



Rich-Cheap and Relative Value Trading

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Investment Analytics



Rich/Cheap Analysis & Relative Value Trading

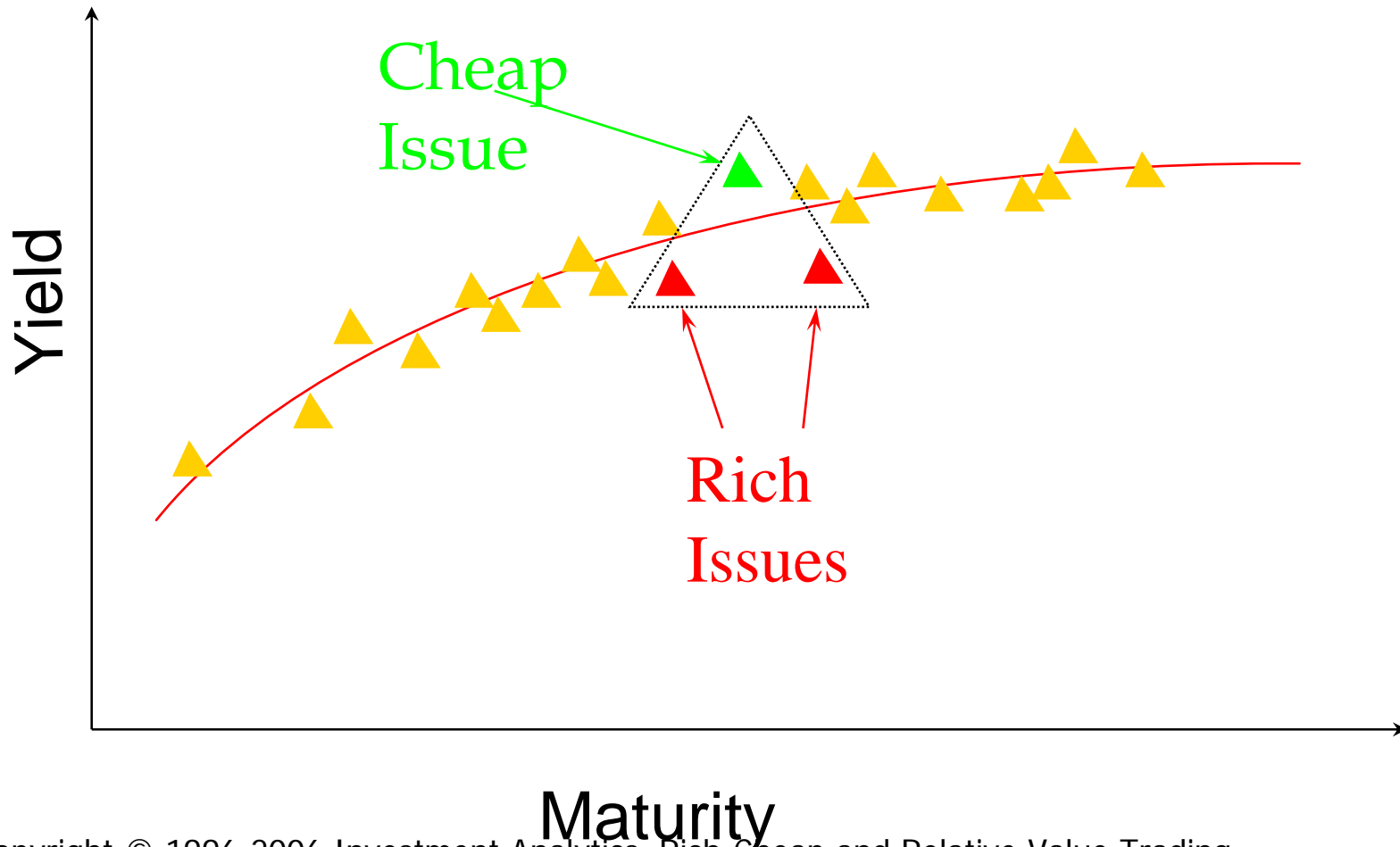
- Principles of rich/cheap analysis
- Relative value concepts
- Total return analysis



Rich-Cheap Analysis

- Select the appropriate tax-rate
- Identify the tax-efficient bonds
- Estimate the spot tax-yield curve using the efficient bonds
- Identify the issues which are low yield ('rich') or high yield ('cheap') relative to the curve
- Initiate duration-weighted trade

Rich-Cheap Graphical Analysis





Problems with Simple Approach

- Coupon
 - Issues with different coupons trade at different yields
- Risk-Return
 - Maturity is an inexact measure of risk
 - Yield is an inexact measure of return
- Liquidity
 - On-the-run vs off-the-run
 - Issues on repo special

Example: Rich/Cheap Analysis



Lab

- Simple Example: Worksheet-Rich Cheap Analysis
 - Work out spot rates
 - Two 2-year notes:
 - 7 1/2% trading at par, 15% trading at 113.69
 - Market Yield
 - Calculate YTM on both bonds, given market prices
 - Theoretical Price/Yield
 - Calculate theoretical price & yield on each note
- Conclusion:
 - What is the relationship between coupon and yield?



Solution: Rich/Cheap Analysis Lab

- 7.5% 2-year Note:

Market

| Price | Yield |
|-------|-------|
| 100 | 7.5% |

Theoretical

| Price | Yield |
|--------|-------|
| 100.09 | 7.45% |

- 15% 2-year Note:

Market

| Price | Yield |
|--------|-------|
| 113.69 | 7.5% |

Theoretical

| Price | Yield |
|--------|-------|
| 113.87 | 7.41% |

- Both issues are cheap, high coupon > low coupon



Impact of Coupon on Bond Value

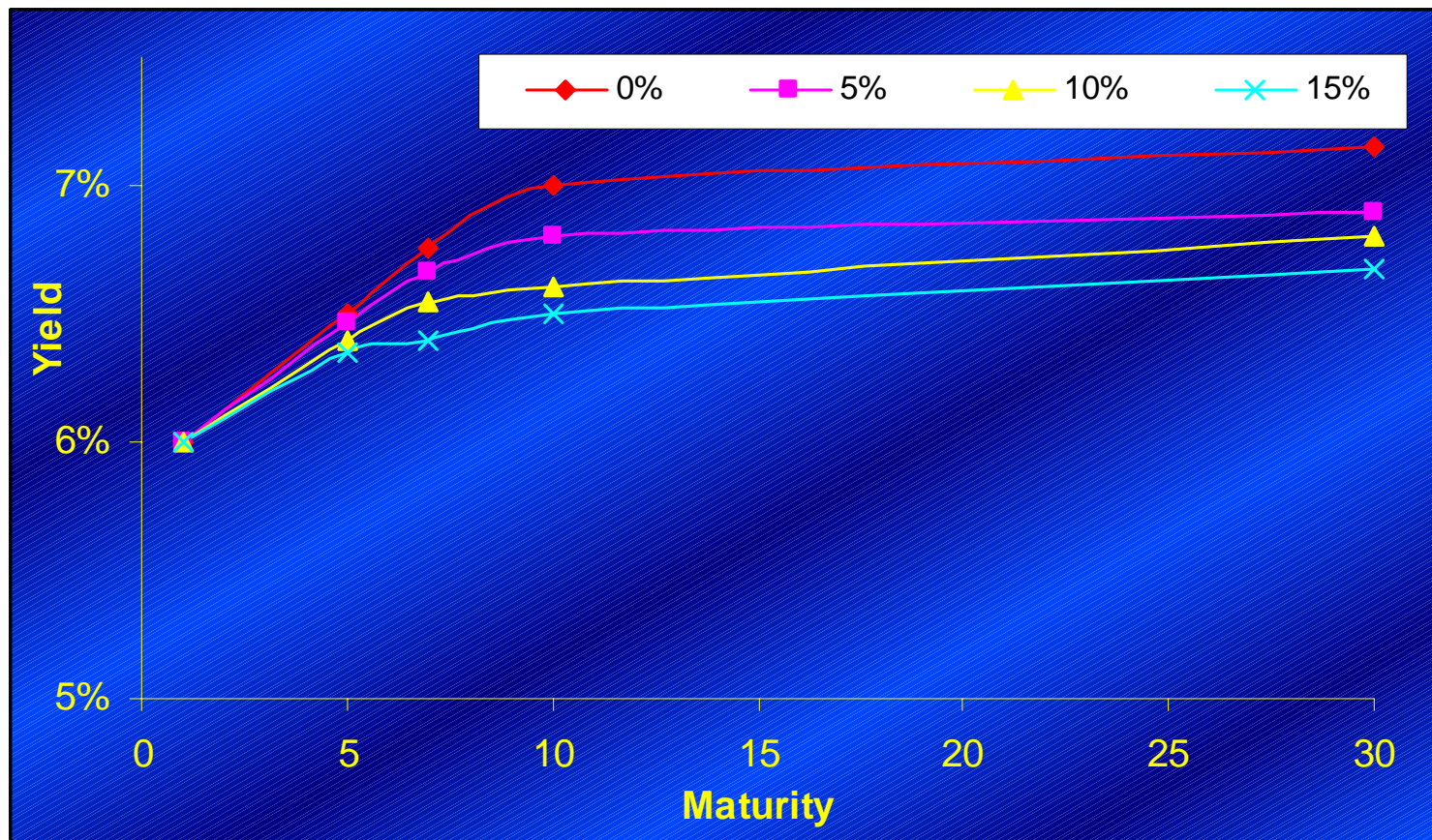
- YTM calculation
 - Makes simplifying assumption of constant reinvestment rate
- With rising spot rates:
 - Low coupon bonds must trade at higher yields than high coupon bonds to compensate



Iso-Coupon Curves

- Implication
 - To judge richness or cheapness of an issue must take account of coupon
 - Coupon adjusted yield
- Iso-Coupon Yield Curves
 - Group bonds by coupon
 - Plot YTM vs Maturity (duration)
 - Assess value vs appropriate curve

Iso-Coupon Curves - Example





Bond Stripping & Repackaging

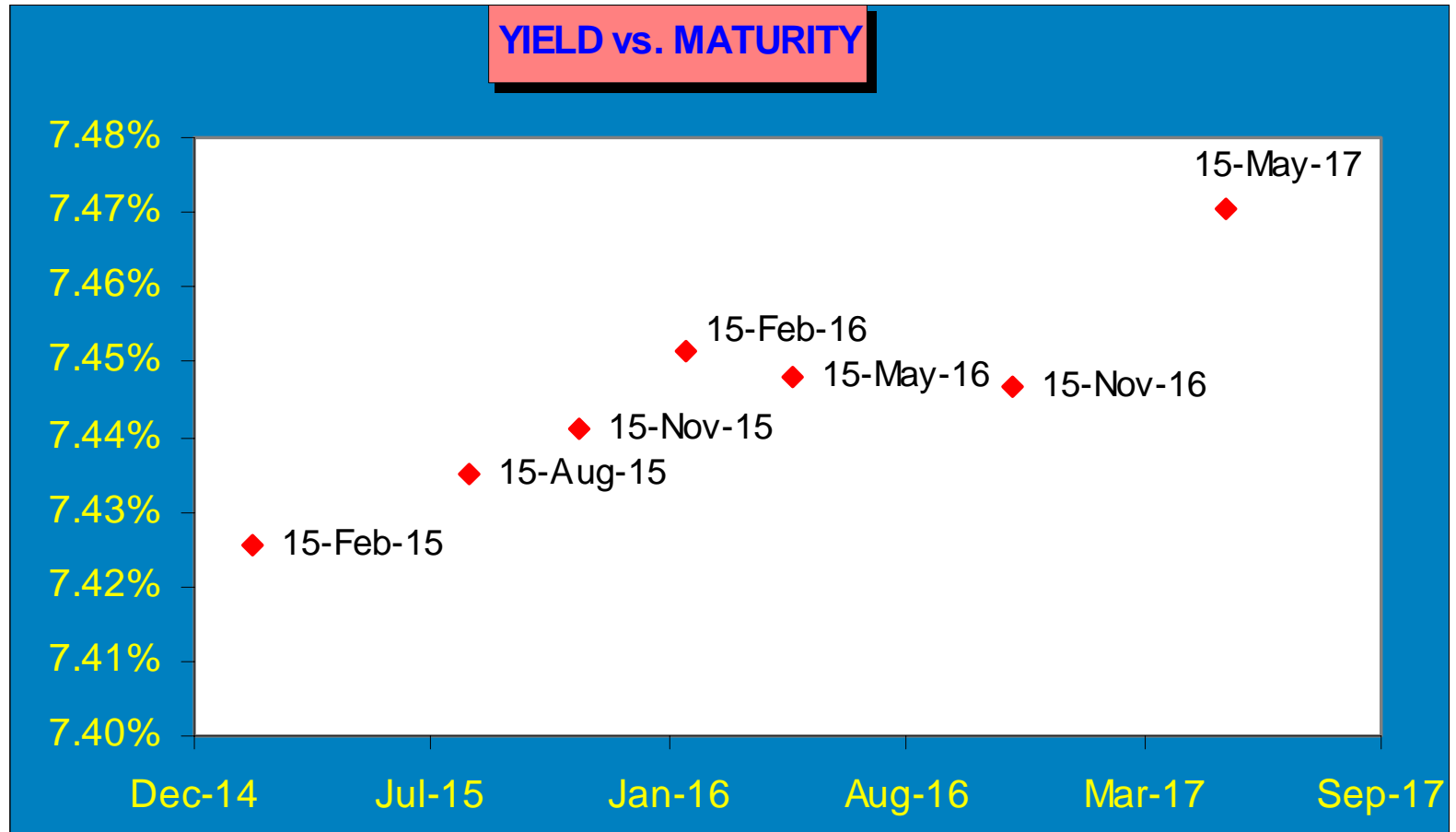
- Trading based on a variant of rich-cheap analysis
- Replicate the cash flows of inefficient bonds using the efficient bonds
- Stripping:
 - Buy cheap bond & sell off the cash flows (as ZCB's)
- Repackaging:
 - Sell rich bond & hedge with replicating cash flows from efficient bonds

Relative Value Concepts

- Yield curve as a measure of risk-return tradeoff
 - Maturity as a proxy for risk
 - Look at yield pickup on extension to identify value
- Example

| Settlement | 2-May-95 | Clean Price | Accrued Interest | Dirty Price | YTM | Yield Pickup (bp) | Modified Duration |
|------------|----------|-------------|------------------|-------------|---------|-------------------|-------------------|
| 15-Feb-15 | 11 1/4 | 139 10/32 | 2.3619 | 141.6744 | 7.4255% | | 9.3628 |
| 15-Aug-15 | 10 5/8 | 133 4/32 | 2.2307 | 135.3557 | 7.4351% | 0.96 | 9.5637 |
| 15-Nov-15 | 9 7/8 | 125 13/32 | 4.5829 | 129.9891 | 7.4412% | 0.61 | 9.5491 |
| 15-Feb-16 | 9 1/4 | 118 27/32 | 1.9420 | 120.7857 | 7.4514% | 1.02 | 9.9062 |
| 15-May-16 | 7 1/4 | 97 29/32 | 3.3646 | 101.2709 | 7.4482% | -0.32 | 10.2487 |
| 15-Nov-16 | 7 1/2 | 100 18/32 | 3.4807 | 104.0432 | 7.4467% | -0.14 | 10.2782 |
| 15-May-17 | 8 3/4 | 113 23/32 | 4.0608 | 117.7795 | 7.4706% | 2.38 | 10.0543 |

Yield vs. Maturity

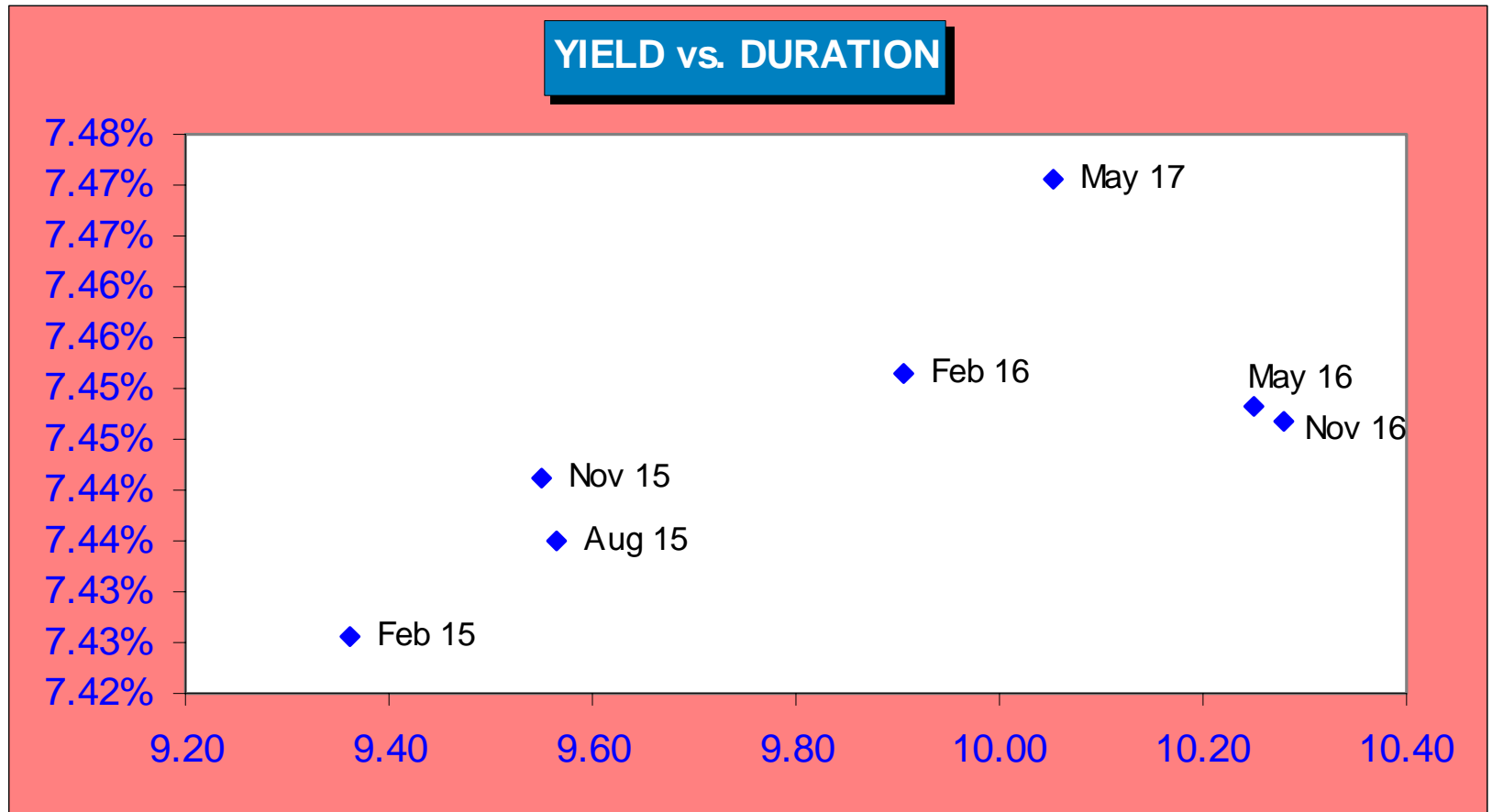




Yield Curve Analysis

- Fairly normal yield curve
 - Yield on the 9 1/4 of Feb '16 looks to be a basis point too high
 - 2.4bp pickup on the 8 /4% of May '17 indicates value in this sector
- Clear relationship between yield and tenor
- What about relationship between yield and risk?
 - Use duration as a proxy for risk
 - Plot yield vs. duration
 - Makes relative values more distinct

Yield vs. Duration





Yield Enhancement Swap

- Because it has higher coupon, the 8 3/4 of May '17 has lower duration than the 7 1/4 of May '16 or the 7 1/2 or Nov '16.
- By trading at slightly higher yield, the market would appear to be underpricing it slightly
- Bond Swap:

| Action | Maturity | Coupon | Price | YTM | Duration |
|--------|-----------|--------|-----------|---------|----------|
| Sell | 15-Nov-16 | 7 1/2% | 100 18/32 | 7.4467% | 10.278 |
| Buy | 15-May-17 | 8 3/4% | 113 23/32 | 7.4706% | 10.054 |



Limitations to Traditional Yield Curve Analysis

- Yield curve:
 - A primitive expression of risk/return tradeoff
- Drawbacks
 - Maturity is poor indicator of bond price volatility
 - YTM is not a measure of potential return
 - For Buy and Hold investor, assumes coupons are reinvested at YTM
 - For Active investor, assumes that if bond is sold prior to maturity, it is sold at same yield as on purchase date



Total Return

- Holding Period Return (HPR)
 - Measures bond's total return over given period
 - HPR is a *time-weighted* average return
- $$\text{HPR} = \frac{\text{ending market value} + \text{income receipts}}{\text{beginning market value}} - 1$$



HPR Example

- 7%, 30Yr T-Bond, priced at par to yield 7%
- 1-year HPR:

$$[(\$1000 + \$35 + \$35 + \$1.23^*) / \$1000] - 1 =$$

$$\text{HPR} = 7.12\%$$

$$* \$35 \times 0.07 \times 0.5 = \$1.23$$



HPR Example

- 7%, 30yr T-Bond, priced at par to yield 7%
- 1 Year HPR:

| | Falling Rates 6% | Constant Rates 7% | Rising Rates 8% |
|-----|------------------------|-------------------------|-----------------------|
| HPR | 20.78% | 7.12% | -4.08% |

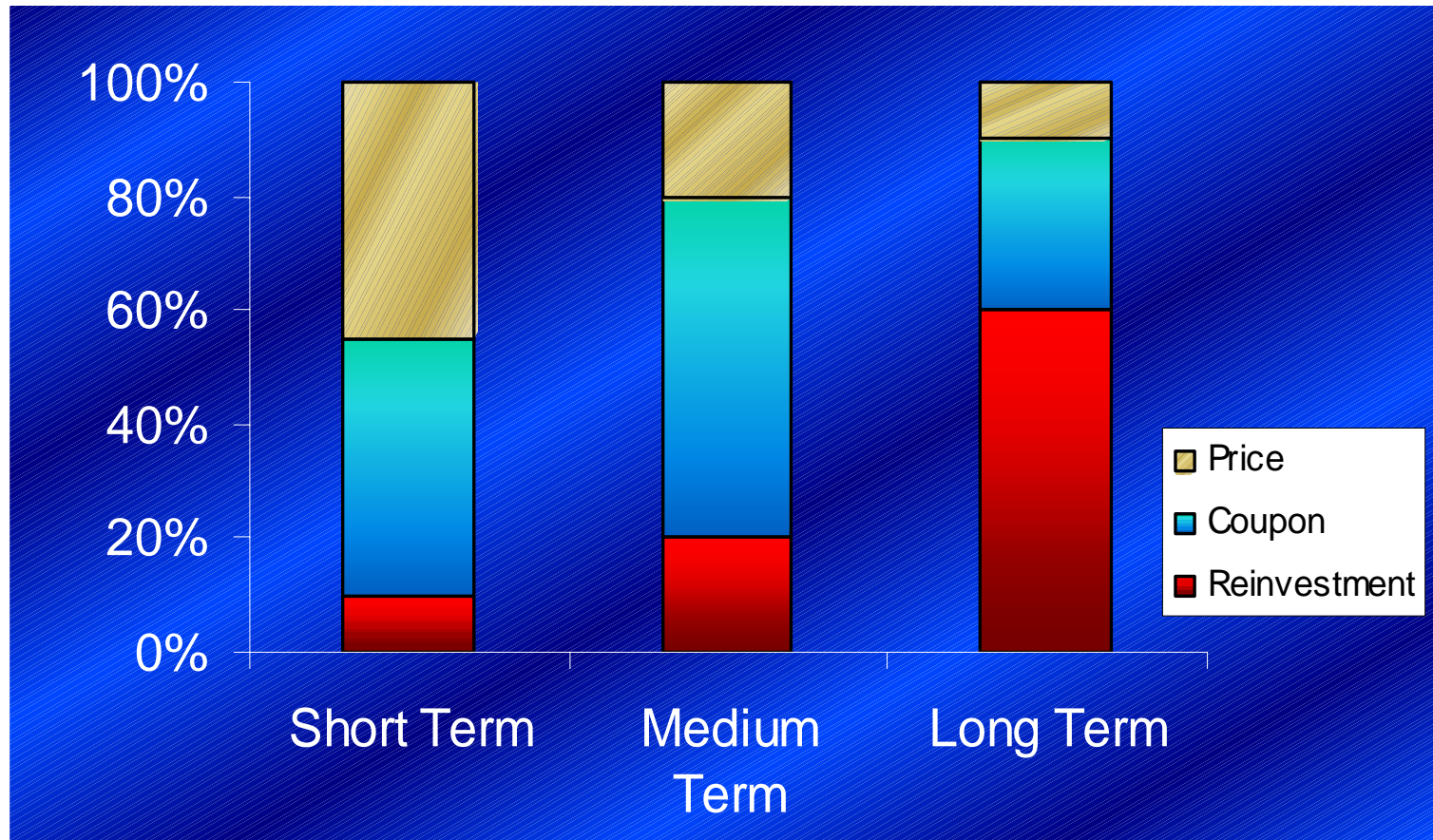


Components of Total Return

- Price return
 - (ending bond price - beginning bond price)
 - Excluding accrued interest
- Coupon return
 - Coupon receipts +/- accrued interest
- Reinvestment return
 - Interest earned on reinvested coupons

Total Return = Price Return + Coupon Return

Components of Total Return



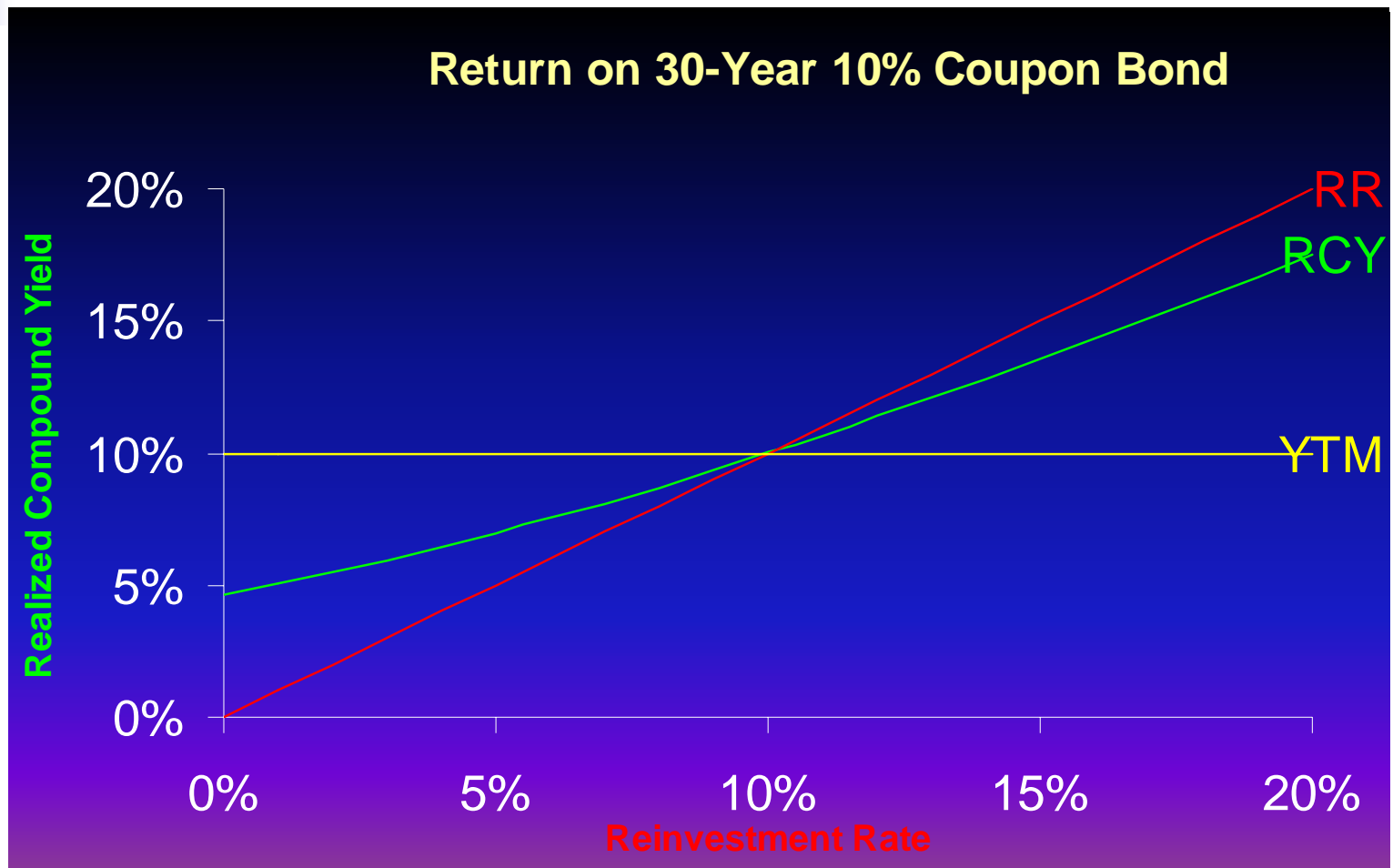


Realized Compound Yield

$$Price = \frac{FV}{\left(1 + \frac{RCY}{2}\right)^T}$$

- RCY is a *dollar-weighted* average return
 - FV is the future value of the bond investment over the holding period

Reinvestment Rate and Realized Compound Yield

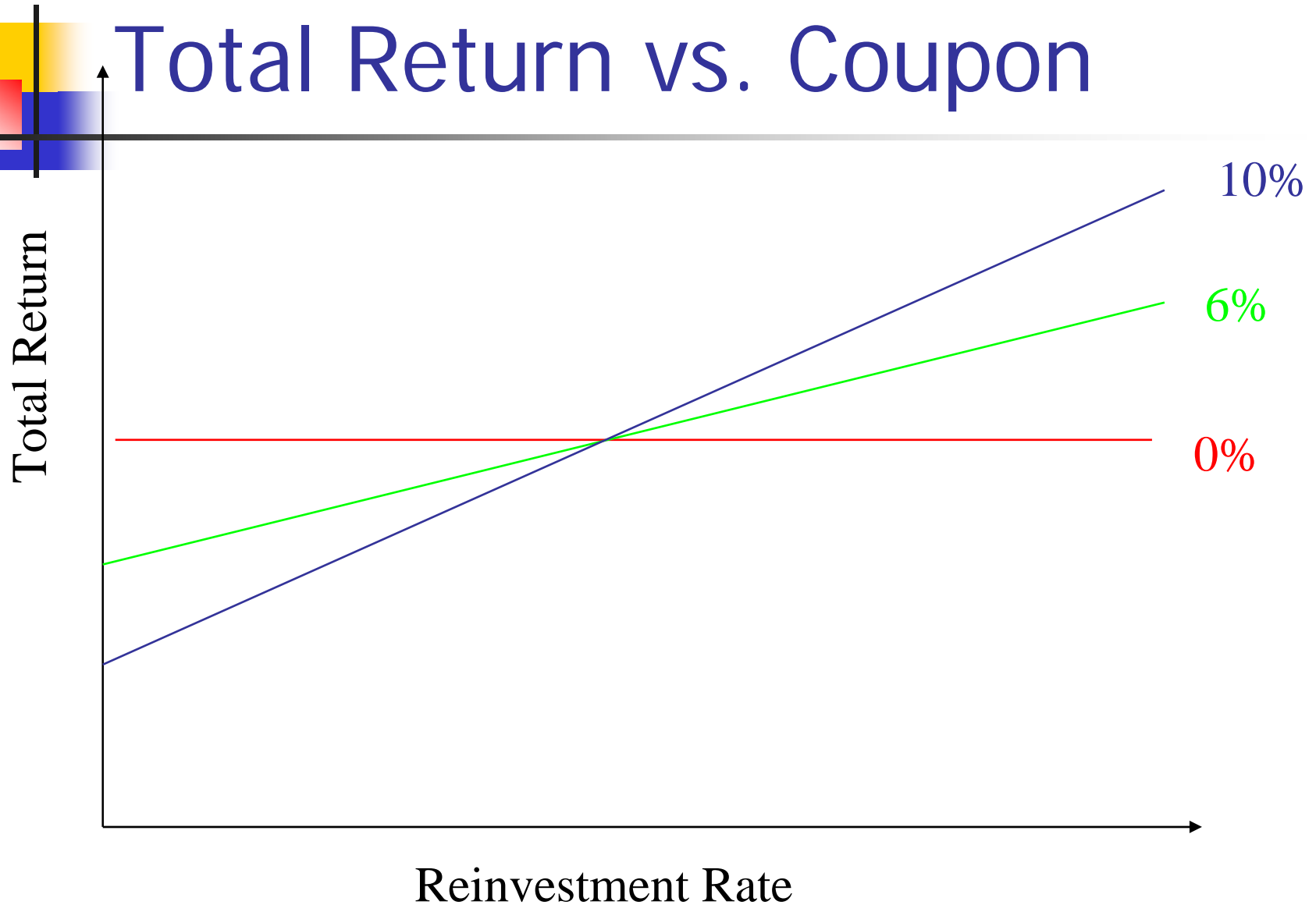




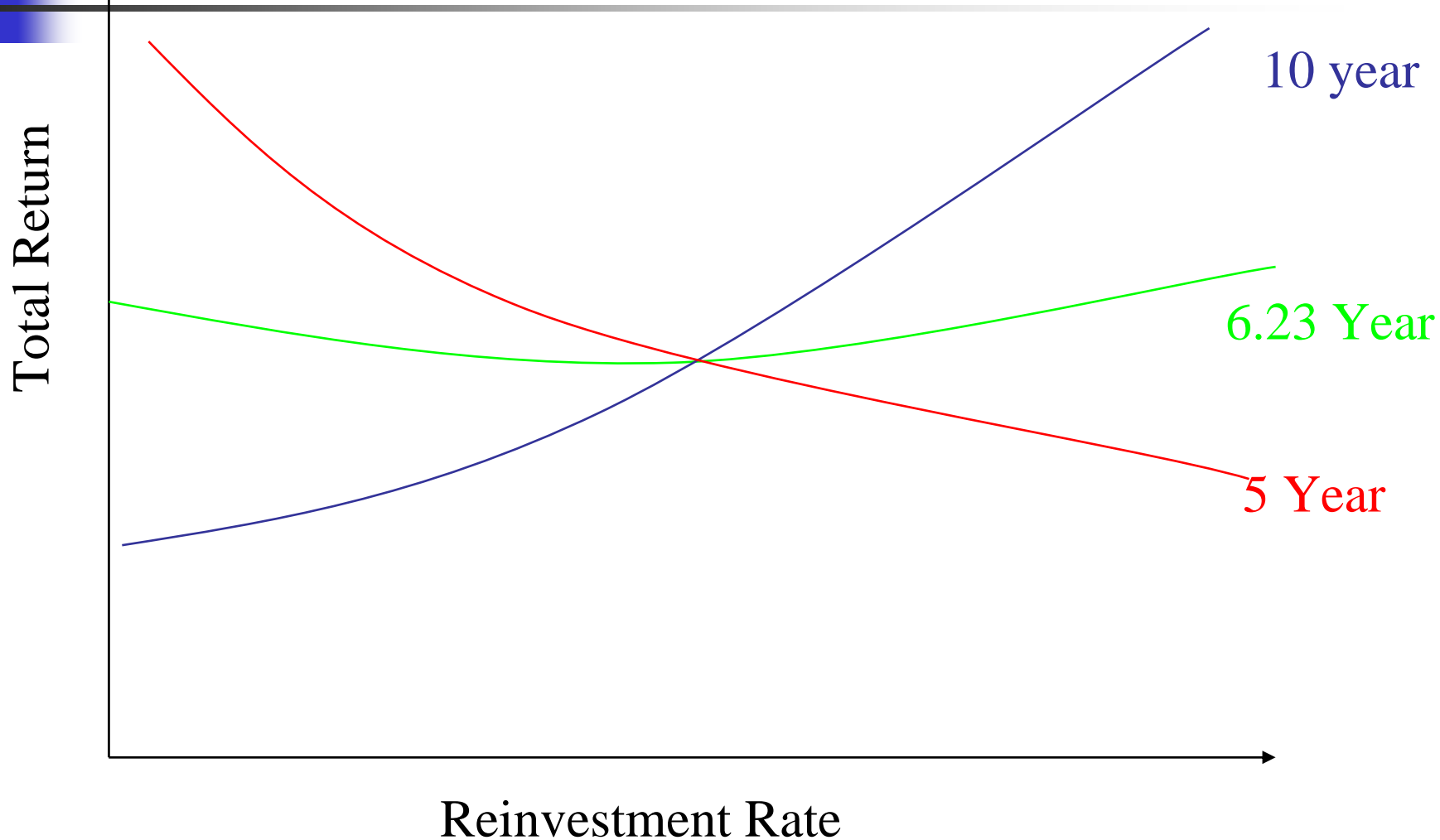
Characteristics of Total Return

- Effect of reinvestment rate on total return
 - Low vs. high coupon bonds
 - Short vs. long maturity issues
 - Holding period < maturity
- Lab: Total Return Analysis

Total Return vs. Coupon



Total Return vs. Horizon



Characteristics of Total Return

- Summary

- Coupon

- RR has greater effect for higher coupon issues
 - No effect for ZCB's

- Holding period

- For long holding periods
 - Total return rises with RR
 - Reinvestment of coupon cash flows dominates return
- For short holding periods
 - Total return falls with RR
 - Bond price at horizon dominates return
 - Greater RR implies lower price, hence return falls



Immunized Portfolios and Total Return

- Portfolio with Horizon = Duration
- Coupon reinvestment effect balances price-discount effect
- Total return is approximately the same regardless of reinvestment rate
- Central concept of portfolio management



Breakeven Reinvestment Rate

- RR at which TR on two bonds is the same over given horizon
 - Used to decide which of two bonds is more attractive
 - For some bonds, may not be a breakeven RR
 - One bond totally dominates the other
 - Total return is always greater

Breakeven RR - Example

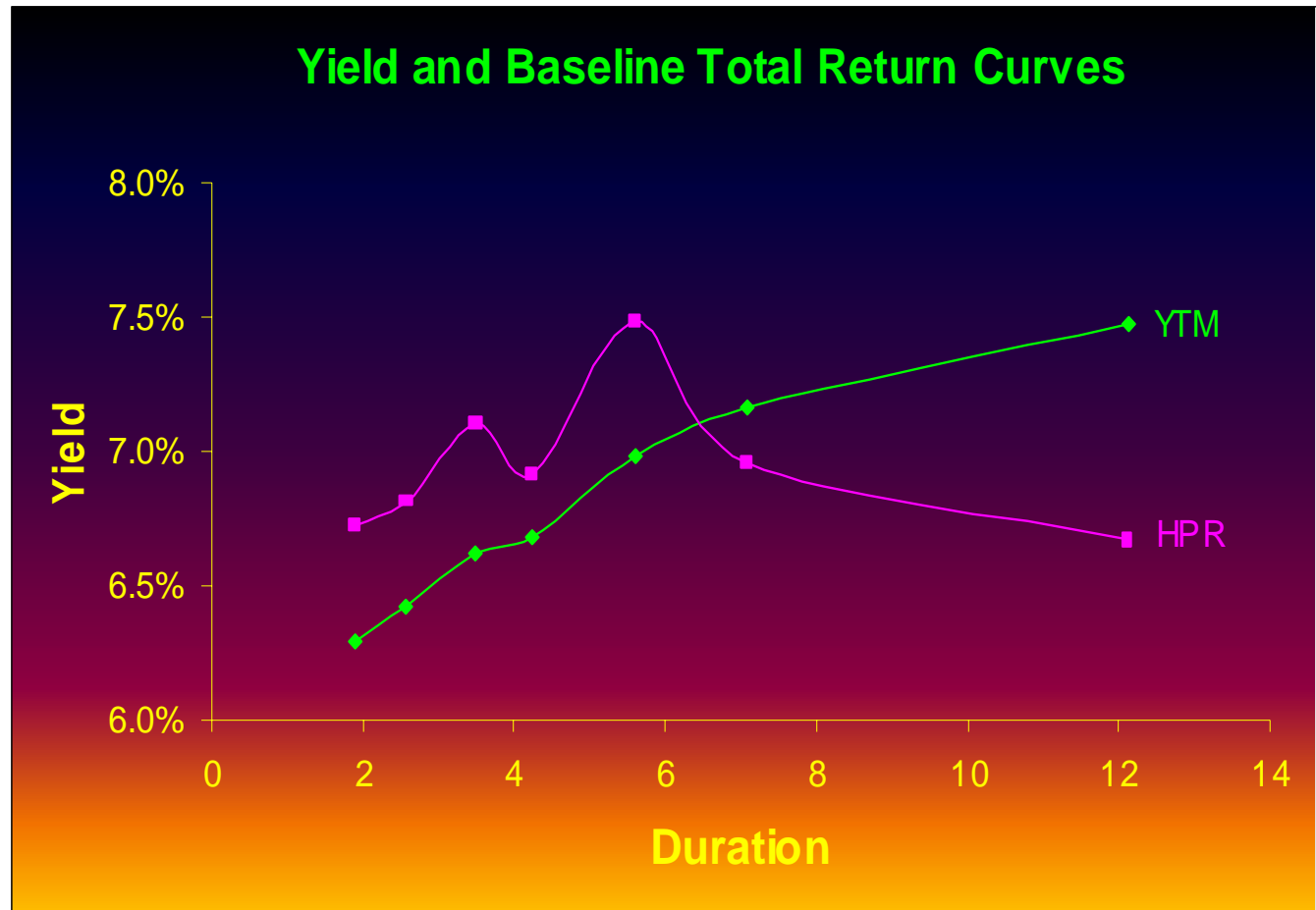




The Total Return Curve

- Project returns for a given holding period
- Plot HPR against duration
 - Return vs. Risk
- Assumptions
 - Interest rates
 - Sector spreads (quality, maturity, coupon, issuer)
 - Reinvestment rate
- Baseline Total Return Curve
 - 1 Year horizon, yield curve shape unchanged
 - All reinvestments made in the middle of the curve

Total Return Curve Example





YTM vs. HPR Pickup

- Difference due to *yield curve roll factor*
 - As bond ages, it rolls down to new, lower yield
 - Also, moves from on-the-run to off-the-run
- Long duration bonds are especially sensitive to roll factors:
- % change in price: $(\Delta P/P) = -D^* \times \Delta Y$
 - D^* is modified duration

Yield and Total Return Pickup

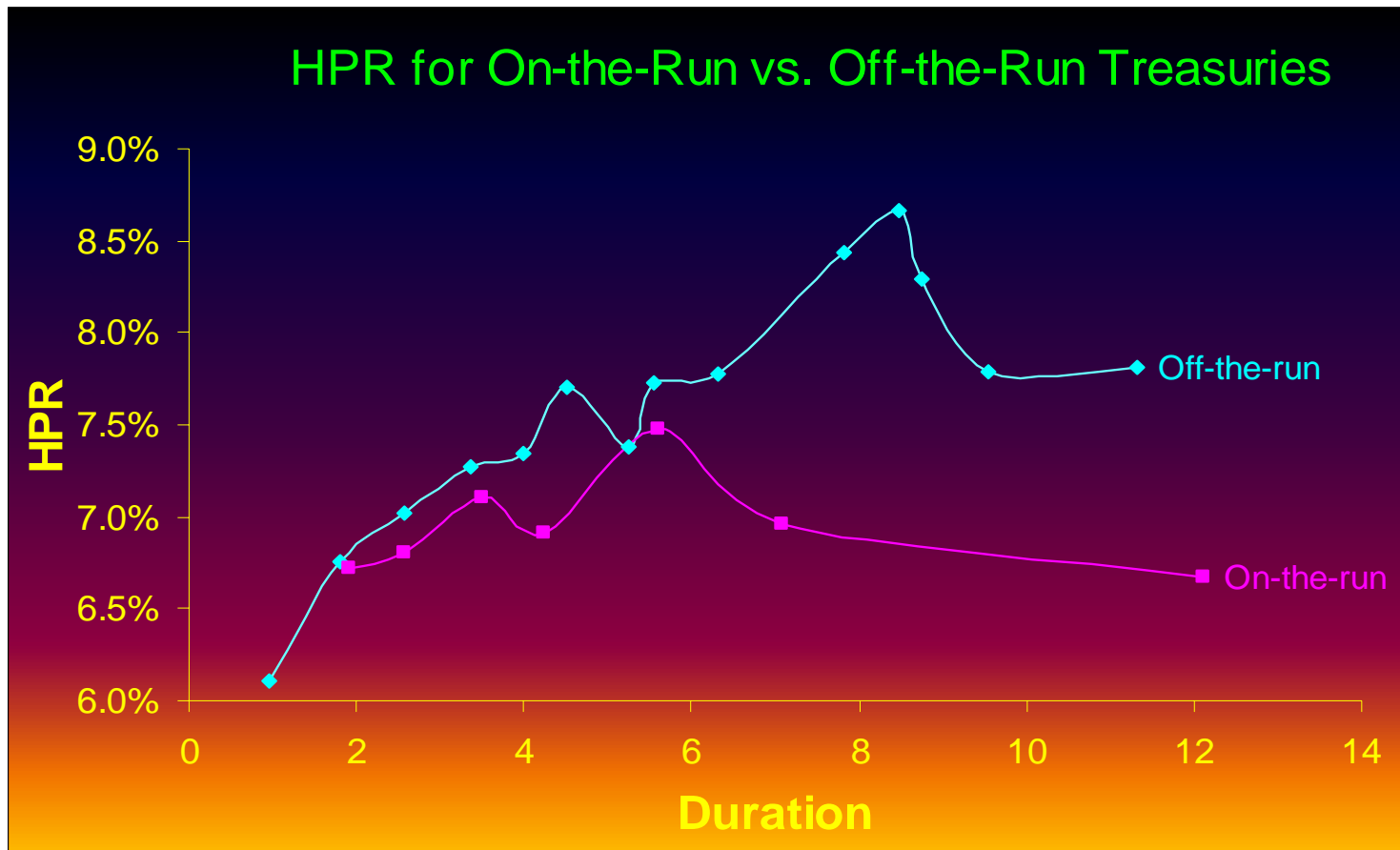
| Maturity | Duration | YTM | YTM Pickup on Extension | 1-Year HPR | Total Return Pickup on Extension |
|----------|----------|-------|-------------------------|------------|----------------------------------|
| 2 | 1.91 | 6.29% | | 6.72% | |
| 3 | 2.56 | 6.42% | 13 | 6.81% | 9 |
| 4 | 3.49 | 6.62% | 20 | 7.10% | 29 |
| 5 | 4.23 | 6.68% | 6 | 6.91% | -19 |
| 7 | 5.6 | 6.98% | 30 | 7.48% | 57 |
| 10 | 7.07 | 7.16% | 18 | 6.96% | -52 |
| 30 | 12.12 | 7.47% | 31 | 6.67% | -29 |

30-year sector preferred on YTM basis

7-year sector preferred on HPR basis

On-the-Run vs. Off-the-Run

HPR's



Relative Value & Risk-Return Tradeoff



- Market does not seem to appraise risk in a consistent fashion
- Attractive issues:
 - Off the run issues with 4-5 years and 8-9 years in duration
 - 6-yr, 8-yr, 15-yr maturities
- Overvalued sectors:
 - All the current coupon issues
 - 5-yr, 7-yr and 29-yr off-the-runs



Factors Affecting Relative Value Trading in Practice

- Coupon
 - Low coupon issues trade at higher yields to give fair value (with an upward sloping yield curve)
- Tax effects
- Liquidity
 - On-the-run vs. off-the run treasuries
 - Issues on “special” in repo market
- Call provisions (& other option features)
- Transaction costs, shorting restrictions