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# Tax Incentives and Retirement Saving in a Low Return Environment

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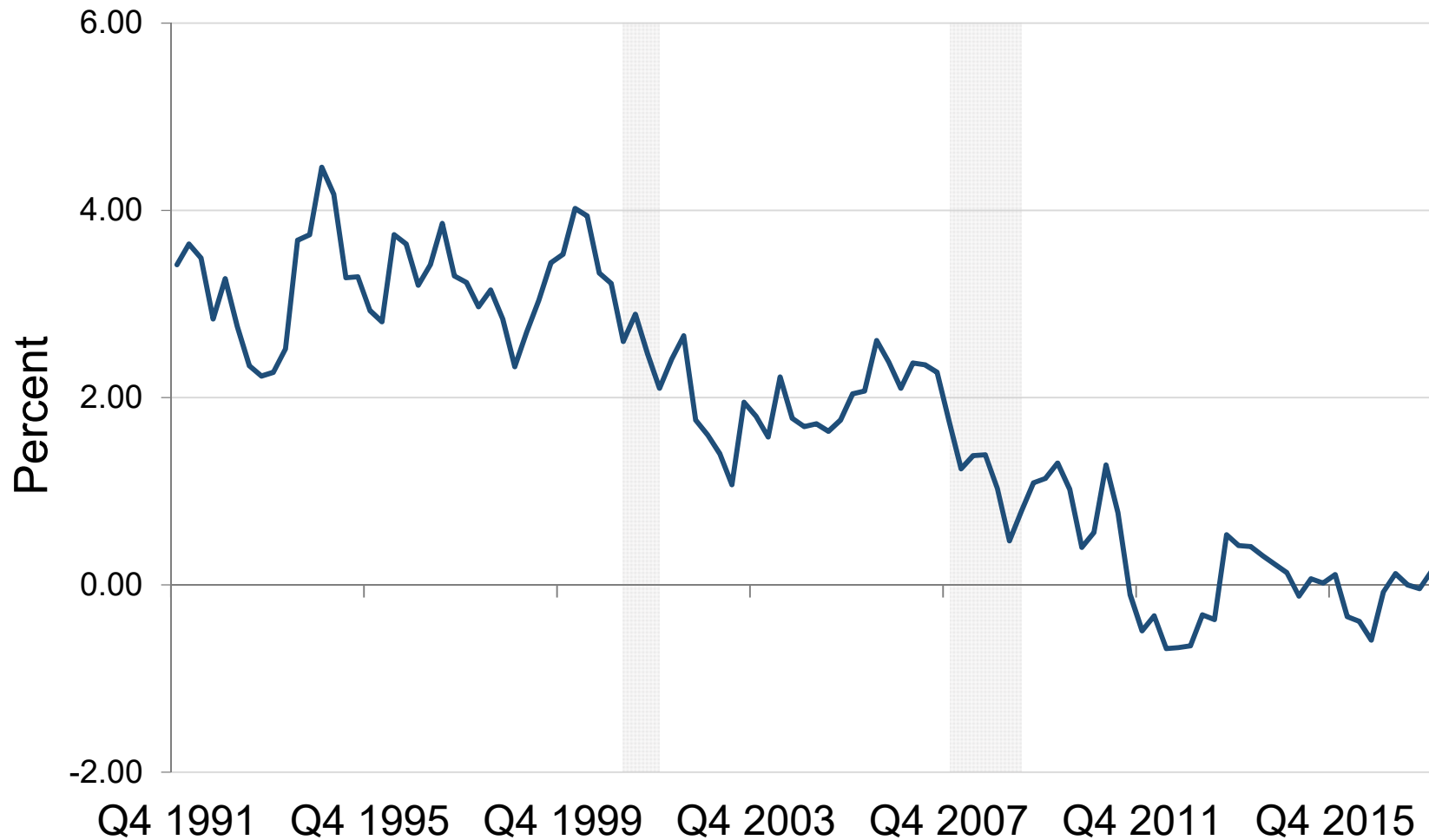
PCBE Luncheon -- 4 January 2018

# 10-Year U.S. Treasury Yield



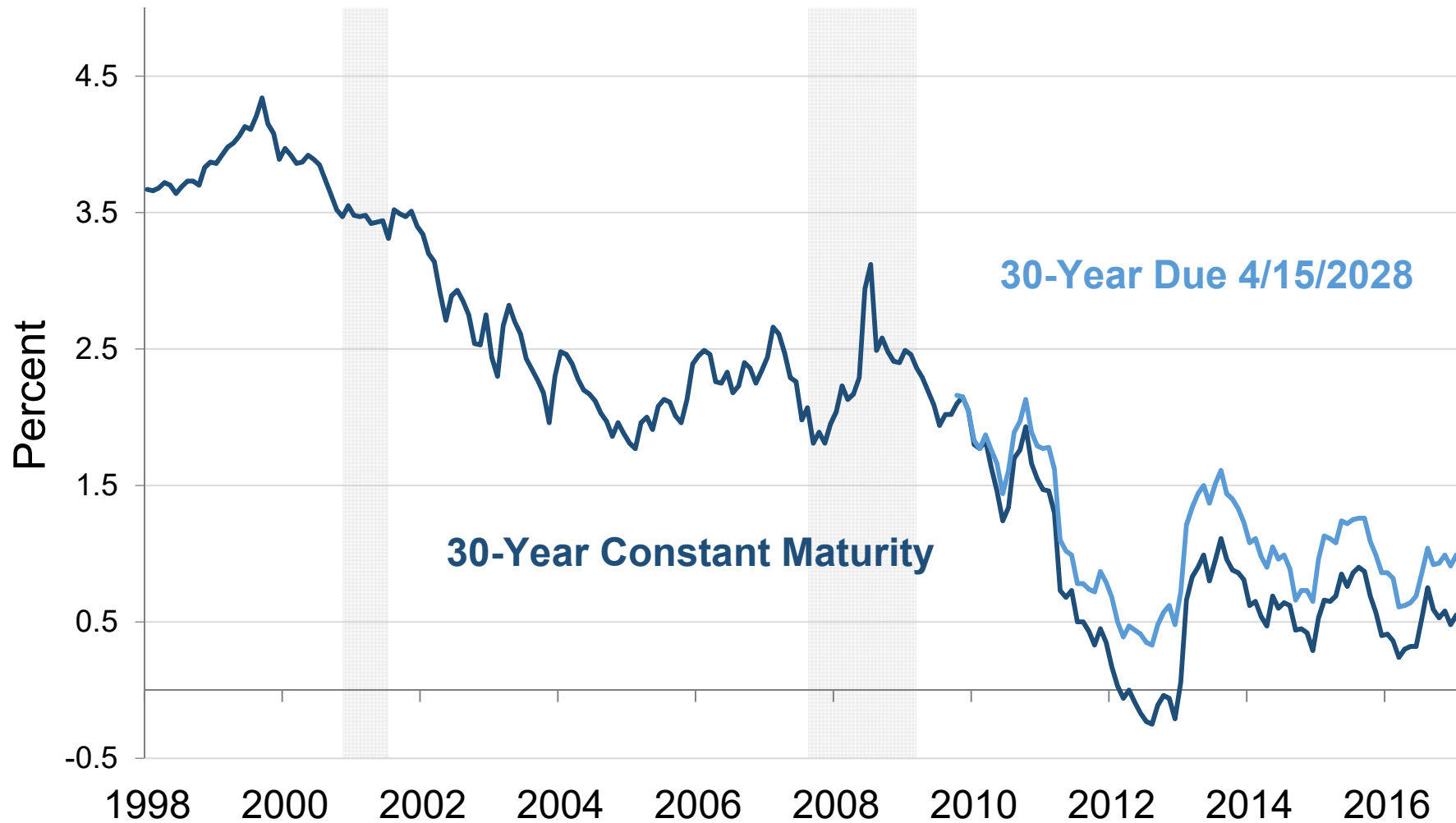
Source: Board of Governors of the Federal Reserve System (US), 10-Year Treasury Constant Maturity Rate [GS10], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/GS10>, December 28, 2017.

# 10 Year US Treasury – 10 Year Expected Inflation



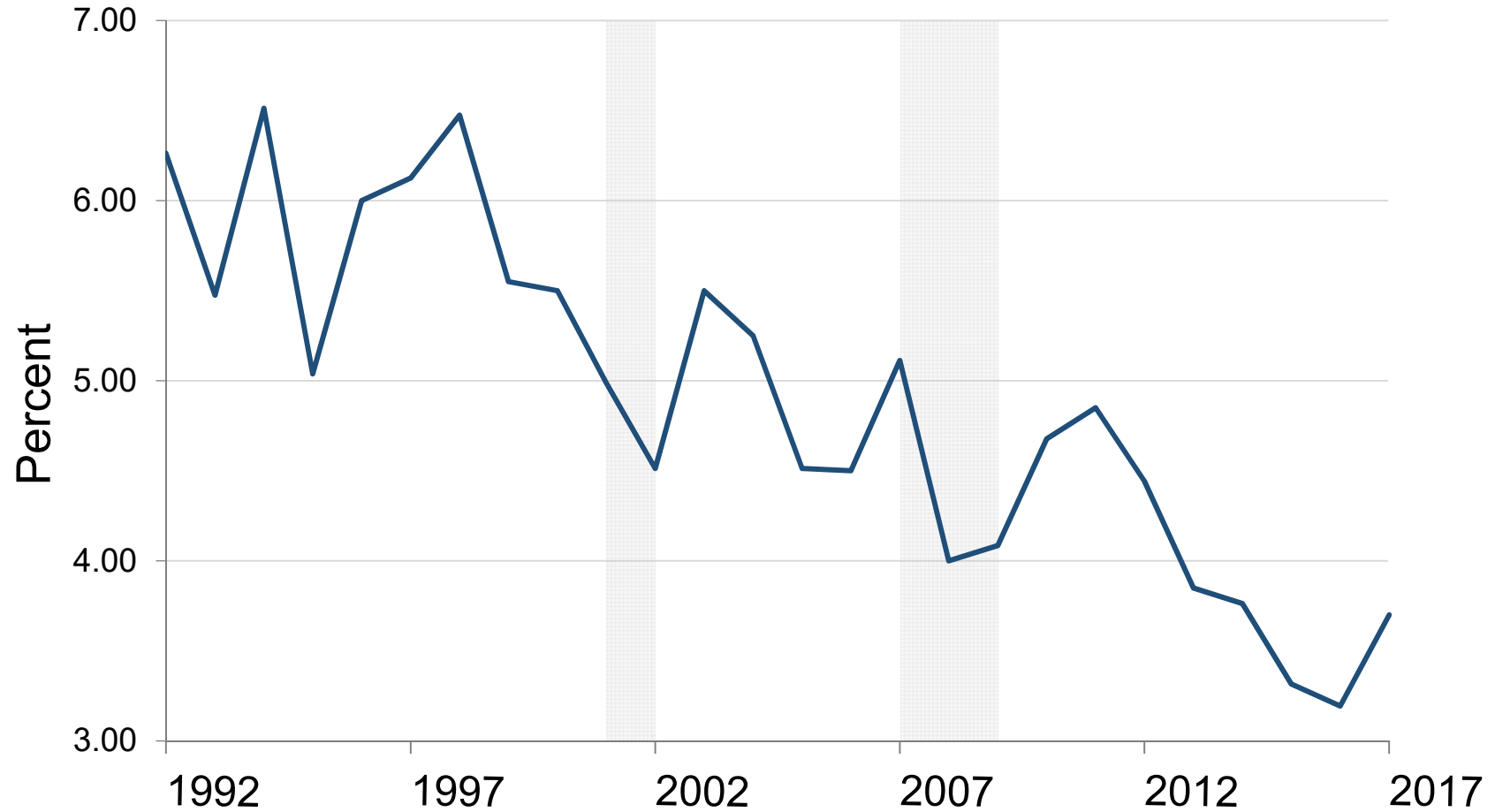
Source: Board of Governors of the Federal Reserve System (US), 10-Year Treasury Constant Maturity Rate [GS10], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/GS10>, December 28, 2017. Federal Reserve Bank of Philadelphia, Survey of Professional Forecasters, 10-Year CPI Inflation Rate (CPI10) (Median Responses), December 28, 2017.

# 30-Year TIPS Yield



Source: Haver Analytics, 30-Year 3-5/8% Treasury Inflation-Indexed Bond, Due 4/15/2028 [TP30A28], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/TP30A28>, December 29, 2017. Board of Governors of the Federal Reserve System (US), 30-Year Treasury Inflation-Indexed Security, Constant Maturity [FII30], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/FII30>, December 29, 2017.

# 10 Year Expected Stock Return – 10 Year Expected Inflation



Source: Federal Reserve Bank of Philadelphia, Survey of Professional Forecasters, 10-Year CPI Inflation Rate (CPI10) (Median Responses), December 28, 2017.

# Real Returns, Pre- and Post-Tax, 1990-2017

	10-Year Treasury Yield	Tax Rate on Interest (TAXSIM)	Expected 10-Year Inflation Rate	Real Pre-Tax Interest Rate	Real After-Tax Interest Rate
June 1990	8.43%	26.5%	4.2%	4.23%	1.98%
June 2000	6.03	31.4	2.50	3.53	1.64
June 2010	3.20	28.3	2.40	0.80	-0.11
Dec 2017	2.40	28.3	2.30	0.10	-0.58

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# Index-Linked Bond Yields: January 3 2018 FT

- United States (2028): 0.51%
- United States (2021): 0.08%
- Canada (2021): 0.27%
- United Kingdom (2035): -1.70%
- Sweden (2022): -2.00%
- France (2020): -1.72%

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## Accumulation in “Tax Deferred” Accounts

- Tax Rate when Contributing:  $\tau_0$
- Tax Rate while Accumulating:  $\tau_A$
- Tax Rate when Withdrawing:  $\tau_1$
- Pre-tax Return:  $i$
- Inflation Rate:  $\pi$



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## Return Comparisons

- After-tax Real Return on Taxable Account:  
 $(1 - \tau_A) * i - \pi$
- After-tax Return Real Return in Tax-Deferred Account:  $i - \pi$
- Value of “Inside Build Up”:  $\tau_A * i$
- Inside Build Up: 1990 = 2.25%, 2000 = 1.88, 2010 = 0.91, 2017 = 0.68

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## Effective Tax Rate

- What Share of Real Return is Claimed by Taxes?  $\tau_A * i / (i - \pi)$
- Effective Tax Rate: 1990 = 53.2%; 2000 = 53.3%; 2010 = 113.4%; 2017 = 680%

# Ratio of Tax-Deferred/Taxable Accounts at Various Horizons

Return Scenario	Saver Time Horizon			
	10 Years	20 Years	30 Years	40 Years
1990, $\tau_A = 0.25$	1.23	1.50	1.85	2.26
2000, $\tau_A = 0.25$	1.16	1.34	1.55	1.80
2017, $\tau_A = 0.25$	1.06	1.12	1.19	1.26
1990, $\tau_A = 0.40$	1.39	1.93	2.68	3.72
2000, $\tau_A = 0.40$	1.27	1.60	2.03	2.57
2017, $\tau_A = 0.40$	1.10	1.20	1.32	1.44

## Revenue Effects of Tax-Deferral

- Timing of Revenues: Reduction at Time of Contribution and During Accumulation, Increase at Time of Withdrawal
- Assume  $\tau_0 = \tau_A = \tau_1$
- Present Discounted Value (PDV) Revenue Collected from “Taxable Account”:  $\tau_0 * \{1 + i * \sum_{j=1}^T [(1+i(1-\tau_0))/(1+i)]^j \}$
- PDV Revenue Collected from “Tax Deferred” Holding:  $\tau_0 * \{(1+i)/(1+i)\}^T = \tau_0$
- How Large is the Difference?

# PDV Revenue Loss from Tax-Deferred Account Per Dollar Contributed

Return Scenario	Saver Time Horizon			
	10 Years	20 Years	30 Years	40 Years
1990, $\tau_A = 0.25$	0.19	0.34	0.47	0.58
2000, $\tau_A = 0.25$	0.14	0.26	0.36	0.45
2017, $\tau_A = 0.25$	0.06	0.11	0.16	0.21
1990, $\tau_A = 0.40$	0.28	0.49	0.64	0.75
2000, $\tau_A = 0.40$	0.21	0.38	0.51	0.62
2017, $\tau_A = 0.40$	0.09	0.17	0.24	0.31

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## Revenue Effects and “10 Year Budget Window”

- When the Budget Window = 10 Years, Tax Expenditure is Greater
  - Less Credit for Taxes Due at Withdrawal on “EET” Accounts
  - Current Proposal: Shift to “EET” Accounts to Raise Revenue
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# Estimates of Tax Expenditures for Retirement Saving, FY2015

Component of Saving	Joint Committee on Taxation Method	Alternative OMB Method
DB Plans	\$48.9 Billion	\$25.0 Billion
DC Plans	72.8	67.2
IRAs – Traditional	20.9	1.4
Roth IRAs	7.1	4.7

Source: Tax Policy Center, “How Large are the Tax Expenditures for Retirement Saving?”, 2017. JCT = Current Revenue Loss from Contributions and Balances – Current Revenue from Withdrawals. OMB = Current Revenue Loss from Contributions + PDV of Future Net Revenue Loss.

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# Why Such Low Riskless Returns?

- Global Savings Glut (Bernanke)
- Scarcity of Safe Assets (Caballero)
- Changing Risk Profile of Treasury Bonds – Better Hedge Today than in 1990 (Campbell/Pflueger/Viceira)



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# Retirement Saving in a Low-Return Environment

- Slow Accumulation of Assets While Working
- Low Payout from Accumulated Assets While Retired

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# Accumulating with Low Returns

- Earnings Grow 1% Each Year, Normalize to 1 at Age 65
- Wealth at Age 65/Final Salary If Save 1% of Earnings in Defined Contribution Plan at Age  $a$ :  
 $(1.01)^{a-65} (1+r)^{65-a}$
- Saving 1% of Earnings Every Year Starting at Age  $(65 - T)$  Yields (DC Wealth / Wage at 65):  
 $W(T) = \sum_{a=65-T}^{65} (1.01)^{a-65} * (1+r)^{65-a}$
- Pre-Tax Environment

# Retirement Wealth/Final Earnings Per 1% of Salary Saved Per Year

Accumulation Period	$r = 0.03$	$r = 0.01$
20 Years	0.24	0.20
30 Years	0.40	0.30
40 Years	0.60	0.40

Calculations assume annual real wage growth of 1% per year.  $r$  denotes the real interest rate.

# Retirement Wealth/Final Earnings Per 1% of Salary Saved Per Year

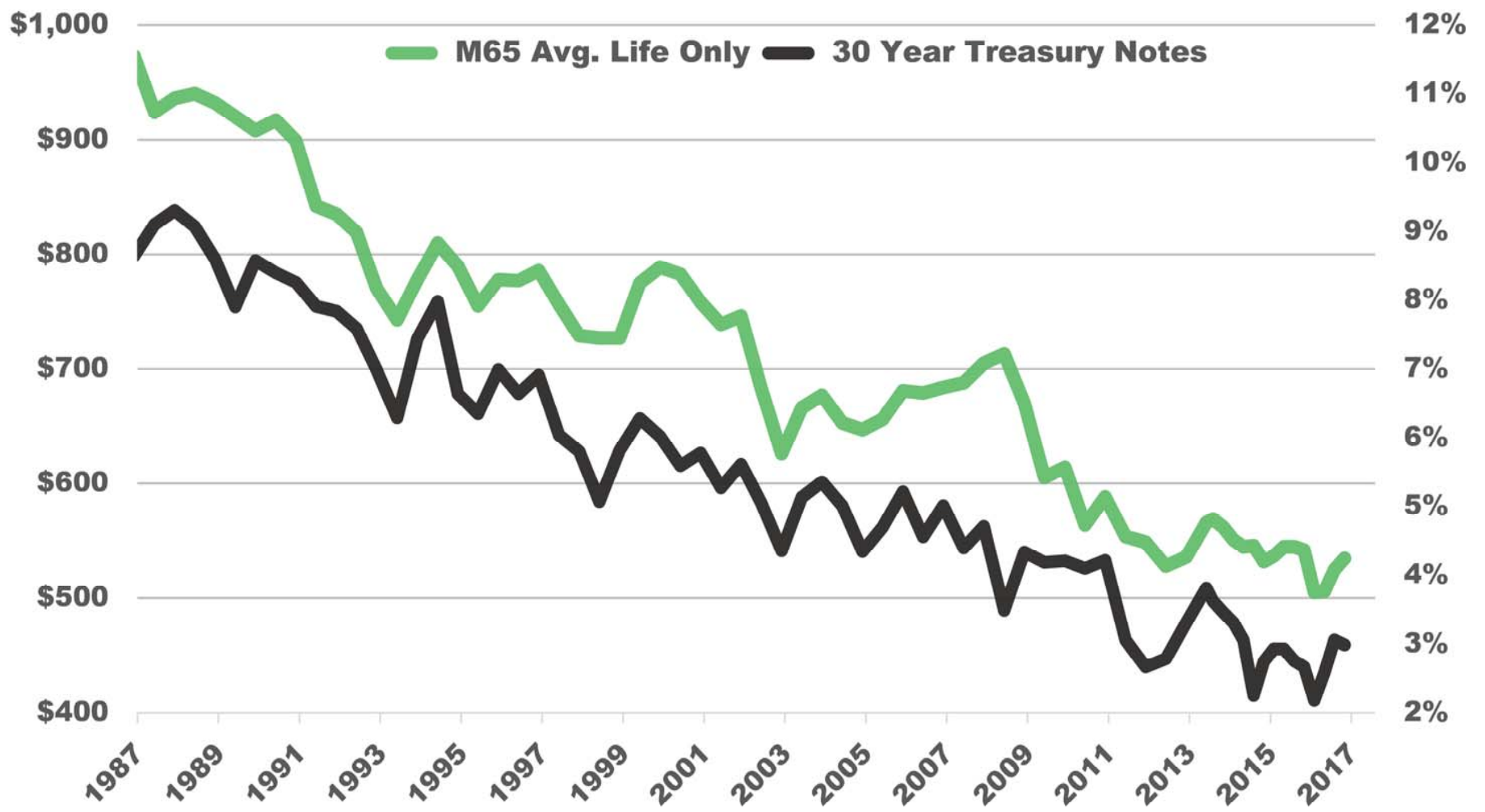
Saving Period	T bills	LT Govt Bonds	50/50 Stock Bonds	100% Stock
20 Years	0.191	0.243	0.324	0.439
40 Years	0.366	0.607	1.164	2.390
Returns Reduced 200 bps/Year				
20 Years	0.159	0.200	0.264	0.354
40 Years	0.257	0.404	0.732	1.441

# Annual Annuity Payout Rates Per \$1 Premium, April 2017

	<b>Annuity</b>	<b>Annuity with 3% Escalation</b>	<b>Annuity 20 Years Certain</b>
Male, Age 65	0.054	0.039	0.048
Female, Age 65	0.050	0.036	0.047
100% J&S, Male 65/ Female 60	0.043	0.029	0.042

Source: Annuity Shopper, April 2017.

**Male Age 65 Single Life Annuity**  
**Monthly Income per \$100,000 Premium (in left margin) and**  
**Yield on 30-Year US Treasury Notes (in right margin)**



# Annual Annuity Payout as Percent of Final Earnings Per 1% Saved

<b>Saving Period</b>	<b><math>r = 0.03</math></b>	<b><math>r = 0.01</math></b>
20 Years	0.018	0.011
30 Years	0.030	0.017
40 Years	0.045	0.022
Annual Annuity Payout Rate Per Dollar Wealth	0.075	0.055

Calculations assume annual real wage growth of 1% per year and mortality rate of 0.045 per year for annuity purchase.  $r$  denotes the real interest rate.

# Saving Rate That Replaces 50% of Final Earnings with Annuity

Saving Period	$r = 0.03$	$r = 0.01$
20 Years	0.275	0.455
30 Years	0.165	0.303
40 Years	0.111	0.227

Calculations assume annual real wage growth of 1% per year.  $r$  denotes the real interest rate.



# Remaining Balance: Spending Rule = $0.04 * \text{With}@65$

Years After Retirement	$r = 0.03$	$r = 0.01$
20 Years	0.749	0.376
25 Years	0.656	0.191
30 Years	0.548	< 0

Probability Real Wealth < 5% of  
 With@65; Spend = .04\*With@65

Years After Retirement	T Bills	LT Gov Bonds	50/50 Stocks Bonds	Stocks
20 Years	7.86	8.8	2.2	8.3
30 Years	92.6	37.1	9.3	15.3
Returns Reduced by 200 bps				
20 Years	71.7	29.7	9.1	15.8
30 Years	100	71.3	29.4	28.0

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# Adaptation Strategies for Low-Return Environment

- Raise Saving Rates
- Work Longer: Double Effect, More Saving & Shorter Payout Period
- “Reaching for Yield” by Investors Seeking to Reach Accumulation Targets
- Intergenerational Risk-Sharing? Are Low Returns a “Negative Shock” for Current Cohorts?

# Allocations in 401(k)s: Are Investors “Reaching for Yield”?

	<b>Equity Funds/ Company Stock</b>	<b>Bond Funds/ Money Market/ GICS</b>	<b>Other</b>
2001	62.4%	28.2%	9.4%
2007	64.3	19.0	16.7
2015	65.3	19.1	15.6

Source: Investment Company Institute, holdings of 401(k) participants 50-59.