# "Diversification and Capital Gains Taxes with Multiple Risky Assets"

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by

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### Introduction and Motivation

- In the absence of taxes (and transaction costs), investors would rebalance their portfolios frequently to benefit from the optimal risk/return tradeoff.
- However, in practice, the sale of an asset triggers a capital gain (or loss) for tax purposes, but capital gains taxes are deferred until the asset is sold and are forgiven at death.
- What is the tradeoff between portfolio rebalancing/diversification and payment of capital gains taxes? How does the tradeoff vary with the investor's situation (e.g., portfolio structure, extent of gains, age)?
- Our aim is to challenge conventional perspectives and rules of thumb on many of the facets of portfolio rebalancing.

### The Investor's Optimization Problem

- Investors begin their consumption/investment decisions at age 20 using an actual mortality curve (assume death by age 100).
- Annual model and decisions (80 periods)
- Investors maximize expected utility of intertemporal consumption.
  - Constant relative risk-averse preferences (g=3).
  - Annual subjective discount factor of  $\mathbf{b} = 0.96$ .
- At death, the investor's portfolio is liquidated *without payment of capital gains taxes* and the proceeds are used to provide a bequest to the investor's beneficiary.
  - Forgiveness of the capital gains tax is consistent with the *reset provision* of the U.S. Tax Code.
  - Bequest is invested in bonds and provides a *constant real annuity* for the investor's beneficiary for H periods (H = ¥).

### The Curse of Dimensionality

- Models of lifetime portfolio allocation decisions suffer from the *curse of dimensionality*.
  - The higher the dimensionality of the state space, the more complicated the problem becomes.
  - Numerical solutions can be obtained provided the dimensionality of the state space remains relatively small.

### Model Simplification

- One-Two risky assets and riskless asset
- Average Basis taxation
- Binomial Process
- Constant Relative Risk Averse Preferences--Decision Rules for Consumption and Equity Holdings will be Proportional to Wealth
- Dynamic Programming can be used to write the optimization problem recursively.
- Problem can be solved by backwards recursion from T.
- State variables: --basis/price ratio

--investor's holding of equity at the basis

--investor's age

### Model Parameters

Financial Markets:

- Riskless one-period bond
  - Constant nominal interest rate of r = 6%.
  - Interest taxed at the rate of  $\mathbf{t}_d = 36\%$ .
  - Borrowing is allowed.
- Single risky stock
  - Constant nominal dividend yield of d = 2%.
  - Dividends taxed at the rate of  $\mathbf{t}_d = 36\%$ .
  - Nominal capital gain return follows a binomial process (m= 7% and s = 20%).
  - *Realized* capital gains and losses are taxed at the rate of  $t_g = 20\%$ .
  - No short sales allowed.
- Constant inflation rate of i = 3.5%.
- Assumed "risk premium" [(1.07)(1.02) 1.06 = 3.14%] is consistent with recent expectations (not with history).
- Mortality rates from 2000 U.S. Life Tables (total population)

## Capital Gains Tax vs. Portfolio Rebalancing

The incentive to sell assets with embedded capital gains in order to diversify (or consume) is inversely related to the size of the gain (rebalancing vs. tax tradeoff) and the investor's age.

- Young investors have strongest diversification incentive.
- Elderly investors benefit the most from reset provision at death and hold relatively more equity (contrast with conventional advice).
- There are ex-ante and ex-post effects of the reset provision.





## Role of "Reset" of Bases at Death

In Canada capital gains taxes are due on the existing appreciation (and the basis is then reset to the market value) at death.

How should investors facing this tax system behave compared to investors subject to the U.S. reset provision?

- With mandatory capital gain realization at death (Canadian law), the deferral option loses considerable value:
  - Investors realize gains before death to maintain an optimally diversified portfolio.
  - Optimal equity holdings are nearly identical across age groups.

#### Figure 4 Optimal Stock Holding Under Mandatory Capital Gains Taxation At Death



0,8 0.7 0.6 **Optimal equity proportion** 0.5 0.4 0,3 0,2 Age=90 0.1 Age=35 4.4 0 0,6 0.2 0.4 0.8 0 1 1.2 **Basis-price** ratio

Note: The initial stock holding as a fraction of beginning-of-period wealth is set at 50 percent for both panels.

### Analysis of Multiple Assets

- Suppose an investor has most of his position in a highly appreciated position in a single company's stock. To what extent should he diversify, despite the capital gains tax?
- If you have a large gain on a substantial position in Citigroup, how does that influence whether you sell JP Morgan Chase if you have a substantially smaller gain on it (but a comparably-sized exposure)?
- What are some general features of optimal portfolio rebalancing?

### **Example with Concentrated Portfolio Position**

- A highly volatile individual company stock,  $s_c=40\%$
- A broadly diversified stock index,  $s_I = 20\%$
- Capital gain return of 7% on each asset
- Risk-free bond ( $\mathbf{m} = 6\%$ )
- Risky asset return correlation (**r** = 0.5)
- Dividend yield  $(d_C = d_I = 2\%)$
- Inflation rate (i = 3.5%)

Dividends and interest are taxed at 36% and capital gains are taxed at 20%.

### **Example with Concentrated Portfolio Position**

Example: The index and 'company' stock have the same expected return and different variability (due to idiosyncratic risk on the individual 'company' stock).

- Scale back holdings of company stock dramatically given opportunity to substitute the market 'index.'
- Incentive to diversify is sensitive to age (greater for young). However, even at age 90 the investor sells most of his concentrated exposure immediately!

As gain on company stock declines, sell more of it and purchase more of index (diversification).

• Selling underweighted index with small gains to minimize tax cost.











### *Symmetric Distributions* (**m**= 10%, **s** = 30%)

- Retain more of position with larger gain
- "Cross" effect is very strong. For example, at age 40 if it is costless to sell each asset the investor will hold 22.4% of his wealth in each, while if the basis-price ratio of one asset is .05 and the other is 1, then the respective holdings are 32.8% and 15% at age 40.
- Tax costs limit trading, despite diversification
- Considerable "no-trade" (no rebalancing) region











### **General Framework**

- J risky assets and a risk-free asset
- Capital gains tax liability is determined by specific share identification (or average basis)
- Stochastic labor income correlated with asset returns
- Asset returns are serially correlated
- General risk preferences (constant relative risk aversion not needed)
- No wash-sale restrictions
- Zero transaction costs
- Constant tax rates

### **General Properties of Rebalancing Solution**

- Realize all losses
- 'High-basis, first-out' realization rule
- 'Wealth Effect' for smaller gains
- 'Own-Basis' Effect
- 'Cross-Basis' Effect
- Dispersion of Gains and 'Wealth Effect'

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