The Markets for Real Estate Assets and Space: A Conceptual Framework

Denise DiPasquale* and William C. Wheaton**

In this study, we present a simple analytic framework that divides the real estate market into two markets: the market for real estate space and the market for real estate assets. After describing the size and character of flows and stocks in the U.S. real estate market, we use our framework to demonstrate the important connections between the space and asset markets. We illustrate how these real estate markets are affected by the nation's macroeconomy and financial markets, tracing out the impacts resulting from various exogenous shocks on rents, asset prices, construction and the stock of real estate.

Analyzing the market for real estate presents a formidable challenge because the market is comprised of two inter-related markets – the market for real estate space and the market for real estate assets. The distinction between real estate as space and real estate as an asset is most clear when buildings are not occupied by their owners. The needs of tenants and the type and quality of buildings available determine the rent for real estate space in the property market. At the same time, buildings may be bought, sold, or exchanged between investors. These transactions occur in the asset or capital market and determine the asset price of space. There are a number of important connections between these two markets, and the central objective of this article is to describe these links.

When space is owned by its occupant, such as occurs with single-family housing and much of the nation's industrial space, the notion of two separate markets is no longer applicable. Purchasing an asset and purchasing the use of space become one combined decision. The motives of

*Joint Center for Housing Studies, Harvard University, Cambridge, Massachusetts 02138-5801
**Center for Real Estate, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139
participants and the forces governing market behavior are very much the same. In purchasing a home, the annual payments that a household can afford are determined primarily by its level of income. Conditions in the capital market, however, determine how a household converts these annual payments into a purchase price. If interest rates are low and inflation high, families will be willing to offer higher prices even though their annual ability to pay is unchanged. This investment motive of the homeowner is the same as that which motivates an investor in rental property.

In this article, we begin with a brief discussion of the size and character of the U.S. real estate market, looking at residential as well as commercial real estate. We examine the value of the nation’s real estate by type and ownership. We then present a simple analytic framework that illustrates the connections between the market for real estate space (the property market) and the market for real estate assets (the asset market). Distinguishing between these two markets helps to clarify how different types of forces influence this important sector. The framework we develop is a generic one, applicable to any type of commercial as well as residential real estate. Using comparative static analysis with this framework permits us to trace out the likely impacts on each market of changes in the behavior of investors, the macroeconomy or public policy. If there is a sudden demand by foreign investors to purchase U.S. office buildings, the impact on rents is very different than if firms suddenly decide that they wish to purchase more office space for their use. A reduction in long-term mortgage rates has just the opposite effect on house prices from that caused by a reduction in short-term interest rates for construction financing. Distinguishing between the property and asset markets helps to provide a clearer understanding of how such forces impact the real estate sector as a whole.

U.S. Real Estate: Flows and Stocks

The flow of real estate is shown in Table 1, which breaks down the value of new construction put in place in 1990. Virtually all private construction was in the form of buildings, representing $301 billion (5.5% of Gross Domestic Product (GDP)). Residential buildings accounted for about 61% of private building construction, with office, industrial and other commercial structures representing 39%. In the GDP accounts for 1990, real estate (residential and nonresidential structures) represented 52% of
Table 1
Value of New Construction Put in Place, 1990

<table>
<thead>
<tr>
<th>Private Construction</th>
<th>Billions of $s</th>
<th>Percent of GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential Buildings</td>
<td>301</td>
<td>5.5</td>
</tr>
<tr>
<td>Nonresidential Buildings</td>
<td>183</td>
<td>3.3</td>
</tr>
<tr>
<td>Industrial</td>
<td>118</td>
<td>2.1</td>
</tr>
<tr>
<td>Office</td>
<td>24</td>
<td>0.4</td>
</tr>
<tr>
<td>Hotels/Motels</td>
<td>29</td>
<td>0.5</td>
</tr>
<tr>
<td>Other Commercial</td>
<td>34</td>
<td>0.6</td>
</tr>
<tr>
<td>All Other Nonresidential</td>
<td>10</td>
<td>0.2</td>
</tr>
<tr>
<td>Non-Building Construction</td>
<td>31</td>
<td>0.6</td>
</tr>
<tr>
<td>Public Utilities</td>
<td>34</td>
<td>0.6</td>
</tr>
<tr>
<td>All Other</td>
<td>21</td>
<td>0.4</td>
</tr>
<tr>
<td>Total</td>
<td>338</td>
<td>6.1</td>
</tr>
<tr>
<td>Total New Construction</td>
<td>446</td>
<td>8.1</td>
</tr>
<tr>
<td>Total GDP</td>
<td>5,514</td>
<td>100.0</td>
</tr>
</tbody>
</table>


Over the years, government statistics have tracked the flow of gross investment into real estate (new building construction) with a high degree of accuracy. Valuing the total real estate stock at any point in time, however, is far more difficult (Miles 1990). A recent study by the IREM

1 The figures on gross domestic product and gross and net private domestic fixed investment are from the GDP accounts as reported in the Economic Report of the President 1992. It should be noted that the methodology for estimating the value of structures is different in the GDP accounts and the Value of New Construction Put in Place reports. The structures components of GDP include value of new mobile homes sold, expenditures for drilling petroleum and natural gas wells, construction of mine shafts, real estate commissions on the sale of new and existing structures and the net value of used public sector structures purchased by the private sector. None of these are included in the Value of New Construction Put in Place estimates. The Value of Put in Place estimates include allowances for funds used in constructing public utility plants, which are excluded in the structures component of GDP (U.S. Bureau of the Census 1991, pp. 1–2).
Table 2
Value of U.S. Real Estate, 1990

<table>
<thead>
<tr>
<th>Type</th>
<th>Billions of $s</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-Family Homes</td>
<td>6,122</td>
<td>69.8</td>
</tr>
<tr>
<td>Multifamily</td>
<td>5,419</td>
<td>61.7</td>
</tr>
<tr>
<td>Condominiums/Coops</td>
<td>552</td>
<td>6.3</td>
</tr>
<tr>
<td>Mobile Homes</td>
<td>96</td>
<td>1.1</td>
</tr>
<tr>
<td></td>
<td>55</td>
<td>0.6</td>
</tr>
<tr>
<td>Retail</td>
<td>1,115</td>
<td>12.7</td>
</tr>
<tr>
<td>Office</td>
<td>1,009</td>
<td>11.5</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>308</td>
<td>3.5</td>
</tr>
<tr>
<td>Warehouse</td>
<td>223</td>
<td>2.5</td>
</tr>
<tr>
<td>Total U.S. Real Estate</td>
<td>8,777</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: IREM Foundation and Arthur Anderson (1991)

Foundation and Arthur Anderson (1991) has made a gallant attempt at estimating the value of all U.S. real estate, by type and owner, piecing together data from a variety of sources. The study employed standard government statistics, trade association data, and state and county property tax records to estimate statistically the value of real estate.

In this study, total real estate in the U.S. is estimated to be worth $8.8 trillion. As shown in Table 2, almost 70% of all U.S. real estate is residential, and almost 90% of the value of residential real estate is in the nation's stock of single-family homes. The 30% of U.S. real estate that is nonresidential is dominated by office and retail space— at least in dollar value. Using the Federal Reserve national net worth estimate of $15.6 trillion in 1990, the figures in Table 2 suggest that real estate constitutes roughly 56% of the nation's wealth.²

² The estimate of national net worth is from the Board of Governors (1991). It should be noted that the Federal Reserve estimates the value of real estate at $10.7 trillion. Miles argues that the BEA/Federal Reserve estimates of the value of nonresidential real estate may be high because the data used for the stock estimates include special purpose fixtures in manufacturing plants which are certainly part of the nation's capital stock but really should not be included when measuring the value of real estate (see Miles 1990, p. 74).
The legal ownership status of this wealth is shown in Table 3. Of residential real estate, 83% is owned by individuals, including individual ownership of personal residences and sole proprietor ownership of apartment buildings. The 61.5% of nonresidential real estate that is owned by corporations covers ownership of investment property as well as buildings occupied by their corporate owners. Partnerships own almost equal shares of residential and nonresidential property, while corporations dominate the nonresidential market. Finally, the ownership of U.S. real estate by foreign entities is virtually nil, despite some considerable concern about this during the last few years.

In summary, U.S. real estate is the largest component of national wealth, and the largest component of annual net private investment. This huge base of assets, however, has been accumulated by devoting only about 5%-7% of each year's GDP to the construction and renovation of that base. It is, of course, the durability of real estate that allows us to devote such a small fraction of GDP to the accumulation and maintenance of such a large share of our assets.

The Markets for Real Estate Assets and Real Estate Space

Since real estate is a durable capital good, its production and price are

<table>
<thead>
<tr>
<th>All Real Estate</th>
<th>Residential Only</th>
<th>Nonresidential Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>$s</td>
<td>Percent</td>
<td>$s</td>
</tr>
<tr>
<td>Individuals</td>
<td>5,088</td>
<td>58.0</td>
</tr>
<tr>
<td>Corporations</td>
<td>1,699</td>
<td>19.4</td>
</tr>
<tr>
<td>Partnerships</td>
<td>1,011</td>
<td>11.5</td>
</tr>
<tr>
<td>Not-For-Profits</td>
<td>411</td>
<td>4.7</td>
</tr>
<tr>
<td>Government</td>
<td>234</td>
<td>2.6</td>
</tr>
<tr>
<td>Institutional Investors</td>
<td>128</td>
<td>1.5</td>
</tr>
<tr>
<td>Financial Institutions</td>
<td>114</td>
<td>1.3</td>
</tr>
<tr>
<td>Other (includes foreign)</td>
<td>92</td>
<td>1.0</td>
</tr>
<tr>
<td>Total:</td>
<td>8,777</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Percent of All Real Estate:

Source: IREM Foundation and Arthur Anderson (1991)
denominated in an asset, or capital, market. The price of houses in the U.S. largely depends on how many households wish to own units and how many units are available for such ownership. Likewise, the value of shopping centers depends on how many investors wish to own such space and how many centers there are available in which to invest. In both cases, all else equal, an increase in the demand to own these assets will raise prices while a greater supply of space will depress prices.

The new supply of real estate assets depends on the price of those assets relative to the cost of replacing or constructing them. In the long run, the asset market should equate market prices with replacement costs. In the short run, however, the two may diverge significantly because of the lags and delays that are inherent in the construction process. For example, if demand for the ownership of space suddenly rises, then with a fixed supply of assets, prices will rise as well. With prices now above construction costs, new construction takes place. As this space arrives on the market, demand is satisfied and prices begin to fall back towards the cost of replacement.

In the market for real estate use or space, demand comes from the occupiers of space, whether they be tenants or owners, firms or households. For firms, space is one of many factors of production, and like any other factor, its use will depend on firm output levels and the relative cost of space. The household demand for space depends on income and the cost of occupying that space relative to the cost of consuming other commodities. For firms or households, the cost of occupying space is the annual outlay necessary to use real estate—its rent. For tenants, rent is simply specified in a lease agreement. For owners, rent is defined as the annualized cost associated with the ownership of property.

Rent is determined in the property market for space, not in the asset market for ownership. In the property market, the supply of space is given from the asset market. The demand for space depends on rent and other exogenous economic factors such as firm production levels, income or the number of households. The task of the property market is to determine a rent level at which the demand for space equals the supply of space. All else equal, when the number of households increases or firms expand production, the demand for space rises. With fixed supply, rents rise as well.

The link between the markets for assets and property occurs at two junctions. First, the rent levels determined in the property market are
central in determining the demand for real assets. After all, in acquiring an
asset, the investors are really purchasing a current or future income
stream. Thus, changes in rent occurring in the property market im-
mediately affect the demand for assets in the capital market. The second
link between the two markets occurs through the construction sector. If
construction increases and the supply of assets grows, not only are prices
driven down in the asset market, but rents decline in the property market
as well. These connections between the two markets are illustrated in the
four-quadrant diagram in Figure 1.

In Figure 1, the two right-hand quadrants represent the property market
for the use of space, while the two left-hand quadrants represent the asset
market for the ownership of real estate. Rents are determined in the short
run in the NE quadrant. The NE quadrant has two axes: rent (per unit of
space) and the stock of space (also measured in units of space such as
square feet). The demand for space is drawn in the NE quadrant. In
equilibrium, the demand for space, $D$, is equal to the stock of space, $S$. In
Figure 1, taking the stock as given, rent, $R$, must be determined so that
demand is exactly equal to the stock. Demand is a function of rent and
conditions in the economy:

$$D(R,Economy) = S. \quad (1)$$

In the NE quadrant of Figure 1, rent is determined by taking a level of
stock on the horizontal axis up to the demand curve and over to the
vertical axis.

The NW quadrant represents the first part of the asset market and has two
axes: rent and price (per unit of space). The ray emanating out of the
origin represents the capitalization rate for real estate assets: the ratio of
rent to price. This is the current yield that investors demand in order to
hold real estate assets. Generally, four considerations make up this
capitalization rate: the long-term interest rate in the economy, the
expected growth in rents, the risks associated with that rental income
stream, and the treatment of real estate in the U.S. federal tax code. A
higher capitalization rate is represented by a clockwise rotation in the ray,
while a decline in the cap rate is represented by a counter-clockwise
rotation. In this quadrant, the capitalization rate is taken as exogenous,
based on interest rates and returns in the broader capital market for all
assets (stocks, bonds, short-term deposits). Thus, the purpose of the NW
quadrant is to take the rent level, $R$, from the NE quadrant and determine
a price for real estate assets, $P$, using a capitalization rate, $i$: 
In Figure 1, the price of the asset is determined by moving from the rent level on the vertical axis in the NE quadrant over to the ray in the NW quadrant, and then down to the horizontal axis (price).

The next (SW) quadrant is that portion of the asset market where the construction of new assets is determined.

Here, the curve, \( f(C) \), represents the replacement cost, \( CC\text{Costs} \), of real estate. In this version of the diagram, the cost of construction is assumed to increase with greater building activity, and therefore the curve moves in a southwesterly direction. It intersects the price axis at that minimum dollar value (per unit of space) required to get some level of construction.

\[
P = \frac{R}{i}.
\]

(2)
under way. If construction can be supplied at any level with almost the same costs, then the ray is almost vertical. Bottlenecks, scarce land and other impediments lead to inelastic supply and a ray that is more horizontal. Given the price of real estate assets from the NW quadrant, a line down to the replacement cost curve and then over to the vertical axis determines the level of new construction where replacement costs equal asset prices. Lower levels of construction would lead to excess profits while higher levels would be unprofitable. Hence, asset price, \( P \), is equal to construction costs, \( C_{\text{Costs}} \), both of which are a function of construction level, \( C \):

\[
P = C_{\text{Costs}} = f(C).
\]

(3)

In the final SE quadrant, the annual flow of new construction is converted into a long-run stock of real estate space. The change in stock, \( \Delta S \), in a given period is equal to new construction minus losses from the stock measured by the depreciation (removal) rate, \( d \):

\[
\Delta S = C - dS.
\]

(4)

The ray emanating from the origin represents that level of the stock (on the horizontal axis) that requires an annual level of construction for replacement just equal to that value on the vertical axis. At that level of the stock and corresponding construction, the stock of space will be constant over time since depreciation will equal new completions. Hence, \( \Delta S \) is equal to 0 and \( S = C/d \). It is important to note that the SE quadrant takes a level of construction and determines the value of the stock that would result if that construction continued forever.

In summary, starting with a stock of space, the property market determines rents which then get translated into property prices by the asset market. These asset prices, in turn, generate new construction that, back in the property market, eventually yields a new level of stock. The combined property and asset markets are in equilibrium when the starting and ending levels of the stock are the same.\(^3\) If the ending stock differs from the starting stock, then the values of the four variables in the diagram (rents, prices, construction and the stock) are not in complete equilibrium. If the starting value exceeds the finishing, then rents, prices

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\(^3\) Our graph provides a simple, intuitive illustration of the solution to the simultaneous system of equations 1–4.
and construction must all rise to be in equilibrium. If the initial stock is less than the finishing stock, then rents, prices and construction must decrease to be in equilibrium.

In the case of real estate occupied by its owner, the four quadrants still hold, but there are not separate asset and property markets. The determination of prices and rents occurs with a single decision in a combined market. In the market for owner-occupied housing, for example, the stock of single-family homes, the number of households, and their incomes will determine an annual payment or willingness to pay by those households who purchase a home (NE quadrant). This is equivalent to a "rent." A rise in the number of households or a fall in available space means that to clear the property market, the annual payment to occupy a house must rise. The NW quadrant then translates this payment into a price actually paid for the home. Lower interest rates, for example, imply that for the same annual payment (rent), households can afford to pay a higher purchase (asset) price. With owner-occupied real estate, a single decision by the user/owner determines both rent and price. This decision, however, is influenced by the same economic and capital market conditions as with rental properties. Once the purchase price is determined, then construction and eventually the equilibrium stock of space follow in the other two quadrants (SW,SE).

It is important to realize that the four-quadrant diagram depicts a long-run equilibrium in the asset and property markets. The diagram is not as well suited to describing short-run market dynamics or the temporary disequilibria that often occur in the real estate sector.

**Comparative Statics**

Using Figure 1, we can trace out the long-run impact of the broader economy on the real estate market. For illustrative purposes, we consider the impacts on the real estate market of changes in the macroeconomy (e.g., growth in income, production, or number of households), short-term or long-term interest rates, the tax treatment of real estate and the availability of construction financing. We identify which quadrant initially is affected by a specific exogenous change and trace the impacts through the other quadrants.

Increases in employment, production, or the number of households would increase the demand for space, shifting out the demand curve in the NE
quadrant. For a given level of real estate space, rents must therefore rise. These higher rents then lead to greater asset prices in the NW quadrant which, in turn, generate a higher level of new construction in the SW quadrant. Eventually this leads to a greater stock of space (SE quadrant). As shown in Figure 2, the new market equilibrium is the dashed box that in every direction lies outside of the box that connected the four curves in the original equilibrium. In the new equilibrium, neither rents, prices, construction, nor the stock can be less than in the initial equilibrium. The magnitude of the changes in these variables depends on the slopes of the various curves. For example, if construction were very elastic with respect to asset prices, then the new levels of prices and rents would be only slightly greater than before, whereas construction and stock would expand considerably.

Economic growth, then, increases all equilibrium variables in the real estate market, whereas economic contraction leads to decreases in all
variables. Figure 3 compares the growth in total office employment in the U.S. with construction of office space and the overall office vacancy rate. It is clear that the national office market does move with the economy; during recessions, vacancies tend to rise and construction falls whereas the opposite occurs during recoveries.

If the demand to own real estate shifts, the impact on the combined markets is quite different than if the demand to use real estate changes. Shifts in the demand to own real estate assets may result from a number of factors. If interest rates in the rest of the economy rise (fall), then the existing "yield" from real estate becomes low (high) relative to fixed income securities and investors will wish to shift their funds from (into) the real estate sector. Similarly, if the risk characteristics of real estate are perceived to have changed, then the existing yield from real estate may also become insufficient (or more than necessary) to get investors to purchase real estate assets relative to other assets. Finally, changes in how real estate income is treated in the U.S. federal tax code can also greatly impact the demand to invest in real estate. Favorable depreciation rules for real estate (e.g., short tax life, accelerated depreciation schedule)
increase the after-tax yield generated by real estate. This will increase the demand to hold real estate assets.

Reductions in long-term interest rates, decreases in the perceived risk of real estate, and generous depreciation or other favorable changes in the tax treatment of real estate all will cause a reduction in the income that investors require from real estate. As shown in Figure 4, in the NW quadrant, this has the effect of a counter-clockwise rotation in the capitalization rate ray that emanates out of the origin. Higher interest rates, greater perceived risk, and adverse tax changes rotate the ray in a clockwise manner.

Given a level of rent from the property market, a reduction in the current yield or capitalization rate for real estate raises asset prices and, in the SW
quadrant, expands construction, as shown in Figure 4. Eventually this increases the stock of space (in the SE quadrant), which then lowers rents in the property market for space (NE quadrant). A new equilibrium requires that the initial and finishing rent levels be equal. In Figure 4, this new equilibrium results in a new solution that is lower and more rectangular than the original.

In the new equilibrium in Figure 4, asset prices must be higher and rents lower, while the long-term stock and its supporting level of construction must be greater. If rents were not lower, the stock would have to be the same (or lower) and this would be inconsistent with higher asset prices and greater construction. If asset prices were not higher, rents would be lower, and this would be inconsistent with the reduced stock (and less construction) which lower asset prices would generate. A positive shift in asset demand, like a positive shift in space demand, will raise prices, construction and the stock. It will, however, eventually lower rather than raise the level of space rents.

A negative relationship between commercial real estate values and interest rates has long been hypothesized, but the absence of a standardized asset price series makes this comparison difficult to test formally. Figure 5 examines this relationship in the housing market by tracking the historic movements in house prices and mortgage rates. The data in Figure 5 illustrate the generally inverse relationship between asset prices and long-term interest rates that is predicted by the model represented in our four-quadrant diagram.

The final exogenous change likely to impact the real estate market is a shift in the supply schedule for new construction. This can come about through several channels. Higher short-term interest rates will increase the costs of providing a given amount of new space, and lead to less construction. Even with modest interest rates, lending institutions may ration credit to selected real estate sectors. Throughout the early 1990s, commercial construction has been subject to a severe credit “crunch,” despite lower short-term rates. Stricter local zoning or other building regulations also can add to development costs and reduce the profitability of new construction. As shown in Figure 6, these kinds of negative supply changes have the effect of causing a leftward shift in the cost schedule of the SW quadrant: for the same level of asset prices, construction will be less. Positive changes in the supply environment, such as the easy availability of construction financing or a relaxation of development
regulations, move the curve directly to the right and (for the same asset price) expand construction.

For a given level of asset prices, a negative shift in the new space supply schedule (SW quadrant) will lower the level of construction, eventually lowering the stock of space (SE quadrant). With less space in the NE quadrant, rent levels will have to rise, which in the NW quadrant will generate higher asset prices. When starting and finishing asset prices are equal, the new solution box will lie strictly to the northwest of the original solution. Rents and asset prices will increase, whereas construction levels and the stock will be lower. The magnitude of these changes, of course, will depend upon the slopes (or elasticities) of the various schedules.

Movements in the national economy can cause several shifts to occur simultaneously. As the national economy enters a slowdown, not only is there a contraction in output and employment (NE quadrant), but there
are usually increases in short-term interest rates as well (SW quadrant). An economic expansion leads to the opposite combination. This combination of shifts can generate any pattern of new box solutions that lies between the two shown in Figures 2 and 6. Although the analysis gets more complicated in the case of multiple shifts, the net outcome is always some combination of the impacts from each individual change.

Conclusions

The distinction between the market for real estate assets and that for real estate space is an important one as we seek to improve our understanding of how this major sector operates. To this end, we have presented a simple analytic framework, illustrated by our four-quadrant diagram, which highlights this distinction and illustrates how real estate is impacted by both the nation’s macroeconomy and its financial markets. This frame-
work has proven to be very useful in the classroom as a way of introducing students to the operation of the real estate sector. With our four-quadrant analysis, we are able to trace out the impact on rents, asset prices, construction and the stock resulting from various exogenous forces.

This simple framework works well in illustrating the new equilibria that result as this exogenous environment changes. An important drawback of this framework is that it is not easy to trace out the intermediate steps as the market moves to its new equilibrium. Depicting the intermediate adjustments of the market would require a dynamic system of equations that would significantly complicate our analysis. Developing an intuitive framework similar to the one in this paper that traces the intermediate-term dynamic path to a new equilibrium remains a formidable challenge.

This article is based on Chapter 1 of our book, The Economics of Real Estate Markets, forthcoming from Prentice-Hall in 1994. We thank Jean L. Cummings and Henry Pollakowski for helpful comments on an earlier draft. Of course, we are responsible for any errors that remain.

References


