDN
Inception Date	10-Mar-2015	28-May-2014	10-May-2015	2-Dec-2014	10-Mar-2015	10-mar-2015
Expiration Date	15-Dec-2017	18-Dec-2018	16-Dec-2019	16-Dec-2020	15-Dec-2021	15-Dec-2022
Initial yield to maturity / coupon	1.41%	1.71%	2.18%	2.74%	2.78%	2.99%
Less fund expenses	(0.10%)	(0.10%)	(0.10%)	(0.10%)	(0.10%)	(0.10%)
Net YTM expected	1.31%	1.61%	2.08%	2.64%	2.68%	2.89%
Total return realized since inception	1.28%	1.65%	2.08%	2.35%	2.29%	2.69%
Performance Diff / Realized Risk	(0.30%)	0.04%	0.00%	(0.29%)	(0.39%)	(0.20%)
Initial bond value (NAV)	$24.75	$25.07	$24.75	$25.00	$24.75	$24.75
Final bond value (NAV)	$24.84	$25.18	$24.87	$25.20	$24.73	$25.06
Difference in NAV	$0.09	$0.11	$0.12	$0.20	($0.02)	$0.31

The table confirms the following:

- The highlighted row shows that realized yield to maturity is slightly less than expected yield. However, the difference is minimal and is less than 0.40%.
- Residual risk can be attributed to corporate actions, including early prepayment of bonds and realized bankruptcies. It is important to stress that the realized risk is less than the expected loss 0.70% based on historic defaults for A-rated bonds.
- It is also clear that the final bond value closely matches the initial bond value. This confirms that bonds held to maturity have minimal price risk. Deviations in price are less than 1% and are positive in most cases.

The data is encouraging and confirms that market price risk for A-rated bonds held to maturity remains very low.

Passive Investing In Bonds

Other Risks

Asset Class Risk – the bonds purchased in the bond ladder may underperform other asset classes like stocks or real assets.

Call Risk – Corporate bond issuers may "call" or repay bonds held in an iBond before the maturity date. This will cause the realize yield to maturity to suffer as the bonds need to be replaced, potentially with lower yields.

Concentration Risk – Diversified bond portfolios that reduce exposure to a single issuer still have concentrations by country, industry, sector, and market segment.

Credit Default Risk – Debt issuers may be unable to or unwilling to make timely interest or principal payments. Changes
in a bond issuers credit rating may also adversely affect bond values.

Expiration Yield Risk – As bonds expire with slightly different dates, cash funds are reinvested in money market accounts. The money market yields could reduce the expected yield to maturity.

Infectious Illness Risk – Widespread pandemic risk has proven to be material and could negatively impact the creditworthiness of companies within the bond portfolio. Markets could also potentially be closed due to illness risks, preventing bond trade.

Market Risk – Bonds held to maturity still have unrealized mark-to-market risks during the holding period. Annual swings in net asset value could be +/- 10-15%. The maturity case studies confirm that these swings will be resolved over time, resulting in low realized risk. However, a client's willingness to hold securities while losses are present could result in impulsive sales before maturity, resulting in unplanned losses (e.g. switching from passive to active trading)

Concluding Comments

Fixed income securities are the lowest risk asset group

Bonds vary by type, maturity and credit rating

Bonds offer many opportunities to customize portfolios given different investment goals and risk tolerance

Bonds are used to achieve

- capital gains (active investing) or
- guaranteed income (passive investing)

Bond ladders are a low-cost alternative to annuities (regardless of annuity type)

Bond ladders can be created easily to lock-in yields at different levels

Data on maturing bonds confirmed that bond ladder risks are relatively low

Bond ladders serve as reliable store of value for predictable income and the return of capital