Phantom Income

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A. Introduction

Holders of equity interests in owner trusts and residual interests in REMICs are required to report taxable income calculated as the difference between the gross income from the assets of the issuer and the deductions allowed with respect to its liabilities (including, in the case of a REMIC, regular interests which are treated for tax purposes as if they were liabilities of the REMIC). This method of taxation can result in some periods in the recognition of taxable income that exceeds economic income. That excess is referred to herein as *phantom income*.

Our study will examine the sources of phantom income and different ways of measuring its effect on investors. We will show that the primary cause of phantom income is the deferral of interest expense that arises when liabilities are divided into multiple classes or tranches with different maturities and yields. This deferral of expense is then magnified by leverage and manifests itself as a front loading of taxable income for the residual investment. Such a front loading of taxable income with its consequent front loading of tax payments can have a significant adverse effect on after-tax yield.

During the course of the discussion, it will become clear that the phantom income problem is one of timing. Excess taxable income in the initial periods is offset by reductions in taxable income (or a loss) in the later periods. As a consequence, a sale before maturity may have the effect of moving the tax benefits inherent in the reduced future taxable income (or loss) up to the point of sale. Thus, such a sale can mitigate the phantom income problem.

Finally, we will illustrate our conclusions with examples representative of the types of transactions done over the past two years.

Except where otherwise indicated, the discussion below applies equally to investments in equity interests in CMO owner trusts and REMIC residual interests.* References to CMOs, bonds or liabilities include regular interests in a REMIC even if they do not take the form of debt obligations of the REMIC. All tax calculations assume a tax rate of 34%. For simplicity, non-interest expenses of the issuer such as administrative costs are ignored.

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* This study assumes that all taxable income is subject to tax and thus does not take account of the possibility that certain holders of REMIC residual interests will be subject to tax only on "excess inclusion" income. See the discussion of excess inclusions in Chapter 7, Part E.4.

B. Illustration of Phantom Income

Phantom income arises when the distribution of taxable income differs from the distribution of economic income. Consider the example in Figure 1:*

Figure 1. Simple Example of Phantom Income

Year	*Cash Flow*	*Taxable Income*	*Economic Income*	*Phantom Income*	*Tax on Phantom Income*
0	$(100.00)				
1	36.00	$11.00	$9.17	$1.83	$0.62
2	31.75	6.75	6.71	0.04	0.01
3	28.50	3.50	4.41	(0.91)	(0.31)
4	26.25	1.25	2.21	(0.96)	(0.33)
	22.50	22.50	22.50	0.00	0.00

Present value @ 6% discount rate of tax on phantom income—$.08
Future value @ 6% reinvestment rate of tax on phantom income—$.10

In the example shown in Figure 1, $100 is invested in an asset which has a total cash flow of $122.50. All accounting methods must recognize income of $22.50 over the life of the investment In the example, however, taxable income is recognized faster than economic income. The difference between economic income and taxable income is what we call phantom income.

Since tax liability is based on taxable income, an investor that purchased the investment described in Figure 1 would pay more taxes in the initial periods and less in the later periods than if taxed according to an economic distribution of income. if the investor had an after-tax rate of return of 6% on reinvested cash flows, this front loading of taxes would result in a $.10 reduction in the value of his portfolio (after paying all taxes due) at the four year horizon as compared with the same investment taxed on an economic basis. Alternatively, an additional $.08 would have to be invested now at a 6% after-tax rate of return in order to counter the $.10 reduction in value at the horizon.

In summary, phantom income is the difference between taxable income and economic income. If taxable income is front loaded relative to

* The derivation of this example and in particular the rationale for the income distributions will become clear in the next section. In all examples, columns may not total due to rounding.

economic income, taxes will be commensurately front loaded, resulting in a decrease in portfolio value at an appropriate investment horizon.

C. Phantom Income and the Yield Curve

In this part, we give a simple example which illustrates the main source of phantom income. We will also define what we mean by an economic distribution of income and show why taxable income can differ from economic income.

The transaction we will consider is the leveraged purchase of a fixed income instrument outlined in Figures 2 and 3. The example serves as a model for the purchase of an equity interest in an owner trust and, subject to the discussion in Part H below of secondary market purchases, of residual interests in REMICs.

In the example shown in Figures 2 and 3, an investor raises $400 by incurring $400 of debt, divided into four classes, A through D, having equal amounts of principal payable at maturity. The maturities range from one to four years. He combines this amount with $100 of his own money and purchases for $500 a $500 principal amount debt security bearing interest at a rate of 9%. The asset provides for four equal annual principal payments of $125. In effect, he has purchased the residual cash flow for $100. It is this investment in the residual that we now will examine in detail.

As shown in Figure 3, the elements of the residual are determined as the difference between the corresponding elements of the asset and combined liabilities. For instance, the cash flow to the residual is the difference between the cash flow of the asset and the cash flow of the liabilities. The taxable income of the residual is the difference between the income from the asset and the deductions allowed with respect to the liabilities. In Figure 3, the amount given as the "tax basis" of the liabilities is the amount at which they are carried for tax purposes (i.e., the amount which could be paid to retire the liabilities without resulting in any income or loss to the residual investor), and equals their issue price, increased by the deductions allowed for interest expense, reduced by payments of principal and interest and adjusted for amortization of discount or premium (of which there is none in the example). The tax basis of the residual is the amount that would be used in calculating gain or loss from sale of the residual and equals the equity investment made in the residual, plus taxable income allocated to the residual, less distributions on the residual and any losses. The same terminology is used in the balance of this study.*

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* Strictly speaking, the basis of an equity interest in an owner trust would include a share of the trust's liabilities but that share is ignored here because

Figure 2. Leveraged Purchase of Fixed Income Asset

	Principal Amount	*Coupon*	*Price (% of Principal)*	*Yield*	*Principal Payments*	*Maturity*
Asset	**$500**	**9%**	**100**	**9%**	**$125/yr**	**4 Yrs**
Liability						
A	100	7	100	7	100	1
B	100	8	100	8	100	2
C	100	9	100	9	100	3
D	100	10	100	10	100	4
ALL	400			8.958		
Equity	100			9.171	25/yr	4

such basis would be reduced by repayments of the liabilities and the balance would be included in the amount realized from a sale, thus offsetting the original increase in basis.

Firgure 3. Taxable Income and Cash Flow Analysis of Leveraged Purchase

	Assets					***Combined Liabilities***						***Residential***			
Year	*Tax Basis*	*Return of Capital*	*Taxable Income*	*Taxable Dynamic Yield*	*Cash Flow*	*Tax Basis*	*Return of Capital*	*Tax Deductions*	*Taxable Dynamic Yield*	*Cash Flow*	*Tax Basis*	*Return of Capital*	*Taxable Income*	*Taxable Dynamic Yield*	*Cash Flow*
0	$550					$400					$100				
1	375	$125	$45.00	9%	$170.00	300	$100	$34	8.5%	$134	75	$25	$11.00	11%	$36.00
2	250	125	33.75	9	158.75	200	100	27	9.0	127	50	25	6.75	9	31.75
3	125	125	22.50	9	147.50	100	100	19	9.5	119	25	25	3.50	7	28.50
4	0	125	11.25	9	136.25	0	100	10	10.0	110	0	25	1.25	5	26.25
													22.50		

Let us focus for a moment on taxable income. Since there is no discount or premium involved, income from the asset and deductions with respect to the liabilities are calculated each year as the interest rate times the outstanding principal balance. In the case of the asset, this product is a constant 9% times a declining balance. In the case of the liabilities, the calculation must be done separately for each tranche and the results summed. Thus, in year 1, the total expense is $7 + $8 + $9 + $10 = $34. In year 2, since the first tranche has matured, the expense is $8 + $9 + $10 = $27.

1. Dynamic Yield

Our primary concern is with the distribution of taxable income over time. Merely listing the income from assets and deductions with respect to liabilities for each period does not lead readily to a determination of whether these amounts are front loaded or back loaded. The amortization of assets and liabilities means that income and deductions naturally decrease with time. The absolute decrease in income therefore is not an indication that it is front loaded. In order to facilitate inter-period comparisons of income and deductions, we introduce the concept of dynamic yield. The dynamic yield pattern will serve as an easily read indication of the extent to which income or deductions are skewed.

The dynamic yield of an asset (or liability) for any period is defined as the income (deductions) for that period with respect to the asset (liability) expressed as a percentage of its tax basis at the beginning of the period, adjusted to be an annual figure if the period is other than a year. In the example set out in Figures 2 and 3, the dynamic yield of the asset is a constant 9%. This is not surprising. When we are dealing with a single asset, the dynamic yield calculation is just the reverse of the income calculation; e.g., with reference to year 1 for the asset:

Income Calculation	$500 x 9% = $45
Dynamic Yield Calculation	$45 / $500 = 9%

The calculation for the liabilities is more complicated. Again with reference to year 1:

Deduction Calculation

$100x7% + $100x8% + $100x9% + $l00xl0% = $34

Dynamic Yield calculation

$$\frac{\$100x7\% + \$100x8\% + \$100x9\% + \$100x10\%}{\$400} = 8.5\%$$

From this last equation, we see that, in the case of a multi-tranche liability, the dynamic yield is a weighted average of the cash flow yields of the outstanding tranches.

The dynamic yield of the residual is calculated in the same manner as for the asset, by comparing the taxable income from the residual in each period with its tax basis at the beginning of the period.

An examination of the dynamic yield patterns shown in Figure 3 prompts the following assertions. The constant 9% dynamic yield of the asset implies that income from the asset is evenly distributed. The increasing dynamic yield of the liabilities indicates that interest expense is back loaded. Finally, the decreasing dynamic yield of the residual indicates that residual income is front loaded.

2. Economic Income

Next, let us use the concept of dynamic yield to define what we mean by an economic distribution of income or deductions. We will say that income or deductions are economically distributed when the dynamic yield does not change from period to period. Thus, in Figure 3 the income from the asset is economically distributed while the deductions with respect to the liabilities and the income from the residual are not. The rationale for this definition is that when dynamic yield is constant it equals the internal rate of return. Thus, our definition of economically distributed income amounts to a requirement that the income reported in each period be determined by the true economic yield of the investment.

Figure 4. Economic Deductions for Combined Liabilities

Year	*Tax Basis*	*Return of Capital*	*Economic Deductions*	*Dynamic Yield*	*Cash Flow*
0	$400.00				
1	301.83	$98.17	$35.83	8.958%	$134
2	201.87	99.96	27.04	8.958	127
3	100.95	100.92	18.08	8.958	119
4	0.00	100.96	9.04	8.958	110

Let us apply this definition to calculate the economically distributed deductions with respect to the liabilities. We first calculate the internal rate of return on the combined liabilities to be 8.958%. We then use this rate and the level yield method* of income calculation to arrive at the table shown in Figure 4. Also, let us calculate the economic distribution of income for the residual. The internal rate of return on the residual investment is 9.171%. Applying the level yield method gives us the table shown in Figure 5.

Figure 5. Economic Income of Residual

Year	*Tax Basis*	*Return of Capital*	*Economic Deductions*	*Dynamic Yield*	*Cash Flow*
0	$100.00				
1	73.17	$26.83	$9.17	9.171%	$36.00
2	48.13	25.04	6.71	9.171	31.75
3	24.04	24.09	4.41	9.171	28.50
4	0.00	24.04	2.21	9.171	26.25

3. Phantom Income

We are now in a position to calculate the phantom income on the residual and show its connection to the distribution of expenses on the liabilities.

Figure 6 shows clearly that the deferral of interest deductions is the source of the phantom income on the residual. The pattern of dynamic yields for the liabilities evidences the deferral of interest deductions.

* The level yield method calculates income for each period by multiplying the beginning of period carrying value by the internal rate of return of the investment. The carrying value is then increased by income and reduced by cash flow to get the next period's carrying value.

Figure 6. Phantom Income of Liabilities and Residual

	Combined Liabilities				*Residual*			
Year	*Economic Deductions*	*Taxable Deductions*	*Dynamic Yield*	*Contribution to Phantom Income*	*Economic Income*	*Taxable Income*	*Dynamic Yield*	*Phantom Income*
1	$35.83	$34.00	8.5%	$1.83	$9.17	$11.00	11.0%	$1.83
2	27.04	27.00	9.0	.04	6.71	6.75	9.0	.04
3	18.08	19.00	9.5	(.91)	4.41	3.50	7.0	(.91)
4	9.04	10.00	10.0	(.96)	2.21	1.25	5.0	(.96)

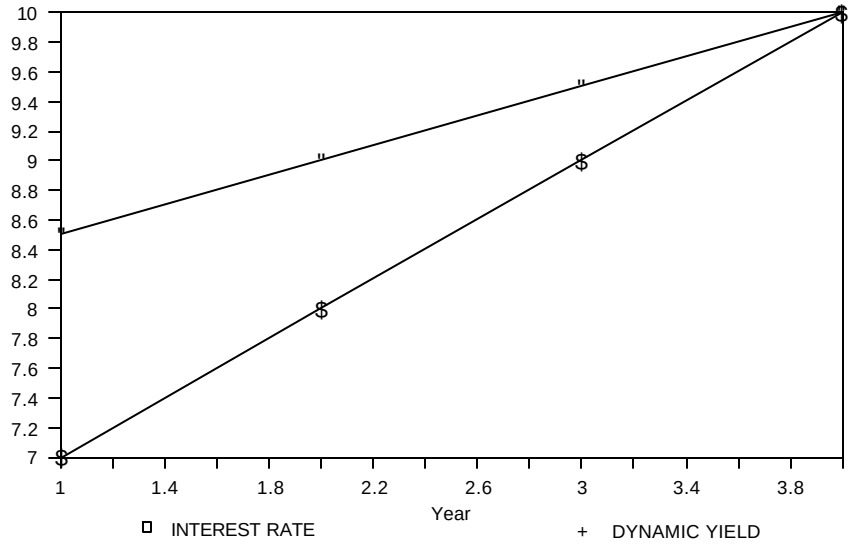
The dynamic yield starts at 8.5% and rises to 10%. An economic distribution of expense would allocate a constant percentage, 8.958%, to each year. The increase in dynamic yields is a consequence of the rate/maturity pattern of the liabilities (see Figure 7): low yields coupled with short maturities, high yields coupled with long maturities. In each period, the dynamic yield of the liabilities is a weighted average of the yields of the remaining trenches. As the lower-yield/shorter-maturity trenches are retired, the average must increase.

This deferral of expense on the liabilities results in a front loading of income on the residual. This front loading is evidenced by the pattern of dynamic yields. The dynamic yield changes over time from 11% to 5%. An economic allocation of income would result in a constant dynamic yield, 9.171%, for each year.

Note that the decrease in the dynamic yield of the residual, from 11% to 5%, is much more pronounced than the increase in the dynamic yield of the liability, from 8.5% to 10%. The difference is brought about by leverage. The phantom income is the same in dollar terms for both the liability and the residual. In percentage terms, though, it is greater for the smaller residual.

In summary, then, the above example illustrates that phantom income arises in a leveraged purchase of assets when the liabilities are divided into tranches that exhibit a positive correlation between maturity and rate. The structure of the liabilities gives rise to a back loading of interest deductions and a consequent front loading of income for the residual.

Figure 7. Phantom Income of Liabilities and Residual



D. Quantifying the Phantom Income Problem

The phantom income problem can be quantified in terms of yield or present value/future value. Recall the analysis done in Part B. In Figure 1, the excess tax on the phantom income was present valued and future valued at 6%, an after-tax opportunity rate. The future value represents the decrease in portfolio value resulting from paying taxes sooner than they would be paid if income was calculated on an economic basis. The present value represents the additional amount of money needed now for investment to counter the decrease in portfolio value stemming from phantom income.

The phantom income problem can also be quantified in terms of its effect on after-tax yield.

Consider the following simple example:

Income Distribution	***Pre-Tax Yield***	***Tax Rate***	***After-Tax Yield***	***Yield Lost to Taxes***	***Effective Tax Rate***
Economic	10%	34%	6.6%	3.4%	3.4%/10% = 34%
Taxable	10%	34%	6.0%	4.0%	4.0%/10% = 40%

When income is economically distributed (i.e., dynamic yield is constant for all periods), the fraction of yield lost to taxes always equals the tax rate. In the presence of phantom income, the yield lost to taxes will be

greater. The effective tax rate, which is defined as the ratio of yield lost to taxes to pre-tax yield, serves as an indicator of the magnitude of the phantom income problem. In this example, the comparison of a 40% effective tax rate with a statutory 34% tax rate indicates that 6 percent of the pre-tax yield has been lost due to phantom income.

Consider now what happens to the effective tax rate as the size of the residual varies while the liabilities are kept constant. The example in part C above is modified to give the results shown in Figure 8. The example is modified by assuming that the equity investment is reduced first to $50, then to $25. The liabilities are kept constant at a total initial amount of $400. Thus, in the successive cases, the total principal amount purchased shrinks to $450 and $425, respectively. The size of the debt portion of the financing relative to the equity portion increases and leverage increases correspondingly.

Figure 8. Effect of Leverage on Phantom Income

Equity Investment	*Leverage*	*Residual Pre-Tax Yield*	*Residual After-Tax Yield*	*Effective Tax Rate*	*Percent of Pre-Tax Yield Lost Due to Phantom Income*	*Present Value at 6% of Tax on Phantom Income*
$100	4:1	9.171%	6.016%	34.403%	.403%	$.081
50	8:1	9.348	6.093	34.814	.814	.081
25	16:1	9.721	6.254	35.660	1.660	.080

Several results shown in Figure 8 should be noted:

(1) The pre-tax yield increases with leverage, as expected.
(2) The percent of yield lost due to phantom income is almost directly proportional to the leverage.
(3) The cost of the phantom income remains fairly constant in present value terms.

These last two results can be traced to the fact that the phantom income problem is caused by the yield/maturity pattern of the liabilities. Since the liabilities are not changing, the phantom income in all three cases is essentially the same. As the residual cash flow becomes smaller, the yield effects of the phantom income problem become proportionately larger.

From Part C and the results above, we conclude that the phantom income effect on after-tax yield will be most pronounced if (1) the trenched liabilities exhibit an upward sloping yield/maturity pattern and (2) the equity investment is highly leveraged.

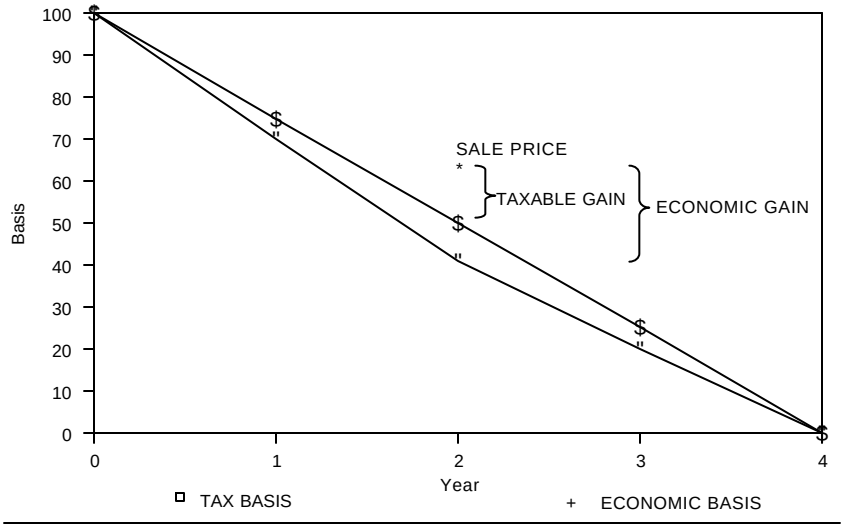
E. Horizon Analysis

The economic effect of phantom income may be greatly reduced when the residual is sold before maturity. This result is best understood by comparing the tax basis of the residual to its economic basis. The economic basis is defined in a manner completely analogous to the tax basis; that is, the initial cost is increased by economic income (as opposed to taxable income) and reduced by cash distributions. The economic basis represents the carrying value of the residual. A sale realizing such an amount would not result in an economic gain or loss.

At all times the tax basis exceeds the economic basis by precisely the cumulative net amount of phantom income to that point. Thus, a sale which realizes the economic carrying value as proceeds would result in a loss for tax purposes equal to the cumulative net amount of phantom income. Or, in general, the taxable gain will be reduced (or loss increased) in comparison with the economic gain by the cumulative net amount of phantom income. Figure 9 illustrates this point using the facts of the example used in Part B and assuming a sale of the residual interest at a price of $55 after two years.

The tax savings consequent upon a sale of a residual interest depend on the ability of a seller to benefit from the greater tax basis attributable to phantom income. If the sale results in a taxable loss rather than a reduction in gain, the ability of the seller to recognize such a loss may

Figure 9. Taxable Gain Compared to Economic Gain



be limited (either because such a loss is a capital loss that can be offset only against capital gain,* or because the "wash sale" rules apply).**

In Figure 10, we split income into two components: periodic income from holding the residual, and gain realized upon sale. We calculate the two components for both taxable and economic income and then, in the usual fashion, compute phantom income as the difference.

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* Gain or loss on the sale of a residual investment will be ordinary income for a bank or thrift institution except possibly in the case of an equity interest in an owner trust that is classified as a partnership. See Chapter 9, Part D.

** The "wash sale" rules are discussed in Chapter 7, footnote 55 and accompanying text. In addition, although the tax rates applicable to ordinary income and capital gain are now the same for corporations, and the same rates are assumed in the examples below, the horizon analysis would be affected by any restoration in the future of the preferential treatment of capital gains (as well as by any change in tax rates generally).

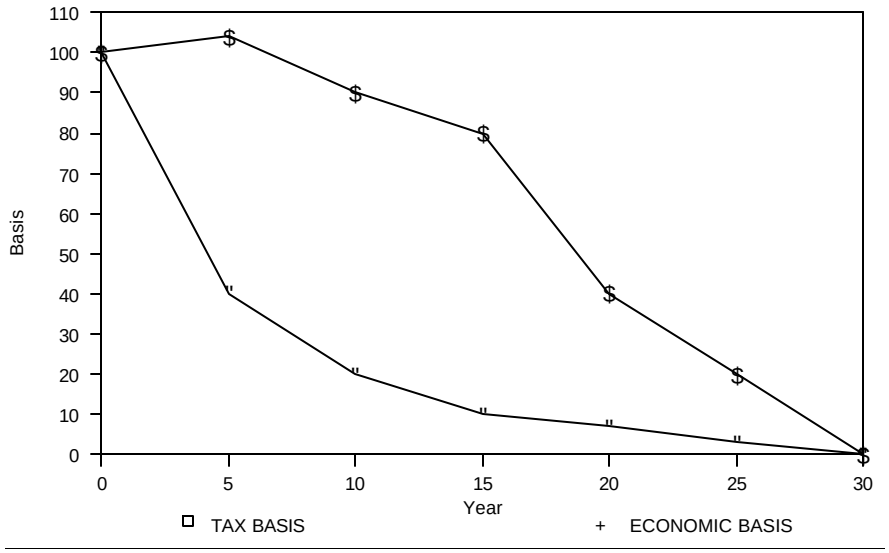
Figure 10. Horizon Analysis

Tax				*Economic*			*Phantom Income*		
Year	*Basis*	*Income*	*Gain On Sale*	*Basis*	*Income*	*Gain On Sale*	*Periodic*	*Sale*	*Total*
0	$100			$100.00					
1	75	$11.00		73.17	$9.17		$1.83		$1.83
2	50	6.75	$5	48.13	6.71	$6.87	0.04	$(1.87)	(1.83)
		$17.75			$15.88		$1.87	$(1.87)	0

Note that the cumulative amount of periodic phantom income, $1.87, is exactly equal to the difference between the tax basis and economic basis after two years. Thus, upon sale, the economic gain will exceed the taxable gain by precisely this amount. In effect, accumulated phantom income of earlier periods is reversed through a reduction in the taxable gain recognized from the sale as compared with the economic gain.

An important point, which is not evident in this simple example but which will become clear when we look at more realistic examples, is that phantom income is a problem primarily in those cases where the economic value of the residual is received in the early years. Recall that it is the positively sloped yield curve that is responsible for phantom income. In the case of a standard multiple class CMO that is structured to take advantage of the upward sloping yield curve, cash distributions on the residual will be attributable primarily to the difference between the rate of interest on the mortgages and the lower rate of interest on the earlier-maturing classes of CMOs. As a result, most of the cash distributions on the residual will be made, and most of the economic investment will be recovered, in the early years. See Figure 11 which shows the tax and economic bases for a typical fixed rate CMO. (See also Figure 16.) For this reason, the economic effect of a sale is likely to become small after a few years. If a residual is sold after its economic value has been reduced to a small amount, any phantom income that has been recognized by the holder is more likely to result in a tax loss on the sale rather than a reduction in taxable gain. As noted above, the ability of a holder to take advantage of such a tax loss may be limited. On the other hand, if the seller has realized an economic loss with respect to the residual, concern over the recognition of such a loss as a result of a sale should be reduced once the economic value of the investment has been reduced to a small amount.

Figure 11. Tax Basis Compared to Economic Basis



F. Examples

We now illustrate the concepts developed in the previous parts with some representative examples. We will examine a fixed rate CMO, a floating rate CMO, and an interest only/principal only issue. In each case, the underlying mortgages bear interest at a fixed rate.

1. Fixed Rate CMO

In the first example, shown in Figure 12, $500,000,000 par amount of 30-year maturity, level-pay residential mortgages are used to collateralize a quarterly-pay CMO which has three regular coupon tranches (A-C) and one "compound interest" or "accrual" tranche (Z). The residual is sold for $7,100,000 to yield 10.658%.

Figure 12. Asset and Liabilities for Fixed Rate CMO

	Initial Principal Amount	*Coupon*	*Avg.** Life (years)*	*Price (% of Principal)*	*Price*	*Yield***
Asset	500*	8.5%	8.7	99.465	$497.3	8.664%
CMOs						
A	274.5	8.000	3.4	100.000	274.5	8.000
B	77.0	8.500	7.8	99.450	76.6	8.598
C	107.8	8.400	11.0	98.200	105.9	8.656
Z	39.3	8.350	19.0	84.667	33.3	9.341
ALL	498.6	8.286	8.7	98.317	490.2	8.604
Residual					7.1	10.658***

* 000,000's omitted.

** Assumes that mortagages prepay at 167% of PSA. Yields are calculated assuming quarterly compounding.

*** Assumes that monthly cash flows are reinvested at 6.25% until bond payment date.

a. Yield/Maturity Pattern. The pattern of yields and weighted average maturities of the liabilities is set out in Figure 13.

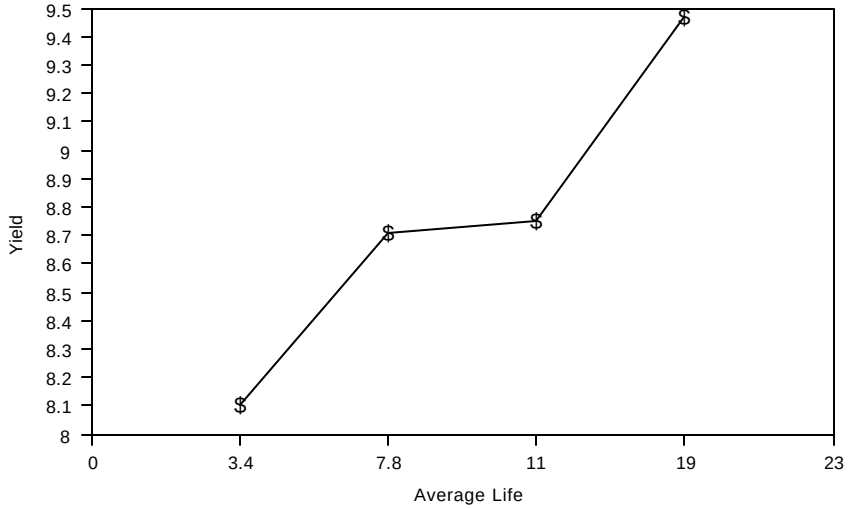
The positive correlation between yield and maturity suggests that the residual will have phantom income. The following table confirms this.

Pre-tax Yield	10.658%*
After-tax Yield	4.865%*
Statutory Tax Rate	34.000%**
Effective Tax Rate	54.354%

* Assumes quarterly compounding.

** The highest marginal tax rate for corporations for taxable years beginning on or after January 1, 1993 is 35%. For taxable years beginning on or after July 1, 1987 and before January 1, 1993 the rate was 34%.

Figure 13. Yield/Maturity: Fixed Rate CMO



In accordance with our previous discussion, the phantom income of the residual can be traced to the distribution of deductions with respect to the liabilities. Figure 14 shows that income on the asset is essentially economically distributed while interest expense is back loaded. Figure 15 depicts the consequences of this pattern for the taxable income of the residual. During the first seven years, there is phantom income. The phantom income is offset by reduced income or losses in the later years.

Figure 14. Part 1. Dynamic Yields for Fixed Rate CMO

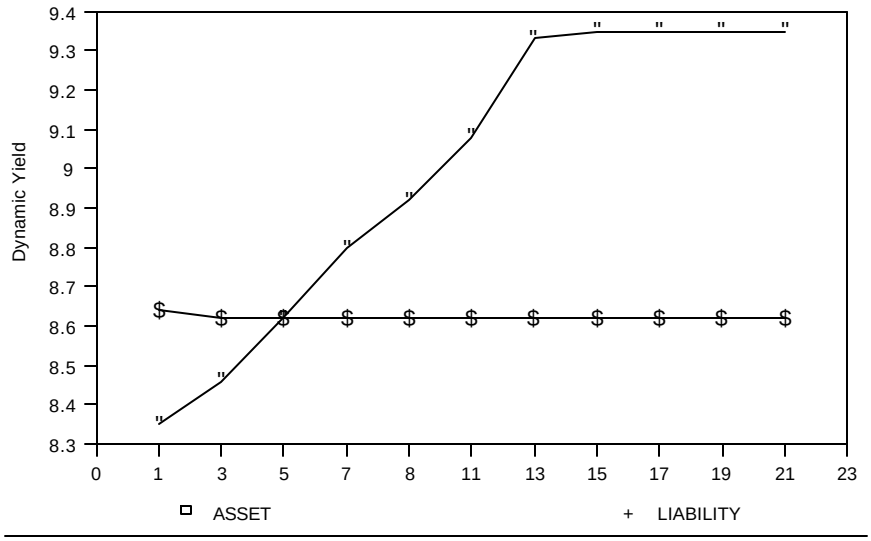
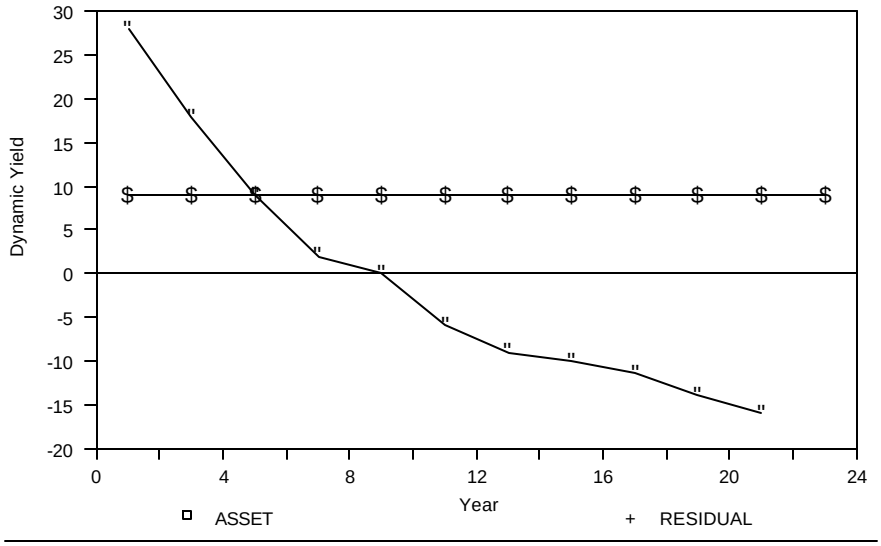


Figure 14. Part 2. Dynamic Yields for Fixed Rate CMO



b. Horizon Analysis. Figure 16 shows the relationship between the tax basis and the economic basis of the residual. Note that even as early as the fifth year more than 60% of the economic value has been amortized, while,

in the same period, the tax basis has actually increased. The consequences of selling the residual at different times at a price equal to its economic basis are shown in Figure 17 assuming a 34% tax benefit from the resulting tax loss.

Figure 15. Taxable and Economic Income of Residual

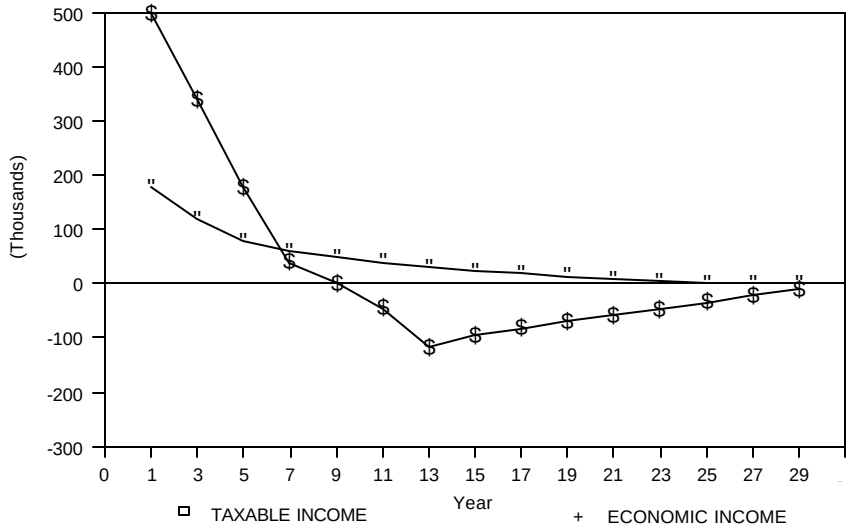
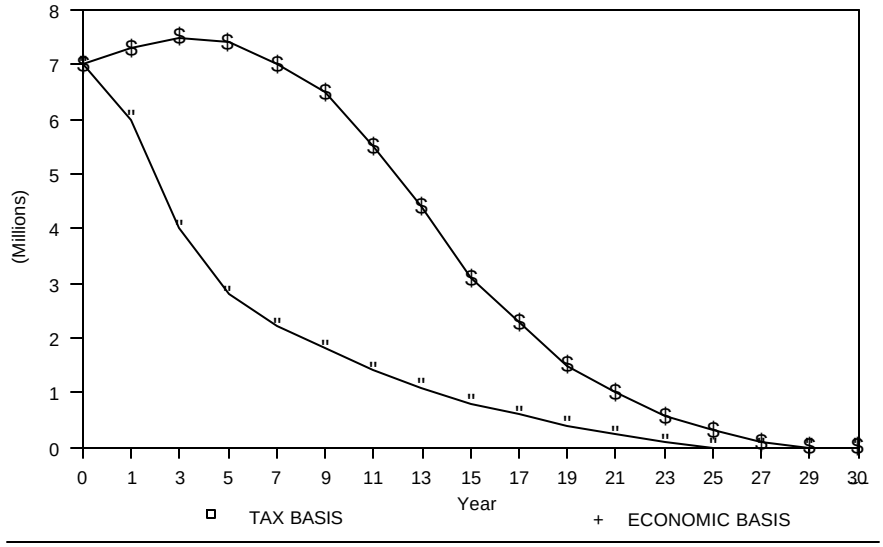


Figure 16. Tax and Economic Basis of Residual



Note that in present value terms, the cost of the phantom income is reduced by more than 70% when the residual is sold at the five-year horizon instead of being held to maturity. Note also that by the fifth year, the economic basis has been largely amortized. Only 38% of the original economic basis remains. At this point, the balance sheet impact of a gain or loss upon sale would be small and, presumably, not an impediment to realizing the consequent tax benefits.

Figure 17. Effect of Sale on Phantom Income

	Holding Period			
	5 Years	***10 Years***	***15 Years***	***30 Years***
Present Value of Tax on Phantom Income at 6% Discount Rate	\$228*	\$545	\$722	\$799
Effective Tax Rate	44.26%	50.73%	53.35%	54.35%
% of Original Economic Value Remaining	38%	21%	11%	0%

* 000's omitted.

c. Leverage and Effective Tax Rate. Figure 18 outlines the relationship between leverage and effective tax rates. The rows of Figure 18 are obtained by combining successively smaller equity investments with a fixed amount of debt. Thus, successively smaller amounts of collateral are purchased and the ratio of debt to equity increases. It is assumed that the residual is not sold. Note that the yield lost to phantom income is almost directly proportional to the leverage.

Figure 18. Leverage and Effective Tax Rates

Initial Tax Basis of Liability	*Initial Tax Basis of Residual*	*Initial Leverage*	*Residual Pre-Tax Yield*	*Residual After-Tax Yield*	*Effective Tax Rate*	*Percentage of Pre-Tax Yield Lost to Phantom Income*
$497.3*	$28.4	17:1	9.03%	5.49%	39.22%	5.22%
497.3	14.2	34:1	9.49	5.28	44.36	10.36
497.3	7.1	69:1	10.658	4.865	54.35	20.35

* 000,000's omitted.

2. Floating Rate CMO

Let us next consider a CMO having as its major component a tranche (F) that bears interest at a floating rate equal to 40 basis points over LIBOR. For purposes of examining phantom income, we will assume that LIBOR remains constant over the life of the issue.* In addition to the F tranche, the CMOs include a zero coupon support tranche. Principal is paid on the two classes of bonds ratably in proportion to their principal balances. Because the underlying mortgages bear interest at a fixed rate, the residual is an inverse floating rate instrument (i.e., its value increases as LIBOR declines). The terms of the mortgages and CMOs are summarized in Figure 19.

* Although interest deductions may, of course, increase or decrease over time in step with the interest index, with the result that the residual holder would recognize correspondingly lesser or grater amounts of taxable income, such changes in taxable income would accurately reflect the holder's economic income.

Figure 19. Asset and Liabilities for Floating Rate CMO

	Initial Principal Amount	*Coupon*	*Avg.** Life (years)*	*Price (% of Principal)*	*Price*	*Yield***
Asset	$350*	10.456%	3.6	106.734***	$373.6	8.119%
CMOs						
F	319.2	6.900	3.6	100.000	319.2	6.900****
A	30.8	0.000	3.6	79.500	24.5	7.079
ALL	350.0	6.293	3.6	98.196	343.7	6.913
Residual					29.9	21.426

* 000,000's omitted.

** Assumes that the mortgages prepay at a constant annual rate of 24%. Yields are calculated assuming quarterly compounding.

*** The collateral for the transaction shown had a value in excess of par but similar results would be realized if par or discount collateral were used.

**** Assumes LIBOR remains constant.

Since the two tranches of CMOs amortize in parallel, there is no positive correlation between yield and maturity. This suggests there will be little or no phantom income for the residual. The following table confirms this result.

Pre-tax Yield	21.426%*
After-tax Yield	14.158%*
Statutory Tax Rate	34.000%
Effective Tax Rate	33.921%

* Assumes quarterly compounding.

Figure 20. Dynamic Yields for Floating Rate CMO

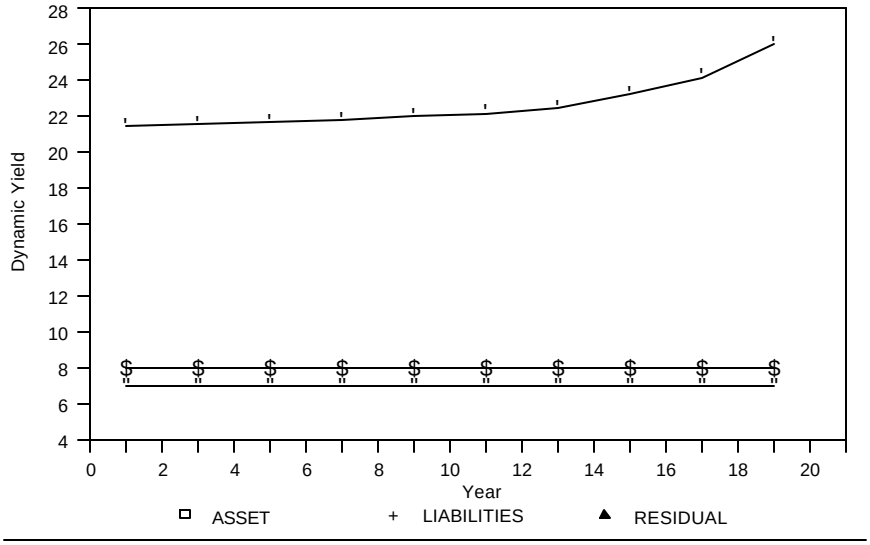
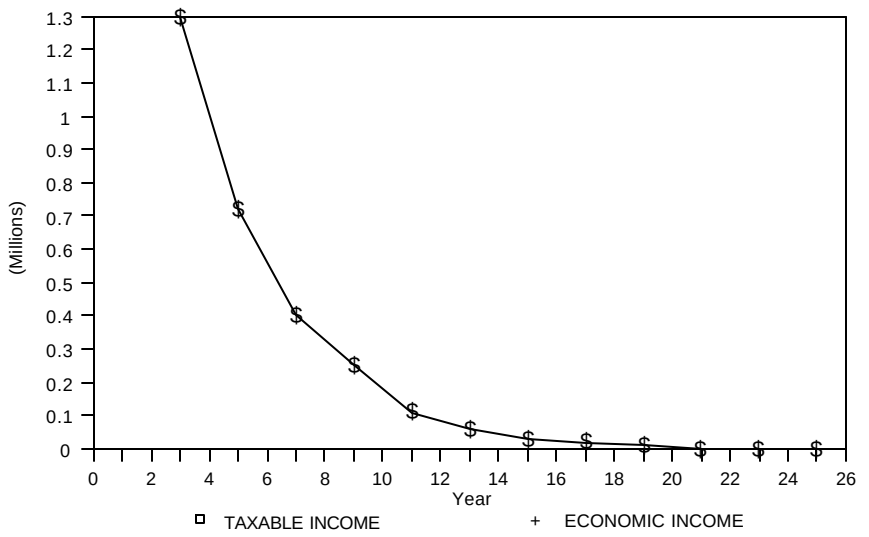


Figure 20 shows the dynamic yields for the asset and liabilities. Both income from the mortgages and interest expense are essentially economical distributed. Figure 21 depicts the taxable income of the residual. It too is essentially economically distributed.

Figure 21. Taxable and Economic Income of Residual



3. REMIC IO/PO Interests

The final example, shown in Figure 22, involves IO (interest only) and PC) (principal only) interests in a REMIC. The IO and PO interests are assumed to be residual and regular interests, respectively.

Again, the lack of multiple tranches with a rising yield structure implies phantom income will not be a problem for an IO interest. The following confirms this result:

Pre-tax Yield	11.711%
After-tax Yield	7.730%
Statutory Tax Rate	34.000%
Effective Tax Rate	33.988%

As shown in Figure 23, the dynamic yields exhibit the expected pattern: both income and interest deductions are economically distributed. It follows that residual income is also economically distributed and this result is shown in Figure 24.

Figure 22. Asset and Liability for REMIC IO/PO Interests

	*Initial Principal Amount**	*Coupon*	*Avg.*** *Life (years)*	*Price (% of Principal)*	*Price*	*Yield***
Asset	$500	11.50%	2.58	106.018	$530.1	8.591%
Liability (PO)	498.7	0	2.58	83.200	414.9	7.809
Residual (IO)					115.2	11.711

* 000,000's omitted.
** Assumes that the mortgages prepay at a constant annual rate of 32%. Yields are calculated assuming monthly compounding.

Figure 23. Dynamic Yields for REMIC IO/PO Interests

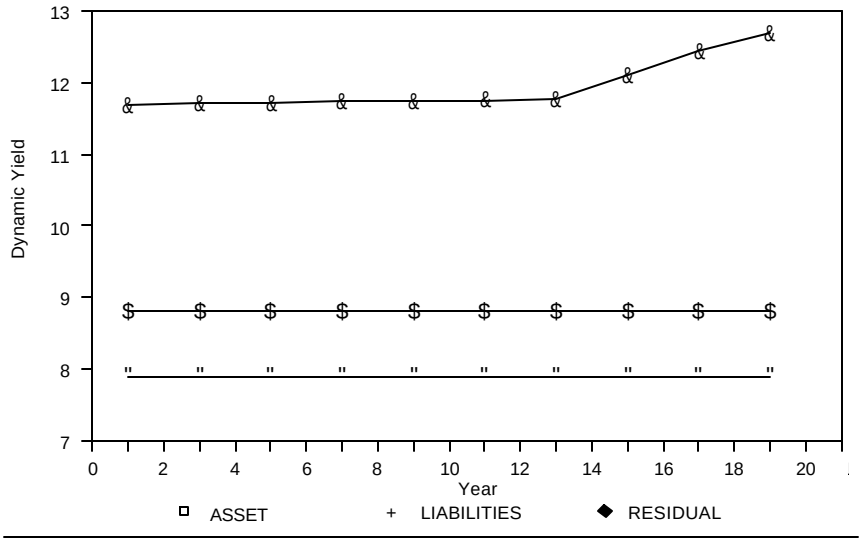
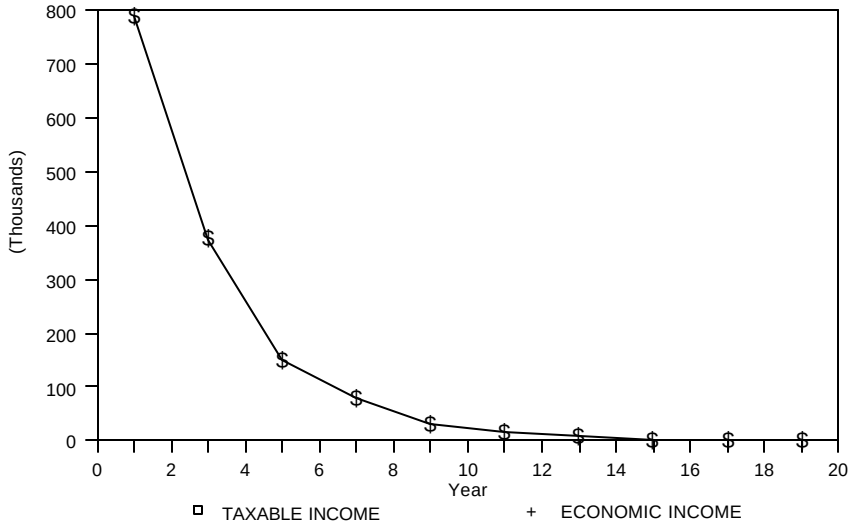


Figure 24. Taxable and Economic Income of REMIC IO Interests



G. Other Sources of Phantom Income

In the examples in Part F, we examined the roles played by leverage and the yield curve in creating phantom income and magnifying its effect on yield. We complete the analysis now by examining two additional sources of phantom income: dynamic leverage, and the reinvestment effect. We will show that the phantom income of the residual has three sources: the phantom income from the liabilities, caused by the yield/maturity pattern of the tranches as discussed above; the phantom income of the asset, caused by the reinvestment effect; and the changing degree of leverage.

1. Dynamic Leverage

An exact description of the relationships between the dynamic yields of the asset, liabilities and residual involves the notion of dynamic leverage. The dynamic leverage for a given period is defined to be the ratio of the tax basis of the liabilities to the tax basis of the residual. The heuristic example in Figure 25 illustrates the relationship that always holds amongst the dynamic yields and dynamic leverage.*

* See Addendum.

Figure 25. Dynamic Leverage and Dynamic Yields

	Beginning of Period Tax Basis		
Liabilities	$100.00	Dynamic Leverage = 5	
Residual	$20.00		
	Dynamic Yield for Period		
Residual	15%		
		Spread = 5%	
Asset	10%		Ratio = 5
		Spread = 1%	
Liabilities	9%		

In words, the ratio of residual-asset yield spread to asset-liability yield spread equals the dynamic leverage. Or, stated another way, the residual dynamic yield equals the asset dynamic yield plus the product of dynamic leverage and asset-liability yield spread. This relationship is apparent in Figures 14, 20, and 23. The residual dynamic yields and liability dynamic yields are, roughly speaking, symetric about the asset dynamic yields. The symmetry would be exact, though scaled for leverage, if the leverage were constant. The fact that the leverage changes with time distorts the symmetry somewhat.

Figure 26. Dynamic Leverage and Dynamic Spread for IO/PO

	Year				
	0	*5*	*10*	*15*	*20*
Tax Basis					
Asset	$530,089*	$174,149	$10,009	$1,252	$128
Liability	414,960	58,253	7,920	1,006	107
Residual	115,129	15,896	2,089	245	21
Dynamic Leverage	3.60	3.66	3.79	4.10	5.09
Dynamic Yield Spread					
Asset-Liability	.84	.84	.84	.84	.84
Residual-Asset	3.03	3.09	3.19	3.46	4.29
Residual Dynamic Yield	11.68%	11.74%	11.84%	12.11%	12.94%

* 000's omitted.

Increasing leverage explains why the residuals in the floating rate CMO and IO/PO examples above are slightly tax advantaged.* The spread between the dynamic yields of assets and liabilities is essentially constant while the dynamic leverage is increasing. This implies that the product of the two is increasing. It follows that the residual dynamic yield is increasing and taxable income is back loaded. Figure 26 shows the dynamic leverage, dynamic yield spreads and residual dynamic yield at five year intervals for the IO and PO interests described above.

2. Reinvestment Effect

A close inspection of Figure 14 (which relates to the multiple tranch CMO example described above) shows that the dynamic yield of the asset decreases gradually with time even though the asset provides for a constant

* The increase in leverage comes about because the cash flow of the IO interest is front loaded in comparison with the PO interest. This is the natural pattern exhibited by mortgage cash flows: interest payments decrease with time while principal payments increase. In the case of the floating rate CMO the same principal applies, since the residual is just a fraction of the total interest payment. As a consequence of this relative front loading of residual cash flow, the tax basis of the residual portion decreases in comparison to that of the liabilities. Thus, the ratio of liability basis to residual basis increases with time.

interest rate. This is caused by the reinvestment effect. The CMOs provide for quarterly payments, so that mortgage cash flows must be reinvested at a low short term interest rate until the end of each quarter. As the mortgages pay down, the importance of the reinvestment income becomes greater relative to the mortgage income.** Thus, the dynamic yield, which is an average of the yields from all sources, must decrease over time as the ratio of income from the higher yielding mortgages to the income on the lower yielding reinvestments declines. This pattern of decreasing dynamic yields indicates that the income of the asset, and therefore of the residual, is slightly front loaded. The effect this has on phantom income will be quantified below.

3. Quantifying the Components of Phantom Income

Phantom income attributable to changes in the dynamic yields of each of the asset and liabilities can be easily determine since in each case both taxable and economic income or deductions are readily calculated. Moreover, it can be shown that when dynamic leverage is constant, the phantom income of the residual is the sum of the phantom income attributable to the liability and the phantom income of the asset.* This makes it reasonable then to attribute any divergence between the actual phantom income of the residual and that sum to dynamic leverage. If we do this, we can attribute the total phantom income of the residual for each example in Part F to three sources: the yield curve effect, connected with the liabilities; the reinvestment effect, connected with the asset; and dynamic leverage. The results are shown in Figure 27.

** This is true because the income from a mortgage is a function of its principal balance which declines over time, while reinvestment income is a function of total debt service which remains constant.

* See Addendum.

Figure 27. The Components of Phantom Income

Present Value of Phantom Income @ 6% Discount Rate

	Yield Curve Effect (Liabilities)	+	*Reinvestment Effect (Asset)*	+	*Dynamic Leverage*	=	*Total Phantom Income*
Fixed Rate CMO							
	$2,335*	+	$18.8	+	$(4.8)	=	$2,349
	99.4%		.8%		(.2%)		100%
Floating Rate CMO							
	0	+	.6	+	(25.3)	=	(24.7)
	0%		2.4%		(102.4%)		100%
IO/PO							
	0	+	0	+	(8.8)	=	(8.8)
	0%		0%		100%		100%

*000's omitted

Two points are noteworthy here. First, the yield curve effect is clearly the dominant source of phantom income. Second, dynamic leverage in all three cases works to mitigate phantom income. This will generally be the case. Most residuals have their cash flow concentrated in the early years. As a result, the dynamic leverage increases with time since the value of the residual decreases relative to the value of the liability. The increase in leverage results in an increasing residual-to-asset dynamic yield spread (see Figure 26) and therefore an increasing residual dynamic yield. An increasing dynamic yield implies a back loading of income with a consequent mitigating effect on phantom income.

H. Phantom Income and Secondary Market Purchases of CMO Residuals

The effect of phantom income on equity in a CMO owner trust purchased in the secondary market depends on whether or not a REMIC election is made with respect to the trust. We examine the two cases separately below, beginning with non-REMIC transactions.

1. Non-REMIC Transactions

In a non-REMIC transaction, following a secondary market purchase of a residual, the tax basis of the asset is generally recalculated to be the sum of the current tax basis of the outstanding liabilities and the purchase price of

the residual.[1] The taxable income on the asset is then calculated taking account of this new basis. The deductions allowed with respect to the liabilities are generally unaffected by the change in owner.[**]

The adjustment in the tax basis of the asset to reflect the purchase price places the new investor in a tax position that is similar to that of the original purchaser. However, the positions of the new and original purchaser are different in three respects:

1. The yield/maturity pattern of the remaining liabilities.
2. The remaining maturity of the investment.
3. The market value of the investment compared with the amount of remaining liabilities.

The first two of these items reduce phantom income in present value and absolute terms.[*] However, in terms of effective tax rate, the new purchaser's situation is not much different from that of the original purchaser because of the third item.

Recall that it is the positive correlation between yield and maturity on the liabilities that is the principal cause of phantom income. For a secondary market purchaser, this correlation will be less pronounced to the extent that the earlier-maturing/lower-yielding tranches of liabilities have already been retired at the time of the purchase. Thus, the pattern of dynamic yields on the remaining liabilities is less steep, indicating that expense is less back loaded for the new investor. Also recall that phantom income is a timing problem. Excess taxable income in the early years is offset by reduced taxable income in the later years. Thus, the shortened investment horizon reduces the cost of phantom income in present value terms.

These two positive elements are offset by the fact that the phantom income must be borne by a considerably smaller investment. The net effect of combining these offsetting factors for the fixed rate CMO discussed earlier is examined in Figure 28.

Figure 28 shows that the effective tax rate to the secondary market purchaser is not much reduced until the sale date is at the tenth year or be-

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1 For a discussion of the effect of a secondary market purchase on the basis used in calculating taxable income, see Chapter 7, Part C. Basis is often, but not always, recalculated if an owner trust is classified for federal income tax purposes as a partnership rather than a grantor trust.

** See Chapter 7, footnote 36 and accompanying text.

* For the balance of this study we will assume that the CMOs are issued in multiple classes structured to take advantage of the yield curve and will thus generate phantom income in the early years.

yond. At that point, the differential between the initial dynamic yield of the liabilities and the final dynamic yield has been reduced to 33 basis points as compared with an initial differential of 102 basis points.

Figure 28. Secondary Market Purchase of CMO Equity and Phantom Income: Non-REMIC Transactions

Purchase Date (Years Since Issuance)	***Dynamic Yield of Liabilities***				
	Quarter When Purchased	*Final Quarter*	*Market Value of Residual*	*Present Value at 6% of Tax on Phantom Income*	*Effective Tax Rate*
0	8.326%	9.341%	$7,113*	$799	54.4%
5	8.631	9.341	2,689	289	50.1
10	9.014	9.341	1,520	54	41.5
15	9.341	9.341	743	2	34.9

* 000's omitted. The example assumes that the residual is always priced to yield 10.858% based on quarterly compounding.

Figure 29 tests the sensitivity of effective tax rates to changes in purchase yields. It shows that effective tax rates are stable over a wide range of yields.

Figure 29. The Effect of Purchase Yield on Phantom Income: Non-REMIC Transactions

Years Since Issuance	*Purchase Yield*	*Market Value of Residual*	*Present Value at 6% Tax on Phantom Income*	*Effective Tax Rate*
5	6.658%	$3,236*	$291	49.6%
5	8.658	2,939	290	50.3
5	10.658	2,689	289	50.1
5	12.658	2,475	288	51.7
5	14.658	2,293	288	52.4

*000's omitted.

2. REMIC Transactions

In the case of a REMIC transaction, we must distinguish between the net basis of the REMIC in its assets and the tax basis of the residual interest to the new purchaser—respectively referred to as the inside basis and the outside basis.* Under current law, the inside or REMIC basis would be unchanged by the sale of the residual. Thus, the taxable income or losses of the REMIC that is allocated to the purchaser might be the same as for the initial purchaser. The legislative history of the REMIC provisions contemplates that some adjustment to inside basis would be made, but at present there is no mechanism for making such an adjustment.** The new purchaser increases his purchase price or outside basis by the amount of taxable income that is allocated to him and decreases such basis (but not below zero) by the amount of distributions and allocations of net losses. Thus, the purchaser inherits the taxable income schedule of the former owner up to the point where his basis is completely recovered through distributions or losses. Once the outside basis has been amortized, no deductions for losses are allowed and all further distributions are accounted for as gain from the sale of the residual interest. Since the inside basis is generally greater than the outside basis (see the discussion in Part E, above, and Figure 16), the new purchaser, in early periods, gets the benefit of smaller taxable income stemming from the amortization of a relatively large basis. This means that, in many cases, the residual purchased in the secondary market is tax advantaged.

Another way of thinking about this is in terms of the crossover point for taxable income relative to economic income. Recall that phantom income arises because taxable income is greater than economic income in early periods and less in later periods. The point in time where taxable income first becomes less than economic income may be referred to as the *crossover point.* Someone who purchases the residual in the secondary market is closer to, and in some cases beyond, this crossover point. Thus, the present value benefit of the phantom losses can be greater than the present value cost of phantom income. In such a case, the residual is tax advantaged.

Figure 30 that this is the case even as early as the fifth year for the standard CMO residual we have been discussing.

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* Strictly speaking, a REMIC's inside basis refers to the bases of all of its assets. For our purposes, though, inside basis will refer to the total asset basis net of the tax basis of the liabilities represented by the regular interests.

** See Chapter 7, footnote 36 and accompanying text.

Figure 30. Secondary Market Purchase of CMO Equity and Phantom Income: REMIC Transactions

Years Since Issuance	*Inherited Tax Basis of Residual*	*Market Value of Residual***	*Years to Crossover Point*	*Present Value at 6% of Tax on Phantom Income*	*Effective Tax Rate*
0	$7,113*	$7,113	6.75	$799	54.4%
5	7,456	2,689	1.75	(71)	28.6
10	6,025	1,520	(3.25)	(96)	15.6
15	3,192	743	(8.25)	(45)	11.0

* 000's omitted.
** The example assumes that the residual is priced to yield 10.658% based on quarterly compounding.

Figure 31 shows that the tax advantaged quality of the residual is present under a wide range of purchase yields. Note than even when the residual is priced at 6.658%—a low yield and high price—the inherited tax basis, $7,456, is still much greater than the market value, $3,236. Thus, the tax benefit of amortizing a relatively large basis is still available.

Figure 31. The Effect of Purchase Yield on Phantom Income: REMIC Transactions

Years Since Issuance	*Purchase Yield*	*Market Value of Residual*	*Inherited Tax Basis of Residual*	*Present Value at 6% of Tax on Phantom Income*	*Effective Tax Rate*
5	6.658%	$3,236*	$7,456	$(53)	29.8%
5	8.658	2,939	7,456	(64)	29.1
5	10.658	2,689	7,456	(71)	28.6
5	12.658	2,475	7,456	(75)	28.2
5	14.658	2,293	7,456	(78)	27.9

*000's omitted.

Addendum

The relationship between the dynamic yield of the residual and the dynamic yields of the asset and liability is given by the following formula:

$$Y_R = Y_A + D \times S$$

where

Y_R	=	dynamic yield of residual
Y_A	=	dynamic yield of asset
Y_L	=	dynamic yield of liability
S	=	the spread between the asset and liability dynamic yields (Y_A - Y_L)
D	=	dynamic leverage (L/R)
A	=	asset tax basis
L	=	liability tax basis
R	=	residual tax basis (A - L)

The proof is as follows:

$$\begin{aligned} YR &= \text{residual income/residual basis} \\ &= (A \times Y_A - L \times Y_L) / R \\ &= A \times Y_A - L \times Y_A + L \times Y_A - L \times Y_L) / R \\ &= [(A - L) \times Y_A + L \times (Y_A - Y_L)] / R \\ &= [(A - L) / R] \times Y_A + L/R \times (Y_A - Y_L) \\ &= Y_A + D \times S \end{aligned}$$

We next show that the residual phantom income can be divided into three components: the asset phantom income, the liability phantom income, and a component attributable to dynamic leverage. We arrive an this point by demonstrating that when dynamic leverage is constant, then residual phantom income is the sum of asset phantom income and liability phantom income. Thus, any divergence of phantom income from the sum must stem from the changing dynamic leverage. For convenience we establish the following notation:

E_A	=	asset economic income
E_L	=	liability economic income
E_R	=	residual economic income
T_A	=	asset taxable income
T_L	=	liability taxable income
T_R	=	residual taxable income
P_A	=	asset phantom income
P_L	=	liability phantom income
P_R	=	residual phantom income

Consider the following chain of equations:

1. $P_R = T_R - E_R$
2. $= (T_A - T_L) - (E_A - E_L)$
3. $= (T_A - E_A) - (T_L - E_L)$
4. $= P_A - P_L$

If each equality in the chain were true the proposition would be proven. The first and fourth equalities are just definitions and therefore true. The third equality is true since the formula in 3 is just a rearrangement of the formula in 2. The first part of equality 2 is true since the taxable income of the residual is by definition the difference between the taxable income of the asset and taxable expense of the liability. The second part, though, is not, in general, true. The economic income of a residual does not always equal the difference between the economic income of the asset and the economic expense of the liability. However, a sufficient condition for this final equality to hold is that the dynamic leverage be constant.

To see this, we approach the problem from the other side. What we show is that when the dynamic leverage is constant, then $(E_A - E_L)$ produces a constant dynamic yield and thus by definition equals the economic income of the residual.

The formula $Y_R = Y_A + D \times S$ was derived above with reference to taxable dynamic yields and bases. The same derivation holds true when economic yields and bases are considered; that is, when Y_A and Y_L correspond, respectively, E_A and E_L instead of T_A and T_L, and Y_R corresponds to $(E_A - E_L)$ instead of $(T_A - T_L)$.

In the context of economic yields, though, Y_A and Y_L, and thus S, are constant. If L is also constant, it follows that Y_R is constant and thus $(E_A - E_L)$ is economically distributed. Therefore $(E_A - E_L) = E_R$.