ANTICIPATED RENT AND PROPERTY VALUE INCREASES AND THEIR INFLUENCE ON THE APPARENT LOW RATES OF RETURN ON FARMLAND INVESTMENTS

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Introduction

Over the past several years, attention has been drawn to the apparent low rates of return earned on farmland investments. [2,3,7,8, 10,11,12,13] But over this same period, farmland prices have continued to move briskly upward (Figures 1 and 2). One possible explanation may be that buyers and sellers are expecting increases in net rents or property prices, each of which is treated as an increase in income. 1/ If this is the case, then the commonly used formula $r = a/V$ (where "a" is the current net rent and "V" is the current market value of the property) will give a misleading indication of the implied capitalization rate, "r".

This paper reviews: (1) the income-capitalization formula and the assumptions underlying it; (2) why the commonly used procedure of estimating future net income results in misuse of the formula; and (3) how this misuse results in an understatement of the actual implied capitalization rate.

1/ Fisher has expressed the widespread belief that it is a mistake to include capital gains as income since "capital gains...are merely capitalization of future income." [6, p.25] However, when capital gains (price appreciation) are the result of change in land usage, the soundness of this belief comes into challenge.

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Figure 1.--Net rent as a percentage of value of farms rented for cash, 1963.

1/ Average for Maine, Ver., N.H., Mass., Conn., and R.I.
2/ Insufficient data to calculate State average.
4/ Average for Wash., Oreg., and Calif.

Source: [11, p.24]

Figure 2.--Average compound rate of increases in farm real estate values per acre, 1963-1973 1/

1/ Based on index of Farm Real Estate Values per acre, 1967=100
2/ Average for Maine, Ver., N.H., Mass., Conn., and R.I.
3/ Not computed for Florida.

Source: [5, p.3] 47 States average 6.9 percent.
A revised income capitalization formula is developed. Use of this formula will enable one to measure the impact of changes in expected income (from rents or property values) on: (1) the rate of return earned on an investment, and (2) the maximum price the purchaser could pay for a particular property to earn a predetermined rate of return.

The Income-Capitalization Formula

A commonly used version of the income-capitalization formula is (Eq. 1.)

\[ V = \frac{a}{r}, \]

where:

- \( V \) = present value of the property
- \( a \) = estimated annual net rent (gross rent minus landlord expenses)
- \( r \) = rate used to discount (capitalize) stream of net rents

This simplified version of the more involved income-capitalization formula,

(Eq. 2.)

\[ V = \sum_{t=1}^{\infty} \left[ \frac{a}{(1+r_1)^1} + \frac{a}{(1+r_2)^2} + \ldots + \frac{a}{(1+r_t)^t} \right], \]

is an easily used and accurate tool for determining the value of a property if three conditions or assumptions are met: (1) the farmland or other income-producing investment is expected to produce the same annual net rent over time, (2) the rate used to discount the future return to a present value remains constant, and (3) an infinite or very long-term investment period is considered. If these conditions are met and assuming the selling price of the investment and the annual net rent figures are known, then the formula can properly be used to solve for the implied capitalization (or discount) rate. For example, if the sales price (or
The appraised value of a property were $1,000 per acre and the anticipated
annual net rent were $50 per acre, then the implied capitalization rate
would be 5 percent; i.e., \( r = \frac{50}{1,000} = 0.05 \). 2/

**Misuse of Formula**

Misuse of the formula occurs whenever one or more of the three assump-
tions underlying the formula are not met. A common misuse of the formula,
and the one of primary concern in this paper, occurs when the level of
the current year's net rent (or the average net rent over the past few
years) is tacitly assumed to represent the level of expected annual net
rents in the future. 3/ Many investors may have assumed rents to remain
at their current level. But many others may have based their offering
price on an expected increase in annual net rent from the property over
time. In the latter case, the capitalization rate implied by the formula,
\( r = \frac{a}{v} \), would understate the actual rate used by many investors in formu-
liating their offering prices.

Another factor, believed to result in misuse of the formula, is an
expected increase in the value of a property over time. This may result

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2/ Conversely, $50 per acre annual net rent capitalized at 5 percent
would imply a $1,000 per acre present value. And, if a 5-percent capitali-
ization rate were typical of comparable investments in an area, an annual
net rent of $50 per acre would be required to justify a purchase price
of $1,000 per acre.

3/ The level used in discounting expected future income may change over
time due, for example, to changes in the risk of an investment, the antici-
pated rate of inflation, and the liquidity position of the investor.
[2, p.192, 14, p.347] However, the discount rate was assumed not to
change over time.
from either an expected increase in net rents or from an expected change in land use as a result of nonagricultural pressures. If the appreciation in property value over time (discounted back to the present) is considered income, then the expected rate of return will exceed the apparent rate of return.

Measuring the Impact of Changes in Expected Income

Incorporating changes in expected income over time into the simplified valuation formula and, in turn, into implied capitalization rates presents some problems not encountered with constant net rents. When net rents are assumed to remain constant over time, the accumulated present value of the future income converges towards the value indicated by the ratio, \( \frac{a}{r} \). \(^4/\)

However, when net rents or the value of a property are expected to change over time, the accumulated present value of the future income exceeds the value determined using Eq. 1 and fails to converge towards an easily determined value. The easiest way of dealing with this latter point is to assume that the property will be sold at the end of a certain time period. The time period or planned investment period can vary

\(^4/\) Using the $50 per acre net rent and 5-percent discount rate example again, the accumulated present market value would converge towards $1,000 per acre. Note that since future income is discounted (and at a compound rate beyond the first year), the more distant the expected income, the less it adds to present value. In the above example, over half of the present value of the expected income stream would be realized during the first 15 years; three-fourths of the present value would not be realized until almost the 30th year (Table 1, Column c).
greatly for properties expected to remain in agricultural production. Therefore, an arbitrary 20-year investment period was selected for use in the following three cases.

In each case, involving various combinations of changes in expected net rents and land prices over time, the current annual net rent and current land price are assumed to be $50 and $1,000 per acre, respectively. It is further assumed that the investor considers his discount rate to be 5 percent. That is, he would be indifferent between having $100 today or $105 a year from now or $110.25 two years from now, etc.

The general form of the income-capitalization formula developed which incorporates possible increases in net rents and/or the value of a property is presented below.

(Eq. 3.)

\[
V_{t_0}^{'} = \sum_{t=1}^{n} \left( \frac{a_t}{(1+r)^t} \right) + \frac{V_{t_0+n}^{n}}{(1+s)^n}
\]

where:

- \( V_{t_0}^{'} \) = value the purchaser could afford to pay for the property, given the following assumptions
- \( a_t \) = the annual net rent. [If the level of net rent is expected to change "g" percent per year, this term would be replaced by \( a_0 (1+g)^t \), where \( a_0 \) is the level of net rent at the beginning of year 1.] Rents assumed to be received at end of year.
- \( r \) = rate used to discount future net rents
- \( V_{t_0+n}^{n} \) = expected market value of the property at the end of year \( n \). [If this price is assumed to reflect a constant annual percentage change, \( h \), over the purchase price, \( V_{t_0}^{0} \), this term would be replaced by \( V_{t_0}^{0} (1+h)^n \).]
- \( s \) = rate used to discount the reversion or future selling price. May equal "\( r \)".

5/ The investment period for a young farmer buying his first tract or farm may be as long as 40 years, whereas the period for an elderly farmer without heirs buying his last tract may be as short as 2 years.

6/ An earlier, and obviously less general, formula presented by the author recognized only the possibility of an increase in the selling
Case 1. Net rents and market value of the property are expected to remain unchanged over time.

This case would portray a land market where land prices are predicated on the level of agricultural rents, where cropping patterns and technology used are not expected to change, and where little nonagricultural demand for farmland exists to cause land prices to increase.

In this case, the actual and apparent capitalization rates are the same and are correctly determined to be 5 percent. That is,

\[
r = \frac{a}{V} = \frac{50}{1,000} = 0.05.
\]

The capitalization rate was derived using the present value formula,

\[
V = \sum_{t=1}^{n} \frac{a_t}{(1+r)^t}; \text{ i.e., since } \lim_{t \to \infty} V = \frac{a}{r}, \text{ then } r = \frac{a}{V}.
\]

An example, which assumes a constant contract rent and property value over a finite time period, is presented in Table 1. 7/

Case 2. Both net rents and market value of the property are expected to increase 6 percent per year over the 20-year investment period.

This case would portray a land market expecting or undergoing shifts in cropping patterns, changes in technology, or benefiting from

7/ The property could be sold at the end of any investment period for $1,000 without altering the $1,000 value of the property. For example, assume the property is to be sold after receiving the second year's rent. In this case, the present value of the income stream for the 2-year period would be $92.97 and the present value of the $1,000 selling price discounted at 5 percent for 2 years would be $907.03.

\[
V = \frac{50}{(1.05)^1} + \frac{50}{(1.05)^2} + \frac{1,000}{(1.05)^2} = 47.62 + 45.35 + 907.03 = 1,000.0
\]
Table 1. (Case 1.) Constant rents; constant land value. (5% discount rate.)

<table>
<thead>
<tr>
<th>End of selected year</th>
<th>Rent data</th>
<th>Land value data</th>
<th>Combined present values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rent (a)</td>
<td>Present value (b)</td>
<td>Cumulative present value (c)</td>
</tr>
<tr>
<td></td>
<td>50.00</td>
<td>47.62</td>
<td>47.62</td>
</tr>
<tr>
<td>2</td>
<td>50.00</td>
<td>45.35</td>
<td>92.97</td>
</tr>
<tr>
<td>5</td>
<td>50.00</td>
<td>39.18</td>
<td>216.47</td>
</tr>
<tr>
<td>10</td>
<td>50.00</td>
<td>30.70</td>
<td>386.09</td>
</tr>
<tr>
<td>15</td>
<td>50.00</td>
<td>24.05</td>
<td>518.98</td>
</tr>
<tr>
<td>20</td>
<td>50.00</td>
<td>18.84</td>
<td>623.11</td>
</tr>
<tr>
<td>30</td>
<td>50.00</td>
<td>11.57</td>
<td>768.62</td>
</tr>
<tr>
<td>50</td>
<td>50.00</td>
<td>4.36</td>
<td>912.80</td>
</tr>
<tr>
<td>100</td>
<td>50.00</td>
<td>.38</td>
<td>992.40</td>
</tr>
</tbody>
</table>

Table 2. (Case 2.) Increasing rents (6%/year); increasing land value (6%/year). (5% discount rate.)

<table>
<thead>
<tr>
<th>End of selected year</th>
<th>Rent data</th>
<th>Land value data</th>
<th>Combined present values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rent (a)</td>
<td>Present value (b)</td>
<td>Cumulative present value (c)</td>
</tr>
<tr>
<td></td>
<td>53.00</td>
<td>50.48</td>
<td>50.48</td>
</tr>
<tr>
<td>2</td>
<td>56.18</td>
<td>50.96</td>
<td>101.44</td>
</tr>
<tr>
<td>5</td>
<td>66.91</td>
<td>52.42</td>
<td>257.24</td>
</tr>
<tr>
<td>10</td>
<td>89.54</td>
<td>54.97</td>
<td>527.07</td>
</tr>
<tr>
<td>15</td>
<td>119.83</td>
<td>57.64</td>
<td>809.89</td>
</tr>
<tr>
<td>20</td>
<td>160.36</td>
<td>60.44</td>
<td>1,106.43</td>
</tr>
</tbody>
</table>

Table 3. (Case 3.) Constant rents; increasing land value (6%/year). (5% discount rate.)

<table>
<thead>
<tr>
<th>End of selected year</th>
<th>Rent data</th>
<th>Land value data</th>
<th>Combined present values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rent (a)</td>
<td>Present value (b)</td>
<td>Cumulative present value (c)</td>
</tr>
<tr>
<td></td>
<td>50.00</td>
<td>47.62</td>
<td>47.62</td>
</tr>
<tr>
<td>2</td>
<td>50.00</td>
<td>45.35</td>
<td>92.97</td>
</tr>
<tr>
<td>5</td>
<td>50.00</td>
<td>39.18</td>
<td>216.47</td>
</tr>
<tr>
<td>10</td>
<td>50.00</td>
<td>30.70</td>
<td>386.09</td>
</tr>
<tr>
<td>15</td>
<td>50.00</td>
<td>24.05</td>
<td>518.98</td>
</tr>
<tr>
<td>20</td>
<td>50.00</td>
<td>18.84</td>
<td>623.11</td>
</tr>
</tbody>
</table>

For present and cumulative values shown in these figures, see [9] or any of numerous other sources containing compound interest and present value tables.
increases in prices of products produced. Because the rate of expected increases in property values matches the rate of expected increases in net rents, one can say that this is also a market in which land prices are predicated on the level of expected rents. As shown in Table 2, both the present value of the expected 20-year stream of net rents (Column c) and the present value of the expected selling price or "reversion" (Column e) exceed the $1,000 purchase price. 8/ The purchaser, therefore, either understated his actual discount rate or will realize a sizeable windfall gain.

To determine the actual rate of return on the original investment (using Eq. 3), we solve for the discount rate which will make the present value of the anticipated contract rents and future selling price equal to the current purchase price of the property ($1,000). This rate is approximately 11 percent—more than twice the 5-percent rate implied when the current contract rent is divided by the current market value of the land.

Case 3. Net Rents are expected to remain constant but the market value of the property is expected to increase 6 percent per year over the 20-year investment period.

This example is believed to portray areas experiencing, or expected to experience, rapid development as a result of industrial, urban, or

8/ The value of a property at the end of a given time period could also be referred to as the "reversion" value of the investment. [1, p.37; 14, p.94] The term "salvage" value is generally reserved for depreciating property, but it is also appropriate for appreciating property values.
recreational growth. Many agricultural tracts in these types of areas or land markets are believed to be purchased for later resale at higher prices to developers or others. In the interim, however, these tracts are rented to farmers to reduce the holding and maintenance costs. To assure himself of a good renter during the holding period, and to compensate the renter for difficulties in farming land in a transitional zone, a contract specifying a constant rent may be offered.

We again solve for the price that the purchaser could have afforded to pay for the property and still have realized a 5-percent return \( (V_{t_0}) \). The results are presented in Table 3. Note that not only is the present value of the property at the end of the investment period greater than its current purchase price, but also that the combined present value of the stream of net rents and the reversion exceeds the purchase price by nearly twice. The discount rate which will make the present value of the anticipated future income equal to the purchase price was found to be slightly over 9 percent. 9/

Additional cases, utilizing other rates or even direction of change in net rent and property value levels over time, could have been presented. However, they also would have shown that expectations for changes in either the level of net rents or property value will cause the actual capitalization rate to differ from the apparent capitalization rate; i.e., the rate determined by dividing the current net rent by the current market value.

9/ Simply summing the rate of return in the first year and the annual rate of land price increase, as done in a recent report, will result in an overstatement of the expected rate of return. What was reported to be a 12.1-percent return turned out to be a 9.9-percent return using the modified income-capitalization formula. [8, p.3] (See Appendixes A and B.)
value of the property. Because Case 2 involved increases in both expected net rents and the future value of the property, and Case 3 involved an increase in the expected future value of the property, the apparent capitalization rate understated the actual capitalization rate in both cases. In a case involving expected decreases in either rents or property value, the apparent capitalization rate would overstate the actual capitalization rate. 10/

Implications and Conclusions

The examples used illustrate that the actual rate of return on a farmland investment is influenced by both the current level of net rent and property value and the change in the level of either variable over time. Because land prices have increased over time in nearly all areas (due to higher net rents or changes in land usage), the modest rates of return solved for using the simplified income-capitalization formula, \( V = \frac{a}{r} \), understate the actual rates of return. Determining expectations of market participants regarding levels and trends in net land rents and property prices would, therefore, be very helpful in understanding what is likely to take place in land markets. But expectations in a dynamic setting (i.e., less than perfect knowledge) are difficult to determine and quantify.

Researchers, lenders, appraisers, investors and others interested in understanding current land price levels and making more accurate forecasts

10/ In the case of expected increases in net rents and expected decreases in property values, or vice-versa, the relationship between apparent and actual implied capitalization rates cannot be determined a priori.
of future land price levels will probably have to rely heavily on analyses of past rent and land value data. But, in keeping with the thesis of this paper, more valid projections of future rent and land value levels can be made utilizing trend data than relying totally on the most current year’s data. Forecasts can always be revised in light of new information. However, much knowledge can be gained and the accuracy of future estimates improved if one can critically analyze why the original estimates turned out to be inaccurate.

These examples also point up the importance of understanding the underlying causes of differing land value trends among areas. Basically, farmland values are believed to increase over time because either the stream of net rents is expected to increase, or the intended use of land is expected to be more heavily influenced by nonagricultural pressures. 11/ Therefore, to more accurately interpret past changes and forecast future changes in farmland value trends, consideration should be given to measuring the relative impact of these two factors on farmland prices in areas with varying types or degrees of nonagricultural influence. The modified income capitalization formula (Eq. 3) could be helpful in measuring these impacts. But it is obvious that the quality of the measurements depends on the quality of the data used in the formula (estimated net land rents, discount rates, and land price changes). Devising procedures or techniques to estimate these values would, therefore, appear to be a high priority area of work for those of us interested in farm real estate values and their movements over time.

11/ For instance, because of rapid population growth in an area, the intended use of land currently used for grazing may shift to rural homesites or recreational areas.


Appendix A. Capital Growth and Earnings Data - Iowa Farmland, 1962-72

Per $1,000 Invested January 1, 1962

<table>
<thead>
<tr>
<th>Year</th>
<th>Value January 1</th>
<th>Net Rent</th>
<th>Rent-to-value ratio (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962</td>
<td>$1,000</td>
<td>$40</td>
<td>4.0</td>
</tr>
<tr>
<td>1963</td>
<td>1,021</td>
<td>44</td>
<td>4.3</td>
</tr>
<tr>
<td>1964</td>
<td>1,063</td>
<td>46</td>
<td>4.3</td>
</tr>
<tr>
<td>1965</td>
<td>1,122</td>
<td>52</td>
<td>4.6</td>
</tr>
<tr>
<td>1966</td>
<td>1,236</td>
<td>54</td>
<td>4.4</td>
</tr>
<tr>
<td>1967</td>
<td>1,397</td>
<td>52</td>
<td>4.7</td>
</tr>
<tr>
<td>1968</td>
<td>1,527</td>
<td>61</td>
<td>4.0</td>
</tr>
<tr>
<td>1969</td>
<td>1,582</td>
<td>63</td>
<td>4.0</td>
</tr>
<tr>
<td>1970</td>
<td>1,612</td>
<td>64</td>
<td>4.0</td>
</tr>
<tr>
<td>1971</td>
<td>1,624</td>
<td>70</td>
<td>4.3</td>
</tr>
<tr>
<td>1972</td>
<td>1,667</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Net earnings Jan. 1962-72 $667 $546

1/ Based on Iowa State University surveys. [8, p.3]

Appendix B. Use of the Iowa Farm Land Data in the Modified Income Capitalization Formula 1/

\[
V_t = \sum_{t=0}^{n-1} \frac{a_t}{(1+r)^t} + \frac{V_{t_0 n}}{(1+s)^n}
\]

\[
$1,000 = \frac{40}{(1+r)^0} + \frac{44}{(1+r)^1} + \ldots + \frac{70}{(1+r)^9} + \frac{1,667}{(1+r)^{10}}
\]

Substituting 10.0 percent for both "r" and "s", a property value of $995 is implied. The calculations are shown below. (A 9.5 percent discount rate implied a $1,032 property value.)

<table>
<thead>
<tr>
<th>Year</th>
<th>Earnings or Sale Price</th>
<th>Discount Factor 2/</th>
<th>Discounted Present Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1962</td>
<td>$40</td>
<td>1/(1.10)^0 = 1.0000</td>
<td>$40.00</td>
</tr>
<tr>
<td>1963</td>
<td>44</td>
<td>1/(1.10)^1 = .9091</td>
<td>40.00</td>
</tr>
<tr>
<td>1964</td>
<td>46</td>
<td>1/(1.10)^2 = .8264</td>
<td>38.01</td>
</tr>
<tr>
<td>1965</td>
<td>52</td>
<td>1/(1.10)^3 = .7513</td>
<td>39.07</td>
</tr>
<tr>
<td>1966</td>
<td>54</td>
<td>1/(1.10)^4 = .6830</td>
<td>36.88</td>
</tr>
<tr>
<td>1967</td>
<td>52</td>
<td>1/(1.10)^5 = .6209</td>
<td>32.29</td>
</tr>
<tr>
<td>1968</td>
<td>61</td>
<td>1/(1.10)^6 = .5645</td>
<td>34.43</td>
</tr>
<tr>
<td>1969</td>
<td>63</td>
<td>1/(1.10)^7 = .5132</td>
<td>32.33</td>
</tr>
<tr>
<td>1970</td>
<td>64</td>
<td>1/(1.10)^8 = .4665</td>
<td>29.86</td>
</tr>
<tr>
<td>1971</td>
<td>70</td>
<td>1/(1.10)^9 = .4241</td>
<td>29.69</td>
</tr>
<tr>
<td>1972</td>
<td>1,667</td>
<td>1/(1.10)^10 = .3855</td>
<td>642.63</td>
</tr>
</tbody>
</table>

1/ Based on Iowa State University surveys. [8, p.3]
2/ Rents assumed to be received at beginning of year.