

## Extra Exercises for Chapter 19. Cycles in Real-Estate Construction:

### What if Developers Pay Attention to the Office Space Under Construction?

Chapter 19 shows major swings in office space construction that matches the boom-bust patterns that have occurred over many years. Developers respond to high prices with a construction boom that leads to far too much new office space. This pattern of overbuilding is attributed to the lag-time for construction to be completed. The construction delay introduces a lag between the developers' decision to start construction and the time when new space is available. Only after this delay will we see a change in the vacancy rate and a change in the monthly rent.

But what if developers were to pay closer attention to the amount of space under construction? More specifically, what if they were to factor the constructed space into their expectations for the future rent. And finally, what if they were to base their decisions on initiating new projects on these expectations for the rent? These extra exercises explore what would happen if developers followed this policy. But first, you should verify the model in the book.

#### 1. Verify the Model in Chapter 19:

Figure 1 shows the model in Figure 19.8 in the book. You should be able to build this model from the information in the book. And if you are unsure of an equation remember the book's pledge to use friendly algebra. (You should be able to guess the equation from the names of the variables.) Then run the model to verify you get the cyclical behavior shown in Figure 19.9.

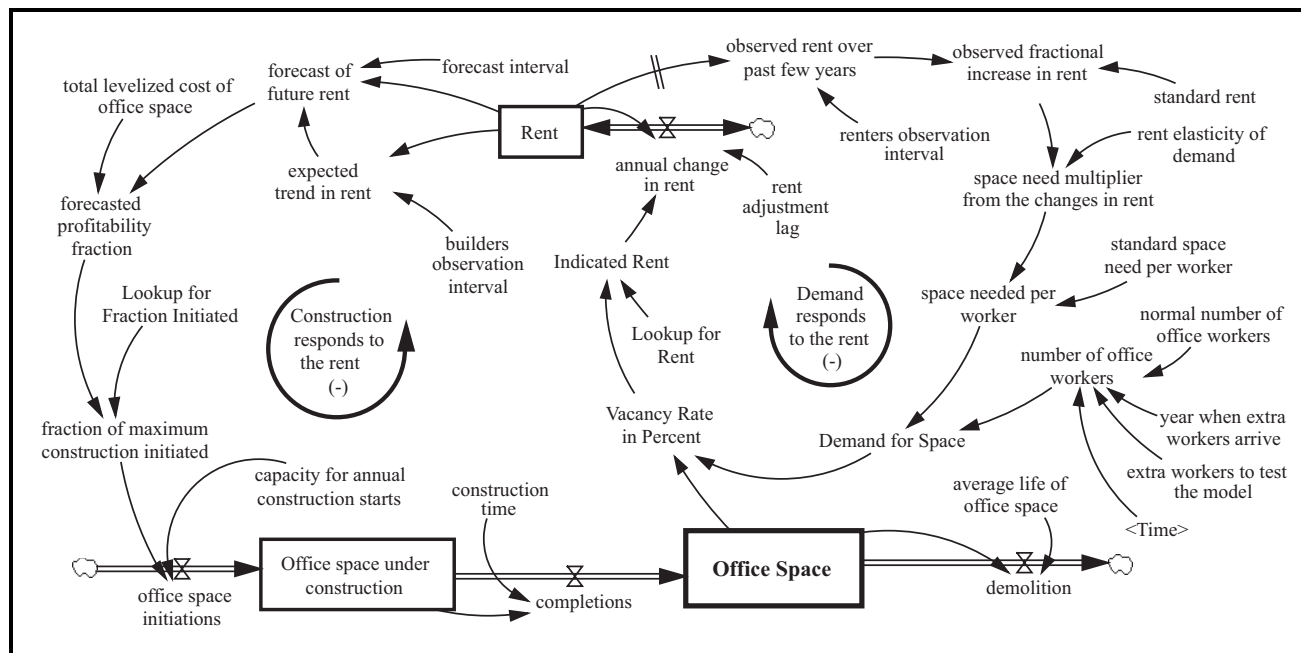


Figure 1. Real-estate construction model from Figure 19.8 of the book.

## 2. Change the Theory of Developer's Behavior:

Figure 2 shows a new view of developers. They no longer respond to the current rent. Rather, they form their own expectation of the likely rent based on their expectations of office space that will be available in the near future. The expected office space considers the current office space, the likely demolitions and a certain fraction of the amount of space under construction. Weights are introduced to give room for experimentation on different ways developers might estimate future space. For example, if they do not pay attention to demolitions, the “weight to loss of space” would be set to zero. And if they do not pay attention to the office space under construction, the “weight on supply line” would be set to zero. However, if they expect all of the space that is under construction to be completed, they would set this weight to 1. In this case, all of the space in the construction pipe line would be counted as if it were part of the current office space. With this impression of space, the developers could calculate the expected vacancy rate. And finally, the model assumes developers know the nonlinear relationship for rent (the Lookup) with perfect accuracy. This allows them to form an expectation for future rent.

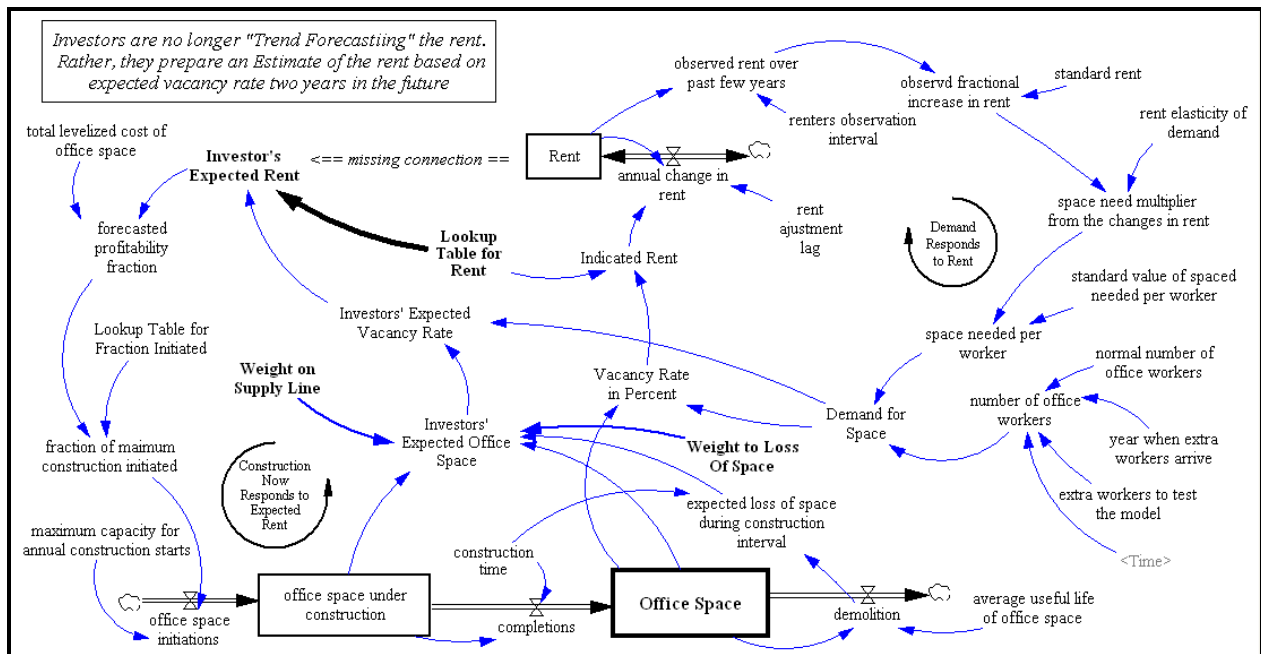


Figure 2. New model with developers giving some weight to space under construction.

Build the model in Figure 2. Set the weights on the supply line and on the demolitions to 1. Retain the same external disturbance (on the demand for space) as before. Now, before running the model (and before turning to the next page), explain what you are likely to see. Will developers fail to respond to the initial increase in the need for office space? Will developers respond as before – creating a pattern of sustained oscillations? Or do you think we will see damped oscillations in construction?

### 3. Simulate with Full Weight to the Supply Line:

Simulate the model in Figure 2 and verify that you get the results in Figure 3. The blue line in the right graph shows that the step-increase in the need for space occurs in year 5, same as before. The green line in the right graph shows an increase in construction to provide the extra space that is needed. The red line shows the gradual increase in office space over time. There is no boom, no overbuilding, and no bust.

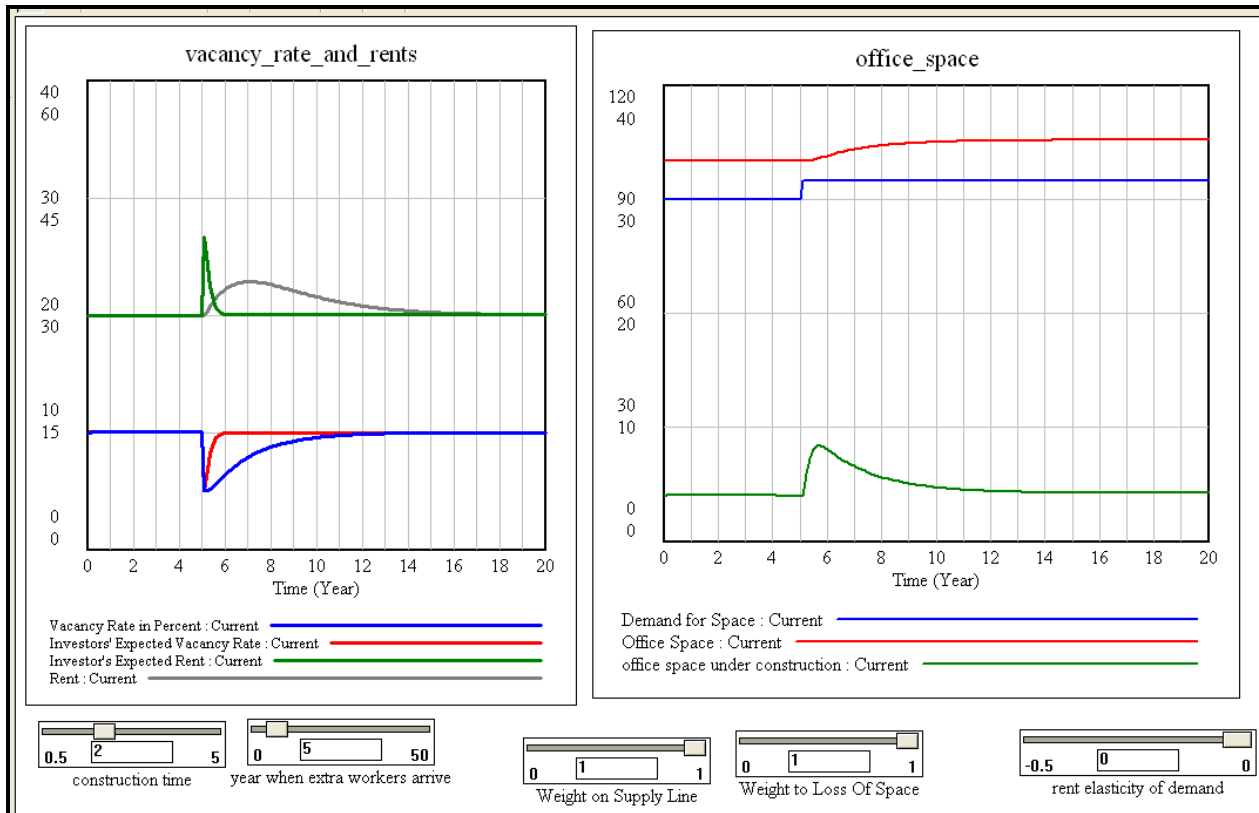


Figure 3. Simulated response with the weight on the supply line set to 1.

The green line in the left graph shows a brief increase in the investor's expected rent. This increase makes sense because of the drop in vacancy rate. The increase in expected rent triggers the increase in construction shown on the right graph. Once this space enters the construction pipeline, the investors' expectations are adjusted downward. This adjustment process is remarkably fast and remarkably accurate. Indeed, by the end of the fifth year, the expected rent is back to the starting value. The actual rent is shown in gray in the left graph. Notice that the actual rent and the developers' expected rent are in exact agreement around year 14. You could say that the developers have a perfect forecast of the future rent.

This simulation shows a collection of assumptions on developers' behavior that could eliminate the tendency for boom and bust.

#### 4. Discussion of the Developers' Rent Expectations and Construction Decisions:

However, we know from chapter 19 that construction does not appear in a calm, orderly manner over time. Rather, the long history of the real-estate industry is characterized by boom and bust pattern in construction. This raises the question of why developers fall into a pattern of over-building. Why don't they simply follow the process simulated in Figure 3?

Part of the answer to this question involves the dynamics of the forecasting and committing to new projects. Let's imagine that you are in charge of rent forecasting at a large development company. (You are the person responsible for the green line in the left chart). With the entire simulation in view, one can say your forecast is a perfect indication of the eventual rent.

In the real world, however, real-estate developers do not know what the future holds. But they certainly are aware of current conditions. Imagine the discussions that would occur as you present your forecast to the rest of the company in year 6 and then again in year 7. In year 6, the actual rent is higher than your forecast. And in year 7, the actual rent is even further above your forecast. What do you think your colleagues would say after two years of your "low-balling" the rent? How could you convince your colleagues to believe your forecast? And for how many years would you be subject to criticism that you are "low-balling" the rent?