Tax Arbitrage Feedback Theory

By Samuel T. Eddins
Director of Research
IronBridge Capital Management LP
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Abstract

A new angle for understanding the global credit crisis of 2008-2009 is presented. Based on control theory principles and the axiom that investors seek the highest, expected after-tax return, I develop the *Tax Arbitrage Feedback Theory*. TAFT explains how the subtle effects of differential tax rates for various market participants produce incentives that strongly contribute to instability and boom/bust economic activity. Moreover, TAFT explains how observed bond credit spreads should be impacted by differential tax rates, in addition to the conventional bankruptcy and recovery factors. The purpose of debt securitization products, when viewed through a TAFT lens, is not only diversification and partitioning of risk, but also tax minimization. Credit default swaps are revealed to be a massive tax arbitrage that shifted government tax receipts to Wall Street bonus pools and necessitated the creation of massive quantities of low credit quality debt.

One Parkview Plaza | Suite 600 | Oakbrook Terrace, Illinois 60181 | 630.684.8300 | Fax: 630.684.8301

Summary of Key Points

1. The conventional view of the yield spreads between differently rated bonds and similar duration Treasuries is that their observed prices reflect different probabilities of default risk and recovery rates.
2. What has not been hereto adequately understood is that yield spreads are also impacted by the differential tax rates levied on investors in the bonds. A new framework, Tax Arbitrage Feedback Theory (TAFT), explains this phenomenon based on the economic axiom that investors seek the highest after-tax return.
3. TAFT quantifies an upper and lower limit of a pricing band caused by different after-tax returns for investors with different tax rates – tax free, individual taxable, mark-to-market business trader.
4. Observed movements in bond prices are due to the combined effects of changing perceptions of the bankruptcy risk and recovery rates plus the size of the invested capital pools for the different tax bracket investors and the magnitude of the differences in their expected after-tax returns.
5. TAFT provides a testable hypothesis. That is, changing tax environments should impact observed credit spreads. For example, in the current environment of large losses being carried by investors, tax benefits are reduced and, all else equal, should boost observed credit spreads.
6. TAFT explains why the fundamental economic logic for debt securitization structures is rooted in differential tax rates for various market participants.
7. TAFT presents a mathematical description of how credit default swaps played a central role in facilitating a massive tax arbitrage. The structure of this trade "insulated" Wall Street agents from the credit risk while allowing them to arbitrage the tax savings of their clients as long as counterparties remained solvent.

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"If the misery of the poor be caused not by the laws of nature, but by our institutions, great is our sin."

Charles Darwin

Introduction

It is widely accepted as a fundamental law of nature that every individual desires to improve their lot in life. Often referred to as the "invisible hand" of self interest, this basic desire is the economic force that drives all transactions within the global economy. What is less widely accepted is the degree to which our government institutions need to intervene to control the forces of self interest. Recent events have only heightened this debate.

At one end of the discussion, supporters of increased government intervention doubt that the uncontrolled decisions of so many different people can possibly combine to achieve the best collective outcome for society. They see the increasing scale of the current, global, economic crisis as evidence of their view, and symbolic of a breakdown of the free market system. "Greed and irresponsibility on the part of some, and our collective failure to make hard choices" were cited in the President's inaugural address as causes of the credit crisis. As a consequence, they argue for more regulatory oversight and government control as the solution. In essence, they believe that government intervention is required to protect us from ourselves.

Free market proponents argue the opposite point of view. They believe that open markets, free from government intervention and regulation, promote a spontaneous order for resource allocation that is far more efficient than any conscious design could achieve. They reason that society's collective well being can only be maximized when scarce resources are directed to those who value them most highly. This objective can only be achieved when each member of society is free to make decisions that are, in their judgment, consistent with their personal best interest. Since government intervention and regulations restrict choice and impose decisions, a less efficient order will emerge as a result.

How can these disparate views be reconciled? On the one hand, self interest is actually a force for orderly and efficient resource allocation. On the other hand, self interest can motivate irresponsible behavior that can destabilize the entire economy. The answer must lie in the alignment of incentives that drive the forces of self interest.

Missing from the national debate is recognition of the critical role played by government tax policy in misaligning the incentives of self interest. More specifically, U.S. tax policy unwittingly altered so many resource allocation decisions that the natural resource balance was ultimately destabilized inflicting great damage on the entire economy. We believe the current financial crisis does not represent a failure of the free market system. Rather, it represents the institutional failure of our government to understand how tax policy can distort incentives within our free market system.

This paper exposes the process by which overly complex U.S. tax policy did (and can) distort market incentives and unintentionally caused the misallocation of economic resources. The adverse impact of tax-based misalignment of incentives can range from imperceptible to catastrophic. Sometimes the response to a tax law can be characterized as systematically stable even though the market pricing of goods and services adjust to levels that provide sub-optimal benefit. At other times, changes in tax law can result in conflicting incentives across different constituent segments within the economy. But, in certain instances, changes in tax policy can initiate unstable and seemingly unrelated feedback loops that cause system wide booms and busts. We call the study of this phenomenon *Tax Arbitrage Feedback Theory* or TAFT for short[1]

The Financial Axioms of Self Interest

It has long been understood by policy makers that the tax code can be used to alter the incentives of self interest to either promote or discourage certain behaviors. Sin taxes, bio-fuel tax credits, tax-deferred retirement accounts, and mortgage interest tax deductibility are well known examples of tax legislation passed to influence economic decisions, and thereby give the invisible hand a nudge. The power of these policies lays in their ability to alter the economic incentives related to targeted activities.

In order to alter behavior, tax policy relies on these financial axioms of self interest:

- *Providers of capital seek to invest where risk adjusted after-tax returns are the highest.*
- *Consumers of capital seek to borrow where the risk adjusted after-tax cost is the lowest.*
- *Transactions result between those providers and consumers of capital that can best satisfy their mutual objectives.*
- *For each transaction, the amount of capital provided will equal the amount of capital consumed.*

Therefore, a policy that alters the after-tax return (cost) for any subset of the market's participants, leads to changes in the pace and the price of associated transactions for all market participants. In the case of purely financial transactions, tax policy can be especially potent. Since financial transactions involve the most exchangeable commodity of all, money, the actions and reactions of a

[1] The *Tax Arbitrage Feedback Theory* (TAFT) uses concepts from classical control theory to describe the behavior of a dynamic economic system. Tax policy alters the decision making process for many market participants in different ways. By understanding the capital supply chain and the decision-making process of different, but interrelated elements, a better description of the transfer functions can be developed. These models help to map the cause and effect relationship between a new input stimulus and the subsequent reallocation of economic resources. Analyses of the transfer functions reveal insights about the efficiency and stability of economic systems.

targeted tax policy can spread far and wide. Profit seeking and arbitrage ensure that the price of similarly risked financial instruments constantly adjust to provide similar after-tax rates of return.

As an economic force, these financial axioms are analogous to the molecular forces that drive chemical reactions. And, like chemical reactions, desired outcomes are achieved when the right conditions are applied. However, if we change the conditions without fully understanding the physical and chemical properties involved, disastrous consequences can result. Our current economic crisis is the financial equivalent of such a result, and demonstrates how a toxic mix of seemingly unrelated tax policies can have dire consequences.

Tax Policy, Residential Borrowing, and Home Ownership Incentives

The roots of the current credit crisis go back more than two decades. It all began in the housing sector. The 1986 Tax Act eliminated the right to deduct most of the interest paid by ordinary taxpayers. The sole exception was mortgage interest on a primary or secondary residence. Homeowners reacted by consolidating other types of consumer debt under home equity lines of credit to take advantage of a lower after-tax borrowing cost, as they could still deduct mortgage interest.

The 1997 Tax Act effectively eliminated capital gains tax for those very same taxpayers when they sold their residence. That act increased the after-tax return potential of home ownership. Consistent with the financial axioms presented earlier, the combined effect of just these two tax policy changes was to decrease the anticipated tax burden on homeowners. But, that benefit was capitalized through an increase in the value of US housing stock relative to the prior status quo.

These two tax policies had the impact of altering the incentive to own a home, and were, in turn, reflected in home prices. The policies did not, in and of themselves, create unstable feedback loops. Their impact was bounded because they were subject to boundary constraints. The first constraint was that the tax benefits were only available to residential homeowners, and only on their primary or secondary residence. Second, the tax-deductible mortgage interest was limited to qualifying loans up to $1.1 million. Finally, the capital gains tax exclusion was limited to the first $500,000 of gain on the primary residence and only after living there for two years.

These conditions controlled the amount of benefit any individual taxpayer could receive. Once the limit of the tax benefit had been reached for any one participant, the tax incentive to buy and finance more residential real estate was eliminated. Therefore, these tax policies forced an increase in residential real estate prices until the present value of the average tax advantage was fully discounted in home prices. This occurred without creating any unstable or unbounded feedback loops. The feedback loops that caused the credit crisis happened later.

Meanwhile, house price increases induced a profit incentive for homebuilders to exploit. Because the cost of labor, materials, and land for residential construction had not risen as quickly as home prices, homebuilders flourished. Outsized profits on newly constructed houses prompted homebuilders to build more houses. Capital was attracted to building, and housing starts boomed. Increased building activity drove more demand for labor, materials, and developable land, leading each of their prices higher. As the affects rippled throughout the system, these adjustments had a further impact on the cost structure and profitability of other businesses competing for those same resources.

Tax Policy, Residential Lending, and Investor Incentives

The tax advantages related to home mortgages weren't limited to borrowers of home financing only. Over the same period, new tax legislation altered economic incentives related to residential lending which, in turn, impacted investor preferences and the allocation of financial resources. While there are numerous examples of government intervention influencing the movement of capital, our attention is focused on credit instruments and a few credit based derivatives that had the most significant role in the financial crisis.

The next few pages may seem basic and unrelated to the study of tax arbitrage. They are not. What is discussed in this section is a necessary prerequisite for truly understanding how tax policy distorts the movement of financial capital and set up the unstable tax arbitrage that fueled a boom/bust cycle ultimately destabilizing the global financial system. To start, we introduce a simplified credit model that will serve as the foundation of the discussion.

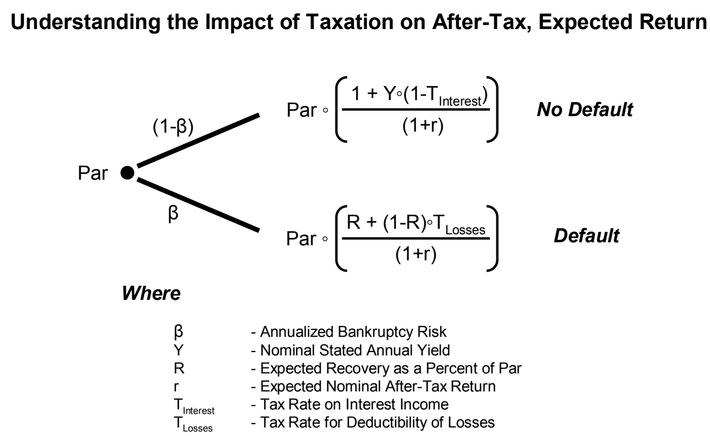

Figure 1

Figure 1 illustrates a simplified model of the after-tax, expected cash flows from a fixed income instrument subject to the possibility of default. In the *No Default* scenario, an investor would expect to receive the principle plus the stated contractual yield while paying income tax on interest. In the *Default* scenario, the same investor would expect to receive only the recovery plus a capital loss tax deduction against other taxes due for the difference between principle and recovery. In order to maintain the price at *Par*, a contractual yield can be calculated that compensates for bankruptcy risk, recovery expectations, capital loss deductions, and income taxes on interest received, while maintaining a cost of capital consistent with returns available on alternative investments.

Alternatively, the model in Figure 1 can be reorganized into an equation that solves for the expected after-tax rate of return an investor receives given an observed market yield (Y), bankruptcy risk (β), recovery rate (R), and tax rates ($T_{Interest}$, T_{Losses}). Equation 1 describes this equation. The accompanying numerical example uses a U.S. government treasury with an assumed yield of 4.5% to describe the key bond inputs and the maximum bracket personal tax rates levied on treasuries to describe the tax inputs.

$$\text{Expected Nominal After-Tax Return} = r = (1-\beta)\circ Y\circ(1-T_{Interest}) - \beta\circ[(1-R)\circ(1-T_{Losses})]$$

Where

(0%)	β	- Annualized Bankruptcy Risk
(4.5%)	Y	- Nominal Stated Annual Yield
(100%)	R	- Expected Recovery as a Percent of Par
(35%)	$T_{Interest}$	- Tax Rate in Interest Income
(15%)	T_{Losses}	- Tax Rate for Deductibility of Losses

$$\text{Expected Nominal After-Tax Return} = 2.93\% = (1-0)\circ 4.50\%\circ(1-.35) - 0\circ[(1-1)\circ(1-.15)]$$

Equation 1

Using the inputs presented, this credit instrument provides a maximum tax bracket personal investor with an expected after-tax rate of return of 2.93%. Given the first financial axiom that providers of capital seek to invest where the risk-adjusted, after-tax returns are the highest, the after-tax return solved in this equation should provide a benchmark for this investor to compare against alternative investments.

Calculating the yield level on another credit instrument, like a corporate BBB bond, that would offer the identical after-tax return to the treasury can be accomplished by reorganizing the equation into the form presented below.

$$\text{Required Stated Annual Yield} = Y = \frac{r + \beta\circ[(1-R)\circ(1-T_{Losses})]}{(1-\beta)\circ(1-T_{Interest})}$$

Where

(0.75%)	β	- Annualized Bankruptcy Risk
(2.93%)	r	- Expected Nominal After-Tax Return
(40%)	R	- Expected Recovery as a Percent of Par
(40.2%)	$T_{Interest}$	- Tax Rate in Interest Income
(21.8%)	T_{Losses}	- Tax Rate for Deductibility of Losses

$$\text{Required Stated Annual Yield For BBB Bond} = 5.52\% = \frac{2.93\% + .0075\circ[(1-.4)\circ(1-.218)]}{(1-.0075)\circ(1-.402)}$$

Equation 2

Notice that in this example, the bankruptcy risk, recovery rate, tax rate on interest income, and tax rate on default losses have all changed. The bankruptcy risk and recovery rates are particular to this corporate BBB bond. The tax rates are set by government policy and reflect that corporate bonds are subject to both federal and state tax where the treasury was only subject to federal tax. In addition, the tax rate differences between interest income and default losses reflect that, for individuals, interest is taxed as ordinary income where losses from default are subject to the capital gains rules.

In this example, the corporate BBB bond would have to provide a stated yield of 5.52% to achieve the same after-tax return as the treasury. This yield is 102 basis points higher than the benchmarked treasury. The increase in yield is necessary to compensate for both increased default risk, and the tax rate differential, while still providing the identical after-tax expected return. Figure 3 continues to solve the required stated yield across the series of alternative credit instruments to achieve the identical (or equilibrium) after-tax rate of return for this investor profile. Notice that the solution from Equation 2 is shown as security 4 in the table.

Calculated Required Yield for Equivalent After-Tax Return to Treasury

		Security Type	Solve for $Y_{(x)}$	Input Assumptions for Solving Required Yield Equation				
				$\beta_{(x)}$	$Rec\%_{(x)}$	$r_{(x)}$	$T_{Interest\ Income(x)}$	$T_{Capital\ Losses(x)}$
Traditional Buy and Hold Investors	1	Treasury	4.50%	0.00%	100%	2.93%	35.0%	15.0%
	2	Agency	4.89%	0.00%	100%	2.93%	40.2%	21.8%
	3	AA Corp	5.05%	0.35%	70%	2.93%	40.2%	21.8%
	4	BBB Corp	5.52%	0.75%	40%	2.93%	40.2%	21.8%
	5	BB Corp	7.36%	2.50%	30%	2.93%	40.2%	21.8%
	6	B Corp	11.26%	5.50%	20%	2.93%	40.2%	21.8%
	7	Muni	3.30%	0.35%	70%	2.93%	8.0%	8.0%

Figure 3

At these calculated yields, the investor profiled should be equally attracted to each investment option since they all provide the identical after-tax expected return. If this investor profile fit every market participant buying or selling these investments, these calculated yields should reflect the natural and stable outcome reflected in the marketplace. Even if economic conditions changed, financially altering both the supply of investment capital and the demand for borrowed money, these changes should only adjust the systemic level of yield and resulting after-tax expected return ($r_{(x)}$). Relative credit spreads consistent with equation 2 should be preserved. However, this investor description does not fit every investor type competing for investment opportunities because tax policy does not treat all investors equally.

The real world has many investor types, subject to different tax rates and rules, all competing within the same markets. In recognition of this point, three distinct investor profiles are introduced into the analysis. They are *Traditional Buy and Hold Investors*, *Mark-to-Market Business Traders*, and *Non-Taxable Investors*. Each of their unique properties is described below.

> *Traditional Buy and Hold Investors*, in this analysis, are subject to federal and state income tax rates on interest received at the marginal rate of 35% and 8% respectively. Losses arising from credit default are subject to the long-term, capital gains tax rate of 15% for federal tax, and 8% for state tax. While we recognize tax rules limit the tax deductibility of losses in any year to no more than $3000 in excess of other realized long-term capital gains, our assumption in this analysis is that all losses are deductible at these marginal rates. If the

limits on default loss deductibility were considered probable, assumption regarding the applicable tax rate for capital gains would need to be adjusted lower.

Mark-to-Market Business Trader status is recognized as a special class of tax payer subject to different rules by the U.S tax code. For this investor class, there is no distinction made between long-term and short-term capital gains treatment versus ordinary income. The benefit of electing this status is that the most onerous rules preventing the tax deductibility of losses are eliminated. The net return of all transactions, after deducting for expenses, is subject to one tax rate equal to the ordinary corporate income tax rate. For this investor class, the analysis assumes both interest income and credit default losses are taxed at a federal rate of 35% and a state tax rate of 7.5%.

Non-taxable Investors are assumed to pay no tax under all circumstances.

Utilizing each of these investor profiles, Figure 4 shows the expected after-tax return that each class of investor would receive using the same U.S. treasury yielding a pretax 4.5% return as the baseline. The resulting after-tax expected return will serve as the benchmark to compare against alternative investments within each investor profile studied.

Solving Expected After-Tax Nominal Return Across Different Investor Classes		
From Equation 1	**r**	**$(1-\beta)\circ Y\circ(1-T_{Interest}) - \beta\circ[(1-R)\circ(1-T_{Losses})]$**
Investor Class	**Solution**	**Equation Inputs**
Traditional Buy & Hold	***2.93%***	***(1-0)◦4.50%◦(1-.35) - 0◦[(1-1)◦(1-.15)]***
Mark-to-Market	***2.93%***	***(1-0)◦4.50%◦(1-.35) - 0◦[(1-1)◦(1-.35)]***
Non-Taxable	***4.50%***	***(1-0)◦4.50%◦(1-0) - 0◦[(1-1)◦(1-0)]***

Figure 4

The solutions in Figure 4 show that both the traditional buy and hold investor and the mark-to-market business trader achieve the identical expected after-tax return at 2.93%. The non-taxable investor achieves the full 4.50% from the Treasury bond since this investor pays no tax. Different investor classes receiving different after-tax rates of return does not, in and of itself, create a problem. Instabilities begin to occur when market prices cannot be discovered, across the span of alternative investments, which deliver the same after-tax return *within* each investor class.

Figure 5 expands the analysis in Figure 3 by calculating the required yields for all alternative investments that achieve an equilibrium after-tax return within each investor class independently. Note that for a BBB corporate credit the traditional buy and hold investor requires 5.52%, while mark-to-market investors requires 5.36%, while the tax-free investor requires 4.99% in order for each to receive the equivalent after-tax return they could get from the Treasury.

Calculated Required Yield for Equivalent After-Tax Return to Treasury by Each Investor Profile									
		Security Type	Solve for $Y_{(x)}$	Input Assumptions for Solving Required Yield Equation					
				$\beta_{(x)}$	$Rec\%_{(x)}$	$r_{(x)}$	$T_{Interest\ Income(x)}$	$T_{Capital\ Losses(x)}$	
Traditional Buy and Hold Investors	1	Treasury	4.50%	0.00%	100%	2.93%	35.0%	15.0%	
	2	Agency	4.89%	0.00%	100%	2.93%	40.2%	21.8%	
	3	AA Corp	5.05%	0.35%	70%	2.93%	40.2%	21.8%	
	4	BBB Corp	5.52%	0.75%	40%	2.93%	40.2%	21.8%	
	5	BB Corp	7.36%	2.50%	30%	2.93%	40.2%	21.8%	
	6	B Corp	11.26%	5.50%	20%	2.93%	40.2%	21.8%	
	7	Muni	3.30%	0.35%	70%	2.93%	8.0%	8.0%	
Mark-to-Market Investors	1	Treasury	4.50%	0.00%	100%	2.93%	35.0%	35.0%	
	2	Agency	4.86%	0.00%	100%	2.93%	39.9%	39.9%	
	3	AA Corp	4.99%	0.35%	70%	2.93%	39.9%	39.9%	
	4	BBB Corp	5.36%	0.75%	40%	2.93%	39.9%	39.9%	
	5	BB Corp	6.78%	2.50%	30%	2.93%	39.9%	39.9%	
	6	B Corp	9.80%	5.50%	20%	2.93%	39.9%	39.9%	
	7	Muni	3.28%	0.35%	70%	2.93%	7.5%	7.5%	
Non-Taxable Investors	1	Treasury	4.50%	0.00%	100%	4.50%	0.0%	0.0%	
	2	Agency	4.50%	0.00%	100%	4.50%	0.0%	0.0%	
	3	AA Corp	4.62%	0.35%	70%	4.50%	0.0%	0.0%	
	4	BBB Corp	4.99%	0.75%	40%	4.50%	0.0%	0.0%	
	5	BB Corp	6.41%	2.50%	30%	4.50%	0.0%	0.0%	
	6	B Corp	9.42%	5.50%	20%	4.50%	0.0%	0.0%	
	7	Muni	4.62%	0.35%	70%	4.50%	0.0%	0.0%	

Figure 5

The analysis began by calculating the after-tax expected return ($r_{(x)}$) that resulted from a Treasury bond yielding 4.5% shown as *Security 1* in the three sections of Figure 5. Notice that outside this security, the required yields necessary to provide an equivalent after-tax return to each investor on every other credit alternative is different. This has important implications. Free markets are available to all comers and therefore offer the same terms and prices to all investors that meet basic transaction requirements. Since the required yields on each security type are different for every investor class profiled, this implies that an equilibrium condition for market prices is impossible to attain, even with the dissemination of perfect information. The reason for this is that different investor classes are subject to different tax rules and therefore require different relative yield relationships to achieve equilibrium. A stable equilibrium requires that each and every investor be indifferent, from a relative profit opportunity standpoint, about which alternative credit instrument to invest in. This table shows that even under the *strong form* of the efficient market hypothesis, relative profit opportunities always exist for some market participants.

In order calibrate the size of the relative profit opportunities, Figure 6 displays the expected after-tax return across all three investor profiles under three different conditions – when all security types are priced to offer equivalent after-tax rate of return to Traditional Buy and Hold Investors, to Mark-to-Market Business Traders, and to Non-Taxable Investors.

Stated Contractual Yields for Various Securities that Provide the Identical After-Tax Return for Listed Investor Classes					***Spread of Equilibrium Conditions***
	Security	Equilibrium for Trad Buy & Hold	Equilibrium for Mark-to-Market	Equilibrium for Non-Taxable	***Boundary of Equilibrium***
1	Treasury	4.50%	4.50%	4.50%	***0.00%***
2	Agency	4.89%	4.86%	4.50%	***0.39%***
3	AA Corp	5.05%	4.99%	4.62%	***0.43%***
4	BBB Corp	5.52%	5.36%	4.99%	***0.53%***
5	BB Corp	7.36%	6.78%	6.41%	***0.95%***
6	B Corp	11.26%	9.80%	9.42%	***1.85%***
7	Muni	3.30%	3.28%	4.62%	***1.34%***

Nominal After-Tax Expected Rate of Return					
		Security	Equilibrium for Trad Buy & Hold	Equilibrium for Mark-to-Market	Equilibrium for Non-Taxable
Traditional Buy and Hold Investors	1	Treasury	2.93%	2.93%	2.93%
	2	Agency	2.93%	2.91%	2.69%
	3	AA Corp	2.93%	2.89%	2.67%
	4	BBB Corp	2.93%	2.83%	2.61%
	5	BB Corp	2.93%	2.59%	2.37%
	6	B Corp	2.93%	2.10%	1.88%
	7	Muni	2.93%	2.91%	4.14%
	Profit Spread		***0.00%***	***0.83%***	***2.26%***
Mark-to-Market Investors	1	Treasury	2.93%	2.93%	2.93%
	2	Agency	2.94%	2.93%	2.71%
	3	AA Corp	2.96%	2.93%	2.71%
	4	BBB Corp	3.02%	2.93%	2.71%
	5	BB Corp	3.26%	2.93%	2.71%
	6	B Corp	3.75%	2.93%	2.71%
	7	Muni	2.94%	2.93%	4.16%
	Profit Spread		***0.83%***	***0.00%***	***1.46%***
Non-Taxable Investors	1	Treasury	4.50%	4.50%	4.50%
	2	Agency	4.89%	4.86%	4.50%
	3	AA Corp	4.92%	4.86%	4.50%
	4	BBB Corp	5.03%	4.86%	4.50%
	5	BB Corp	5.43%	4.86%	4.50%
	6	B Corp	6.25%	4.86%	4.50%
	7	Muni	3.18%	3.16%	4.50%
	Profit Spread		***3.07%***	***1.70%***	***0.00%***

Figure 6

Figure 6 clearly shows where the after-tax expected returns are out of equilibrium creating a relative profit opportunity for certain investor groups. The top panel displays the stated yields across the listed security types that provide an equilibrium, after-tax, return for the investor group listed at the top of each column. Just to the right is a table that shows the spread of the equilibrium conditions across the investor profiles. The bottom panel shows the after-tax expected return for each profiled investor group labeled on the left across the same securities. The blue shaded areas in the bottom panel indicate where the after-tax expected returns are in equilibrium indicating a relative profit spread of zero. The white areas indicate where after-tax returns are out of balance. For these investors relative profit opportunities exist, as indicated by the spread, to trade among the listed securities to improve the after-tax return. Since only one price on each security can be quoted at any point in time, the price data within the columns represents the only possible states that can exist in an exchange traded free market. It is immediately apparent from this data that there is considerable variation in the expected after-tax return for each investor class when the yields are not arbitraged to their particular circumstance. Why does this occur?

Tax policy! Differential tax policy, not only across the groups but also within some groups, is causing very substantial differences in the expected tax liabilities of investing in these securities. To better describe the cause and effect of differential tax policy, we will revisit the required stated yield calculations for the BBB corporate bond presented in Equation 2.

$$\text{Required Stated Annual Yield} = Y = \frac{r + \beta\cdot[(1-R)\cdot(1-T_{Losses})]}{(1-\beta)\cdot(1-T_{Interest})}$$

Where

	(0.75%)	β	- Annualized Bankruptcy Risk
	(2.93%)	r	- Expected Nominal After-Tax Return
	(40%)	R	- Expected Recovery as a Percent of Par
(40.2%)	(40.2%)	$T_{Interest}$	- Tax Rate in Interest Income
(40.2%)	(21.8%)	T_{Losses}	- Tax Rate for Deductibility of Losses

$$\text{Required Stated Annual Yield For BBB Bond} = 5.52\% = \frac{2.93\% + .0075\cdot[(1-.4)\cdot(1-.218)]}{(1-.0075)\cdot(1-.402)}$$

Differential Tax

$$\text{Required Stated Annual Yield For BBB Bond (Equal Tax Rates)} = 5.38\% = \frac{2.93\% + .0075\cdot[(1-.4)\cdot(1-.402)]}{(1-.0075)\cdot(1-.402)}$$

Equal Tax

Equation 2 – Revisited

Recall that our earlier analysis on a traditional investor solved for a required yield of 5.52% on a BBB corporate bond in order to generate an equivalent after-tax return to the 4.5% Treasury. If the statutory tax rates applied to interest income and the deductibility of credit default losses had both equaled 40.2% instead of our original assumptions, the required yield would have been 14 basis points lower at 5.38%. This difference implies that 14 basis points of the increase in yield over the treasury is related to the tax rates applied to traditional buy and hold investors. The "extra" observed spread is not related to "extra" risk. Instead, the "extra" spread reflects the compensation required to offset a tax penalty that results from an increase in the effective tax rate. Simply put, the tax penalty is a function of borrowing being subject to a higher tax rate if the credit is good and a lower rate for tax deduction if the credit is bad. This tax policy produces an asymmetrical tax consequence that must be compensated for through a higher contractual yield than would otherwise exist if the tax rates were the same.

When the tax rates on capital losses and interest income are the same for any investor, the required credit spread (or increase in yield over a similarly taxed default-free instrument), to achieve an equivalent after-tax return, will only compensate for actual expected losses. But when tax rates are different, the required credit spread will have to adjust in response to a new "effective" tax rate distinctly different from either statutory rate. Using this same simplified modeling approach, the effective tax rate for any investor on any credit instrument, can be calculated. Equation 3 describes the calculation.

Effective Nominal Tax Rate on a Credit Instrument

$$\text{Effective Tax Rate} = T_{Interest} \circ \left[\frac{1 - \left(\dfrac{\beta \circ (1-R) \circ T_{Losses}}{(1-\beta) \circ Y \circ T_{Interest}} \right)}{1 - \left(\dfrac{\beta \circ (1-R)}{(1-\beta) \circ Y} \right)} \right]$$

Where

β	- Annualized Bankruptcy Risk
Y	- Nominal Stated Annual Yield
R	- Expected Recovery as a Percent of Par
$T_{Interest}$	- Tax Rate in Interest Income
T_{Losses}	- Tax Rate for Deductibility of Losses

Equation 3

This equation reveals a number of interesting insights when the tax rate on interest income differs from the rate of tax deductibility applied to capital losses. First, it shows that the effective tax rate can be higher than either statutory tax rate when the tax rate on capital losses is lower than the tax rate on interest income and default recovery is less than 100%. Second, after these first two conditions are met, the rate of increase in the effective tax rate is geometrically related to increasing bankruptcy risk and a declining rate of recovery. Lastly, the effective tax rate will increase as stated nominal yields decrease.

The next table (Figure 6 – Revisited) appends the "effective" tax rate solutions from equation 3 to our prior analysis. The major revelation from analyzing this table is that the root cause preventing market forces from finding an after-tax return equilibrium, across the spectrum of investments, is differences in the "effective" tax rates that arise from different investment options within same investor class. This table displays a visual example of why market equilibrium is so elusive. When credit instruments are priced to offer an arbitrage-neutral, after-tax return across the spectrum of alternative investments for one class of investors, those same investments necessarily offer a relative profit opportunity to another class of investors. And since many securities can be held long or short, the relative after-tax spread of the opportunity matters much more than the direction (high or low) off equilibrium.

Stated Contractual Yields for Various Securities that Provide the Identical After-Tax Return for Listed Investor Classes					*Spread of Equilibrium Conditions*
	Security	Equilibrium for Trad Buy & Hold	Equilibrium for Mark-to-Market	Equilibrium for Non-Taxable	*Boundary of Equilibrium*
1	Treasury	4.50%	4.50%	4.50%	*0.00%*
2	Agency	4.89%	4.86%	4.50%	*0.39%*
3	AA Corp	5.05%	4.99%	4.62%	*0.43%*
4	BBB Corp	5.52%	5.36%	4.99%	*0.53%*
5	BB Corp	7.36%	6.78%	6.41%	*0.95%*
6	B Corp	11.26%	9.80%	9.42%	*1.85%*
7	Muni	3.30%	3.28%	4.62%	*1.34%*

Nominal After-Tax Expected Rate of Return

Investors		Security	Equilibrium for Trad Buy & Hold	Equilibrium for Mark-to-Market	Equilibrium for Non-Taxable
Traditional Buy and Hold Investors	1	Treasury	2.93%	2.93%	2.93%
	2	Agency	2.93%	2.91%	2.69%
	3	AA Corp	2.93%	2.89%	2.67%
	4	BBB Corp	2.93%	2.83%	2.61%
	5	BB Corp	2.93%	2.59%	2.37%
	6	B Corp	2.93%	2.10%	1.88%
	7	Muni	2.93%	2.91%	4.14%
		Profit Spread	***0.00%***	***0.83%***	***2.26%***
Mark-to-Market Investors	1	Treasury	2.93%	2.93%	2.93%
	2	Agency	2.94%	2.93%	2.71%
	3	AA Corp	2.96%	2.93%	2.71%
	4	BBB Corp	3.02%	2.93%	2.71%
	5	BB Corp	3.26%	2.93%	2.71%
	6	B Corp	3.75%	2.93%	2.71%
	7	Muni	2.94%	2.93%	4.16%
		Profit Spread	***0.83%***	***0.00%***	***1.46%***
Non-Taxable Investors	1	Treasury	4.50%	4.50%	4.50%
	2	Agency	4.89%	4.86%	4.50%
	3	AA Corp	4.92%	4.86%	4.50%
	4	BBB Corp	5.03%	4.86%	4.50%
	5	BB Corp	5.43%	4.86%	4.50%
	6	B Corp	6.25%	4.86%	4.50%
	7	Muni	3.18%	3.16%	4.50%
		Profit Spread	***3.07%***	***1.70%***	***0.00%***

Nominal Effective Tax Rates

Investors		Security	Equilibrium for Trad Buy & Hold	Equilibrium for Mark-to-Market	Equilibrium for Non-Taxable
Traditional Buy and Hold Investors	1	Treasury	35.00%	35.00%	35.00%
	2	Agency	40.20%	40.20%	40.20%
	3	AA Corp	40.59%	40.60%	40.63%
	4	BBB Corp	41.85%	41.90%	42.04%
	5	BB Corp	46.13%	46.82%	47.36%
	6	B Corp	53.16%	56.84%	58.19%
	7	Muni	8.00%	8.00%	8.00%
Mark-to-Market Investors	1	Treasury	35.00%	35.00%	35.00%
	2	Agency	39.88%	39.88%	39.88%
	3	AA Corp	39.88%	39.88%	39.88%
	4	BBB Corp	39.88%	39.88%	39.88%
	5	BB Corp	39.88%	39.88%	39.88%
	6	B Corp	39.88%	39.88%	39.88%
	7	Muni	7.50%	7.50%	7.50%
Non-Taxable Investors	1	Treasury	0.00%	0.00%	0.00%
	2	Agency	0.00%	0.00%	0.00%
	3	AA Corp	0.00%	0.00%	0.00%
	4	BBB Corp	0.00%	0.00%	0.00%
	5	BB Corp	0.00%	0.00%	0.00%
	6	B Corp	0.00%	0.00%	0.00%
	7	Muni	0.00%	0.00%	0.00%

Figure 6 – Revisited

Remember the financial axiom that providers of capital seek to invest where the risk adjusted after-tax returns are the highest. This axiom, when combined with the opportunities presented in the table (Figure 6 – Revisited), creates a condition that must result in fluctuating credit spreads within a bounded range. The limits of range are determined by the unique tax rules that apply to the investors available to trade in the security. Because of self interest, any investor that is out of balance will react by selling relatively lower return investments and reallocating the resources into relatively higher return investments. As this occurs, prices will respond and adjust accordingly to remove the profit opportunity for that investor, thereby driving other investor classes out of balance. This facilitates a perpetual cycle where credit spreads will fluctuate between a narrow level that neutralizes one group's incentive to trade and a wider lever that neutralizes another. This cycle should continue until all competing groups abandon a credit instrument class completely (such as non-taxable investors absence from municipal bond markets because they rarely, if ever, offer a competitive return), tax asymmetry disappears in response to a change in policy, or the financial capital within an investor class become too small to have a noticeable impact.

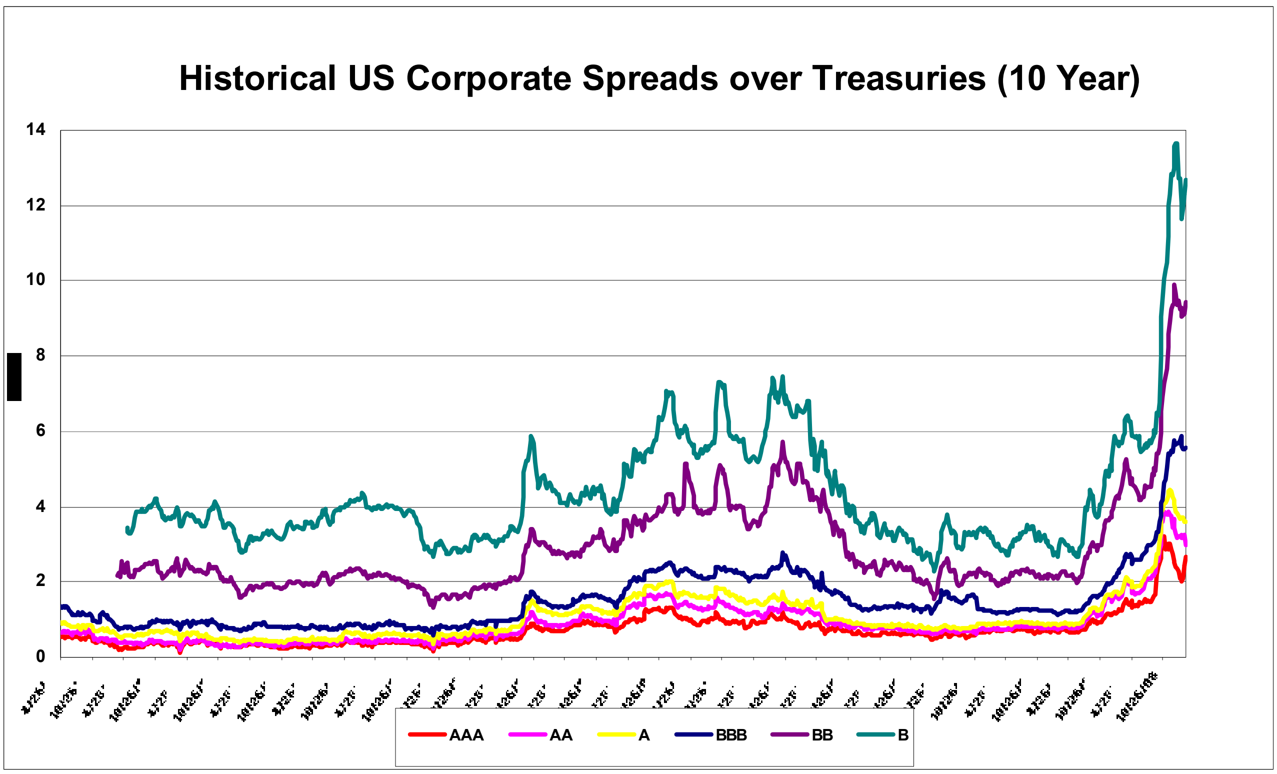

Figure 7

Figure 7 shows the historical fluctuation between U.S. treasury securities and U.S. corporate debt across the credit spectrum. Recall that corporate debt instruments are subject to both federal and state tax while treasury securities are only subject to federal tax. This means that most of the spread differential between AAA rated corporate bonds and similar duration treasuries under normal circumstances is due to additional state tax liabilities. Notice that actual credit spreads have historically fluctuated in a manner similar to that predicted earlier. This data suggests that in addition to changing bankruptcy risk and recovery assumptions, tax-based price fluctuations have existed for some time. Yield fluctuations manifest from competing investor classes engaging in a tug-of-war trying to adjust to capture the highest after-tax return available.

At this point, it is helpful to summarize the major points presented so far with regard to the market pricing of credit instruments.

1. *Providers of capital seek to invest where risk adjusted after-tax returns are the highest.*
2. *Free markets are available to all comers and therefore offer the same terms and prices to any and all investors.*
3. *The real world has many investor types subject to different tax rates and rules all competing within the same markets.*
4. *An investor is only at equilibrium when all investment options offer an equal after-tax rate of return.*
5. *An equilibrium condition across the market complex is impossible to attain, even with the dissemination of perfect information. The reason for this is that different investor classes are subject to different tax rules and therefore require different relative yield relationships to achieve equilibrium.*
6. *The root cause preventing market forces from finding an after-tax return equilibrium, across the spectrum of investments, is investor differences in "effective" tax rates.*
7. *Differences in "effective" tax rates create a condition that must result in fluctuating credit spread relationships within a bounded range over time.*
8. *Historical credit spread data suggests that tax-based price fluctuations have existed for some time as competing investor classes engage in a tug-of-war trying to adjust their investment mix to capture to highest after-tax return available.*

Based on the foundation summarized in these key points, the discussion can now proceed to the tax benefits provided through innovation of packaged mortgages for investors.

Tax Advantages of Securitization

The tax advantages related to home mortgages weren't limited to borrowers of home financing only. Over the same period, changes in tax legislation also created tax advantages for mortgage investors through home mortgage securitization.

Mortgage securitization was also born out of the 1986 Tax Act in response to the savings and loan crisis. Originally structured as Real Estate Mortgage Investment Conduits, or REMICs for short, these legislated securitization structures are generally not subject to tax. Rather, the tax consequence flows through the conduit to investors in pass-through certificates (or tranches) much like partners in a partnership or members in a limited liability company. This arrangement provides two primary tax benefits over prior practices. The first benefit was that it eliminated the income tax liability of the business entity when compared to holding mortgages on a banks balance sheet. The second benefit is that it moves the taxable event from the principle and interest received into the REMIC to the characterization described by the securities issued out of the REMIC. This shifting of the taxable event enabled tax savings for traditional investors. In addition, the magnitude of the tax benefit increased in proportion to the uncorrelated credit risk of the individual positions within the securitization conduit.

Therefore the significant benefit of securitization is that it moves the taxable event from *individual positions* within the pool to the *collective result* of the pool. This allows some of the "extra" spread received from good credit to offset some of the losses from bad credit. As a result, securitization creates a more tax efficient interpretation of income for the tax authorities.[2] This important change allows portfolio diversification concepts to actually reduce the expected tax liability as long as the default risks of the individual positions are uncorrelated. The uncertainty of the collective cash flows from a pool of mortgages is significantly less than the uncertainty of any single mortgage within the pool.

From the standpoint of Equation 3, securitization effectively both reduces the bankruptcy risk (β), and increases the anticipated recovery (R) in case of default of the taxable event. These modifications reduce the required tax penalty through a lower effective tax rate for traditional investors. The fact that accurate default and recovery rates are not known in advance, limits the total tax efficiency that can be accomplished through pooling alone. Tranching helps to isolate the remaining unknown credit risk by directing this exposure toward the lower rated tranches first, with a subsequent waterfall into higher rated tranches afterward. (See Figure 8)

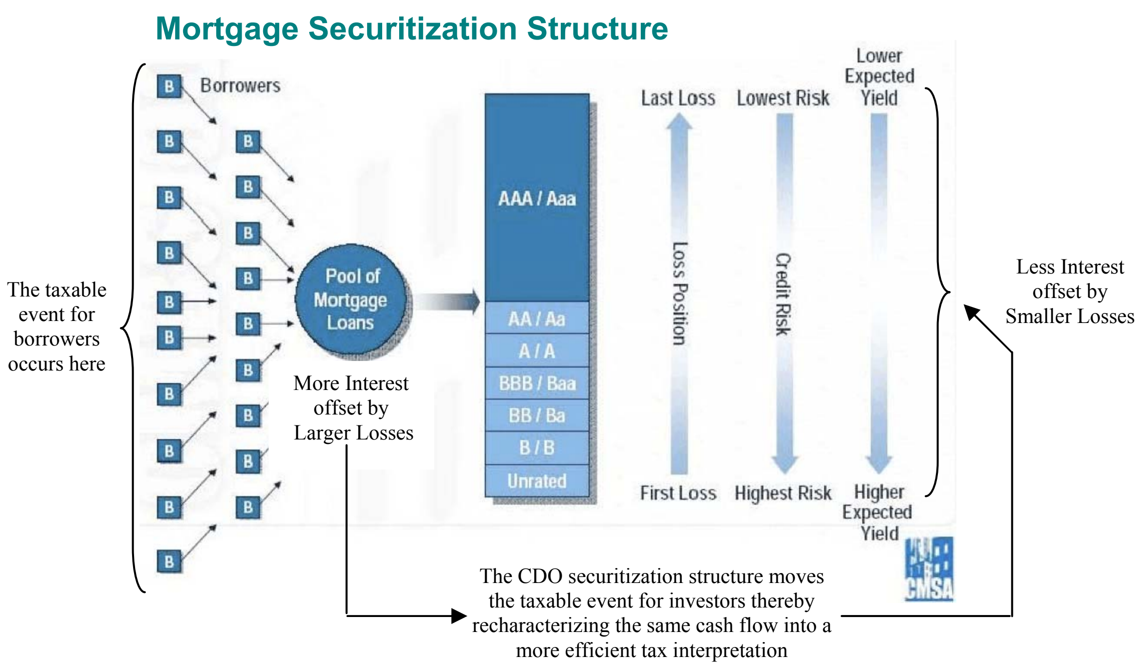

Figure 8

[2] For example, if a securitization conduit receives $105 in total cash flow made up of $10 in interest and $95 in principle from a $100 initial loan amount, it could be re-characterized as $5 in interest and $100 in principle paid out to investors. For investors subject to different tax rates on interest income versus capital losses, this modified interpretation of the cash flow will result in a lower overall tax bill. Tax savings generated through securitizations can be directed to broker profit or shared with investors through a higher after-tax return.

The tax benefits of REMICs to traditional buy and hold investors are limited however. Since the tax code contains restrictions on the real estate and underwriting standards that could back mortgage securities within a tax favored conduit, the credit quality of the mortgages going into the pools were generally high. This limitation reduced that amount of tax reduction that could be accomplished through these U.S. based conduits. In spite of this fact, residential mortgage backed securities soared in popularity from their introduction throughout the decade of the 90's. Wall Street's next innovation would end these restrictions and dramatically increase the profitability of securitization.

Securitization goes into Overdrive

Around 2000, the more troublesome feedback loops started to develop. Wall Street created a new vehicle to pool loans that could circumvent most of the IRS limitations on underwriting standards and permitted assets that apply to REMICs, while still capturing the tax benefit of the securitization structure. This innovation was called a Collateralized Debt Obligation or CDO for short.

To accomplish these goals, the CDO had to first avoid any business entity related income tax liability, and second, move the tax characterization of the cash flows to the securities issued out of the CDO rather than the payments received into the CDO. These goals were accomplished through a complex, but innovative, legal structure. First, all CDOs are legally located off-shore in locations known as tax havens because they levy no business income tax. Second, all CDOs are structured as non-transparent, limited liability companies. According to U.S tax treaties, limited liability companies are non-transparent for U.S. tax purposes. This means that income characterization for tax purposes is solely based on the income characterization received out of the legal entity without any offset for foreign taxes paid within the entity. Since CDOs are located in tax havens and pay no tax, there was no cost associated with this limitation. But this legal structure did provide a benefit by allowing the CDO to move the taxable event from the payments received into the structure to the characterization defined by the securities issued out of the structure. This feature allowed the CDOs to issue securities in tranches which were familiar in form to traditional mortgage backed securities. (See Figure 8)

Selling non-transparent and complex financial structures normally does not occur since investors are unable to adequately evaluate the risks. However, if these non-transparent financial structures could attain credit protection and a high-grade endorsement from the credit rating agencies, selling them would be much easier. All that was needed was cost effective default insurance. That would allow rating agencies and investors to grade the credit worthiness of CDO tranches based on the financial strength and underwriting skill of the insurer backing the bonds rather than a thorough analysis of the underlying pool of assets supporting the cash flows. For CDO issuers, financial innovation in the form of Credit Default Swaps provided the solution.

A credit default swap (CDS) is a swap contract in which the buyer of credit protection makes a series of payments to the seller and, in exchange, receives a payoff if a bond or loan goes into default. Because the terms are negotiated to fit the unique circumstances of both the buyer and seller with regard to the reference credit, pricing, and settlement, they trade on the over-the-counter market rather than a standardized exchange. These derivative contracts allow market participants to separate the *time value of money* component of a bond from the *credit risk* component. By isolating the credit issue alone, credit default swaps are highly efficient instruments for tax arbitrage.

Recall that the tax asymmetry of interest versus default losses creates a tax penalty for traditional taxable investors. This is not the case for mark-to-market business traders or non-taxable investors. For these market participants, tax rate equality in both interest and loss eliminates the need for the tax penalty. This means that when mark-to-market business traders write credit protection contracts, the premiums received from traditional investors usually exceed the expected value of the loss by the amount of the tax penalty. Traditional investors gladly pay this larger premium because they reduce their downside credit exposure while maintaining (or slightly improving) their expected after-tax expected return. The CDS protection buyer and seller both financially benefit since the increase in premium comes from a reduction in the expected tax liability. Because the broker selling the protection has the information advantage, he retains the lion share of the tax profit. And, since writing credit default swaps require no initial investment, the expected rate-of-return for the broker is infinite. These features released powerful profit incentives to shift default risk from buy and hold investors toward those taxpayers with tax rate equality for both interest and loss.

Diagram of Credit Default Swap Tax Arbitrage

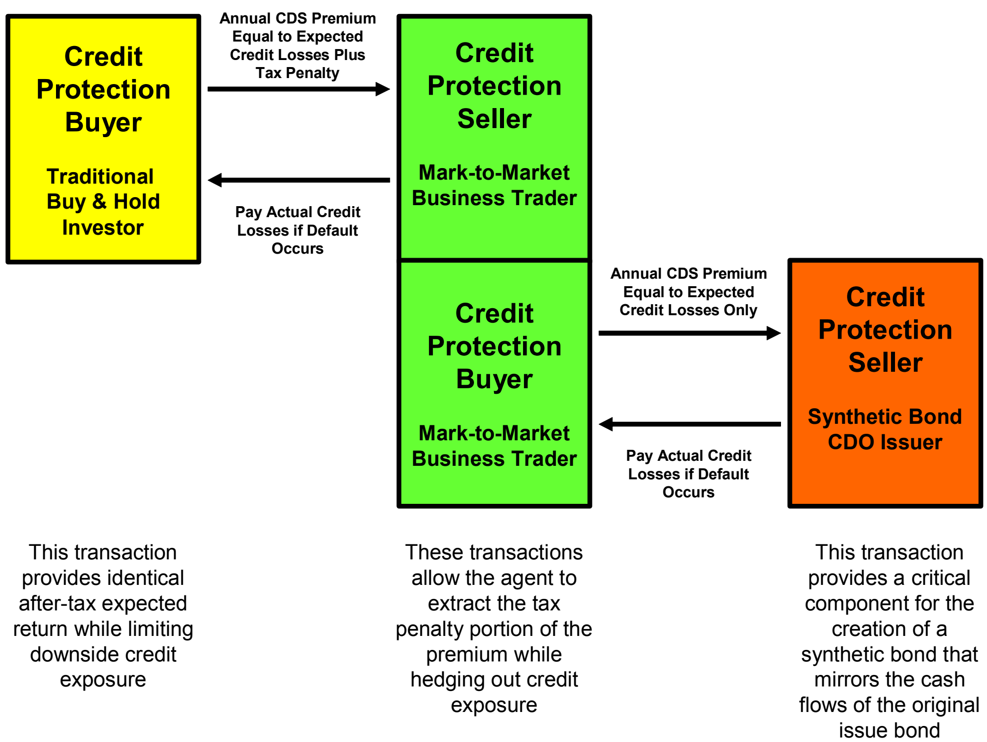

Figure 9

To construct the arbitrage, Wall Street brokerages and mono-line insurers had units set up under this mark-to-market tax structure to write credit protection contracts. However, prudent risk management prevented these firms from retaining too much concentrated default exposure in any single area. To manage this risk, Wall Street encouraged the development of the synthetic bond market. Synthetic bonds, made in part from CDSs, served as an alternative to original issue bonds for the collateralized debt obligation market. This enabled a wealth transfer strategy where Wall Street brokers could strip out the excess tax profit from the original CDS while effectively neutralizing the credit exposure as long as contract counterparties remained solvent. Now the tax arbitrage was complete. (See Figure 9 or Appendix A for a more detailed explanation)

In essence, this multipart, transactional structure legally transferred government tax receipts to Wall Street bonus pools. The unintended consequence of this tax policy was to make investment in the wealth transfer strategies of the derivative markets more profitable than investment in the wealth creation strategies of the primary markets.[3] In the process, capital and labor resources were diverted from more productive uses to the creation of a new financial infrastructure (supply chain and distribution capability) to monetize the tax arbitrage and enrich facilitating brokers. Nobody ever financed a factory with a credit default swap or a futures contract.

Credit Default Swap Tax Arbitrage Equation

$$\text{Broker Bonus} = \text{Tax Penalty} = \beta \circ (1-R) \circ \left(\frac{(T_{Interest} - T_{Losses})}{(1 - T_{Interest})} \right)$$

Where

β - Annualized Bankruptcy Risk
R - Expected Recovery as a Percent of Par
$T_{Interest}$ - Tax Rate in Interest Income
T_{Losses} - Tax Rate for Deductibility of Losses

All these inputs reflect the protected credit instrument and tax status of the protection buyer – not seller

Equation 4

The feedback mechanism that ultimately created the unstable boom/bust cycle was essentially a massive tax arbitrage. Equation 4 shows the factors that determine the size of tax arbitrage

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3 From a pure economic sense, wealth is created within an economic system from an improvement in the allocation of scarce resources that better meets the changing needs of its members over the prior existing state. These improvements are born out of the implementation of innovative ideas and productivity solutions that better utilize finite economic resources in the production of goods and services that the members desire. Innovative ideas and productivity solutions often require the acquisition of economic resources to effect their implementation. In a capitalist system, debt and equity markets provide the capital that makes implementation possible. That's why we refer to these markets as the primary markets for wealth creation because they are directly attached to the funding mechanism of wealth creation activity.

Derivative markets, by contrast, are not direct funding mechanisms for economic innovation or productivity implementation. The financial instruments within the derivative market come in many different forms but do contain one common element. The gain that one party receives is offset by a loss of equal magnitude plus agency costs to affect the trade. There is no productivity gain to the economic system directly tied to any derivative transaction. This does not imply that they are not useful to the economic system. They often help market participants manage risks and thereby allow market makers to provide needed liquidity to the economic system. But this also means that there should be a rapidly diminishing economic benefit for the growth in any derivative instrument beyond some point. When we observe any large and rapidly growing derivative market, we study the transaction structure in search of a tax arbitrage.

When tax policy unknowingly makes investment in the wealth transfer markets more financially profitable than investment in the primary markets of wealth creation, the odds are good that a boom/bust cycle will be the result.

opportunity that occurs annually as a percentage of original principle value. From this equation it is apparent that the size of the arbitrage profit is equal to the magnitude of the tax penalty. This tax penalty is eliminated from the tax liability of the CDS protection buyer. In addition, the profitability of the arbitrage increases as bankruptcy risk increases and recovery rates fall. This actually encouraged the creation of risky credit. These characteristics are particularly troublesome since rising defaults and lower recoveries are economic warning signals.

Arbitrage profits are generally short-lived, as the buying and selling of assets will change the price of those assets in such a way as to eliminate the arbitrage opportunity. But this case is different. This arbitrage opportunity is created through the application of different tax rules (capital gains versus ordinary income) to different types of investors (traditional buy and hold investors versus mark-to-market business traders) on the identical loss from a credit default. Financial innovation and skillfully crafted legal opinions made it possible. And because this arbitrage is tax-based, instead of price-based, it cannot be eliminated by price moves.

Self-reinforcing Feedback

Once Wall Street recognized the profit opportunity, the growth in the CDO and CDS markets exploded. These products became the new profit engine for Wall Street. So profitable, that $300 billion of CDS insurance has been sold to cover $30 billion of General Motors debt. If you bought a house for $100,000, would you insure it for $1,000,000? Of course not, but vast multiples of credit protection contracts per insured bond has become commonplace. In 1999, the CDS market was virtually non-existent. By year-end 2007, the CDS market stood at an estimated $60-$70 trillion. Estimated, because there is no transparent market where CDS trade and disclosure is on a voluntary basis.

Note that this particular tax arbitrage does not exist for high-grade credit because the odds of default are so low that there is hardly any tax benefit to arbitrage. Therefore, the creation of low-grade credit was a requirement to fuel the arbitrage. The extreme profitability of these businesses to Wall Street provided powerful feedback to induce the creation of lots of low-grade debt. Unrecognized was the fact that increasing the quantity of low-grade credit within the financial system also increased the systematic risk of default. This set off a chain reaction that spread far and wide.

Ironically, and disastrously, the tax advantages of securitization and credit default swaps drove lending rates lower, leading to the illusion of lower default risk. Lower rates induced more borrowing. Falling credit spreads pressured bank lending margins. Banks adapted by moving from a principal-lending model to an agent-lending model.[4] By shortening risk horizons from a hold-to-maturity to a hold-to-sell perspective, credit exposure was truncated, ultimately leading to an easing

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[4] Banks had traditionally operated a principle-lending model where they originate, underwrite, and hold the majority of loans until maturity. This began to change after securitization began to grow. Banks are subject to income tax on their net interest margins and bank investors/depositors are subject to taxes on interest received, dividends, and capital gains. This combined level of tax burden could not compete with securitization structures that avoided any business level tax and dramatically improved the tax efficiency of investment in pass-through securities. These tax advantages drove credit spreads down as securitization products increased market share. This dramatically reduced the profitability of holding loans on banks balance sheets. But since securitization structures did not have an originate/service capability, the profitability of these activities relatively increased forcing most banks to an agent-lending model where they originated and sold the loans.

of credit standards. Since CDOs are sliced, diced, and credit enhanced, documentation on purchased loans seemed less relevant.

In response, documentation standards and down payment requirements plummeted and drew in more borrowers as the new Wall Street model required more low-grade debt. Home prices soared in reaction to increased demand based on easy credit. Declining "risk" premiums spread into other asset classes competing for the same capital. Easy credit standards, cheap money, and rampant promotion of it, fueled a credit induced, liquidity boom. And with tax advantages to both the borrowers and investors, there was plenty of "spread" to ensure all the agents were well compensated.

At this point, the self reinforcing feedback loops were firmly in place setting off a global liquidity boom. And, just like chemical reactions where the energy released from the burn perpetuates the cycle until the environment changes, or the last of the fuel is consumed, the debt fueled consumption frenzy continued. This self reinforcing cycle persisted until a combination of rising default rates, rising interest rates, revised bankruptcy laws, and a debt-burdened, consumptive exhaustion took hold, forcing the trends to reverse violently.

From Boom to Bust

It is ill fated that so many borrowers, investors, agents, regulators, pundits, and politicians interpreted the narrowing of credit spreads as a reduction in default risk. Credit default swaps were hyped as a new frontier in risk management, for which "distributed risk" lowered the cost of capital to corporations, and provided investors a higher return with less risk. But, in reality, the only reason for a declining cost of capital and narrowing credit spreads was the porting of the tax benefit. And as far as risk is concerned, nobody understood or considered the global credit consequence of a complex web of interrelated counterparty risk, which is why, when Lehman went bust, all bets were off. In the saddest irony of all, tax payer money is now being allocated in massive quantities to bailout the very institutions that benefited most from the tax avoidance.

The global economy is now about 24 months into the bust phase of this credit induced liquidity boom/bust cycle. In retrospect, we can see that the road to hell was paved with good intentions. Policymakers, in an effort to help constituents, never recognized or acknowledged the most basic axiom--that for every action there is an equal and opposite reaction. With the benefit of hindsight, we can see that the reaction to these tax policies have played a major role in creating the crisis. Policies meant to improve housing affordability, and promote home ownership, fundamentally changed the allocation of economic resources. Not only across the mortgage market, but across the entire market complex. Profit seeking and arbitrage ensure that policy impacts spread far and wide as each market seeks to find its new level.

The average size of new home construction in the U.S. has increased from 1,100 sq. ft. in 1947, to 1,500 sq. ft. in 1987, to almost 2,500 sq. ft. in 2007. At the same time, the average number of occupants per home decreased from 3.9 in 1947, to 2.9 in 1987, to 2.6 in 2007. As a result, the average square footage per occupant increased over three and a half fold. These statistics illustrate how a tax policy targeted toward improving home ownership affordability induced a massive shift in the allocation of economic resources.

More labor and material resources have been allocated to building larger homes. Commodity prices respond by moving higher. More energy resources are allocated to heat and cool larger homes. Energy prices respond by moving higher. More consumer goods are produced and consumed to fill larger homes. Consumer spending and trade deficits respond by moving higher. Tax incentives encouraged the building of larger houses, and larger houses consume more resources. Tax incentives also encouraged more borrowing. And savings rates declined. Tax arbitrage lowered the cost of capital, and asset prices increased in response, making us all feel wealthier. The feedback network was well established, altering the allocation of economic resources.

Today public spending deficits are increasing property tax levies. Rising property taxes, energy costs, infrastructure spending, and home maintenance outlays are dramatically increasing the cost of carry on home ownership. These trends counterbalance much of the mortgage interest tax benefit, forcing home prices to adjust downward. Falling home prices reverse the capital gains tax exclusion benefit. This, in turn, forces another downward adjustment to home prices. Prices on existing homes are falling faster than new home construction costs. In response, new home construction has plummeted by over 75%. This is forcing yet another shift in the allocation of economic, material, and labor resources as the incentives unwind through the collapse. At the same time housing affordability, while going through ebbs and flows, is at about the same level as it was in 1970.

Concluding Remarks

Conventional wisdom is that a free market system naturally directs economic resources to their highest and best use. This is only partly true. Consistent with the financial axioms presented in this paper, free markets act on incentives to direct resources toward their most highly profitable uses. In the absence of distorted incentives, the most profitable uses are generally aligned with the best (most productive) uses, as profitability is an indication of society's most pressing needs. Tax policy often distorts self interest, and in doing so, resources are misallocated, and economic efficiency is compromised. When finite resources are directed away from their highest and best use, economic efficiency is impacted in proportion to the magnitude of the misallocation.

The current credit crisis serves as a painful example of misaligned incentives, and reveals the potential damage and unintended consequences of an overly complex tax system. As each market participant pursued activities that were, in their judgment, in their own self interest, system resources were misallocated, ultimately undermining our collective economic health. This happened dynamically and automatically, without any person or institution fully aware of it, or in control of it. When viewed from the perspective of self interest, the individual actions of each participant were totally rational. As such, the credit crisis does not represent a failure of the free market. Rather it stands as an example of the unintended consequence of a tax policy that distorted incentives within the free market system. Regulation cannot control investors from acting in their self interest.

The flexibility of an economic system is vital as the needs of society constantly change in response to innovation, productivity, knowledge, and discovery. While changing needs are impossible to forecast, they always disturb the equilibrium of the system. They cause disruptions by abandoning the assets and employment skills utilized by the outgoing paradigm. If shifting priorities are born out of the innovation and productivity inherent in a capitalist system, stranded resource costs have to be offset in the aggregate by the resource advantages of the new model in order for them to take hold. If, on the other hand, a change in resource allocation is triggered by changes in tax incentives, stranded skills and resources will represent a real economic loss. When there is no government innovation or productivity benefit to offset the loss, this conclusion cannot be denied.

We understand the political process and the well intentioned desire of politicians and their constituents to help avoid disruptions. It is critical, however, that politicians resist the urge to institute new policies that further misallocate resources as it will only extend and magnify the pain. Avoiding unnecessary misallocations of resources is vital to driving standards of living higher.

Tax policy has clearly played a major role in misaligning the incentives that drive economic activity. This paper has described the processes by which complex tax policy distorts the economics of self interest, leading to the misallocation of resources. Some of these misallocations are systematically stable. Others are not, inducing significant boom/bust cycles. In all these cases, however, the misallocations result in a lower standard of living that would have otherwise existed absent the distortions.

According to the U.S. Government Printing Office, our tax code is now over 13,458 pages long. Lawmakers don't comprehensively understand the code, and taxpayers have difficulty complying. Our President can hardly appoint anyone to office that has not made an "honest mistake" in trying to interpret and comply with our tax code. The increasing complexity of a constantly changing US tax policy that applies different rules to different parties, and is confronted with an ever increasing pace of financial innovation and market globalization, makes it impossible for policy makers to control unintended consequences. But, the economic force of tax incentives remains just as potent.

In summary, in order to encourage a more efficient allocation of economic resources that result in more stable and robust economic growth, we must first recognize where we have a problem. Our tax code is rife with inconsistencies and special interest tax incentives capable of causing unintended economic disruptions. We cannot regulate ourselves out of this simple truth. World leaders need to recognize this and call for a better understanding of the role tax policy played in this and other economic disruptions. Tax reform should move to the top of every political agenda. A better understanding of tax policy, arbitrage, and feedback theory is critical to resolving our current economic difficulties and avoiding future misallocation of resources. Without a deeper understanding of Tax Arbitrage Feedback Theory, we are most likely destined to an increasingly rapid sequence of bubbles and bursts, always blamed on the irresponsible behavior of others.

In conclusion, cost/benefit analysis is increasingly viewed as a prudent and necessary step in crafting new legislation and regulations. Should this not be applied to the subtle, but enormously powerful effects of differential tax rates and related financial innovation to repackage risk and return? The effects are huge in terms of inducing booms and busts in the economy.

Tax Arbitrage Feedback Theory provides a needed framework to guide tax legislation and regulation of financial innovation in order to promote higher, and less volatile, long-term, economic growth.

Appendix A

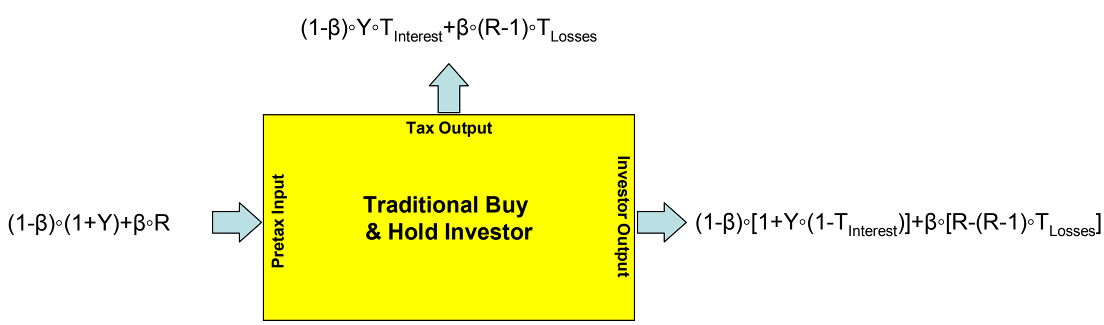
Credit Default Swap Tax Arbitrage
In Eight Steps

The *Tax Arbitrage Feedback Theory* (TAFT) uses concepts from classical control theory to describe the behavior of a dynamic economic system. Tax policy alters the decision making process for many market participants in different ways. By understanding the capital supply chain and the decision-making process of different, but interrelated elements, a better description of the transfer functions can be developed within the financial system. These models help to map the cause and effect relationship between a new input stimulus and the subsequent reallocation of economic resources. Analyses of the transfer functions reveal insights about the efficiency and stability of economic systems and the relative profit opportunities created out of the design of financial instruments.

The large profit opportunity created from writing Credit Default Swaps is described in eight steps. Since credit protection is often sold to investors that hold credit instruments subject to the possibility of default, the analysis will start with the basic transfer functions of an investor that is long an unprotected credit instrument.

Step #1 Perspective of Traditional Buy & Hold Investor for the Unprotected Bond
Identify Input and Output Cash Flows

Block Diagram of the Expected Cash Flows on an
Simple Investment in a Credit Instrument



Where

β	- Annualized Bankruptcy Risk
Y	- Nominal Stated Annual Yield
R	- Expected Recovery as a Percent of Par
$T_{Interest}$	- Tax Rate in Interest Income
T_{Losses}	- Tax Rate for Deductibility of Losses

Figure A-1

Using the same simplified modeling approach presented in Figure 1 of the paper, the above block diagram (Figure A-1) presents equations that describe the expected pretax cash flows anticipated by the investor labeled as *Pretax Input*. The expected tax liability is shown at the top, and the resulting after-tax cash flow is labeled *Investor Output* on the left. To properly interpret these block diagrams, the sum of the incoming cash flows must equal the sum of the outgoing cash flows. Therefore in Figure A-1, the *Pretax Input* must equal the sum of the *Tax Output* plus the after-tax *Investor Output*.

When default protection is purchased by an investor, the equations change in the following ways. Recovery is set equal to 100% and the stated yield is reduced by the CDS premium paid. The following block diagram shows the modified equations. The CDS premium is denoted as (P) in Figure A-2, and is, for mathematical simplicity, shown as a reduction in stated yield.

Step #2 Perspective of Traditional Buy & Hold Investor for the CDS Protected Bond Identify Input and Output Cash Flows

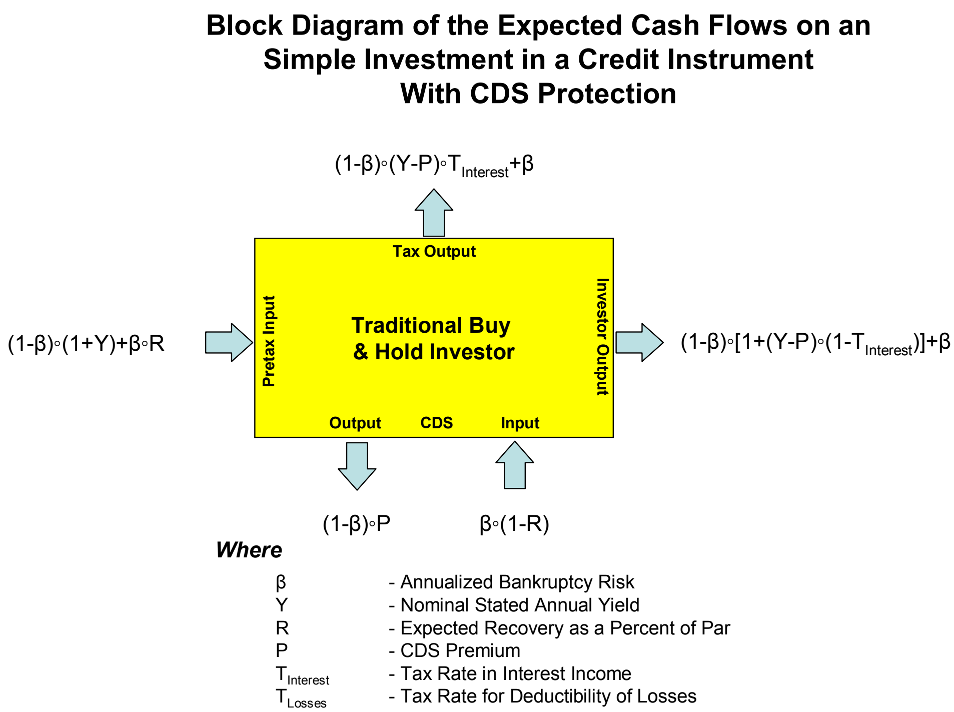


Figure A-2

In this diagram, the pretax input cash flows remain unchanged. In order to maintain equilibrium in the after-tax return available to the investor, a CDS premium can be solved so that the after-tax expected cash flows have the identical value. Figure A-3 presents the equation setup to solve for the required CDS premium.

$$\text{Expected After-Tax Cash Flow with CDS Protection} = \text{Expected After-Tax Cash Flow without CDS Protection}$$

$$(1-\beta)\circ[1+(Y-P)\circ(1-T_{Interest})]+\beta = (1-\beta)\circ[1+Y\circ(1-T_{Interest})]+\beta\circ[R-(R-1)\circ T_{Losses}]$$

Figure A-3

Solving for P yields the following equation:

$$\text{CDS Premium} = P = \frac{\beta}{(1-\beta)}\circ\left[(1-R)\circ\frac{(1-T_{Losses})}{(1-T_{Interest})}\right]$$

Figure A-4

The *CDS Input* and *Output* equations shown in Figure A-2 can be combined into a single equation as shown below to identify the magnitude of the net expected inflow or outflow.

$$\text{Net CDS Output} = (1-\beta)\circ P - \beta\circ(1-R)$$

Substituting P with the equation in Figure A-4 yields the following.

$$\text{Net CDS Output} = (1-\beta)\circ\left[\frac{\beta}{(1-\beta)}\circ\left[(1-R)\circ\frac{(1-T_{Losses})}{(1-T_{Interest})}\right]\right] - \beta\circ(1-R)$$

This simplifies to:

$$\text{Net CDS Output} = \beta\circ(1-R)\circ\left[\frac{(T_{Interest}-T_{Losses})}{(1-T_{Interest})}\right]$$

Figure A-5

Since the net CDS output is not equal to zero, the magnitude of the CDS insurance premium that can be paid by the Traditional Investor and still deliver the identical expected after-tax cash flow as the uninsured original credit must be greater than the expected value of pretax default losses. This net cash flow has to be sourced from a reduction in the expected tax liability because the pretax input cash flows are identical and the after-tax expected cash flow was solved to provide the identical expected value. (See Figure A-6)

$$\text{Change in Expected Tax Liability} = \text{Expected Tax Liability with CDS Protection} - \text{Expected Tax Liability without CDS Protection}$$

$$\text{Change in Expected Tax Liability} = [(1-\beta)\circ(Y-P)\circ T_{Interest}] - [(1-\beta)\circ Y\circ T_{Interest}+\beta\circ(R-1)\circ T_{Losses}]$$

$$\text{Change in Expected Tax Liability} = \left[(1-\beta)\circ\left(Y-\frac{\beta}{(1-\beta)}\circ\left((1-R)\circ\frac{(1-T_{Losses})}{(1-T_{Interest})}\right)\right)\circ T_{Interest}\right] - [(1-\beta)\circ Y\circ T_{Interest}+\beta\circ(R-1)\circ T_{Losses}]$$

$$\text{Change in Expected Tax Liability} = -\beta\circ(1-R)\circ\left(\frac{(T_{Interest}-T_{Losses})}{(1-T_{Interest})}\right)$$

Figure A-6

To solve for the change in the expected tax liability after insuring for default with a credit default swap, the tax liability without the CDS protection is compared against the tax liability with CDS protection. Notice that these equations solve for a net reduction in expected tax liability that exactly offsets the net cash flow that the CDS protection seller receives.

Step #3 Perspective of Traditional Buy & Hold Investor for the CDS Protected Bond Maintain Same Expected Return While Accepting Less Risk

Block Diagram Comparing the Expected Cash Flows from the Original Investment Alone with the Expected Cash Flows After Purchasing CDS Protection

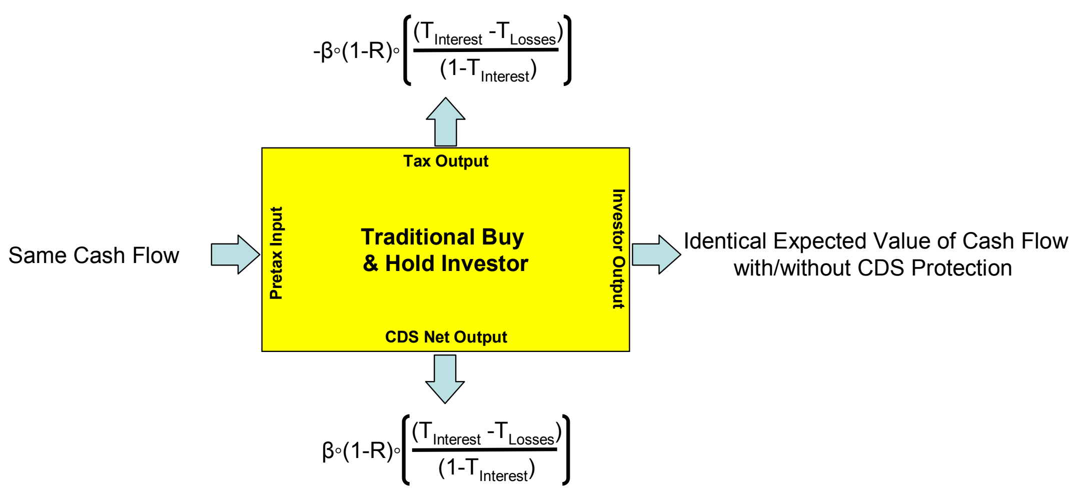
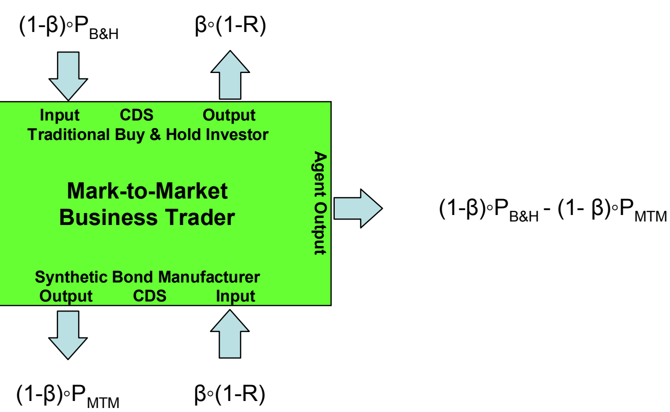


Figure A-7

Figure A-7 diagrams that the investor probabilistically receives the identical after-tax expected cash flow after securing CDS protection but reduces the uncertainty of the actual outcome. CDS Protection reduces the upside potential by the amount of the CDS premium which is probabilistically offset by the reduction of principle losses under default. Therefore, the traditional investor benefits by maintaining the same expected return with less risk. Figure A-8 identifies what the CDS protection selling broker (i.e., Mark-to-Market Business Trader) gains from providing default protection.

Step #4 Perspective of Mark-to-Market Business Trader Brokering CDS Protection Identifying Input and Output Cash Flows

Block Diagram of the Expected Cash Flows for the Mark-to-Market Business Trader



Where

β	- Annualized Bankruptcy Risk
Y	- Nominal Stated Annual Yield
R	- Expected Recovery as a Percent of Par
$P_{B\&H}$	- CDS Premium from Traditional Buy & Hold
P_{MTM}	- CDS Premium from Mark-to-Market Trader
$T_{Interest(B\&H)}$	- Tax Rate in Interest Income for Buy & Hold
$T_{Losses(B\&H)}$	- Tax Rate for Deductibility of Losses For Buy & Hold
$T_{Interest(MTM)}$	- Tax Rate in Interest Income for Mark-to-Market
$T_{Losses(MTM)}$	- Tax Rate for Deductibility of Losses for Mark-to-Market

Figure A-8

The top *CDS input/output* in Figure A-8 represents the transaction between the Traditional Buy & Hold investor and the Mark-to-Market Business Trader. The bottom *CDS input/output* is where this agent transfers the default risk off to a Synthetic Bond Manufacturer. By structuring the pair trade in this manner, the Mark-to-Market agent is able to strip off the tax savings created for the Traditional Buy & Hold investor while neutralizing (by reinsuring) the default risk. This structure secures a "riskless" profit as long as the Synthetic Bond Manufacturer counterparty remains solvent. To secure the "riskless" profit, notice in this block diagram that the CDS premiums are different. Recall that the equation for calculating the CDS premium that achieves after-tax return equilibrium against the unprotected security is

$$\text{CDS Premium} = P = \frac{\beta}{(1-\beta)} \circ \left[(1-R) \circ \frac{(1-T_{Losses})}{(1-T_{Interest})} \right]$$

While the bankruptcy risk (β) and recovery rates (R) are the same for both the Buy & Hold Investor and Mark-to-Market Business Traders since they refer to the underlying credit, the tax rates applied in this equation are not. The tax rates used in calculating an after-tax, return-neutral premium is determined by the investor buying protection. Since the tax rate applied to both interest received and the deductibility of default losses are the same for the Mark-to-Market business trader and different for the Traditional Buy & Hold investor, the equations for calculating the CDS premium applied to each side of the transaction simplifies to

$$\text{CDS Premium}_{B\&H} = P_{B\&H} = \frac{\beta}{(1-\beta)} \circ \left[(1-R) \circ \frac{(1-T_{Losses(B\&H)})}{(1-T_{Interest(B\&H)})} \right]$$

and

$$\text{CDS Premium}_{MTM} = P_{MTM} = \frac{\beta}{(1-\beta)} \circ (1-R)$$

Substituting these equations into the block diagram for the Mark-to-Market business trader yields

Step #5 Perspective of Mark-to-Market Business Trader Brokering CDS Protection
Substitute for P and Simplify Equations

Block Diagram of the Expected Cash Flows
for the Mark-to-Market Business Trader

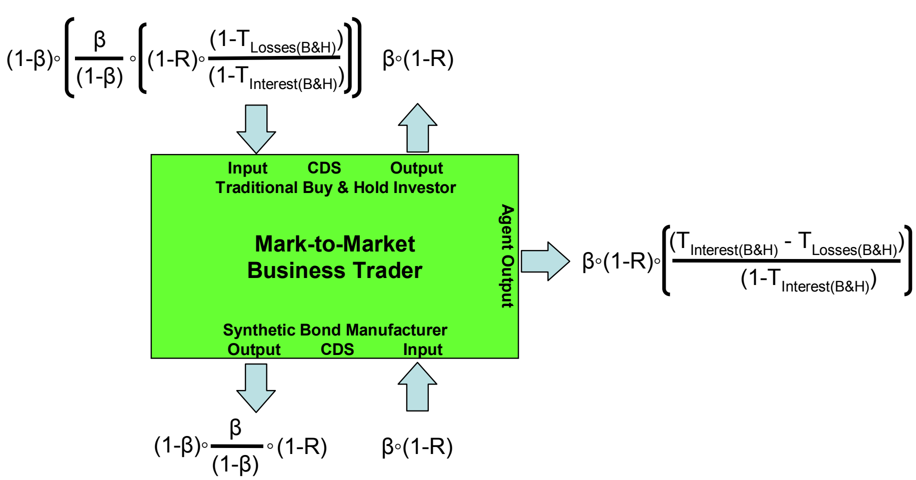


Figure A-9

Netting the input and output cash flows from both the CDS transactions yields the results in Figure A-10. Note that from a probabilistic point of view, the net output between the Mark-to-Market Business Trader and the Synthetic Bond Manufacturer is zero. For this transaction, the CDS premium exactly mirrors the probabilistic loss from default.

Step #6 Perspective of Mark-to-Market Business Trader Brokering CDS Protection Captures Tax Arbitrage Profit While Reinsuring Default Risk

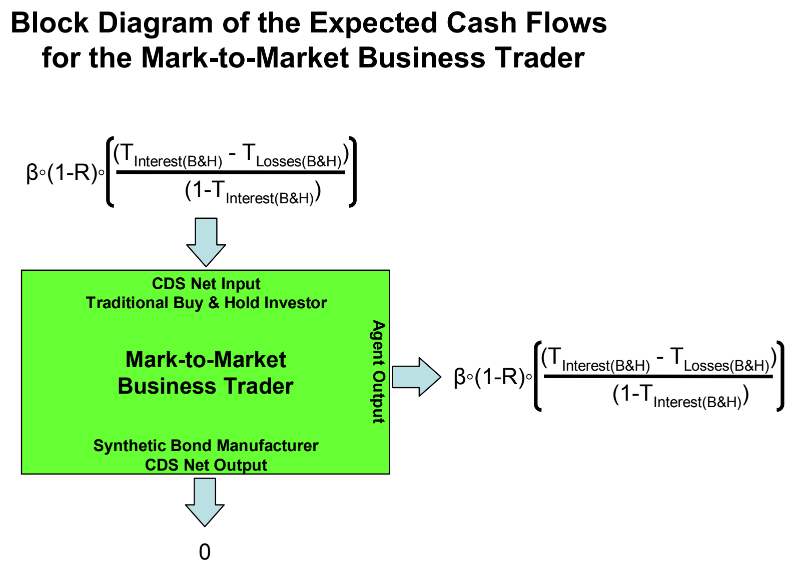


Figure A-10

This figure shows that the net profit from the combined CDS premium cash flow streams is immune from disturbances, during the contract period, as long as the underlying bond does not default. If the bond does default, the only downside is the loss of the profit stream. No other risk of loss is maintained within the Mark-to-Market agent as long as the offsetting counterparty remains good.

Step #7 Perspective of Synthetic Bond Manufacturer
Create Synthetic Bond with Identical Cash Flows to the Original Issue Bond

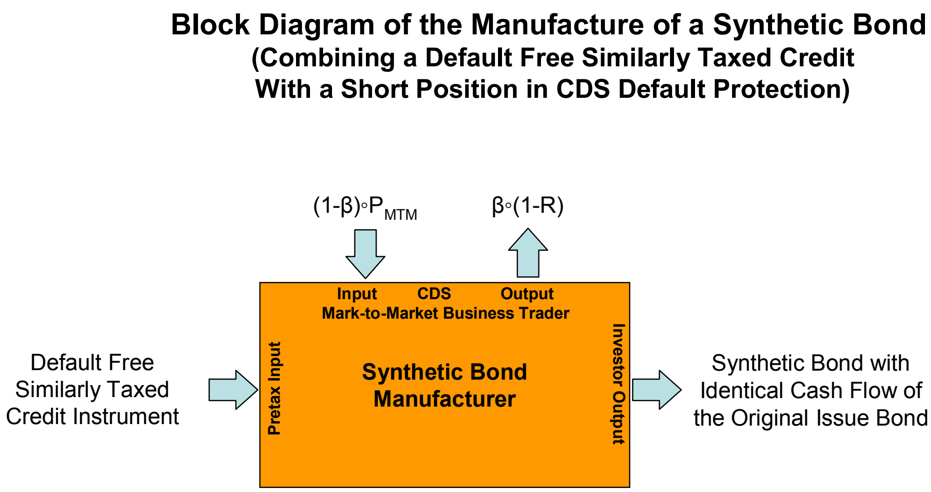


Figure A-11

As mentioned before, the CDS transaction between the Synthetic Bond Manufacture and the Mark-to-Market agent transfers risk but no net expected value from a probabilistic point of view. Combining this risk with a default-free instrument yields the identical cash flow stream as the original issue credit purchased by the Traditional Buy & Hold investor in Figure A-1. This bond can now be sold or packaged in a securitization structure like the one presented in Figure 8 of the main body of this paper. By supplementing original issue securities with synthetic bonds, the pool of available securities (raw materials) to create securitization structures is dramatically increased. Thus, the profitability of agents that assemble CDOs, CLOs, CMOs, and other securitization structures is increased. And, since the profitability of securitization is based, in part, on tax advantages, the profit margin will not be competed away as long as bankruptcy risk remains uncorrelated.

Step #8 Viewing the Entire Capital Supply Chain of the CDS Tax Arbitrage

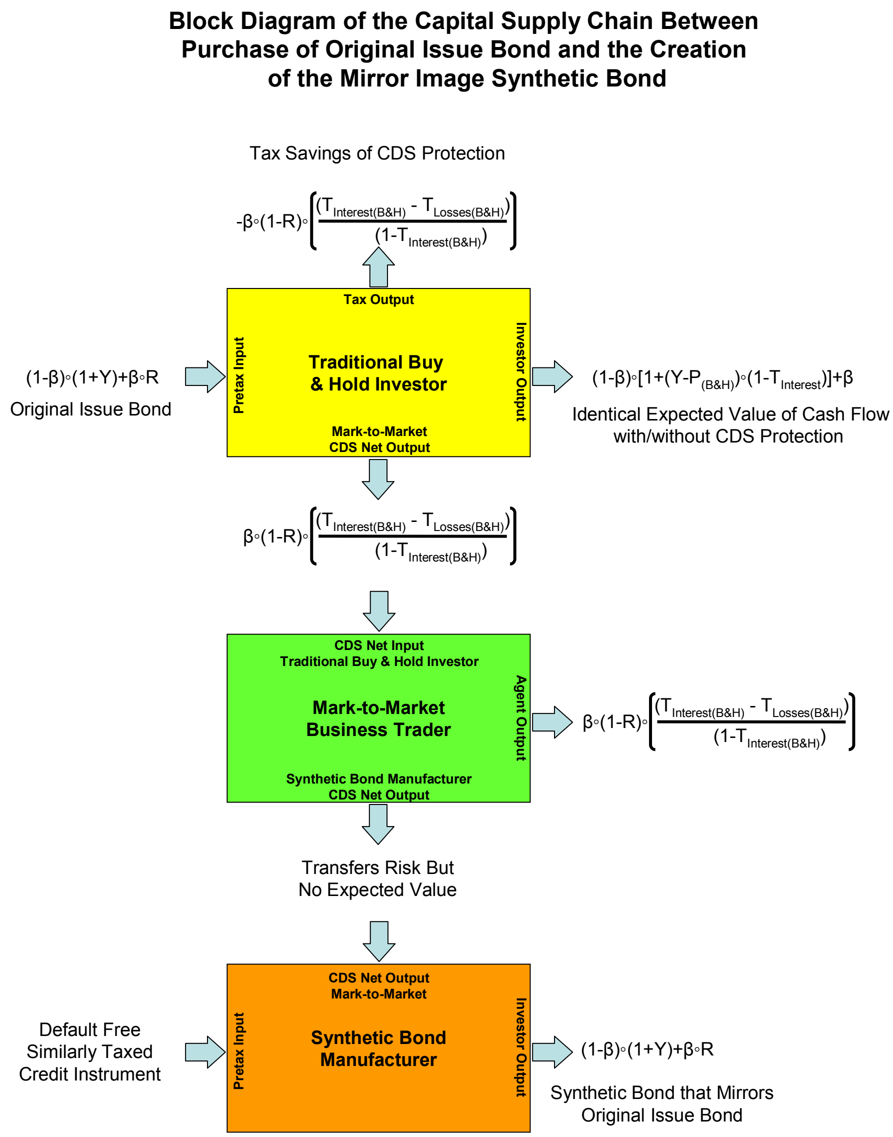


Figure A-12

This figure shows that the expected pretax cash flow that the Traditional Investor receives in the *Pretax Input* is identical to the synthetic bond created by the *Investor Output* of the Synthetic Bond Manufacturer. Simply, the input equals the output. In between however, a significant benefit is available for each participant in the transaction stream.

The Traditional Buy & Hold investor benefits by receiving the same after-tax expected return (from a probabilistic perspective) while taking less risk with regard to range of outcome. The Mark-to-Market Business Trader benefits by stripping off the tax savings created for the Traditional Buy & Hold investor for his profit while neutralizing (by reinsuring) the default risk. Since this transaction requires no initial investment from the Mark-to-Market Business Trader, the expected rate-of-return for the agent is infinite. *This structure locks in a "riskless" profit stream for the contract period, as long as the Synthetic Bond Manufacturer counterparty remains solvent.* Lastly, the Synthetic Bond Manufacturer benefits by creating a larger pool of securities from which to create securitization structures. In a rapidly growing market, synthetic bonds can be created and procured with less market price impact than buying original issue bonds in the public market. Thus, the profitability of assembling CDOs, CLOs, CMOs, and other securitization structures is increased. And, since the profitability of securitization is based, in part, on tax advantages, the total profit available to securitization assemblers is solely based on the size of the available pool of raw material bonds.

The incredible profitability, produced from engineering more tax efficient financial structures, improved the availability of financial capital for more speculative and risky investment. This, in turn, drove a less efficient allocation of society's real economic resources (labor and materials). Financial resource allocation became more complex, separating the root borrowers from the root investors. This made it more difficult for root investors to appraise the risk. The profitability of the CDS tax arbitrage increased geometrically with increasing bankruptcy risk and lower recovery assumptions, this made it easier for the agents to ignore the risk. All this was made possible because the tax code made innovating complex, multipart, financing structures more profitable than the "old fashioned" direct lending (debt or equity) model. No individual needed to understand any of this analysis either. Profitability and self-interest drove these actions and innovations because the tax code encouraged it.