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Institute of Agriculture & Natural Resources
Department of Agricultural Economics
University of Nebraska – Lincoln

Land Valuation and the Income Capitalization Model

Market Report	Yr Ago	4 Wks Ago	8/13/04
Livestock and Products, Weekly Average			
Nebraska Slaughter Steers, 35-65% Choice, Live Weight	$79.79	$83.05	$85.03
Nebraska Feeder Steers, Med. & Large Frame, 550-600 lb	*	133.92	139.33
Nebraska Feeder Steers, Med. & Large Frame 750-800 lb	*	115.60	123.98
Choice Boxed Beef, 600-750 lb. Carcass	140.46	140.81	137.53
Western Corn Belt Base Hog Price Carcass, Negotiated	56.18	77.56	74.46
Feeder Pigs, National Direct 45 lbs, FOB	19.15	43.27	42.39
Pork Carcass Cutout, 185 lb. Carcass, 51-52% Lean	62.52	82.19	78.73
Slaughter Lambs, Ch. & Pr., 90-160 lbs., Shorn, Midwest	87.00	*	90.50
National Carcass Lamb Cutout, FOB	214.76	229.58	216.83
Crops, Daily Spot Prices			
Wheat, No. 1, H.W. Omaha, bu	3.85	3.60	3.13
Corn, No. 2, Yellow Omaha, bu	2.10	2.33	2.18
Soybeans, No. 1, Yellow Omaha, bu	5.55	6.87	6.13
Grain Sorghum, No. 2, Yellow Columbus, cwt	*	3.46	3.11
Oats, No. 2, Heavy Minneapolis, MN , bu	1.55	1.60	1.50
Hay			
Alfalfa, Large Square Bales, Good to Premium, RFV 160-185 Northeast Nebraska, ton	117.50	115.00	115.00
Alfalfa, Large Rounds, Good Platte Valley, ton	70.00	55.00	62.50
Grass Hay, Large Rounds, Good Northeast Nebraska, ton	71.25	62.50	57.50

* No market.

Early work in agricultural land appraisal emphasized several factors contributing to the value of agricultural land. These included productivity, building quality, location, adjoining road quality and other factors. Irrigation potential also came to be important and more recently, recreational factors and urban development have become important in explaining land values. Productivity gained in importance over time as the underlying force, although the remaining factors still are considered in explaining value differences among tracts. The reliance on productivity is the focus of this article, and other influences on land values such as urban development potential are not considered, even though they may strongly impact land tracts in particular locations.

Crucial to the understanding of how to value a non-depreciable asset such as land is the income capitalization model. This approach gained favor early in land appraisal in quantifying the impact of productivity on land values. It simply summarizes all discounted future returns from an asset for an infinite time horizon. According to the income capitalization model, land values are based solely on future income flows. The model is

$$V = \frac{NR}{r}$$

where V = Value, NR is net return to the asset, and r is the discount rate used to discount future returns. Net land returns (NR) can be estimated as net owner returns to land, or alternatively net cash rents are often used. The discount rate r is commonly represented by the current long-term interest rate. Over time many observed a divergence between values estimated from the income capitalization model and market values. Market values generally were much higher than that estimated by the

income capitalization model, leading some to suggest that land's income producing value often was unrelated to its market value. Implicit in this is the idea that many land purchases cannot be justified economically and other forces create the divergence. A sometimes mentioned reason for higher land values than that based on productivity was that farm purchasers were able to achieve greater size economies on their entire cropland operation from a land purchase even though the land purchase, in itself, was economically unjustified. Yet this does not explain the increasing interest in land ownership by non-producers.

The simple income capitalization approach still remains, however, as a very viable tool in land value estimation. What is frequently misunderstood is how it must be configured under conditions of inflation. Inflation is clearly related to nominal interest rates and interest rates (the denominator) are instrumental to the income capitalization model. Interest rates over the past 25 years have significantly declined in response to reduced inflation. A nominal interest rate has an imbedded rate of inflation. For example, a 6.75 percent nominal interest rate includes underlying inflation, perhaps 3.4 percent. Further, it would be expected that the 6.75 percent nominal rate would be constant if inflation did not change. Less obvious is that inflation is related to land returns in the long-run. Certainly over short-run periods this may not be the case, but the rate of inflation tracks both net returns to land and land values over the long-run. Nebraska agricultural land values in 2003 stood in a nearly identical relationship to 1917 land values as the 2003 consumer price index did to its 1917 level. Nominal land returns rise over time with inflation and should not be thought of as constant. Here then is the problem. The income capitalization model requires the numerator (net returns) to be on a constant basis, just as the denominator must be on a constant basis. We earlier noted that with a given level of inflation interest rates are expected to be constant. The problem resides with the numerator. There are two ways to insure that the numerator and denominator are on an equivalent basis.

The more difficult approach is to retain the nominal denominator (6.75 percent) and adjust the numerator to a constant basis. For example, assume the net land return is $80 per acre. Without adjustment the income capitalization model estimates the land value at $80/.0675 or $1,185 per acre. The necessary adjustment in the numerator is accomplished by creating the constant equivalent to the inflation impacted net returns for an infinite time horizon. This requires discounting the $82.40, 84, 87, etc., by 6.75 percent and annualizing the discounted sum at 6.75 percent to achieve a constant return basis. The result approaches $166.66 per acre as infinity is reached. The income capitalization estimate is then $166.66/.0675 or $2,469 per acre.

A simpler alternative is to place both numerator and denominator on an inflation free or "real" basis. The numerator ($80) requires no adjustment. This reflects the expectation that land returns will rise nominally with inflation but remain at an $80 inflation free level. The nominal interest rate does require an adjustment to remove the 3.4 percent inflation from it. This can be estimated by the equation

$$r' = \frac{1 + r}{1 + f} - 1$$

where r' is the real interest rate, and f is the rate of inflation. Thus, r' using the example of 6.75 percent nominal interest and 3.4 percent inflation is 3.24 percent. Dividing $80 by .0324 also yields $2,469 per acre. This is the simplest approach and readily workable.

It is tempting to use a long-term real interest rate in the denominator and employ a current net cash rent in the numerator to estimate current land values. Under stable economic conditions this can be a useful technique. Long-term real interest rates for real estate have averaged roughly 3.24 percent. Hence, an $80 per acre net cash rent suggests a $2,469 value for land. This may be a useful starting point, but caution is required here. A current net cash rent applicable to a particular land track, in itself, may not be readily available. Further, current rents may not be fully reflective of expected conditions. For the real interest rate side real interest rates as we commonly estimate them have varied over time. Thus, at any point in time a long-term average may be at odds with existing levels.

Finally, even with the best evaluation techniques, economic conditions change. An accurate estimated value for a point in time is only that and should economic conditions change, land values can be expected to change.

Glenn A. Helmers, (402) 472-1788
Professor, Agricultural Economics