REFEREED ARTICLE

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Sustainable Land Values and Price Premiums for North American Farmland

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ABSTRACT

This paper analyses current farmland prices in five US states and five Canadian provinces to assess whether and to what extent there are current price premiums for ''irrational exuberance'' and non-farm influences such as urbanization, hobby farms, commercial development and other non-farm uses. It appears that the farmland market in North America is in a boom period, showing significant premiums for irrational exuberance. If interest rates continue to be low and commodity prices return to higher levels, these premiums could get even larger in the next few years. However, if inflation and interest rates rise while commodity prices remain lower, we may see a significant farmland price correction.

KEYWORDS: irrational exuberance; non-farm price premium; over/under valuation; valuation trend line

1. Introduction

In 2014, we saw significant price gains for stock markets and farmland in North America. The United States stock markets have averaged 4.5% total real return on investment since 1972 while US farmland has averaged 6.8% over the same period.[2] During that time period, stock markets and farmland have been over and under-valued relative to a growth value line, for varying degrees of magnitude and time. In Figure 1, the farmland over-valuation experienced in the 1975-1985 years is visible and it appears that an over-valuation may be occurring today, starting around 2010. On the Stock Market chart, the market was less volatile and somewhat stagnant from 1972 to the mid 90's, but then climbed significantly during the Dot-com craze, with a correction beginning in 2000 and carrying through the 2002 aftermath of 9-11. After 2002, stock markets were in a bull period until the 2008 financial crisis, which precipitated another large correction. After a fairly long recovery period, 2013 saw significant stock market gains and by the end of 2013, it appeared that a new plateau had been reached.

The phenomenon of over and under-valuation is very common in freely traded markets, especially in stock markets. True values are always being sought by many market participants but there is a tendency to over or under-shoot true value due to emotions such as greed and panic so corrections are necessary from time to time. Alan Greenspan, past chairman of the US Federal reserve, famously used the phrase ''irrational exuberance'' in a speech on December 5, 1996 at the beginning of the Dot-com bubble, to describe investor enthusiasm for buying and bidding up stock values, especially Dot-com stocks. This was largely interpreted at the time as a warning that the stock market may be overvalued. As can be seen in Figure 1, a large correction ensued three years later. At the end of 2013, it appeared that a stock market correction could be imminent as stock valuation multiples seemed to be at the top of the historical range, but prices did not seem to be hugely over-valued. However, by the end of 2013, US farmland prices had risen to very high levels, thought to be caused by high commodity prices and good yields, making farm cash flows very good. Also, high growth in profitability and low interest rates caused farmland valuation multiples to be higher than usual. The high cash flows combined with unusually high valuation multiples caused farmland prices to jump. It is possible that there is a certain amount of ''irrational exuberance'' built into the current farmland prices and, if so, a significant correction could occur if there is a drop in commodity prices or yields, if the sector starts to experience lower revenue and income growth, or if interest rates increase.

This paper analyses current farmland prices in five US states and five Canadian provinces to assess whether and to what extent there are current price premiums for ''irrational exuberance'' and non-farm influences such as urbanization, hobby farms, commercial development and other non-farm uses. The specific research questions are:

1. What is the current sustainable farmland value in each state and province compared to the actual observed prices;
2. For each state and province, estimate whether and to what extent there is a current price premium for ''irrational exuberance''; and

[2] US stock market returns are provided by Morgan Stanley International. US farmland returns are estimated in this study using USDA data (see methodology of this study for details).

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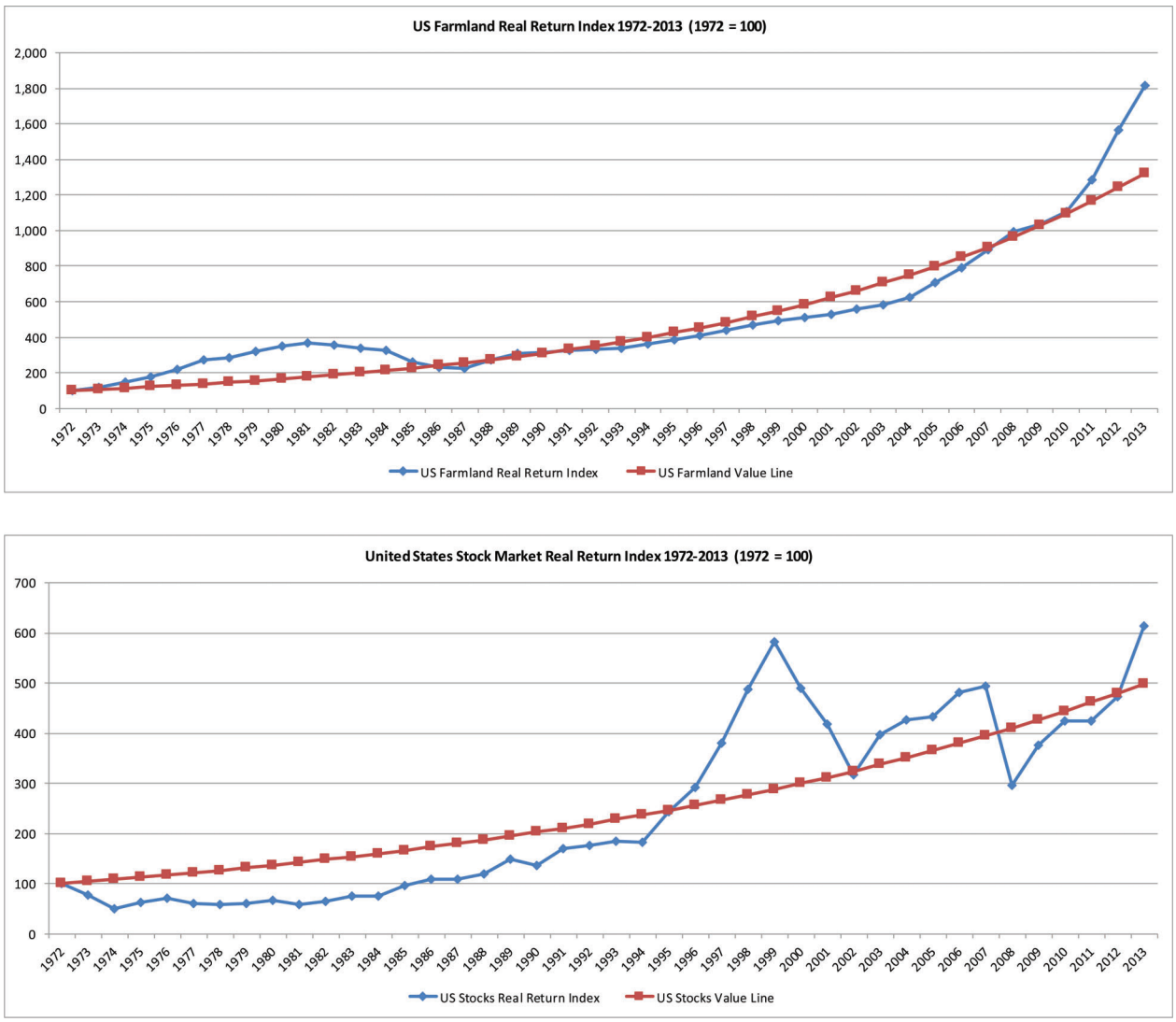

Figure 1: US stock market and farmland value growth 1972 – 2013

3. For each state and province, estimate whether and to what extent there is a current price premium for non-farm influences such as buying demand from non-farmers, where prices are not determined solely by farmland productivity.

The results illustrate and explain the price premiums for each state and province.

2. Past Research

Studies on farmland valuation by Melichar (1979) and Alston (1986) showed that farmland values could be explained using a discounted earning model. Melichar indicated the importance of estimating and including expected earnings growth as well as accounting for technological change so that a true estimate of earnings could be obtained. Alston concluded that growth in earnings, as opposed to other factors such as inflation, could explain capital gains on farmland, which supports the standard theory of valuation. Castle and Hoch (1982) indicated that valuation analysis must include expected growth in earnings and the discount rate used must not be the debt rate only but rather a risk-adjusted opportunity cost for farmland investors. Wiesensel, Schoney and Van Kooten (1988) suggested that previous years' land prices along with current farm rents explained 86% of farmland values, thereby supporting the discounted earning approach. Just and Miranowski (1993) suggested that inflation, changes in real returns on capital and farmland earnings were the major farmland value explanatory factors. Vasquez, Nelson and Hamilton (2002) found that farmland values in Idaho are largely determined by factors that affect profitability, as opposed to non-farm or urban pressures. Helmers, Shaik and Johnson (2005) found that the income capitalization approach including recent changes in land values provided a good predictor of farmland values. Painter (2008) assessed farmland values in Canada using a discounted cash flow model and found non-farm price influence in Ontario and Alberta. Overall, these past research studies suggest that farmland is valued similarly to other assets, such as stock market companies, by capitalizing future expected returns at current required rates of return.

3. Background And Methodology

The discounted cash flow valuation model

To analyse and assess the current farmland price premiums in North America, a discounted cash flow model is employed:

$$V_0 = E_0 \frac{(1+g)}{r-g} \quad (1)$$

where:
V_0 = the current estimated value of farmland;
E_0 = the expected annuity of future sustainable earnings to farmland ownership in current dollars;
g = the expected average real growth in sustainable earnings to farmland equity. In a perfect market, g would also be equivalent to the expected capital gain yield on farmland, assuming there are no influences on farmland value other than farmland earnings;
r = the real required return on equity investment in farmland, where r is a combination of the real risk-free rate of return (t-bill real rate of return) and the risk premium required by equity investors in farmland.

and,
The farmland income multiple $(\frac{V_0}{E})$ is IM $= \frac{(1+g)}{r-g}$

Substituting IM into equation (1), $V_0 = E_0$ x IM. Note that the two factors affecting the income multiple are the expected growth in future income and the required return on investment, which is a function of interest rates and farmland investment risk.

Estimating farmland yields

Farmland ownership yields are calculated annually for the 1972-2013 study period, for five Canadian provinces (Alberta, Saskatchewan, Manitoba, Ontario and Quebec) and five US states (Iowa, Illinois, Nebraska, Minnesota and Kansas).[3] In each province and state, aggregate farmland data is used to simulate a geographically diversified farmland holding. The total return to farmland ownership is divided into two parts; income return and capital gain return. The income return is based on the net lease revenue obtained from renting the farmland to farm operators. The capital gain return is the change from year to year in the market value of the land. A standard crop share approach is used where the landowner receives a percentage of the gross revenues produced. During this time period, rents were changing as North American farmers gradually adjusted to continuous cropping so for this study, the average crop share rent is 33% for 1972-80, 25% for 1980-90, and 17.5% from 1990 to 2013. The landowner is then responsible for paying property taxes and building depreciation to arrive at a net lease amount or income return. Hence, the annual income return per acre to farmland ownership is calculated as follows:

$$IR_t = LR_t - PT_t - BD_t \quad (2)$$

Where,
IR_t = $ income return to farmland per hectare in year t;
LR_t = gross lease (rent) revenue per hectare in year t;
PT_t = property taxes per hectare in year t;
BD_t = building depreciation per hectare in year t;

The annual income and capital gain yields for each province and state are calculated as follows:

$$IY_t = \frac{IR_t}{V_{t-1}} \quad (3)$$

Where;
IY_t = % income yield per hectare in year t;
IR_t = $ income return to farmland per hectare in year t;
V_{t-1} = average farmland value per hectare in year t-1.

$$CGY_t = \frac{V_t - V_{t-1}}{V_{t-1}} \quad (4)$$

Where;
CGY_t = % capital gain yield per hectare in year t;
V_t, V_{t-1} = average farmland values per hectare in years t and t-1, respectively.

Annual income and capital gain yields are calculated for each province and state, for the period 1972-2013. The annual total investment yields for each province and state are the sum of the annual income and capital gain yields, calculated as follows

$$ROI_t = \frac{IR_t}{V_{t-1}} + \frac{V_t - V_{t-1}}{V_{t-1}} \quad (5)$$

The resulting farmland ownership yields are provided in Table 1.

Table 1: Average nominal yields for Canadian and US farmland (1972 – 2013)

Farmland Asset	Income (Dividend) Yield	Capital Gain Yield	Total Investment Yield
Canada:			
Alberta	3.5%	8.0%	11.4%
Saskatchewan	4.7%	6.8%	11.4%
Manitoba	6.1%	7.3%	13.3%
Ontario	3.7%	8.0%	11.7%
Quebec	8.6%	8.7%	17.3%
Canadian Average	5.3%	7.8%	13.0%
United States:			
Iowa	4.5%	7.4%	11.8%
Illinois	2.8%	6.0%	8.8%
Nebraska	5.7%	7.1%	12.8%
Minnesota	4.9%	7.3%	12.1%
Kansas	5.5%	5.8%	11.3%
US Average	4.7%	6.7%	11.4%

4. The Price/dividend Ratio For Farmland And Stock Markets

The farmland income return (IR) is akin to the dividend income (D) received by company stockholders and hence, the farmland price to income multiple is akin to the price

[3] Canadian data sources are Statistics Canada Cansim Tables 002-0001, 0003, 0005, 0009, 0012. US data source is the USDA website: http://www.ers.usda.gov/data-products/farm-income-and-wealth-statistics.aspx#27405

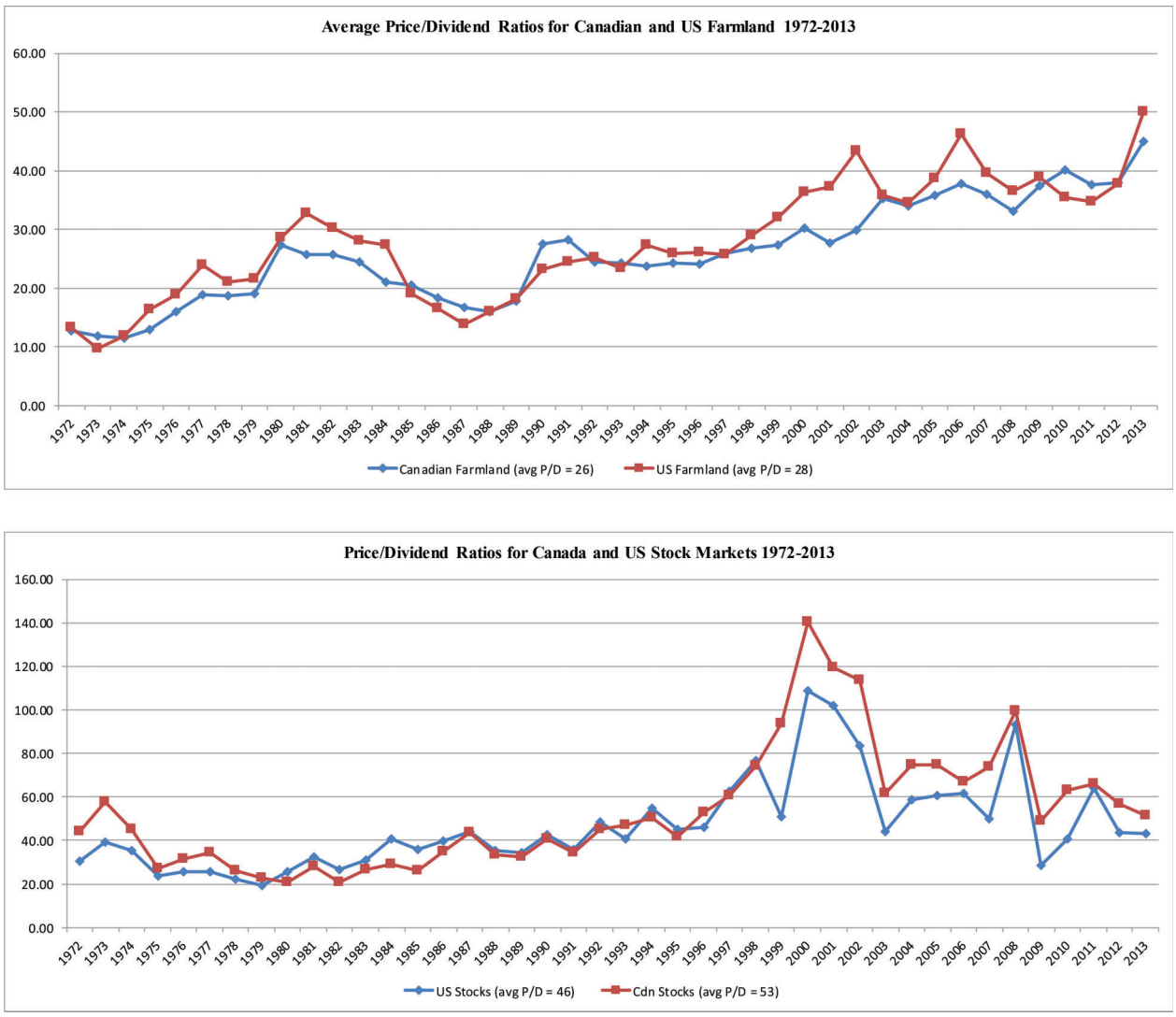

Figure 2: Price/dividend ratios for farmland and stock markets in Canada and US

to dividend (P/D) multiple in stock markets. Figure 2 compares actual P/D's for farmland and stock markets[4] for the period 1972-2013. For both farmland and stock markets the average P/D's are relatively stable, however, in both cases there are periods where the P/D's have risen above the normal (long-term average) range. Farmland price inflation in the 1975-1985 period can be explained by the increased income returns, as shown in Figure 3, as well as higher than average P/D's that investors used to value farmland. The increased farmland P/D at that time was likely a function of abnormally high income growth expectations, which is often a sign of "irrational exuberance". The Canadian and US stock market P/D's also show signs of "irrational exuberance" for the Dot-com bubble (1999-2000) and again in the run up to the 2008 financial crisis and correction. For 2013, the stock markets do not seem to be experiencing abnormally high P/D's but farmland P/D's are higher than their long-term averages, which may be contributing to a farmland price premium for "irrational exuberance".

5. Explaining The Non-farm Price Premium[5]

One of the difficulties in estimating farmland values is in isolating the impact of non-farm demand. Non-farm demand includes hobby farms, urban expansion, commercial development, and any other demands for farmland that are not for agricultural production. If non-farm demand in a province or state is significant, it will impact the provincial average farmland value, making the value greater than that supported by farmland earnings. The resulting non-farm price premium is not always supported by any measurable earnings from the land, making it difficult to assess. In the case of business and commercial use, there will be expected earnings from the commercial venture to assess but in the case of personal use, such as a hobby farm or personal residence, the buyers will not be looking for a cash flow from the land but expected future capital appreciation may be a significant factor in the purchase decision. The non-farm price premium can be explained using the discounted cash flow model, by breaking down the growth component, g,

[4] Stock market data for yields, prices and dividends is available at the Morgan Stanley website: http://www.mscibarra.com/legal/index_data_additional_terms_of_use.html?/products/indices/international_equity_indices/gimi/stdindex/performance.html

[5] This section was also explained in Painter (2008).

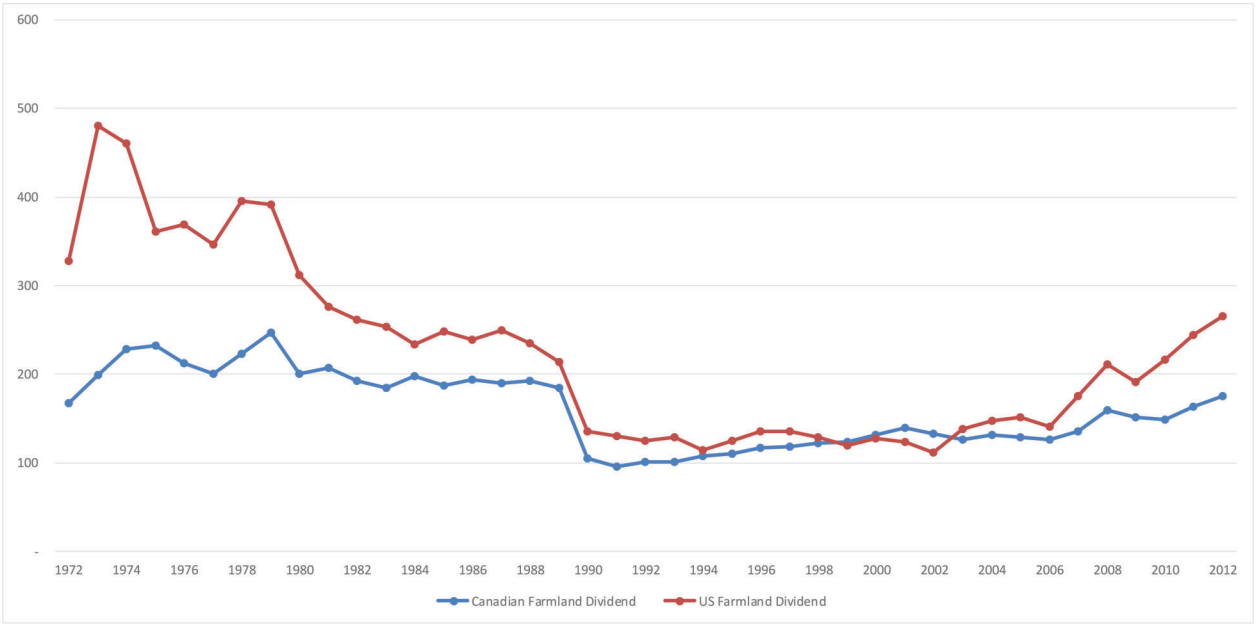

Figure 3: Average Canadian and US farmland dividends 1972-2013 (in real 2013 $/hectare)

into two parts; the expected growth in farmland value due to growth in the income return or farmland dividend (D) to owners, g_f, and the expected growth in the non-farm price premium due to non-farm demand, g_{nf}. To illustrate the breakdown of g, a numerical example is used for a farmer (as opposed to a non-farm or non-commercial buyer). Suppose D_0 is $300/hectare (net income return to the lessor), expected real growth is 1.5% and the required real return on investment is 5% annually. Applying equation (1) we get the estimate of value, as follows:

$$V_0 = D_0 \frac{(1+g)}{r-g} = (300)\text{x}(1.015)/(.05-.015)$$
$$= \$300 \text{ times P/D of } 29 = \$8,700$$

Equation (1) can be re-written as:

$$r = \frac{D_0(1+g)}{V} + g = \text{Income Yield} + \text{Capital Gain Yield}$$

Applying to the example:

$$r = \frac{300(1.015)}{8700} + .015 = 3.5\%(\text{income yield})$$
$$+ 1.5\% \text{ (CG yield)} = 5\% \text{ total yield}$$

Therefore, if the farmer paid $8,700/hectare and actually received $300/hectare income, growing at 1.5% per year, he would earn the required rate of return of 5% annually (3.5% as income yield and 1.5% from appreciating land value). $8,700/hectare is referred to as the sustainable farmland value where the expected future earnings support that value. But what if the asking price for the same farmland is $10,000/hectare? From an agricultural point of view, the asking price is too high, as indicated by the expected return on investment, r, if $10,000 is paid:

$$r = \frac{300(1.015)}{10,000} + .015 = 3.05\% \text{ (income yield)}$$
$$+ 1.5\% \text{ (CG yield)} = 4.55\% \text{ total yield}$$

The expected return on investment is too low, which should cause the market to lower the selling price to $8,700. However, if the buyer expected there would be further growth in value due to non-farm demand for the land, he may be willing to pay the $10,000 asking price. The total asking price of $10,000 can be divided into a sustainable farm price of $8,700 and a non-farm premium of $1,300. If the farm price of $8,700 can earn a return of 5% (income yield of 3.5% plus CG yield of 1.5%) then for a total yield of 5% on the asking price of $10,000, the non-farm premium of $1,300 has to appreciate by 5% per year (it also has to earn 5%). Therefore, if the buyer expected farmland earnings growth, g_f = 1.5% and additionally, growth in the non-farm price premium, g_{nf} = 5%, then the total farmland value would be $10,000. Therefore, a non-farm price premium can persist as long as there is persistent non-farm demand and growth in non-farm value.

6. Methodology For Estimating Farmland Price Premiums

The objective of this paper is to determine whether and to what extent there are current price premiums associated with North American farmland values. The analysis involves the following steps:

Step 1: Sustainable current farmland values are estimated for each province and state using past 5-year averages as estimates for future income returns in each province and state, past 20-year average real growth and risk premiums averaged over all provinces and states, and an expected future real risk free rate of 1.0%. This produces sustainable farmland P/D's of 29.2 and 30.7 (calculations are shown in the results section), for Canadian and US farmland, respectively which are then used are used to determine sustainable current farmland values.

Step 2: Optimistic farmland values are estimated using aggressive estimates of future income returns, growth and risk premiums, as happened in the 1975-1985 farmland

Table 2: Estimated North American farmland price premiums using historical income, growth and risk premium data for the period 1972 - 2013

Canada:	**Alberta**	**Saskatchewan**	**Manitoba**	**Ontario**	**Quebec**
Farmland Dividends (net lease revenue/hectare): real 2013 $/hectare					
Sustainable (past 5yr avg)	73.14	63.80	102.00	270.17	304.18
Optimistic (2013 div)	80.94	72.16	113.08	289.13	310.85
Farmland Dividend Growth: average real growth					
Sustainable (20 year average)	2.49%	2.49%	2.49%	2.49%	2.49%
Optimistic (Sust + .5%)	2.99%	2.99%	2.99%	2.99%	2.99%
Farmland Risk Premium					
30 yr average	5.0%	5.0%	5.0%	5.0%	5.0%
Real Risk-Free Rate of Interest					
Sustainable	1.0%	1.0%	1.0%	1.0%	1.0%
Optimistic	0.5%	0.5%	0.5%	0.5%	0.5%
Estimated Price/Dividend Ratios (P/D's)					
Sustainable	29.2	29.2	29.2	29.2	29.2
Optimistic	41.0	41.0	41.0	41.0	41.0
Estimated Canadian Farmland Values ($/hectare)					
Sustainable	2,136	1,863	2,978	7,889	8,882
Optimistic	3,321	2,961	4,640	11,864	12,755
Actual 2013	4,777	2,176	3,428	20,790	10,451
IE price Premium	1,185	313	450	3,975	1,569
Non-Farm Price Premium	1,456	0	0	8,926	0
United States:	**Iowa**	**Illinois**	**Nebraska**	**Minnesota**	**Kansas**
Farmland Dividends (net lease revenue/hectare): real 2013 $/hectare					
Sustainable (past 5yr avg)	344.12	235.03	157.63	257.34	118.17
Optimistic (2013 div)	367.22	209.82	162.31	299.74	116.78
Farmland Dividend Growth: average real growth					
Sustainable (20 year average)	2.56%	2.56%	2.56%	2.56%	2.56%
Optimistic (Sust + .5%)	3.06%	3.06%	3.06%	3.06%	3.06%
Farmland Risk Premium					
30 yr average	4.9%	4.9%	4.9%	4.9%	4.9%
Real Risk-Free Rate of Interest					
Sustainable	1.0%	1.0%	1.0%	1.0%	1.0%
Optimistic	0.5%	0.5%	0.5%	0.5%	0.5%
Estimated Price/Dividend Ratios (P/D's)					
Sustainable	30.7	30.7	30.7	30.7	30.7
Optimistic	44.0	44.0	44.0	44.0	44.0
Estimated US Farmland Values ($/hectare)					
Sustainable	10,567	7,217	4,840	7,902	3,629
Optimistic	16,173	9,241	7,149	13,201	5,143
Actual 2013	19,019	17,537	6,916	10,621	4,323
IE price Premium	5,607	2,024	2,076	2,719	694
Non-Farm Price Premium	2,846	8,296	0	0	0

price bubble. The farmland income return for 2013 is used as the expected future return, which for both countries is significantly higher than the past 5-year average return used for the sustainable value. An optimistic growth rate of 0.5% higher than the sustainable level in step 1 and a required rate of return of 0.5% lower than in the sustainable level in step 1 (lower risk premium) would produce optimistic farmland P/D's of 41.0 and 44.0, for Canadian and US farmland, respectively. The optimistic P/D's are applied to 2013 farmland income returns to create optimistic farmland value estimates.

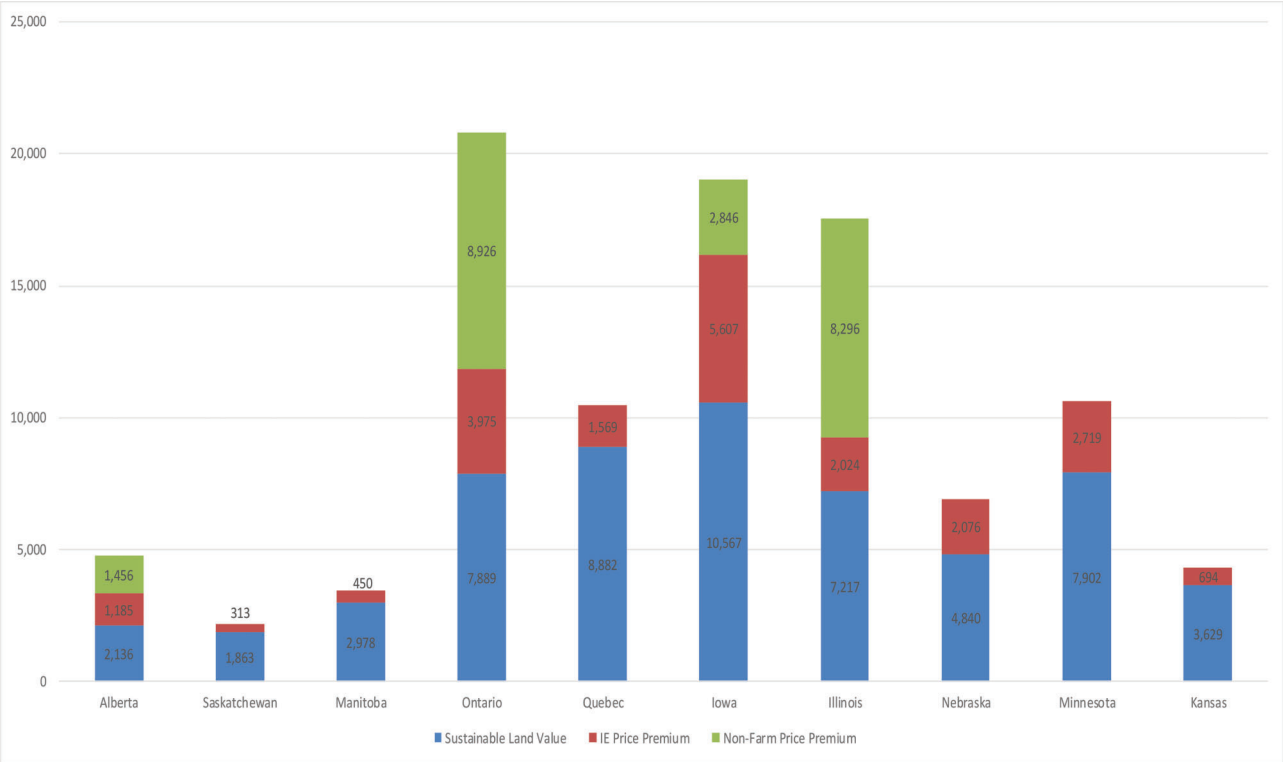

Figure 4: Sustainable land values and price premiums for North American farmland ($/hectare)

Step 3: Actual farmland prices for 2013 are compared to the sustainable and optimistic estimates. If the actual price is close to the sustainable estimate, the land is considered to be fairly valued with no price premiums. If the actual land price is greater than the sustainable estimate, especially if it is as high as the optimistic value, there is considered to be a farmland price premium for "irrational exuberance". To the extent that the current farmland price is greater than the optimistic estimate, there is also considered to be a non-farm price premium. The next section illustrates the extent to which there are price premiums for farmland in each of the Canadian provinces and US states.

7. Results: Assessing The Current Farmland Price Premiums

Table 2 provides the data analysis and results associated with calculating farmland price premiums and Figure 4 illustrates the results. Every province and state included in this study exhibits a price premium for "irrational exuberance" (IE), although some more than others, implying that North American farmland is overpriced. But by how much? The IE premium could be considered an indicator of the amount that the farmland is currently overvalued. For example, in Saskatchewan and Illinois, the IE premiums represents 14% of the 2013 stated value, while in Alberta it is 25% and Iowa is 29%, representing significant overvaluation. The implication is that if net lease revenues (dividends) fall back to average levels, interest rates and/or risk premiums rise to average levels (or at least do not decline), and growth in net lease revenues falls back to average levels, then the IE premiums will disappear and land prices will correct.

The data for this study included up to the year 2013. What has happened since the end of 2013? In Canada, farmland prices have continued to rise, with 2015 prices 23% higher than 2013, on average for the five provinces in this study. In May 2014, Michael Hoffort at Farm Credit Canada stated; "As of right now we're quite comfortable that the economics still work with what we're seeing in farmland prices," but he also cautioned that some forecasts suggest farmland prices will soften (http://www.cbc.ca/news/canada/saskatchewan/eye-popping-farmland-prices-may-have-peaked-experts-say-1.2629259). The president of Toronto-based Bonnefield, Tom Eisenhaur, said farmland has been one of the most lucrative and secure investments especially when markets are volatile, and "a better hedge against inflation than gold." Eisenhaur said he expects the price of land to continue to rise, if not at the same rate as over the past decade. (http://www.cbc.ca/news/canada/soaring-farmland-prices-a-crisis-in-the-making-don-pittis-1.2420223).

In the United States, U.S. policymakers and bankers feared a significant decline in farmland prices for 2014, but instead, they were up 8 percent as of August 1 according to the U.S. Department of Agriculture (USDA). They expect values - especially for prime farmland - to hold near record highs even though corn and soybeans are at four-year lows. The reason? Farming families have money from recent boom years to invest into assets they think give long-term value. (http://www.reuters.com/article/2014/09/07/usa-farmland-values-idUSL3N0R565R20140907). US Farmland prices in 2015 for the five states in this study, were up an average of 9% over 2013 prices.

It appears that the farmland market in North America is in a boom period. If interest rates continue to be low and commodity prices return to higher levels, these premiums could get even larger in the next few years.

However, if inflation and interest rates rise while commodity prices trend lower, we may see a significant farmland price correction.

About the author

Marvin J. Painter teaches entrepreneurship and has been involved in consulting projects that include business plans, feasibility studies for agribusiness ventures and farmland and business valuations both for forensic and investment purposes.

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