

ANSWER KEY for Land Ownership and Leasing Homework #1 (MAST 11-12)

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This homework is based on using the *KSU-Landbuy.xls* spreadsheet. This spreadsheet is available on the website: www.agmanager.info.

To simplify comparisons in this homework, the blue-box assumptions in the spreadsheet should start at these values (call this the base scenario):

160 acres of crop land in KS state where land is located

\$1,500 market price

\$1,600 purchase price

\$60 ag rent

\$6.00 real estate tax (0.40% of market value)

\$0 non-ag rent

30 time horizon

0.43 income tax rate (shows 43%)

0.15 capital gains tax

0.065 interest rate

0.40 part financed

0.0264 growth rate on ag rent

0.00 growth rate on non-ag rent

0.0395 growth rate on total (ag+non-ag) land value

Question #1:

Given the assumptions above, *KSU-Landbuy* should say you can pay up to around \$2,239 for the land (see the *PVL* cell). We'll call this the maxbid price. Notice that the *PVL* formula is the sum of three others (*PVRA*, *PVRN*, *PVS*). Which of these others change when current ag rent changes?

Answer:

The *PVRA* cell will change when ag rent is changed.

Note: A purchase price of \$2,239 would equate to an ROA and ROE of approximately 6.5% (i.e., the interest rate). Given your expected purchase price of \$1,600, the expected ROE is 10.77% (as a general rule when using this spreadsheet you will want to focus on ROE not *PVL*).

Question #2:

If current ag rent actually were \$75 rather than the \$60 assumed, how much more could be paid for the land? Is the percentage change in the maxbid price about the same as the percentage change assumed for ag rent? Why or why not?

Answer:

Putting \$75 in the ag rent cell, a 25% higher rent, causes the *PVL* cell to change from \$2,239 to \$2,459, an approximate 10% increase in what could be paid. This percentage change is smaller than the 25% change in land rent because the maxbid price is determined by expected capital gains as well, not just by rents. Additionally, the different growth rates (2.64% on ag and 3.95% total) also impact this difference.

What is the expected ROE at this initial rent if land is still purchased at the initial price (\$1,600)?

Answer:

At this higher rent and holding all else constant, the expected ROE increases roughly 1.5 percentage points from 10.77% to 12.25%.

Question #3:

Can a person who is in a higher income tax bracket pay more, or less, for land than someone in a lower bracket? Can you explain the intuition behind what you have found?

Answer:

Folks in higher tax brackets generally can pay more for land than low-bracket folks.

Unfortunately, the intuition is not straightforward. But, it principally depends on the idea that the effective (after-tax) opportunity cost of money for those in a high bracket is less than for those in a low bracket. Put another way, part of the taxes on land returns (i.e., that associated with capital gains) is deferred until some point in the future, and if capital gains taxes were zero, would essentially be deferred indefinitely. Relative to low-tax-bracket folks, it is more advantageous for those in high brackets to put off paying taxes until the future (because they otherwise would have a lot less after-tax income today).

Question #4:

Do higher capital gains tax rates imply higher or lower maxbid prices? Are capital gains tax rates more or less important to buyers with short time horizons, such as real estate traders?

Answer:

Higher capital gains taxes imply lower bid prices. Surprisingly, capital gains tax rates are not necessarily more important to the short term land trader. For example, in the base scenario, but for a 50-year horizon, the bid prices for 0 and 15% capital gains tax rate situations are \$2,884 (no tax) and \$2,670 (capital gains tax of 15%), which is about a 8.0% difference in bid prices. But, for the five-year horizon, the bid prices associated with the two tax rates are \$1,667 (no tax) and \$1,639 (15% capital gains tax), which is a 1.7% difference. The longer the time horizon, the more differences tend to be magnified up to a point. For example, at a 100-year horizon, the difference between 0 and 15% capital gains tax rates is only about \$279, which is 7.9%.

Question #5:

Consider the base scenario where the expected return on equity (ROE) is 10.77% annually.

Which of these events would be the most harmful to you in terms of ROE: a) finding out that the land was not as productive as everyone had believed, implying a rent that should be 10% lower than you had thought, thus \$54.00 (but the market doesn't know that so land market value stays at \$1,600); b) finding out that you had been duped by the real estate agent into believing the market was at \$1,500 when it actually was 10% worse, thus \$1,350; c) learning that the Fed had just announced a 10% higher interest rate, causing your effective interest rate to rise from 6.5% to 7.15%; d) finding out that the ag growth rate actually is half a percentage point lower than you had thought, thus 2.14% instead of 2.64% ag growth?

Answer:

My calculations show ROE's of 10.77%, 10.18%, 10.07%, 10.34%, and 10.43% for the base scenario and a through d, respectively. None of these hits is particularly bad, but among the contrived situations, finding out that the land's market value actually was 10% less than you had thought was the most costly, leading to an ROE of 10.07%. A one-half percentage point drop in the ag growth rate was the least harmful of these scenarios.

Question #6:

Going back to the base scenario, how much more could you pay for land if you believe you can capture a non-ag rent of \$5 per acre AND you believe that these rents will grow at roughly the rate of inflation, which you assume is 3.0%?

Answer:

My calculations show you can bid up to \$2,316, which is about 3.4% greater than the \$2,239 you could bid under the base scenario. Note that if you still only paid \$1,600 for the land in this situation your expected ROE increases from 10.77% (base scenario) to 11.29%.

Assume the land market price stays at \$1,500, what is the purchase price you could pay with this added income and still maintain an expected ROE of 10.77%?

Answer:

You find this answer by iteratively changing the purchase price in cell B7 until the ROE (cell B36) is equal to 10.77%. My calculations show you could increase your purchase price from \$1,600 to \$1,665, which is about 4.1% greater than the \$1,600 you could bid under the base scenario.

Question #7:

Go back to the base scenario but put \$1,500 in the purchase price cell. You should see an expected ROE of 11.60%. Now, suppose the government subsidies drop out of the picture and so you are left with a cash rent equivalent of only say \$45 per acre. Approximately to what level would the market price and purchase price (keep them the same) need to fall in order to maintain an expected ROE of 11.60%?

Answer:

You should have ended up with a land value somewhere around \$1,125 (assuming that you allowed real estate taxes to fall with market value, i.e., keeping the rate at 0.40%). This drop in land values is exactly the same as the drop in rent, that is $45/60 * 1,500 = \$1,125$. If real estate taxes are held constant at \$6.00 per acre, then the land value would have to drop to \$1,083.

Question #8:

Go back to the base scenario but change the amount of land financed from 40% to 70%. What happens to return on assets (ROA) and return on equity (ROE)? Now put the land growth rate at 0.0% rather than the 3.95% of the base scenario. Now, what happens when leverage goes from 40 to 70%?

Answer:

ROA stays the same but ROE rises, going from 10.77% to 15.04%, since you are profiting more than the cost of money so leverage pays. With the 0.0% land growth rate, ROE goes from 3.53% at 40% leverage to 0.56% at 70% leverage. When profits are lower than the borrowing rate, ROE falls with increased leverage. This is one reason farmers got into trouble in the early 1980s: they were highly leveraged AND growth projections fell precipitously with falling land values during that time.