

**Problem Set 4: Introduction Corporate Real Estate  
Self-Correcting, Hyperlinked File**

**Overview**

The purpose of this problem set is to extend basic Time Value of Money (TVM) concepts to a range of corporate real estate decisions. The problems build on “Basic TVM: Problem Set 2). At this stage, it is assumed that students have mastered the basic “Six Functions of a \$1” and can visualize how various problems are set up. As such, the interactive solutions will provide “Calculator Summary” tables that indicate the basic inputs.

**Use of File**

To use this file and its hyperlinks, read each question and try to work the answer. When you finish or need to sneak a look, click on the link to the answer. Read the steps and the solutions. To return to question, click the Return to Problem links.

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## **Problem 1. Surplus Property Disposition**

Assume you have been asked to dispose of surplus corporate real estate and have determined that you could net \$80 per square foot for your 120,000 square foot office building after all sales expenses. You have been asked to take those proceeds and deposit them in a relatively safe investment that you can use to fund a new development that you have forecast the need for 4 years from the date of your sale. If you deposit the money in a relatively safe investment earning 5.25% annual, compounded monthly, how much would you have to spend on the new facility when you are ready to build it?

[Click here for Answer 1](#)

## **Problem 2. Surplus Property Sale**

### **2 ( a). Outright vs. Installment Sale**

As an alternative to the outright sale, your buyer has promised to pay you \$210,000 each month at for 4 years. If you have the ability to earn 6% compounded annually on your money, from a pure economic perspective, which choice is right for you?

[Click here for Answer 2-a](#)

### **2 (b). Minimum Installment Payment**

What is the minimum you would you have to get from your buyer each month to get you to accept the annuity in Problem 2 over the lump of \$9,600,000? In this case, assume you don't fully "trust" your relative and think you should get a 2% premium on your return to justify deferring payment.

[Click here for Answer 2-b](#)

### **Problem 3. Funding Future Development**

#### **Problem 3 (a). Reserve Fund for Development**

Assume that your company is envisioning launching a new product line and wants you to help them plan for the future. You have estimated that you will need to accommodate 260 new employees for the expansion and that the company will be ready to start development in 5 years. Under the new workplace model you have been exploring, you estimate that you will need 280 square feet per employee. Your cost service estimates that the cost of the building and land of the quality needed to adequately house your employees is \$110 per square foot fully loaded. Rather than depending on the capital markets for debt or placing a financial burden on the company to support the new business venture, they have asked you to estimate what they would have to set aside monthly in order to be able to fully fund the development. The CFO has established an investment program that will guarantee you 7% annual, compounded monthly. How much would they have to put aside each month to be able to fund the development outright in 5 years?

[Click here for Answer 3 \(a\)](#)

#### **Problem 3 (b). Lump Sum for Future Development**

As an alternative to the monthly deposit, what lump sum would you have to set aside today to cover the cost of the \$8,008,000 expansion assuming you can earn 7% annual, compounded monthly?

[Click here for Answer 3 \(b\)](#)

**Problem 3 (c). Funding Inflated Costs: Annuity and Lump**

In reviewing your answers to the previous problems (3a-b), someone on the Board of Directors asked you whether you had accounted for rising building costs in your answer. Unfortunately, you had forgotten to consider inflation in your estimates and were asked how different your answers would be without that oversight. Assume that we come out of the current recession quickly and move into a sustained period of 5% annual inflation, what would your annuity and lump sum requirements be to fund the expansion in 5 years assuming the same basic parameters (inflation to be compounded annually-per the answer). Assume you can earn 7% on your periodic payments and 8% on a lump deposit, indicate the following: 1) the monthly payments necessary to raise the targeted amount, and, 2) the lump sum deposit to fund the targeted amount 5 years removed.

[Click here for Answer 3 \(c\)](#)

**Problem 4. Lease Alternatives**

Assume that you are the corporate real estate executive for a medium-sized firm. You have been asked to provide some basic guidelines that can be used by various divisions in making lease commitments. In particular, you are trying to help them match leases to their particular needs in terms of control and flexibility of real estate solutions. Answer the following questions from a “financial” perspective.

**Problem 4 (a). Cost of Fixed Lease**

One of your divisions has been asking you for help in valuing a lease proposal. The lease is for 7 years on 100,000 square feet at an annualized rate of \$25/square foot in gross rent. Assuming your cost of capital is 8% annual, compounded monthly. What is the cost to you of that lease?

[Click here for Answer 4 \(a\)](#)

**Problem 4 (b). Cost of Indexed Lease**

Your CFO has asked you to develop a 11 year strategy for leasing your corporate headquarters. Your current lease runs for another 3 years at \$21 per square foot and you are in a softening market. You have 352 employees at an average of 275 sf/employee. Assume you renew your current lease at 10.77% increase/sf for a fixed rate for the second phase of the total combined lease period. What would the lease cost you in PV if your cost of capital is 7.06% annual, compounded 12 times per year?

[Click here for Answer 4 \(b\)](#)

## **Problem 5: Workplace Downsizing**

### **Problem 5 (a). Savings from Spatial Downsizing**

Your CFO just attended a seminar sponsored by an interior design firm and was told that the benchmark for office space has declined to 160 square feet per employee. He remembers from your annual review that you reported that your company was averaging 260 square foot per employee. He has asked you to compare the cost savings that you could generate if you move the firm to the industry “benchmark” and has directed you to explore that alternative in your recommended lease renewal. Furthermore, one of the other attendees at the meeting told him that you were paying above market rent and could lower your current \$25/SF to \$22/SF for added savings. Cost of capital is still 8% for the firm. The general inputs for your lease deliberations include:

	<b>Current</b>	<b>Proposed</b>
Number of Employees	100	100
SF/employee	260	160
Rent/SF/yr	\$25.00	\$22.00
Term of Lease	7	7

How much could you save if you followed his lead and downsized your space at the lower rent?

[\*Click here for Answer 5 \(a\)\*](#)

**Problem 5 (b). Turnover-Adjusted Savings from Spatial Downsizing**

When you presented your initial calculations to your CFO, he asked you to present your findings to the Executive Committee. Your experience told you that such a drastic move might promise false economies and should be considered very carefully before such a recommendation. Of particular concern was the impact on employee morale due to the small spatial allocation and the poorer furnishings and location of the cheaper space. Unfortunately, you had no hard evidence to convince him otherwise and were strongly advised to go along with his idea to prove you were a “team player. When you presented your results, the new head of Human Resources whom you hadn’t met yet, jumped up unexpectedly and vehemently opposed the changes. Coincidentally, he had joined your firm partly because of your reputation for pro-active, employee-friendly workplaces. Indeed, at his other firm that was a direct competitor, there was a chronic problem with employee morale and turnover that was attributable in large part to a poor location, cheap space, and excessive crowding. The Executive Committee directed the two of you to look into the situation and bring a new recommendation to the next meeting. Assume that you concluded the following impacts of the new workplace versus your current space. What are the financial implications of the spatial downsizing from this broader perspective?

	<b>Current</b>	<b>Proposed</b>
Number of Employees	100	100
SF/employee	260	160
Rent/SF/yr	\$25.00	\$22.00
Term of Lease	7	7

<b>Variable</b>	<b>Current</b>	<b>Proposed</b>
Turnover Costs		
Rate	20%	30%
Turnover Cost/employee	\$50,000	\$50,000

[\*Click here for Answer 5 \(b\)\*](#)

**Answer Problem 1.**

Assume you have been asked to dispose of surplus corporate real estate and have determined that you could net \$80 per square foot for your 120,000 square foot office building after all sales expenses. You have been asked to take those proceeds and deposit them in a relatively safe investment that you can use to fund a new development that you have forecast the need for 4 years from the date of your sale. If you deposit the money in a relatively safe investment earning 5.25% annual, compounded monthly, how much would you have to spend on the new facility when you are ready to build it?

A. Step 1: Calculate Net Proceeds

$$\$80/\text{SF} \times 120,000\text{SF} = \$9,600,000$$

B. Calculator summary \*

<b>Factor</b>	<b>Code</b>	<b>Initial</b>	<b>Answer</b>
Compounding / Period	m	12	
Term	t	4	
Present Value	PV	\$9,600,000	
Payment	PMT		
Future Value	FV		\$11,837,886
Interest Rate	i	5.25%	

[Click here to return to Problem 1](#)



**Answer: Problem 2: Surplus Property**

Answer Problem 2 (a)

As an alternative to the outright sale, your buyer has promised to pay you \$210,000 each month at for 4 years. If you have the ability to earn 6% compounded annually on your money, from a pure economic perspective, which choice is right for you?

A. Step 1: Calculate total payments

$$\$210,000/\text{mo.} \times 48 \text{ months} = \$10,080,000 \text{ (vs. the } \$9.6 \text{ million with a cash sale).}$$

B. Calculator Summary

Compounding / Period	m	12	
Term	t	4	
Present Value	PV		\$8,941,867
Payment	PMT	\$210,000	
Future Value	FV	\$0	
Interest Rate	i	6.00%	

C. Answer

You should take the cash since present value of the payments is less than the present value of the cash (\$8,941,867 vs. \$9,600,000).

D. Sensitivity

What if the yield you could earn drops to 4.5% due to the decline in interest rates associated with the current recession?

Compounding / Period	m	12	
Term	t	4	
Present Value	PV		\$9,209,118
Payment	PMT	\$210,000	
Future Value	FV	\$0	
Interest Rate	i	4.50%	

In this case you should still take the cash, since the present value is \$390,882 less than the current cash offer.

[Click here to return to Problem 2a](#)

**Answer Problem 2 (b): Minimum Installment Payment**

What is the minimum you would you have to get from your buyer each month for 4 years to get you to accept the annuity in Problem 2 over the lump \$9,600,000? In this case, assume you don't fully "trust" the buyer and think you should get a 2% premium over your 6% on your return to justify deferring payment.

Compounding / Period	m	12	
Term	t	4	
Present Value	PV	\$9,600,000	
Payment	PMT		\$234,364
Future Value	FV	\$0	
Interest Rate	i	8.00%	

[Click here to return to Problem 2 b](#)

**Problem 3. Funding Future Development**

**Answer 3 (a): Reserve Fund for Development**

Assume that your company is envisioning launching a new product line and wants you to help them plan for the future. You have estimated that you will need to accommodate 260 new employees for the expansion and that the company will be ready to start development in 5 years. Under the new workplace model you have been exploring, you estimate that you will need 280 square feet per employee. Your cost service estimates that the cost of the building and land of the quality needed to adequately house your employees is \$110 per square foot fully loaded. Rather than depending on the capital markets for debt or placing a financial burden on the company to support the new business venture, they have asked you to estimate what they would have to set aside monthly in order to be able to fully fund the development. The CFO has established an investment program that will guarantee you 7% annual, compounded monthly. How much would they have to put aside each month to be able to fund the development outright in 5 years?

A. Calculate the total cost of the facility.

$$260 \text{ employees} \times 280 \text{ SF/employee} = 72,800 \text{ SF} * \$110/\text{SF} = \$8,008,000$$

B. Calculator Summary

Compounding / Period	m	12	
Term	t	5	
Present Value	PV	\$0	
Payment	PMT		\$111,855
Future Value	FV	\$8,008,000	
Interest Rate	i	7.00%	

[Click here to return to Problem 3 a](#)

**Answer 3 (b): Lump Sum for Future Development**

3 (b). As an alternative to the monthly deposit, what lump sum would you have to set aside today to cover the cost of the \$8,008,000 expansion assuming you can earn 7% annual, compounded monthly?

Compounding / Period	m	12	
Term	t	5	
Present Value	PV		\$5,648,884
Payment	PMT	\$0	
Future Value	FV	\$8,008,000	
Interest Rate	i	7.00%	

[Click here to return to Problem 3 b](#)

**Answer 3 (c): Earning a Moving Targeted Sum**

3 (c). In reviewing your answers to the previous problems (3a-b), someone on the Board of Directors asked you whether you had accounted for rising building costs in your answer. Unfortunately, you had forgotten to consider inflation in your estimates and were asked how different your answers would be without that oversight. Assume that we come out of the current recession quickly and move into a sustained period of 5% annual inflation, what would your annuity and lump sum requirements be to fund the expansion in 5 years assuming the same basic parameters. Assume you can earn 7% on your periodic payments and 8% on a lump deposit, indicate the following: 1) the monthly payments necessary to raise the targeted amount, and, 2) the lump sum deposit to fund the targeted amount 5 years removed.

A. Step 1: Calculate future cost of expansion.

$$\$8,008,000 * (1 + 5\%)^5 \text{ or,}$$

Compounding / Period	m	12	
Term	t	5	
Present Value	PV	\$8,008,000	
Payment	PMT	\$0	
Future Value	FV		\$10,277,136
Interest Rate	i	5.00%	

B. Calculate annuity requirements.

Compounding / Period	m	12	
Term	t	5	
Present Value	PV	\$0	
Payment	PMT		\$143,550
Future Value	FV	\$10,277,136	
Interest Rate	i	7.00%	

C. Calculate lump sum requirement.

Compounding / Period	m	12	
Term	t	5	
Present Value	PV		\$6,898,121
Payment	PMT	\$0	
Future Value	FV	\$10,277,136	
Interest Rate	i	8.00%	

[Click here to return to Problem 3 c](#)

**Answer Problem 4 (a)**

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**Problem Set 4: Intro to Corporate Finance**

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One of your divisions has been asking you for help in evaluating various leases. The first lease is for 7 years on 100,000 square feet at an annualized rate of \$25/square foot in gross rent. Assuming your cost of capital is 8% annual, compounded monthly. What is the cost to you of that lease?

Step 1: Calculate monthly rent.

$$(\$25/\text{month} / 12 \text{ months}) * 100,000 \text{ SF} = \$208,333$$

Step 2: Calculate PV of monthly rent.

Compounding / Period	m	12	
Term	t	7	
Present Value	PV		\$13,366,513
Payment	PMT	\$208,333	
Future Value	FV		
Interest Rate	i	8.00%	

[Click here to return to Problem 4 \(a\)](#)

**Answer 4 (b).** Your CFO has asked you to develop a 11 year strategy for leasing your corporate headquarters. Your current lease runs for another 3 years at \$21 per square foot and you are in a softening market. You have 352 employees at an average of 275 sf/employee. Assume you renew your current lease at 10.77% increase/sf for a fixed rate for the second phase of the total combined lease period. What would the lease cost you in PV if your cost of capital is 7.06% annual, compounded 12 times per year?

Preliminary Step: Calculate Phase 2 Rent and Schedule			
	Stage 1	Stage 2	
Phase 2 Rent		\$ 36.13	
Total Rent/Year	\$3,451,986	\$3,668,080	
Total Rent/Month	\$287,666	\$305,673	
Step 1: PV of Phase 1 Rent			
Factor	Code	Initial	Answer
Compounding/Period	m	12	
Term	t	2	
Present Value	PV		\$6,328,484
Payment	PMT	\$287,666	
Future Value	FV	\$0	
Interest Rate	I	8.50%	
Step 2: PV of Phase 2 Annuity			
Factor	Code	Initial	Answer
Compounding/Period	m	12	
Term	t	9	
Present Value	PV		\$23,018,694
Payment	PMT	\$305,673	
Future Value	FV	\$0	
Interest Rate	I	8.50%	
Step 3: PV of Phase 2 Lump			
Factor	Code	Initial	Answer
Compounding/Period	m	12	
Term	t	2	
Present Value	PV		\$19,431,704
Payment	PMT	\$0.00	
Future Value	FV	\$23,018,694	
Interest Rate	I	8.50%	
		Total PV	\$25,760,187
		Square Feet	101,529
		PV/sf	\$254

[Click here to return to Problem 4 \(b\)](#)



Problem 5: Workplace Downsizing

Answer 5 (a). Savings from Spatial Downsizing

Your CFO just attended a seminar sponsored by an interior design firm and was told that the benchmark for office space has declined to 160 square feet per employee. He remembers from your annual review that you reported that your company was averaging 260 square foot per employee. He has asked you to compare the cost savings that you could generate if you move the firm to the industry “benchmark” and has directed you to explore that alternative in your recommended lease renewal. Furthermore, one of the other attendees at the meeting told him that you were paying above market rent and could lower your current \$25/SF to \$22/SF for added savings. The general inputs for your lease deliberations include:

	<b>Current</b>	<b>Proposed</b>
Number of Employees	100	100
SF/employee	260	160
Rent/SF/yr	\$25.00	\$22.00
Term of Lease	7	7

How much could you save if you followed his lead and downsized your space at the lower rent?

Step 1: Calculate Annual Rent

<b>Current</b>	<b>Proposed</b>
\$650,000	\$352,000

Step 2: Calculate PV of Savings  
Annual Rent Savings  
Monthly Equivalent

\$298,000
\$24,833

Compounding / Period	m	12	
Term	t	7	
Present Value	PV		\$1,593,288
Payment	PMT	\$24,833	
Future Value	FV	\$0	
Interest Rate	i	8.00%	

Thus, the CFO has hit on a savings of \$1.6 million !!!!!

[Click here to return to Problem 5 \(a\)](#)



**Problem Set 4: Intro to Corporate Finance**

Answer 5 (b). Turnover-Adjusted Savings from Spatial Downsizing

The Executive Committee directed the two of you to look into the leasing situation and explicitly consider the impact of turnover on the financial picture and bring a new recommendation to the next meeting. What are the financial implications of the spatial downsizing from this broader perspective?

Here are the initial assumptions:

	<b>Current</b>	<b>Proposed</b>
Number of Employees	100	100
SF/employee	260	160
Rent/SF/yr	\$25.00	\$22.00
Term of Lease	7	7

Here are the turnover impacts you and the head of HR have estimated based on your experiences.

<b>Variable</b>	<b>Current</b>	<b>Proposed</b>
Turnover Costs		
Rate	20%	30%
Turnover Cost/employee	\$50,000	\$50,000
Added Turnover Cost	\$1,000,000	\$1,500,000
Excess Cost		\$500,000
Turnover Adjusted Rent		
Face Rent/Yr	\$650,000	\$352,000
Apparent Rent Savings		\$298,000
Turnover Adj. Savings/Yr		-\$202,000
Turnover Adj. Savings/mo.		-\$16,833

Answer

<b>Factor</b>	<b>Code</b>	<b>Initial</b>	<b>Answer</b>
Compounding/Period	m	12	
Term	t	7	
Present Value	PV		(\$1,080,014)
Payment	PMT	(\$16,833)	
Future Value	FV	\$0	
Interest Rate	i	8.00%	

Note, the CFO's numbers represent false economies. Indeed, the difference between the two scenarios is a whopping \$2.7 million (\$1.6 false savings, \$1.1 turnover cost). This is on top of the likelihood of lower productivity and overall employee morale.

[Click here to return to Problem 5 \(b\)](#)

[Click here to go to beginning](#)