Financing Growth of Cellulosic Ethanol

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The U.S. biofuel industry is striving to produce ethanol from cellulosic feedstock sources in an effort to augment its existing corn grain-based ethanol production infrastructure. Technology to commercially produce cellulosic ethanol is rapidly advancing due in large part to the availability of substancial federal research and development funding. The most recent round grant funding awarded 10 grants totaling more than $10 million to accelerate fundamental research in the development of cellulosic biofuels. (USDA, 2008). At the moment, several firms have pilot scale cellulosic ethanol production facilities under construction and testing.

The transition from pilot scale to full commercialization of cellulosic ethanol will be difficult, due in large part financial constraints being imposed both internally and externally on the biofuels industry. This paper provides an overview of the biofuel industry's current financial setting and describes future challenges it faces in attempting to expand. These challenges are rooted in lack of industry capital, limited availability of performance benchmarks, concerns regarding future prospects of the industry, and general uncertainty in U.S. financial markets. If the U.S. biofuels industry is unable to capitalize and develop this next phase of growth, foreign competitors, primarily Brazil and Mexico, appear well positioned to fill U.S. consumer's demand for advanced biofuels.

Background

In 2005, the U.S. established ambitious goals for production of ethanol and other biofuels with passage of the Renewable Fuel Standard (RFS) as part of the Energy Policy Act of 2005 (H.R.2)[1]. This legislation set a national goal of increasing the volume of renewable fuel required to be blended into gasoline of 7.5 billion gallons by 2012. To achieve this goal, a number of tax credits including $0.51/gal. of ethanol blended, a $0.54 tariff on imported ethanol and other incentives stimulating both ethanol supply and demand were provided. Many states also provided incentives and mandates to complement the new federal legislation.

Following passage of this legislation, investment in new corn grain ethanol facilities skyrocketed. Production capacity in 2005 totaled 3.9 bil. gal. (Renewable Fuel Association). In 2008, production is expected to exceed 9 bil. gal, surpassing the original RFS goal nearly four years early.

In addition to favorable federal legislation, several positive economic factors contributed to rapid growth of the corn grain ethanol industry. First, national corn prices averaged $2.00/bu. (USDA/NASS, 2008), relatively low compared to both historical and current levels. Moreover, oil prices were continuing to increase due to rising domestic and foreign demand coupled with stagnating increases in supply (Hamilton, J., 2008). Consequently, ethanol plant profit margins were very positive enabling many plants to repay their debt financing ahead of schedule and profit from larger than expected returns to equity investors. The strong financial performance of the industry caught the attention of Wall Street investors. In Oct. 2007, the Wall Street Journal reported that over $3 billion has flowed from Wall Street investors to rural

[1] For brevity, the rest of this paper will focus on ethanol. Comments made generally apply to other biofuels as well.

America. This inflow of funds created new economic activity in rural areas of the economy that were previously quite stressed.

The final important economic factor leading to rapid expansion of the industry was ready access to current technology as well as the availability of production standards. When investors were evaluating potential construction of a new corn grain ethanol production facility, they could be assured that the plant would produce at the name plate capacity. In additional, the supply chain and risk management support provided as part of the comprehensive investment package yielded attractive, but more importantly, stable returns. Consequently, replication of ethanol plant facilities rapidly advanced across the country, further heightening investor expectations.

In addition to investors, rural communities benefited from both the economic activity associated with construction as well as on-going revenue enhancement from operations. Urbanchuk (2008) estimated a direct increase of $1.3 billion in state and local tax revenues attributable to the biofuel industry. These additional revenues have been invaluable to cash-strapped rural communities who face both population declines as well increasing federal and state mandates.

While many original ethanol producing facilities were organized and financed by local investors and cooperatives, the growth of external finance has changed the local economic impact of these firms. Swenson and Eathington (2008) find that for each one percent reduction in ethanol plant ownership, one less job is created in a local community. Rather than patronize local firms and hire people from the surrounding region, externally owned plants purchase items from national suppliers and bring in people with experience working on previous projects.

Current Financial Situation

Figure 1 shows historical ethanol plant margins compiled by ProExporter. Ethanol plant margin is defined as residual returns after all costs are subtracted from available revenues. The data illustrate the growth of investment returns from 2002 to mid-2006. At peak profitability investment returns spiked to over $2.25 per gallon. At the time, plant investment costs hovered around $1.00 per gallon. Consequently, investors at the time could rapidly recover their original investment and earn substantial returns.

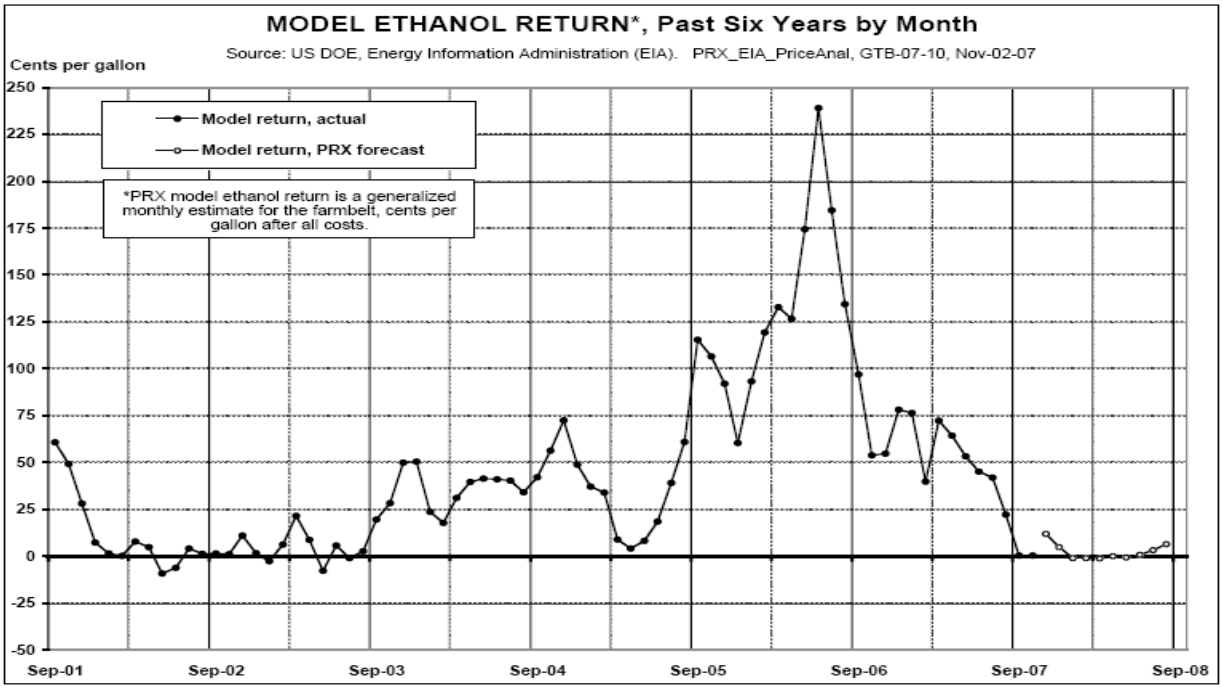

Fig. 1 Ethanol Plant Margins

Since mid-2006 though, ethanol plant margins have steadily deteriorated. Ethanol prices have declined as the increasing number of plants entering the industry have expanded supply. Larger supplies of ethanol have pressured ethanol prices because demand has not risen commensurately. Likewise, the greater number of plants have bid up corn feedstock costs which in turn has raised costs of production and lowered profitability. The effects of both changes have resulted in ethanol plant margins being driven to near zero. When plant margins approach zero in any industry, the point is reached where existing firms continue to operate at breakeven levels, but new firms are not encouraged to enter. Consequently, external financial capital now has limited interest in the industry.

Share prices of publically traded ethanol firms have declined in tandem with falling margins. Fig. 2 illustrates the negative trend in Verasun Energy Corporation's stock price. Verasun's current stock price is approximately one-tenth of its peak value. This decline in firm value makes attraction of additional capital and expansion difficult. However, declining share prices have minimal impact on firm operations – more important are operating margins.

One must remember that existing firms in the industry have differing financial characteristics and profitability as they were constructed at different times, face varying input and product price opportunities and have made diverse strategic and risk management decisions.

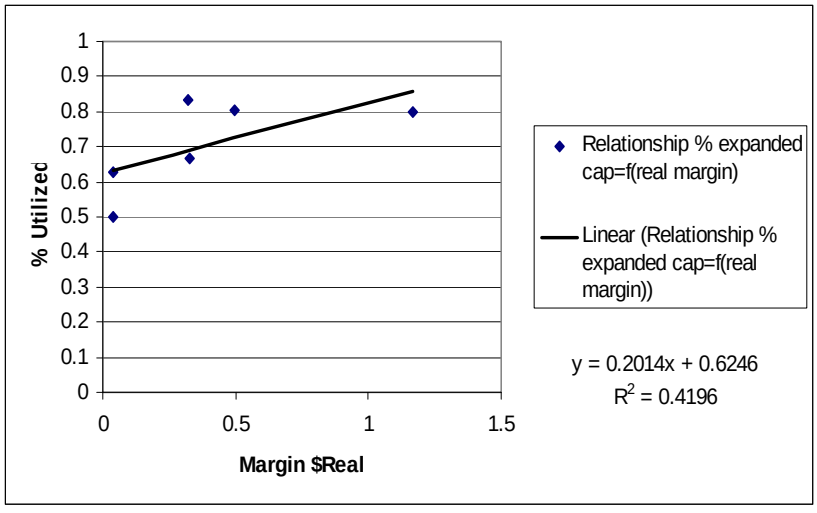

Fig. 3 Ethanol Plant Margin vs. Capacity Utilization

Therefore, at any one time some firms are likely to be quite profitable, even in less than favorable economic climates while others will struggle in the best of times. Figure 3 shows that some firms will be idle even at high profit margins (Wilson, 2008). At presently low margins, capacity utilization declines to only 62 percent. Again, new firms have minimal incentive to enter industry.

In addition to margin pressures, several other industry forces are discouraging further investment in new corn grain ethanol facilities. First, construction costs for erecting a new plant have doubled since passage of the original RFS. Current construction costs exceed $2 per gallon of capacity (DeVos, 2007). Second, tax credits underpinning growth of the industry are not certain. Most were scheduled to expire at the end of 2010. However, recently passed Emergency Economic Stabilization Act (EESA) extends these tax provisions 1-2 years. Although helpful, this extension is of minimal value to prospective investors because they desire great certainty and assurances that tax benefits will continue over the lifespan of their project. Third, the general public has raised new concerns regarding environmental impacts and resource demands, especially water, associated with ethanol plant operations, and competition with available food supplies. Fourth, DeVos (2007) carefully describes limitations of existing credit programs designed to facilitate industry expansion. As individual ethanol plants increase in physical size and capacity, size restrictions placed in legislative provisions constrain their usefulness to plant operators and investors. Finally, one of the most important factors is the rapid availability of new ethanol plant technology following large federal investments in research and development. Essentially, new construction of corn grain ethanol plants has stalled as investors wait for the availability of next generation cellulosic ethanol plants.

In a commodity market, which both ethanol and corn are, firms must be low cost producers in order to compete. Consequently, they most quickly adopt innovations which either increase revenues or lower costs. In addition to potential adoption of new cellulosic feedstock technology, the industry is striving to adopt new fractionation and gasification technology. Fractionation is a process whereby incoming feedstock is separated into component parts prior to entering fermenation. As a result, the enriched input provides a higher conversion rate which expands plant capacity (e.g. less waste material needs to be handled). In addition, Gustafson, et al. (2008) find that fractionation can also quicken fermentation which improves throughput, again increasing capacity. Gustafson, et al. also find that the value of co-products increases with fractionation. Since not all starch is fermented, the higher quality input results in higher quality co-products. Finally, the other fraction, which is typically a higher protein or oil based product provides a new additional revenue stream. Gasification enables an ethanol plant to either gasify a waste product or lower cost feedstock for plant heat.

While investor interest in new projects is at a temporary lull, the overall health of the industry remains positive. AgCountry, a regional Farm Credit System lender, has financed 44 ethanol plants or one-fourth of the country's industry through direct loans, participations, and securitization. As of Sept. 2008, only 3 plants were under "watch" due to poor financial health, and only one plant was "a concern" (DeVos, 2008). However, the last plant's situation is not dire, and AgCountry does not expect to lose any portion of credit that they have extended to the firm.

Collapse of International Credit Markets

The most recent development impacting financial health of the ethanol industry is the collapse of international credit markets. Given slim industry margins and other factors prevailing in the corn grain ethanol industry's notably cool investment climate, financing for either new ethanol plants or major expansion projects was virtually nonexistant prior to the collapse. Therefore, the actual collapse of international financial markets has had a minimal effect on industry expansion.

Likewise, existing biofuel plants have only been "bruised" by the collapse given the large impact seasonality has on the industry. Due to the seasonality of feedstock supply most agribusinesses negotiate their credit arrangements prior to the harvest season when input supply purchases begin. They start by forecasting peak operating credit need for the coming year (fig. 4).

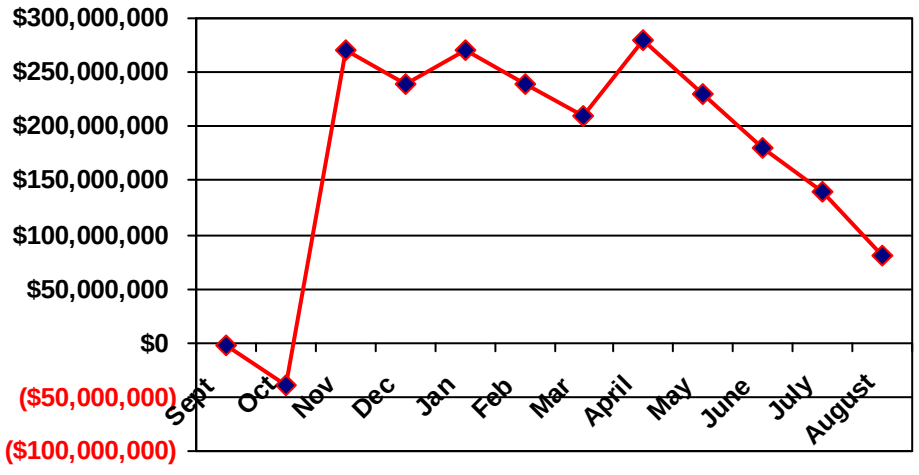

Fig. 4 Agribusiness Seasonal Credit Need

In this example, the firm's fiscal year begins Sept. 1st. With some produce left to sell from the previous fiscal year, they start with a small surplus. However, when feedstock purchases begin in mid- October, their seasonal credit needs escalate to a point in April when a maximum of $280 million is required. To finance this need, the firm obtains either a letter of credit or revolving loan from a lender. Given the

magnitude of the credit request, the lender will partner with other creditors and develop either a participation or securitization instrument[2]. Larger agribusinesses, typically pay a fee to obtain this line of credit, but usually do not expect to draw upon available funds. In essence annual letters of credit serve as a safety net and signify creditworthiness that permit large agribusiness to borrow less expensive credit in commercial paper markets. Credit obtained through commercial paper is lower cost, otherwise firms would simply draw on existing letters of credit. When national credit and commercial paper markets dried up in fall 2008, large ethanol plants had backup sources of credit (their existing formal letters of credit), albeit at higher cost. Therefore, when commercial paper financing was unavailable, plant operations could continue and firms drew upon letters of credit, lowering firm profitability. Smaller firms precluded from commercial paper markets due to size, were already drawing upon existing lines of credit. Firms most impacted by the collapse were those that delayed negotiating letters of credit. They did so in an attempt to lock in lower rates in an environment of declining interest rates due to favorable monetary policy and lower credit demand. However, they found their situation problematic as lenders had difficulty forging participation and securitization agreements.

The EEAS provides the biofuel industry with a number of beneficial tax provisions. Many existing biofuel tax provisions are extended for another 1-2 years, as mentioned above. An important new addition is that cellulosic biofuel plants are now eligible for a 50 percent tax credit. The cellulosic biofuel industry is on the verge of becoming commercially viable in the next couple of years. Rising construction costs are an important constraint to commercialization. Due to their complexity and additional equipment requirements, cellulosic biofuel plants are nearly twice as expensive as corn ethanol plants ($4 compared with $2 per gallon of capacity), Devos (2007). The new cellulosic tax provision reduces construction costs of a new cellulosic plant, placing it nearly on par with existing corn grain ethanol plants. Several pilot scale facilities are operational, and construction of commercial scale plants are expected in the near future if test runs are positive.

The 2008 EESA also provides an important glimpse into growth of the U.S. carbon market. U.S. citizens are becoming more concerned about global warming, climate change, greenhouse gas emissions and carbon. Therefore, it is central to the development of recent biofuels legislation. In addition, California, Florida and Massachusetts have passed state legislation lowering the carbon intensity of their liquid transportation fuels. It is quite likely that biofuels created with low carbon release processes will command a premium in the market place.

However, the economic value of carbon has been difficult to determine.The trading of carbon on the Chicago Climate Exchange has been somewhat thin. The federal government continues to discuss how national carbon values will be determined and controlled. One scheme being widely debated is “cap and trade.”

In the 2008 EESA, the legislation provides a $10 credit per ton for the first 75 million metric tons of carbon dioxide captured and transported from an industrial source for use in enhanced oil recovery and $20 credit per ton for carbon dioxide captured and transported from an industrial source for permanent storage in a geologic formation. Budget staff expects that more than $1.1 billion will be spent in the next decade. With publication of these values in the legislation, we now have a guidepost for establishing carbon values in the future. The biofuels industry will have an important benchmark for valuing carbon when new investment budgets are constructed. Inclusion of carbon credits in financial budgets will directly enhance both ethanol plant profitability and investment prospects.

Financing Next Generation Biofuel Plants

While financial growth of the corn grain biofuel industry has been relatively straightforward to

[2] In a participation, the lead lender has primary contact with creditor who services the loan. Under securitization, all lenders have direct contact and service responsibility, although shares and involvment may not be equal.

document and track, defining financial prospects for the biofuels next stage of growth, primarily into cellulosic and other advanced biofuels outlined in EISA, is not as transparent. Several key uncertainties at the firm financial, industry, and capital market level cloud the investment horizon.

Issue 1 - Lack of Capital

Only a handful of lenders across the country have actively provided credit to the biofuels industry. Most notable is First National Bank of Omaha. The portfolios of these lenders are saturated (DeVos, 2008). New suppliers of credit will be required to foster additional growth of the industry.

Likewise, existing ethanol firms have limited credit reserves. Most ethanol credit arrangements have covenants which dictate terms of credit advancement and other loan performance behavior. Most onerous of these is the imposition of "sweeps". Sweeps were imposed during the industry's boom period. They are designed to accelerate repayment of principal and interest during periods of high profitability. In essence, both lenders and equity holders share in the prosperity and overall lending risks are reduced. However, imposition of sweeps constrains equity future growth as firms never get the chance to build equity reserves. Now when the industry is experiencing marginal profitability but requires significant capital to adopt new technology, firms have only modest equity to form a new borrowing base. This is especially problematic with new technology is four times as expensive as previous investment costs, although passage of EESA tax credits is helpful (DeVos, 2007).

Issue 2 - Industry Uncertainty

Biofuel plants of the future will likely utilize a wide variety of feedstocks and conversion technologies, given the breadth of current research projects under study. As a result, there is likely to be wide variation in plant size and performance. Investors are going to have difficulty evaluating new proposals if industry performance benchmarks are unavailable. Recall growth of the industry to this point was fostered by widely available performance standards that enabled replication of corn ethanol plants across the countryside.

While federal tax credits have been extended for 1-2 years, uncertainty still surrounds their long term availability – especially in our country's present financial predicament. Passage of long-term provisions would alleviate investor concerns.

In addition, implementation of 2007 EISA, especially definition of the process for trading of RINs, is still under development (Meyer, 2008). Specification of the RIN trading process is required to establish and value low carbon fuels. Premiums commanded by these fuels will be a key determinant of future cellulosic plant profitability. As mentioned earlier, market values of carbon are not readily transparent and tradable. Consequently, investors are reluctant to advance equity funds until these values can be capitalized.

Finally, a gap exists between producer costs for biomass collection and a cellulosic plant's ability to pay for feedstock supplied – without any consideration of transportation cost. Bangsund, et al. (2008), and Epplin (2008). While $30-40/t cost is usually budgeted as a feedstock cost in an cellulosic ethanol feasibility study, producer supply costs are typically double that value.

Issue 3 - Wall Street Turmoil

As this is being written, the extent of fallout from the collapse of Wall Street financial markets is unknown. Given what has already occurred, coupled with passage of the $700 billion package of assistance in EESA, our nation's economy and credit markets will be affected for some time. At the recent meeting of NC1014: Agricultural and Rural Finance Markets in Transition, Thomas Hoening, president, Federal Reserve Bank of Kansas City indicated that economic performance of our country maybe subdued for the next decade. When financial market crisis have recently afflicted other countries, namely Japan and Sweden, it took nearly a decade to restore investor wealth to pre-existing levels. Throughout the recovery period, investors were hesitant and capital availability was constrained

While the length of recovery can be debated, slower economic performance translates into lower demand for products. Now that the U.S. financial crisis has affected other countries spanning the globe, worldwide demand for oil is likely to decline. After closing NYMEX futures closed at $77.70/barrel on Friday, Oct. 10, 2008 prices for light sweet Texas crude oil are nearly one-half of their high last July. Consequently, prices of other liquid petroleum products have dropped as well, lowering future profitability of all biofuel plants.

Finally, given worldwide turmoil in financial markets, investors are driving up the exchange value of the U.S. dollar in a "flight to quality". Given that the U.S. was the original source of the turmoil and real investor returns have been lowered following expansionary monetary policy, a decline in the dollar's exchange rate would have been expected. However, given that financial market problems are of similar concern worldwide, investors have sought out U.S. securities and view them as most stable.

With a rising exchange value of the U.S. dollar, exports become less affordable overseas. Since a large proportion of agricultural commodities are exported, and are now in less demand, commodity prices have softened. Therefore, ethanol plants are striving to devise risk management plans in an environment when both input and output prices are rapidly declining. Increasing attention to margin protection will likely result. Nevertheless, investors will need assurance that newly devised margin risk management schemes will protect biofuel plant profitability and repayment capacity in whatever economic climate eventually unfolds.

If the investment pace in next generation biofuel plants slows, it appears that South American and Mexican firms are ready to fill the supply void in meeting 2007 EESA projections. Recently announced intentions include:

- ApexBrasil/Unica, $10 million promotion campaign
- Grupo Santos, $12 billion, 60 sugarcane plants
- BP, $60 million sugar to ethanol plant, Gaois, Brazil
- Bunge and Itochu ink Sugar-Ethanol JV in Brazil

Construction of these facilities would rapidly assist the U.S. in meeting its goal of producing 36 bgy of renewable energy.

Conclusion

The corn grain ethanol industry experienced rapid growth from 2005-07. U.S. financial markets obliged and supplied credit at reasonable cost and terms which facilitated this expansion. Now, the biofuel industry is being asked to nearly triple production under recently passed federal legislation, 2007 EESA.

However, the status of U.S. financial markets is in question. Both existing first generation and prospective next generation biofuel plants are demanding a large influx of capital to support adoption of new technological innovations. First generation plants require the innovations to remain low cost producers in highly competitive commodity markets. Second generation plants seek innovations to commercialize the production of cellulosic and advanced biofuels. In either case, the ability of financial markets to supply needed credit is unclear due to impediments that have reduced the borrowing capacity of biofuel firms; uncertainty surrounding future industry performance benchmarks, tax provisions, and implementation of current biofuel legislation; and the need for new risk management strategies which protect firm margins in volatile economic times.

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