Real Estate Investment Analysis

Real estate finance

Pricing a revenue-generating property

- Consider a property made of a collection of leasable units
- How much should a given investor pay for such a property?
- Two approaches:
  1. DCF method (forecast expected flows, discount them)
  2. Ratio approach (cap and GRM)
- Both approaches require detailed cash flow data

Three levels of cash-flows

- *Before tax cash flows* accrue to:
  1. Taxes (income and capital gains)
  2. Debt holders
  3. Equity holders

- *After tax cash flows* accrue to:
  1. Debt holders
  2. Equity holders

- *Equity after tax cash flows* accrue to equity holders

Three appropriate discount rates

- *Before tax cash flows* should be discounted at before-tax WACC
- *After tax cash flows* should be discounted at WACC
- *Equity after tax cash flows* should be discounted at required return on equity
- First two calculations give the value of the firm, the last one gives the value of equity

Cash flow pro-forma

- Table of expected cash flows associated with the property over a certain horizon
- Typical horizon: 5 to 10 years, yearly data
- We will first ignore the potential role of debt and taxes, and focus on before tax cash flows

Potential gross income

- *Potential Gross Income* (PGI): revenue when occupancy is full
- PGI = Capacity (in sq. ft) x Expected Rent/Sq. Ft.
- Second element requires market trend analysis
- Best to go unit by unit and lease by lease to forecast expected rent/sq. ft.

How to project rents

- Forecast market rents:
  1. Assume a constant growth rate for market rents (CPI, or average growth rate over recent period)
  2. Use econometric model to forecast rent growth

- Unit-by-unit, use current rent as long as leased, use projected market rent when lease expires, adjusted for unit-specific information

A typical econometric model (GM 6)

- Rents reflect supply and demand
- Supply at date t: $S_t = S_{t-1} + C_t$
- C_t is the number of new units on the market at date t
- $S_t = s(S_{t-1}, R_{t-k})$ where k is construction lag
- $D_t = d(D_{t-1}, R_t, N_t)$ where N_t is a list of demand drivers
- Vacancy rate: 0 if $D_t > S_t$, $(S_t - D_t)/S_t$ otherwise
- $R_{t+1} = r(R_t , (S_t - D_t)/S_t)$
- 1) Estimate/calibrate r, s and d
- 2) Forecast N_t , and you're done

The real estate cycle

1. Market Value exceeds Replacement Cost
2. Investment boom
3. Vacancies rise, rents fall, market value falls below replacement cost
4. Supply only responds with a lag
5. Vacancy and rents bottom out
6. Until market value exceeds replacement cost
7. And on we go

"Fitting is sh%%%ing."

Edward C. Prescott, Nobel Prize Economist

Warning

- Designing a model that fits historical evidence is trivial
- Forecasting is tough
- More complex models fit better, but forecast poorly (Wiki "overfitting")
- Only criterion that matters: out-of-sample forecasting fit
- In other words, how has your forecast performed?
- Truth: beating naïve models is tough, and naïve models are free

Vacancy allowance

- Vacancy allowance = PGI lost to vacancy
- Effective Gross Income (EGI) = PGI –Vacancy allowance
- Sources: past information, and market analysis
- Best to go unit by unit to reflect their specific features, and, obviously, lease length

Operating expenses

- Cost of operating the building: labor, utility bills, property taxes, simple maintenance…
- Can be *fixed* (independent of occupancy) or *variable* (increasing with occupancy)
- Distinguishing features of operating expenses: frequent, mostly predictable and regular
- Building betterment investment are not operating expenses
- Leases specify who bears what cost and, sometimes, *expense stops*

A taxonomy of leases: gross vs. net

- *Gross lease*: owner pays all operating expenses
- *Net lease*: tenant is responsible for at least some operating expenses
- *Triple net (NNN) lease*: all operating expenses are paid by the tenant (EGI+non-rent income≈NOI)
- *Lease with expense stop*: landlord pays operating expenses up to a certain amount, tenant pays the rest

A taxonomy of leases: types of rent

- *Flat rent*: rent is constant until lease ends
- *Graduated rent*: rent increases on a fixed schedule
- *Revaluated rent*: rent reappraised periodically by an independent professional
- *Indexed rent*: rent is indexed to public index such as CPI
- *Percentage lease*: rent is fixed component (base rent) plus fraction of tenant's net income or sales

Net operating income

- NOI= PGI – Vacancy Allowance+ Other Income – Operating Expense

- Other income = net income from non-rent activities (e.g. laundry machines)

- Operating income for the property

Capital expenditures

- Infrequent expenditures, typically though not always meant to better or add to the property (building improvements, leasing commissions…)
- Expenses not associated with basic operation
- They are cash outflows, and matter for the bottom line
- Tax treatment of capital expenditures differs from treatment of operating expenses

Property before tax cash flow

- PBTCF= NOI - Capital expenditures
- Expected inflows minus expected outflows
- Cash flows to be distributed across three types of stake-holders:
  1. Equity holders
  2. Debt holders
  3. The tax man

Reversion cash flows

- Reversion cash flows are the result of selling all or part of the property
- In most cases, one big reversion cash flow in the last year of the analysis, equal to the expected value of the property at that time, net of transaction costs
- Two methods:
  1. Guess a perpetual rate of growth of PBTCF and discount the perpetuity at appropriate rate
  2. Use multiple approach (guess year 11 NOI or EGI, and apply standard multiple)

Typical Pro Forma Items

Operating (all years):

Potential Gross Income = (Rent*SF)	= PGI
- Vacancy Allowance = -(vac.rate)*(PGI)	= - V
+ Other Income = (eg, parking, laundry)	= +OI
- Operating Expenses	= - OE
Net Operating Income	= NOI
- Capital Expenditures	= - CE
Property Before-tax Cash Flow	= PBTCF

Reversion (last year & yrs of partial sales only):

Property Value at time of sale	= V
- Selling Expenses = -(eg, broker)	= - SE
Property Before-tax Cash Flow	= PBTCF

Exhibit 11-2: The Noname Building: Cash Flow Projection											
Item:	Year: 1	2	3	4	5	6	7	8	9	10	11
Market Rent/SF:	$10.00	$10.10	$10.20	$10.30	$10.41	$10.51	$10.62	$10.72	$10.83	$10.94	$11.05
Potential Revenue:											
Gross Rent Space 1 (10000SF)	$105,000	$105,000	$105,000	$103,030	$103,030	$103,030	$103,030	$103,030	$108,286	$108,286	$108,286
Gross Rent Space 2 (10000SF)	$100,000	$100,000	$100,000	$100,000	$100,000	$105,101	$105,101	$105,101	$105,101	$105,101	$110,462
Gross Rent Space 3 (10000SF)	$100,000	$101,000	$101,000	$101,000	$101,000	$101,000	$106,152	$106,152	$106,152	$106,152	$106,152
Total PGI	$305,000	$306,000	$306,000	$304,030	$304,030	$309,131	$314,283	$314,283	$319,539	$319,539	$324,900
Vacancy allowance:											
Space 1	$0	$0	$0	$51,515	$0	$0	$0	$0	$54,143	$0	$0
Space 2	$0	$0	$0	$0	$0	$52,551	$0	$0	$0	$0	$55,231
Space 3	$100,000	$0	$0	$0	$0	$0	$53,076	$0	$0	$0	$0
Total vacancy allowance	$100,000	$0	$0	$51,515	$0	$52,551	$53,076	$0	$54,143	$0	$55,231
Total EGI	$205,000	$306,000	$306,000	$252,515	$304,030	$256,581	$261,207	$314,283	$265,396	$319,539	$269,669
Other Income	$30,000	$30,300	$30,603	$30,909	$31,218	$31,530	$31,846	$32,164	$32,486	$32,811	$33,139
Expense Reimbursements											
Space 1	$0	$1,833	$2,003	$0	$1,651	$964	$1,118	$2,870	$0	$1,823	$329
Space 2	$0	$2,944	$3,114	$1,814	$3,465	$0	$153	$1,905	$469	$2,292	$0
Space 3	$0	$0	$170	$0	$260	$0	$0	$1,752	$316	$2,139	$645
Total Revenue	$235,000	$341,078	$341,891	$285,238	$340,624	$289,075	$294,324	$352,974	$298,667	$358,602	$303,781
Reimbursable Operating Expenses											
Property Taxes	$35,000	$35,000	$35,000	$35,000	$35,000	$36,750	$36,750	$36,750	$36,750	$36,750	$36,750
Insurance	$5,000	$5,000	$5,000	$5,000	$5,000	$5,250	$5,250	$5,250	$5,250	$5,250	$5,250
Utilities	$16,667	$25,500	$26,010	$22,109	$27,061	$23,002	$23,462	$28,717	$24,410	$29,877	$25,396
Total Reimbursable Expenses	$56,667	$65,500	$66,010	$62,109	$67,061	$65,002	$65,462	$70,717	$66,410	$71,877	$67,396
Management Expense	$6,150	$9,180	$9,180	$7,575	$9,121	$7,697	$7,836	$9,428	$7,962	$9,586	$8,090
Total Operating Expenses	$62,817	$74,680	$75,190	$69,684	$76,182	$72,699	$73,298	$80,146	$74,371	$81,463	$75,486
NOI	$172,183	$266,398	$266,701	$215,554	$264,442	$216,376	$221,026	$272,828	$224,295	$277,139	$228,295
Capital Expenditures											
TI		$50,000		$50,000		$55,000	$55,000		$55,000		$55,000
Leasing Commissions		$15,150		$15,455		$15,765	$15,923		$16,243		$16,569
Common physical improvements					$100,000						
Net Cash Flow (operations)	$172,183	$201,248	$266,701	$150,100	$164,442	$145,611	$150,103	$272,828	$153,053	$277,139	
Net Cash Flow (reversion)										$2,282,951	
IRR @ $2,000,000 price: 10.51%											

Going in IRR

- Given a proposed property price, and a full pro-forma, a "total" IRR can be calculated
- It is the discount rate that makes the present value of all expected PBTCF equal to the price
- A sound decision rule: compute typical IRR on similar properties, and take project if property IRR exceeds this typical IRR

Equivalently, use the DCF method

- Estimate required return on similar property (*the opportunity cost of capital*)
- Discount PBTCF at rate
- Another sound decision rule: accept project if resulting value exceeds the price

Typical returns: real estate indices

- *NCREIF property index* (NPI)
- Survey
- Cap rate approach (holy trinity)
- CAPM

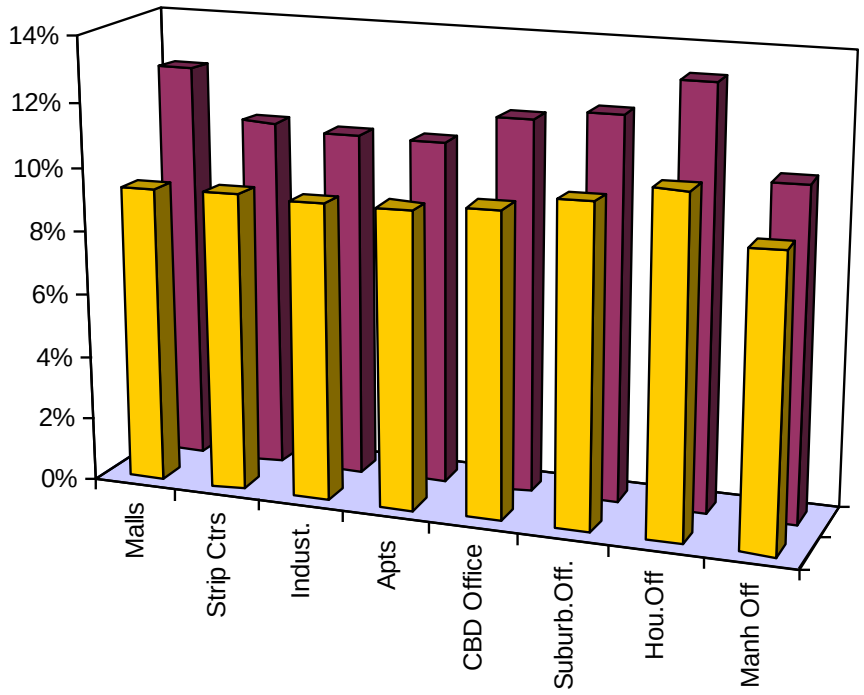
Historical evidence, 1970-2003

	Total Return	Volatility	Risk Premium
T Bills	6.30%	2.83%	NA
G Bonds	9.74%	11.76%	3.44%
Real Estate*	9.91%	9.02%	3.61%
Stocks	12.72%	17.48%	6.42%

*NCREIF: large, institutional quality commercial properties

Survey evidence

Exh.11-6a: Investor Total Return Expectations (IRR) for Various Property Types*



***Source: Korpacz Investor Survey, 1st quarter 2005**

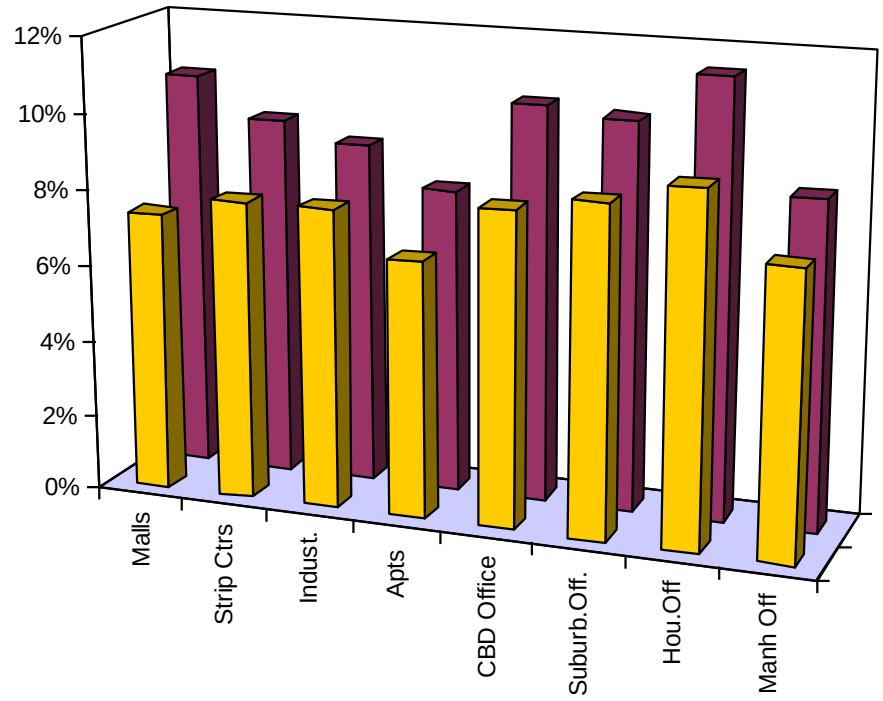
	Malls	Strip Ctrs	Indust.	Apts	CBD Office	Suburb. Off.	Hou.Off	Manh Off
Institutional	9.27%	9.35%	9.28%	9.31%	9.56%	10.03%	10.58%	9.11%
Non-institutional	12.53%	11.00%	10.81%	10.80%	11.68%	12.05%	13.19%	10.38%

Capitalization rate approach

- Cap rate = (current NOI or PBTCF) / Property Value
- Assume current PBTCF cap rate is y, and that we expect PBTCF to grow at rate g for ever
- Then IRR on property is $r \approx y + g$

Survey evidence *(!! on NOI cap rates !!)*

Exh.11-6b: Investor Cap Rate Expectations for Various Property Types*



***Source: Korpacz Investor Survey, 1st quarter 2005**

	Malls	Strip Ctrs	Indust.	Apts	CBD Office	Suburb. Off.	Hou.Off	Manh Off
Institutional	7.33%	7.86%	7.88%	6.74%	8.26%	8.63%	9.19%	7.45%
Non-institutional	10.51%	9.50%	9.02%	8.00%	10.38%	10.18%	11.44%	8.59%

CAPM/REIT approach

- Find the average unlevered equity beta of similar properties, using, presumably, REITs or NCREIF data
- Invoke CAPM to calculate required return on equity
- Calculate WACC
- Discount

Multiple/Ratio approach

- Find a group of peer properties on which good value data is available due to recent transaction, or rock-solid appraisal
- Alternatively, collect/purchase info on appropriate multiples
- Apply Cap rate and GRM approach to current property

When does the multiple approach work?

- When comparable properties don't just have the same y, but also when they have the same g
- Outside of fixed g world, we need comparable properties to be roughly scaled up or down version of the target property
- Heroic, but standard, and a good way to frame an argument over value

Debt and taxes

- Many investors are subject to taxes at the property level, which matters greatly for value

- Two ways to deal properly with the effects of debt and taxes:
  1. Discount after tax cash flows at after tax WACC
  2. Discount flows-to-equity (EATCF) at the required rate of equity

- First approach yields the property's total value, the second one yields the value of equity in the property

Calculating taxes and flows-to-equity

- Taxable income = NOI – Depreciation – Interest expenses
- Income taxes = Taxable income x Tax rate
- ATCF= PBTCF – Income taxes
- EATCF=ATCF – Debt service payments

Depreciation

- Value of property= Value of Land + Value of Structures and Equipment
- Land cannot be depreciated
- Depreciable cost basis < Value of the property
- Depreciation rates and methods vary for different items
- Buildings: 27.5 years straight-line (residential)
  39 years (non-residential)

Calculating reversion cash flows

- Capital gains = Net sale proceeds – Adjusted basis
- Adjusted basis= Original basis + (Total CAPEX – Depreciation)
- Capital gains tax = Capital gains x relevant tax rate
- It is also proper to show a final debt payment in a pro-forma table (even though, in principle, it could be folded into standard debt service line)

Capital Gains Tax

- Capital gains = (Net sale price – (Original basis +Capex)) + Depreciation
- The two pieces are taxed differently
- *Net sale proceeds – (Original Basis+Capex)* is taxed at the capital gains tax rate
- *Depreciation* is taxed at the "depreciation recapture tax rate", which is typically higher

Example

- Net sale price=$1,000,000, Original Basis=$800,000, CAPEX=$100,000, Depreciation=$50,000

- Capital gains tax: 15%, Recapture Tax: 25%

- CGT = (1,000,000 – 800,000 -100,000) x 0.15
  + (50,000) x 0.25
  = 27,500

And we're done

- Discount ATCF at WACC, or EATCF at required return on equity
- One should do an obvious set of multiple calculations too, but in practice it is seldom done
- Key point: leverage can make a deal worth it, or kill it, depending on the direct and indirect costs of debt

EATCF from operations

Exhibit 14-1a: Equity After-Tax Cash Flows from Operations

PGI
- vacancy
= EGI
- OEs
=NOI

Cash Flow
- Capital Improvements Exp.
= PBTCF
- Debt Service (Int. & Principal)
- Income Tax
= EATCF

Taxes
Net Operating Income (NOI)
-Interest (I)
-Depreciation expense (DE)
= Taxable Income
x Investor's income tax rate
= Income Tax Due

Exhibit 14-2: Example After-Tax Income & Cash Flow Proformas . . .

			Unlevered:	Levered:
Property Purchase Price (Year 0):	$1,000,000			
Depreciable Cost Basis:	$800,000	Before-tax IRR:	6.04%	7.40%
Ordinary Income Tax Rate:	35.00%	After-tax IRR:	4.34%	6.44%
Capital Gains Tax Rate:	15.00%	Ratio AT/BT:	0.719	0.870
Depreciation Recaptu	25.00%			

	Year: 1	2	3	4	5	6	7	8	9	Oper. Yr.10	Reversion Item:	Rever. Yr.10	Total Yr.10
Operating:													
Accrual Items:													
NOI	$60,000	$60,600	$61,206	$61,818	$62,436	$63,061	$63,691	$64,328	$64,971	$65,621	Sale Price	$1,104,622	
- Depr.Exp.	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	- Book Val	$809,091	
- Int.Exp.	$41,250	$41,140	$41,030	$40,920	$40,810	$40,700	$40,590	$40,480	$40,370	$40,260			
=Net Income (BT)	($10,341)	($9,631)	($8,915)	($8,193)	($7,465)	($6,730)	($5,990)	($5,243)	($4,490)	($3,730)	=Book Gain	$295,531	$291,801
- IncTax	($3,619)	($3,371)	($3,120)	($2,867)	($2,613)	($2,356)	($2,096)	($1,835)	($1,571)	($1,305)	- CGT	$73,421	
=Net Income (AT)	($6,722)	($6,260)	($5,795)	($5,325)	($4,852)	($4,375)	($3,893)	($3,408)	($2,918)	($2,424)	=Gain (AT)	$222,111	$219,686
Adjusting Accrual to Reflect Cash Flow:													
- Cap. Imprv. Expdtr.	$0	$0	$50,000	$0	$0	$0	$0	$50,000	$0	$0			
+ Depr.Exp.	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	+ Book Val	$809,091	
-DebtAmort	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	-LoanBal	$730,000	
=EATCF	$20,369	$20,831	($28,704)	$21,766	$22,239	$22,716	$23,198	($26,317)	$24,173	$24,667	=EATCF	$301,202	$325,868
+ IncTax	($3,619)	($3,371)	($3,120)	($2,867)	($2,613)	($2,356)	($2,096)	($1,835)	($1,571)	($1,305)	+ CGT	$73,421	
=EBTCF	$16,750	$17,460	($31,824)	$18,898	$19,626	$20,361	$21,101	($28,152)	$22,601	$23,361	=EBTCF	$374,622	$397,983

CASH FLOW COMPONENTS FORMAT

	Year: 1	2	3	4	5	6	7	8	9	Oper. Yr.10	Reversion Item	Rever. Yr.10	Total Yr.10
Operating:													
Accrual Items:													
NOI	$60,000	$60,600	$61,206	$61,818	$62,436	$63,061	$63,691	$64,328	$64,971	$65,621	Sale Price	$1,104,622	
- Cap. Imprv. Expdtr.	$0	$0	$50,000	$0	$0	$0	$0	$50,000	$0	$0			
=PBTCF	$60,000	$60,600	$11,206	$61,818	$62,436	$63,061	$63,691	$14,328	$64,971	$65,621	=PBTCF	$1,104,622	$1,170,243
- Debt Svc	$43,250	$43,140	$43,030	$42,920	$42,810	$42,700	$42,590	$42,480	$42,370	$42,260	- LoanBal	$730,000	
=EBTCF	$16,750	$17,460	($31,824)	$18,898	$19,626	$20,361	$21,101	($28,152)	$22,601	$23,361	=EBTCF	$374,622	$397,983
-taxNOI	$21,000	$21,210	$21,422	$21,636	$21,853	$22,071	$22,292	$22,515	$22,740	$22,967	taxMktGain	$693	$23,661
+ DTS	$10,182	$10,182	$10,182	$10,182	$10,182	$10,182	$10,182	$10,182	$10,182	$10,182	- AccDTS	($72,727)	($62,545)
+ ITS	$14,438	$14,399	$14,361	$14,322	$14,284	$14,245	$14,207	$14,168	$14,130	$14,091			$14,091
=EATCF	$20,369	$20,831	($28,704)	$21,766	$22,239	$22,716	$23,198	($26,317)	$24,173	$24,667	EATCF	$301,202	$325,868

After-tax proforma items (operations)

- BT net income = NOI - Depreciation – Interest
- AT net income = BT net income – Income Taxes
- *(ATCF = AT net income – CAPEX + Depreciation + Interest)*
- EATCF = AT net income
  - CAPEX – Debt Amortization
  + Depreciation
- EBTCF = EATCF + Income taxes

First year cash flows (details)

NOI	= $60,000, 1st yr.
- Depr.Exp.	= $800,000/27.5 = $29,091, ea. yr.
- Int.Exp.	= $750,000*5.5% = $41,250, 1st yr.
=Net Income (BT)	= 60000 - 29091- 41250 = -$10,341.
- IncTax	= (.35)(-10341) = - $3,619, 1st yr.
=Net Income (AT)	= -10341 - (-3619) = - $6,722, 1st yr.
Adjusting Accrual to Reflect Cash Flow:	
- Cap. Imprv. Expdtr.	= - $0, 1st yr.
+ Depr.Exp.	= + $29,091, ea. yr.
-DebtAmort	= - $2,000, ea. yr (this loan).
=EATCF	= (-6722-0+29091-2000) = $20,369, 1st yr.
+ IncTax	= +(-$3,619) = -$3,619, 1st y r.
=EBTCF	= 20369 - 3619 = $16,750, 1st yr.

Calculating reversion cash flows

- EATCF (reversion) = **Net** Sale Price – Loan Balance - CGT

After-tax proforma items (reversion)

- Book Value = Adjusted basis
  = Original Basis +CAPEX - Depreciation
- Book Gain = **Net** Sale Price – Book Value
- CGT = (**Net** Sale Price –Original Basis – Capex) * CGT rate
  + Depreciation * Recapture Rate
- Gain (AT) = Book Gain - CGT
- EATCF = Book Value + Gain (AT) – Loan Balance
  (= Sale Price – Loan Balance –CGT)
- EBTCF = EATCF + CGT

Exhibit 14-2: Example After-Tax Income & Cash Flow Proformas . . .

			Unlevered:	Levered:
Property Purchase Price (Year 0):	$1,000,000			
Depreciable Cost Basis:	$800,000	Before-tax IRR:	6.04%	7.40%
Ordinary Income Tax Rate:	35.00%	After-tax IRR:	4.34%	6.44%
Capital Gains Tax Rate:	15.00%	Ratio AT/BT:	0.719	0.870
Depreciation Recaptu	25.00%			

	Year: 1	2	3	4	5	6	7	8	9	Oper. Yr.10	Reversion Item:	Rever. Yr.10	Total Yr.10
Operating:													
Accrual Items:													
NOI	$60,000	$60,600	$61,206	$61,818	$62,436	$63,061	$63,691	$64,328	$64,971	$65,621	Sale Price	$1,104,622	
- Depr.Exp.	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	- Book Val	$809,091	
- Int.Exp.	$41,250	$41,140	$41,030	$40,920	$40,810	$40,700	$40,590	$40,480	$40,370	$40,260			
=Net Income (BT)	($10,341)	($9,631)	($8,915)	($8,193)	($7,465)	($6,730)	($5,990)	($5,243)	($4,490)	($3,730)	=Book Gain	$295,531	$291,801
- IncTax	($3,619)	($3,371)	($3,120)	($2,867)	($2,613)	($2,356)	($2,096)	($1,835)	($1,571)	($1,305)	- CGT	$73,421	
=Net Income (AT)	($6,722)	($6,260)	($5,795)	($5,325)	($4,852)	($4,375)	($3,893)	($3,408)	($2,918)	($2,424)	=Gain (AT)	$222,111	$219,686
Adjusting Accrual to Reflect Cash Flow:													
- Cap. Imprv. Expdtr.	$0	$0	$50,000	$0	$0	$0	$0	$50,000	$0	$0			
+ Depr.Exp.	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	$29,091	+ Book Val	$809,091	
-DebtAmort	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000	-LoanBal	$730,000	
=EATCF	$20,369	$20,831	($28,704)	$21,766	$22,239	$22,716	$23,198	($26,317)	$24,173	$24,667	=EATCF	$301,202	$325,868
+ IncTax	($3,619)	($3,371)	($3,120)	($2,867)	($2,613)	($2,356)	($2,096)	($1,835)	($1,571)	($1,305)	+ CGT	$73,421	
=EBTCF	$16,750	$17,460	($31,824)	$18,898	$19,626	$20,361	$21,101	($28,152)	$22,601	$23,361	=EBTCF	$374,622	$397,983

CASH FLOW COMPONENTS FORMAT

	Year: 1	2	3	4	5	6	7	8	9	Oper. Yr.10	Reversion Item	Rever. Yr.10	Total Yr.10
Operating:													
Accrual Items:													
NOI	$60,000	$60,600	$61,206	$61,818	$62,436	$63,061	$63,691	$64,328	$64,971	$65,621	Sale Price	$1,104,622	
- Cap. Imprv. Expdtr.	$0	$0	$50,000	$0	$0	$0	$0	$50,000	$0	$0			
=PBTCF	$60,000	$60,600	$11,206	$61,818	$62,436	$63,061	$63,691	$14,328	$64,971	$65,621	=PBTCF	$1,104,622	$1,170,243
- Debt Svc	$43,250	$43,140	$43,030	$42,920	$42,810	$42,700	$42,590	$42,480	$42,370	$42,260	- LoanBal	$730,000	
=EBTCF	$16,750	$17,460	($31,824)	$18,898	$19,626	$20,361	$21,101	($28,152)	$22,601	$23,361	=EBTCF	$374,622	$397,983
-taxNOI	$21,000	$21,210	$21,422	$21,636	$21,853	$22,071	$22,292	$22,515	$22,740	$22,967	taxMktGain	$693	$23,661
+ DTS	$10,182	$10,182	$10,182	$10,182	$10,182	$10,182	$10,182	$10,182	$10,182	$10,182	- AccDTS	($72,727)	($62,545)
+ ITS	$14,438	$14,399	$14,361	$14,322	$14,284	$14,245	$14,207	$14,168	$14,130	$14,091			$14,091
=EATCF	$20,369	$20,831	($28,704)	$21,766	$22,239	$22,716	$23,198	($26,317)	$24,173	$24,667	EATCF	$301,202	$325,868

Net Sale Price	**= V_T - SE** = NOI_{11}/.06 - SE = 1.01*$65,621/0.06 – 0 = $1,104,620
- Book Val	**= - (V_0 + AccCI - AccDE)** = - (1000000 + 100000 – 290910) = - $809,091
=Book Gain	= 1104620 – 809091 = $295,531 **Inclu 1104620 – (1000000+100000) = 4620 Gain, + 290910 Recapture**
- CGT	= (.15)(4620) + (.25)(290910) = -$73,421
=Gain (AT)	= 295531 – 73421 = $222,111
Adjusting Accrual to Reflect Cash Flow:	
+ Book Val	= + $809,091
-LoanBal	= - (750000 – 10*2000) = -$730,000
=EATCF	= 222111 + 809091 – 730000 = $301,202
+ CGT	= + $73,421
=EBTCF	= 301202 + 73421 = $374,622

Cash flow components (operations)

- Cash Flows to Equity:

	PBTCF
-	Loan Debt Service
=	EBTCF
-	Taxes if no DTS or ITS
+	DTS
+	ITS
=	EATCF

- PATCF:

	PBTCF
-	Taxes if no DTS or ITS
+	DTS
=	PATCF
-	Loan Debt Service
+	ITS
=	EATCF

Breaking it down

Apprec.Rate =		1.00%		Bldg.Val/Prop.Val=		80.00%		Loan=	$750,000				
Yield =		6.00%		Depreciable Life=		27.5	years	Int=	5.50%				
Income Tax Rate =		35.00%		CGTax Rate =		15.00%		Amort/yr	$2,000				
				DepRecapture Rate=		25.00%							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
					tax w/out		(4)-(5)+(6)		Loan		(4)-(9)	(7)-(9)+(10)	(9)-(10)
Year	Prop.Val	NOI	CI	PBTCF	shields	DTS	PATCF	LoanBal	DS	ITS	EBTCF	EATCF	LoanATCFs
0	$1,000,000			($1,000,000)			($1,000,000)	$750,000	($750,000)		($250,000)	($250,000)	($750,000)
1	$1,010,000	$60,000	$0	$60,000	$21,000	$10,182	$49,182	$748,000	$43,250	$14,438	$16,750	$20,369	$28,813
2	$1,020,100	$60,600	$0	$60,600	$21,210	$10,182	$49,572	$746,000	$43,140	$14,399	$17,460	$20,831	$28,741
3	$1,030,301	$61,206	$50,000	$11,206	$21,422	$10,182	($34)	$744,000	$43,030	$14,361	($31,824)	($28,704)	$28,670
4	$1,040,604	$61,818	$0	$61,818	$21,636	$10,182	$50,364	$742,000	$42,920	$14,322	$18,898	$21,766	$28,598
5	$1,051,010	$62,436	$0	$62,436	$21,853	$10,182	$50,765	$740,000	$42,810	$14,284	$19,626	$22,239	$28,527
6	$1,061,520	$63,061	$0	$63,061	$22,071	$10,182	$51,171	$738,000	$42,700	$14,245	$20,361	$22,716	$28,455
7	$1,072,135	$63,691	$0	$63,691	$22,292	$10,182	$51,581	$736,000	$42,590	$14,207	$21,101	$23,198	$28,384
8	$1,082,857	$64,328	$50,000	$14,328	$22,515	$10,182	$1,995	$734,000	$42,480	$14,168	($28,152)	($26,317)	$28,312
9	$1,093,685	$64,971	$0	$64,971	$22,740	$10,182	$52,413	$732,000	$42,370	$14,130	$22,601	$24,173	$28,241
10	$1,104,622	$65,621	$0	$1,170,243	$23,661	($62,545)	$1,084,037	$730,000	$772,260	$14,091	$397,983	$325,868	$758,169
IRR of above CF Stream =				6.04%			4.34%		5.50%		7.40%	6.44%	3.58%

Cash flow components (reversion)

- Cash Flows to Equity:

	Net Sale Price
-	Loan Debt Service
=	EBTCF
-	Taxes if no DTS
+	DTS (-)
=	EATCF

- PATCF

=	PBTCF
–	Taxes if no DTS
+	DTS (-)
=	PATCF
-	Loan Debt Service
=	EATCF

Projected IRR calculations

10-yr Going-in IRR:		
	Property (Unlvd)	**Equity (Levd)**
Before-tax	6.04%	7.40%
After-tax	4.34%	6.44%
AT/BT	434/604 = 72%	644/740 = 87%
➔ Effective Tax Rate With ord inc=35%, CGT=15%, Recapt=25%.	**100% – 72% = 28%**	**100% - 87% = 13%**

A puzzle

- Assume that deal is a zero NPV deal for this investor (investor is *marginal*)
- That is: $E(r^E)$ = IRR on EATCF at \$250,000 cost
  = 6.44%
- By the same logic, expected return on unlevered equity would seem to be:

  $E(r^U)$ = IRR on PATCF at \$1,000,000
  = 4.34%
- But $r^D = 5.5\% > E(r^U)$
- If MM holds: $E(r^E) = E(r^U) + ((1-\tau)\, D/E)\,(E(r^U) - r^D) < E(r^U)$

What's going on?

- IRR on PATCF at $1,000,000 is not $E(r^U)$
- If the investor is willing to pay $1,000,000 with some debt financing, she would not be willing to pay the same if constrained to go all-equity
- In other words $E(r^U)$> IRR on PATCF at $1,000,000
- Can we tell what $E(r^U)$ is?

Value additivity principle

- NPV of investment = PV(ATCF) – Property Price (MV)

  = NPV of investment if 100% equity financed
  + NPV of financing

  = NPV(Property) + NPV(Financing)

  = *Adjusted Present Value (APV)*

  = [PV(PATCF) – MV] + NPV of financing

- If the investor is *marginal*, APV=0
- Market value (MV) of an asset is the value to marginal investor

Investment value

- Investment value: IV = MV + APV
- IV can exceed MV for some investors because:
  1. their tax rate is lower than that of marginal investors
  2. they have access to better/more financing
  3. they can squeeze more CFs out of the property
  4. they have some private information about PBTCF prospects
  5. …
- Investors whose IV>MV are called *intramarginal*
- !!!! Doesn't mean they should pay above MV !!!!

What is $E(r^u)$?

- Assume that the investor in exhibit 14.2 is marginal at \$1,000,000 (i.e. $E(r^E)$ = IRR on EATCF at \$250,000)

- We have: APV = 0
  = NPV(Property) + NPV(Financing)
  = PV(PATCF) – MV + PV(ITS)

- It follows that PV(PATCF)= MV-PV(ITS)

- We know MV, we know all PATCF, $E(r^u)$ is the discount rate in PV(PATCF)

- If we can calculate PV(ITS), we will know $E(r^u)$

Discount rates

- ITS is highly correlated with debt service flows (perfectly so, in fact, for IOMs)
- The natural discount rate for ITS is the rate of interest on debt
- In earlier example, if investor is marginal, this implies $E(r^u)=5.77\%$ (see excel file), which is bigger than r^D
- Why is it bigger than 4.34%? Why is it lower than 6.44%?

What is the implicit average tax rate?

- If Modigliani-Miller is roughly right, then:

$$E(r^E) = E(r^U) + ((1-\tau)\, D/E)\, (E(r^U) - r^D)$$

- We know $E(r^E)=6.44\%$ in previous example, while $D/E=750/250=3$, and $(E(r^U)-r^D)=.27\%$

- Given $E(r^u)$, the average tax rate consistent with MM formula is $\tau=17\%$ (roughly)

- Tax rate seems low

Summary

- How to build a cash-flow pro-forma
- Know your leases (easy), know your market (tough)
- Decision rules:
  1. Buy if IRR in PBTCF terms exceeds returns on alternative investments in comparable properties
  2. Buy if IRR in EATCF terms exceeds after-tax required rate on levered equity
- IV vs. MV