IBSU Scientific Journal, 5(1): 45-56, 2011
ISSN: 1512-3731 print / 2233-3002 online

Evaluating, Taxing and Insuring Agricultural Enterprises

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Abstract

By analyzing the pros and cons of the US farms taxation methodologies, this paper aims to suggest that best practice of taxing farms in transition economies would be consistent with a multiple of cash flow valuation approach and suggests that a liquid market for agricultural insurance can be created in emerging economies as it provides a methodology for valuation of drought insurance contracts. As such recent drought and flood damages in such countries could have been reimbursed privately and thus the recent rise of food prices internationally may have been prevented.

Keywords: evaluation; taxing; insurance; agriculture; US farms

JEL Classification Codes: H21, Q12, Q14

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Introduction: Current farm valuation and tax methodology

This paper has the purpose of investigating the recent raise of food prices internationally in view of the tax, valuation and insurance framework of agricultural entities. The recent uprisings in the developing world with regards to raising food prices indicate that the regulatory bodies need to address promptly this issue.

In the USA, valuation of farms and farmland is naturally linked to theoretical outputs thus the quality of the soil, given that accelerated depreciation methodology for fixed assets allow the capital base to become fast production means rather than have value themselves.

The formula for double declining depreciation, which is deductible for tax purposes, is:

Depreciable base * (2 * 100% / Useful life in years)

Why is the tax framework linked to theoretical, and not real outputs: since there is a high opportunity cost for inactivity/ lack of performance, which should be taxed in order to facilitate optimum use (optimum use can be defined as achieving the optimum labor/capital ratio $\delta L/\delta K = t = \max Y$ where L is labor, K is capital and Y is output per the Solow-Swan model that would bring the output per acre within acceptable yield(Solow, 1956) ranges and at the same time satisfy a cost benefit analysis through methods that will be listed in the course of this study, knowing that occupational L in agriculture is quasi-fixed because of birth rates and propensity for other occupations). Thus if the farm operates at less than its true potential proven by the performance levels of its peers, it is penalized for its shortcoming differential through a higher effective tax per unit, namely reverting to real estate tax rates. Thus in the equation above, only Y is monitored and regulated by the taxing authority.

With accelerated depreciation methods for farm fixed assets (MACRS) (from US Internal Revenue Service Publication 225 “Farmer's Tax Guide”) and higher tax rates for residential properties, taxation of farms ensures that a profit incentive for the respective property to continue to operate as a farm still exists and therefore its value rests in its production capability rather than in the value of its fixed assets. Thus this ensures an equitable scope of the agricultural taxation framework.

Historical background

Gains in productivity have been a driving force for growth in U.S. agriculture. The effects of these changes over the second half of the 20th century were dramatic: between 1950 and 2000, the average amount of milk produced per cow increased from 5,314 pounds to 18,201 pounds per year, the average yield of corn rose from 39 bushels to 153 bushels per acre, and each farmer in 2000 produced on average 12 times as much farm output per hour worked as a farmer did in 1950. The development of new technology was a primary factor in these improvements.

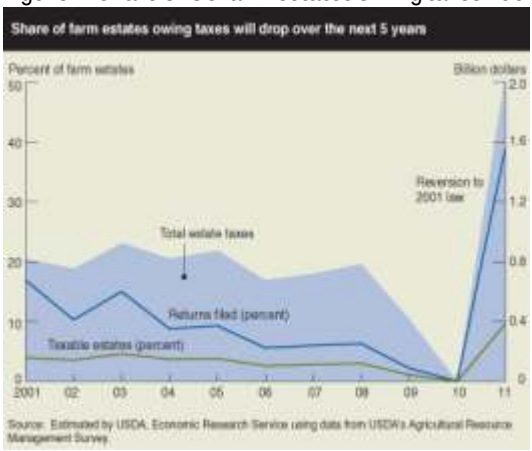
Historically construction and land have been positively correlated. Between 1975 and 2010, land accounted in USA, on average, for 36 percent of the value of the aggregate housing stock. Over the same period, the inflation-adjusted price of residential land nearly quadrupled, while the real price of structures increased cumulatively by only 33 percent. At business cycle frequencies, the price of land has been more than three times as volatile as the price of structures, since recessions in the industrial sector induce recessions in the agricultural sector as well, as the aggregate demand curve drops cumulatively. Moreover, this is more evident as the optimum labor/capital ratio is achieved in order to optimize production capability (Solow, 1957).

Both trend growth in house prices and cyclical house price fluctuations are primarily attributable to changes in the price of residential land and not to changes in the price of structures(Davis & Jonathan,2004).

Best practice shows that when there is a discrepancy between the tax rates on non-farm property and farm property, obtaining initial farmland classification would be given for a period of 3-7 years in which farmland comparable outputs would have to be proven. Thus the taxation factor in this relationship is the driver to sustain labor force allocation in the agricultural sector.

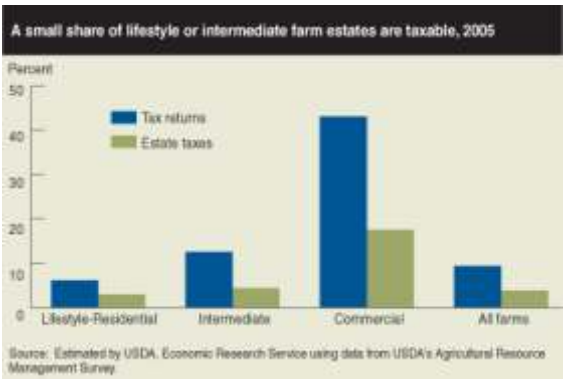
A further wage tax exemption for employed farmers is granted in the US economy, which is limited to no more than 50 percent of wages paid to hired farm labor. An estate tax kicks in only if the inherited farm becomes ordinary real estate (Figure 1). If benchmarked outputs are not achieved in 3-7 years, the farm loses fiscal farm classification; its tax basis is revalued through real estate appraisals and taxed like residential real estate (Figure 1 – Reversal to 2001 law).

Figure 1: Share of US farm estates owing taxes 2001-2011



In the US, some farm estates that would owe no Federal estate tax or capital gains tax under current law are faced with a tax reporting compliance burden and would owe capital gains taxes upon the sale of the inherited assets, to prevent avoidance of the estate tax. The combination of no estate tax and potential capital gains taxes could increase the amount of farm assets transferred to the next generation and encourage the heirs to continue to hold the transferred assets to avoid capital gains taxes. See tax granularity of US farms in Figure 2.

Figure 2: Tax granularity of US farms, 2005-2010

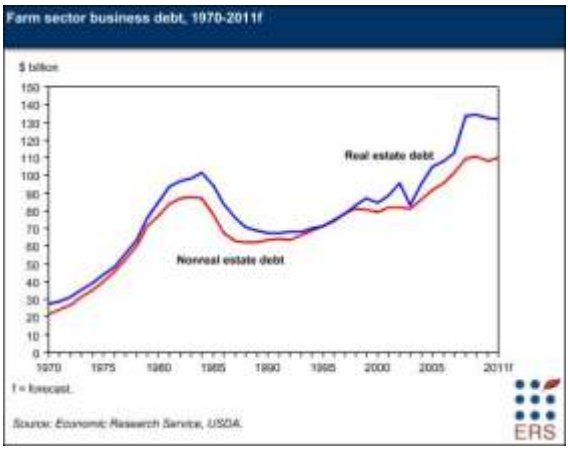


Rationale, current trends

The viable argument against collectivization of land owners as pursued in the socialist years to minimize capital investment in fixed assets, would be to

achieve the productivity intensity proven for that type of land and culture on your own and be profitable, namely to be able to fund your own investment in sufficient fixed assets and still be within historical debt-to equity bands. The below historical ranges of debt-to-equity ratios in the US economy is presented, which indicate that the recent food price raises could be due to an aggravation of the debt burden of farms at both real estate as well as machinery levels (Figure 3).

Figure 3: US Farm Sector business debt, 1970-2011.



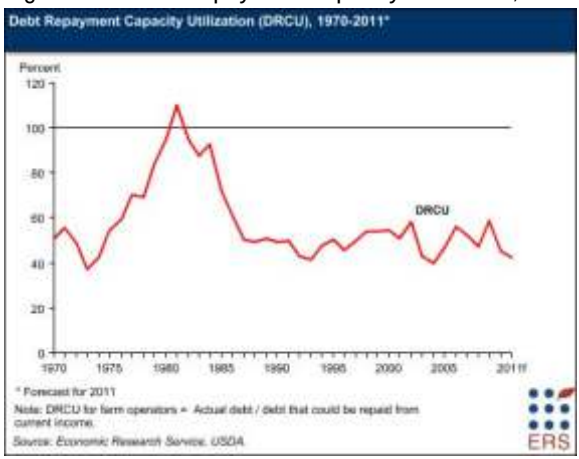
The farm business sector's debt-to-asset ratio is expected to decline from 11.3 percent in 2010 to 10.7 percent in 2011, and the debt-to-equity ratio is expected to decline from 12.8 percent in 2010 to 12.0 percent in 2011 (Table 1). These declines indicate that the farm sector's solvency position remains viable but factors in the recent food price increases.

Farm operator debt repayment capacity utilization (DRCU) is the actual farm operator business debt relative to the maximum feasible farm operator business debt economically possible. DRCU measures the extent to which farmer operators can service farm debt using only current farm net cash income. The use of other noncash farm assets to payoff farm business debt, such as farmland, is not included. The greater the share of the farm household's net cash income that comes from farming activities, the more meaningful the farm operator's DRCU is as a measure of their exposure to farm financial and business risk.

Table 1: Balance sheet of the U.S. farming sector, 2007-2011

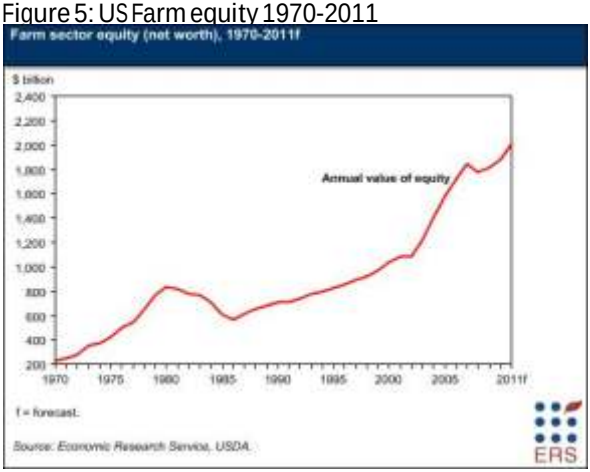
Financial measures	2007	2008	2009	2010	2011	% change 08-09	% change 09-10	% change 10-11
as of 01/28/2011	$ Million							
Farm assets	2,055,276	2,023,302	2,057,140	2,121,103	2,250,367	1.67%	3.11%	6.09%
Real estate	1,751,386	1,702,961	1,727,173	1,781,925	1,894,186	1.42%	3.17%	6.30%
Livestock and poultry	80,649	80,607	79,785	81,372	80,803	-1.02%	1.99%	-0.70%
Machinery and motor vehicles	114,706	123,380	125,971	129,121	134,718	2.10%	2.50%	4.33%
Crops stored	22,703	27,610	32,887	35,595	42,717	19.11%	8.23%	20.01%
Purchased inputs	7,019	7,167	7,217	7,345	7,567	0.70%	1.77%	3.03%
Financial assets	78,812	81,577	84,106	85,746	90,376	3.10%	1.95%	5.40%
Total farm debt	214,063	242,677	245,360	240,265	241,597	1.11%	-2.08%	0.55%
Real estate	112,682	133,582	134,514	132,261	131,472	0.70%	-1.67%	-0.60%
Farm Credit System	46,793	57,124	58,423					
Farm Service Agency	2,281	2,313	2,343					
Commercial banks	41,884	49,705	50,338					
Life insurance companies	12,750	14,736	14,246					
Individuals and others	8,657	9,552	8,695					
Storage facility loans	316	151	469					
Non-real estate	101,382	109,096	110,846	108,004	110,125	1.60%	-2.56%	1.96%
Farm Credit System	31,622	37,290	39,883					
Farm Service Agency	2,808	2,652	2,823					
Commercial banks	54,129	57,313	57,027					
Individuals and others	12,823	11,841	11,113					
Farm equity	1,841,212	1,780,625	1,811,779	1,880,838	2,008,770	1.75%	3.81%	6.80%
Calculated ratios:								
Debt-to-equity	11.6	13.6	13.5	12.8	12.0			
Debt-to-asset	10.4	12.0	11.9	11.3	10.7			

Figure 4: US Debt repayment capacity utilization, 1970-2011.



DRCU for U.S. farm operators ranged from about 77 percent to 104.1 percent from 1979 through 1984 (Figure 4). Since then, DRCU has declined significantly. DRCU for farm operators declined from 57.0 percent in 2006 to 49.2 percent in 2010 while under its 2000-2006 average of 50.4 percent. Maximum feasible operator debt capacity rose sharply from 2006 to 2010 reflecting a large anticipated increase in farm operators' net cash income. As you compare this graph with the previous graph, the higher debt-to-equity does not necessarily imply lower repayment capacity, therefore an optimal debt-to-equity ratio, not necessarily the lowest, can be found in order to maximize marginal revenue and maintain a solid repayment capacity, but again, in view of Figure 3 this entails higher and raising food prices or some equipment price inflation since the debt burden is higher overall.

Figure 5: US Farm equity 1970-2011



The slight drop in equity in 2007 (Figure 5) coincides with the timing of the US real estate crisis as the sales value of farms is associated with their real estate since it is uncertain if the new owners would have the know-how to keep the production levels of former owners.

Integrating agricultural insurance into the normal Property-Casualty actuarial framework

An important factor in the encouragement of farmers and maintenance of constant food process is insulating them from catastrophic events such as droughts and floods and implicitly through adequate insurance. Insurance contracts become less onerous and potentially profitable, so they can be modeled like weather derivatives with the strike price the levels of an observable vegetation index.

Such insurance policies resemble derivative contracts. All the criteria in Para 6 of FAS 133 of USGAAP (recognition of a derivative contract (according to Financial Accounting Standards Board "FAS 133, Accounting for Derivative Instruments and Hedging Activities")) are normally met, namely:

a. It has one or more underlyings and one or more notional amounts or payment provisions or both. Those terms determine the amount of the settlement or settlements, and, in some cases, whether or not a settlement is required.

b. It requires no initial net investment or an initial net investment that is smaller than would be required for other types of contracts that would be expected to have a similar response to changes in market factors.

c. Its terms require or permit net settlement, it can readily be settled net by a means outside the contract, or it provides for delivery of an asset that puts the recipient in a position not substantially different from net settlement.

The long put option is Marked-to-Market based of monitoring the level of vegetation index, so the underlying is the Vegetation Index, the notional being a certain acreage covered.

The underwriter realizes economies of scale the more diversified coverage is provided, since overall the global food production varies less on a year to year basis than food production in individual countries which are more likely to be affected by weather events. Therefore this insurance type of coverage is oligopolistic in nature. This is proven by the large insurance players present in this market.

Vegetation Index is calculated using NDVI Index.

NDVI is the Normalized Difference Vegetation Index:

$$NDVI = \frac{Ch\_2 - Ch\_1}{Ch\_2 + Ch\_1}$$

Where Ch_1 and Ch_2 is the infrared and red spectral measurements by satellite. Images recorded daily via satellite by NOAA. These spectral reflectances are themselves ratios of the reflected measurement over the incoming radiation in each spectral band individually; hence they take on values between 0.0 and 1.0. By design, the NDVI itself thus varies between -1.0 and +1.0.

Subsequent work has shown that the NDVI is directly related to the photosynthetic capacity and hence energy absorption of plant canopies (Myneni et al. (1995)). A spatial resolution grid of 1.1km x 1.1km is used.

Vegetation Index, VI is defined as a measure of biomass available:

$$VI_{cp} = \frac{1}{NDVI_{cp\_t=0}} - \frac{1}{NDVI_{cp}}$$

If the put becomes in the money, the premiums coming in will be reserved until the earlier of the termination date or when the option becomes out of the money again.

If these biomass inputs cannot be actively monitored, the P&L recognition can be accrual-based: as the quarterly premium comes in it will be linearly amortized over the quarter.

The eventual payout on the termination date will be booked as an additional loss.

If the biomass inputs cannot be actively monitored, the option cannot be marked to market, the revenue will be booked when the premium comes in as the net off between the pay leg and the receive leg in an interest rate swap. The receive leg will be the quarterly premium and the pay leg the drop in the vegetation index to the strike level multiplied by the notional amount. This revenue recognition method will likely cause P&L volatility if there is a loss (fat tail event), resembling the derivative to a reinsurance contract from this standpoint.

Conclusion

Obviously, a tax reduction for farms should be encouraged since the farms model of business is close to corporates, but the PERs, stock market capitalization and valuation increases through M&A have been replicated to a much lesser extent by agricultural enterprises. Meanwhile, in the actual context of global food shortages and price increases, a meaningful response from the World Bank should be tax action also rather than solely offering unsecured loans.

The US real estate price drop of the past 4 years may only alleviate the increase in total debt situation for US farms for new farms (Figure 3) as older farms are likely to sit on an important amount of real estate debt tagged as negative equity which currently since it is not either bailed out through tax deduction or otherwise, it is likely to pass through directly to food prices. Since the US is an important international food exporter thus this increased debt burden passes through to international food prices and indicates that rather than the US Government, the World Bank would be expected to focus on US farms as part of its mandate.

An idea to equitably taxing farms in order to satisfy cost benefit constraints of a historical investment return rate for farmers of 8-9% (slightly higher than the average 7% mean annual return of stock markets thus providing an incentive for investment), would be to apply a flat tax rate on their hypothetical output during the farm rates qualification period and to tax anywhere between 1 to 3% of a mean zonal production output per acre based on fertility of the land and type of crop, and allowing for reasonable untaxed accommodation quarters for farmers, rather than tax production facilities and acreage. This would encourage the farmer to obtain a higher production than everybody else, since the marginal production would be tax-free. This figure is obtained based on the removal of the direct taxes on farm property in the table below, and assuming constant productivity per acreage which provides same effective rates at a 2.5% of mean production value per acre.

Now it is understood that in the era when hedge fund managers and real estate developers spot investment opportunities that can make you rich overnight, overtaxing via estate/ inheritance tax agricultural enterprises which offer limited returns can mean exit and implicitly rural to urban migration from an industry which is typically family run for hundreds of years.

Accordingly, there are two factors necessary in determining agricultural assessments. First, a land classification system is needed to establish the different levels of land quality for which values must be determined.

Second, a base agricultural assessment value must be calculated and an agricultural assessment per acre assigned for each level of land quality designated.

To establish a uniform nationwide classification system, differences in soil productivity as per the ability of the soil to support crops production should be calculated based off soil composition.

A question arises as to the fiscal deductibility of mortgage interest. Mortgage interest would be normally excluded from the fiscal basis since the fiscal basis is the production output. Thus a fiscal bias exists since if the crops do not break even, production would cease since the fiscal basis is the production output. This constraint forces the farmer to rationalize the use of inputs in order to remain profitable and to change crops based on maximizing their market value. The deductibility of mortgage interest for ordinary real estate would thus incentify the farmer himself to revert the property classification to ordinary real estate the moment he feels he wants to rely on a non-farming income and deduct the mortgage interest from that wage base.

A cash-flow based valuation basis for farms and farming land in the range of 8-15 years the value of production is the benchmark range, since the expected duration with interest-rate sensitive prepayments of a 30 years conventional mortgage is 12 years in the US. Thus supposing that the property has been debt-funded completely, a 12 year break-even benchmark on which to gauge the profitability, should be aimed for. If the value of the assets and land cannot be amortized via the 12 year value of production benchmark, the farm becomes expensive to fund and the landowners would gain an unfair advantage over other types of investment besides unmerited social clout (i.e. see the South-American classic examples).

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