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ABSTRACT

This note addresses the issue of countercyclical strategies in the beef-cattle industry. It also attempts to clarify and comment on several issues raised by Hamilton and Kastens (2000) in their article entitled "Does Market Timing Contribute to the Cattle Cycle?"
MARKET TIMING AND THE CATTLE CYCLE: 
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1 Introduction

Recent research related to the supply of cattle has greatly furthered our understanding of the cycle in aggregate cattle numbers. Yet, despite these gains, researchers and cattle producers continue to debate whether it is possible for producers to profit by using the regular nature of the cattle cycle to act countercyclically or “time the market.” In academic circles, some research indicates that there are profits to be made from a countercyclical strategy while other research suggests there are not. For instance, Rosen et al. (1994) build a dynamic, rational expectations model of the cattle industry where there is no possibility to increase profits by acting countercyclically. Trapp (1986), on the other hand, indicates the optimal strategy is to time the market by building up herds on the upside of the cycle and reduce herd sizes on the downside of the cycle. In non-academic settings, the message sent to producers tends to be one advocating countercyclical behavior, although it is unclear whether producers are following their advice. Beale et al. (1983) in a USDA report entitled “Cattle Cycles: How to Profit From Them,” strongly advocate that producers develop management strategies over the cattle cycle and offer explicit instructions on how to do so. In trade publications, such as the Western Livestock Journal (WLJ), the message to ranchers is frequently one in support of timing the market (e.g., the April 3, 2000 Market Advisor column in the WLJ).

This note addresses the issue of countercyclical strategies in the beef-cattle industry and also attempts to clarify and comment on several issues raised by Stephen Hamilton and Terry Kastens in their February 2000 article in this journal entitled, "Does Market Timing Contribute to the Cattle Cycle?" The primary contribution of their paper is to show that "market timing" is an important determinant of the cattle cycle. In their words, market timing is defined as the "incentive . . . to deviate from the aggregate movement of the cycle by behaving 'countercyclically'." This incentive arises because "a competitive producer views aggregate output to be independent of his or her own output choice." They state that an implication of market timing is that the representative producer (i.e., one who acts cyclically by adjusting inventories to follow the aggregate cattle cycle) will perform worse

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than a producer following a constant-inventory strategy if changes in cattle prices are due to the "market-timing" effect rather than due to cycles caused by exogenous factors. They then use this implication to test for (and ultimately find evidence in favor of) market-timing effects by simulating returns for a hypothetical producer using both strategies.

We center our discussion around two questions. First, under what theoretical conditions will a market-timing effect exist and how should it be incorporated into a model of the cattle cycle? And second, what can we learn about the likelihood of successful market timing from a simple analysis of aggregate US cattle data? With regards to the second question, we offer evidence regarding the relationship (or lack thereof) between the cycles in cattle stocks and prices and use it to suggest that cattle producers may be acting rationally by *not* timing the market.

### 2 Market Timing and Theory

How should market timing be incorporated into a theoretical model of cattle supply? One thing that is clear is that countercyclical behavior cannot occur unless there is heterogeneity across producers. If all producers are identical, then they must all be behaving the same in a symmetric equilibrium, which means by definition they will be acting procyclically. Put differently, with identical agents and constant returns to scale, a model of cattle supply can be simplified by considering only a single representative producer, who will respond to exogenous shocks in a manner which in turn produces the cattle cycle. There is no reason for any individual producer to "time the market" because they are responding to exactly the same incentives and have the same information set as all other producers.

Hamilton and Kastens (2000) introduce the possibility that an atomistic producer may benefit from choosing a different strategy than the representative producer. In their analysis, it is therefore implicit that countercyclical producers must be different than the majority of producers—either through their objectives or constraints. Then in response to an exogenous shock in the cattle industry (e.g., change in beef demand or production costs), the
majority of producers will respond in a procyclical fashion (in essence, producing the cattle cycle), and then taking that as given, other producers may choose to respond to the same shock by going against the cycle (i.e., behaving countercyclically). While we believe this to be the gist of Hamilton and Kastens' argument, at times, their statements and methodology blur the message.

First, they differentiate between two influences on the cattle cycle: "an exogenous shock effect that shifts the demand function, itself, and a market timing effect that represents the ... movement along a particular, dynamically stable demand function." In fact, any movement along a stable demand function would itself be due to some exogenous shock that caused the aggregate cattle supply function to shift. Therefore, it is a bit misleading to refer to one influence as an exogenous shock effect and the other as a market timing effect. To the extent each is possible, they are both effects generated by exogenous shocks. And second, the effect of market timing on the cattle cycle is not clearly characterized. Hamilton and Kastens test for the possibility of a market timing effect and claim to find one, but do not discuss the quantitative impacts of such an effect on the cattle cycle. They claim that their results indicate "that the market timing effect has an important influence on the determination of the various phases of expansion and contraction in the cattle cycle." While we suspect that countercyclical behavior may be an important influence on the cattle cycle, their article leaves us wondering exactly how market timing affects the cattle cycle. To describe exactly how market timing affects the cattle cycle, a complete model of the cattle cycle with heterogenous producers is necessary, such that some producers would react in one fashion (e.g., procyclically) to the shock and others respond in another fashion (e.g., countercyclically).

1In certain types of models, there is the possibility of endogenous fluctuations or sunspots to show up in the equilibrium solution. They are, however, ruled out for the class of models considered by Hamilton and Kastens (2000).
3 Market Timing and the Data

In order for a countercyclical production strategy to be feasible, the location of future prices within the cattle cycle must be at least somewhat predictable. However, the empirical evidence regarding the nature and existence of cycles in cattle prices is mixed. Rosen et al. (1994) state that "cycles in price and consumption ... are not observed." Mathews et al. (1999) state that "cattle prices also fluctuate during cattle cycles, but have their own patterns, somewhat but not perfectly correlated with cattle inventories." In other writings, one gets the sense that there is a regular price cycle, which is the mirror image of the cattle stock cycle. This is seen most clearly in trade and professional publications, and to a lesser degree, in some academic publications. For example, Hughes (2000) writes in the Market Advisor of the WLJ that "the key to developing profitable heifer retention lies in the U-shaped price cycle. The 10-year cattle cycle causes 10-year beef price cycles." Beale et al. (1983) write that "a conscientious cowboy or rancher can conquer the ... price cycle." Rucker et al. (1984) state that "after all, the cyclical behavior of cattle prices has prevailed for a century and with considerable predictability." Mundlak and Huang (1995) write that "spectral decompositions ... show the existence of cycles having surprising regularity for all the four time series [including prices]."

In Figure 1, we superimpose a plot of aggregate US calf numbers on the real price of calves (deflated by the consumer price index, 1967 = 100) over the period 1930 - 1997.2 The stock of calves (represented by the dashed line) in Figure 1 clearly exhibits a regular cyclical pattern with a period of approximately ten years. This is the well-known cattle cycle. Cattle prices (represented by the solid line) also appear to display a cyclical pattern, although much less regular. It is clear that cattle prices are not the mirror image of cattle inventories. Although there are periods such as 1954, 1959 and 1979 where peaks (troughs) in cattle numbers correspond approximately to troughs (peaks) in cattle prices, there are other periods such as 1943, 1973 and 1986 where the opposite is true. This is, however,

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2 We focus on the stock and prices for calves to simplify the presentation. An analysis of cows and heifers provided similar results.
exactly what one would expect in a market subject to periodic demand and supply shocks. Only in the case where demand is dynamically stable and aggregate supply is continually shifting should we expect to observe prices cycles that are mirror images of stocks. In fact, the simple correlation between the calf stock and real calf prices is -0.506, which does indicate a significant inverse relationship between the two, although it is as equally close to zero as to one.³

What does all this imply about the possibility of a producer adopting a countercyclical strategy? We suggest that it may indeed be rational for a risk-averse producer to not attempt to time the market. To be successful in a countercyclical strategy, producers need to be able to forecast with a reasonable degree of certainty, the future path of prices during a cattle cycle. This is difficult for a couple of reasons. First, every stock cycle is different. Although stock cycles are fairly regular with an approximate ten-year period on average, some cycles are as long as 15 years (e.g., 1980 peak to 1995 peak) and some are as short as six years (e.g., 1974 peak to 1980 peak). Second, ranchers are constantly posed with a nontrivial identification problem. Supply and demand shocks are continuously hitting the market and, for a countercyclical strategy to be successful, they need to infer whether cattle prices are going to mirror the stock cycle or not.

Another way of making this point is to examine the accuracy of out-of-sample price forecasts based only on current and past information. Using data from 1930 through 1985, we estimated an unrestricted bivariate vector autoregression using the (detrended) stock and real price for calves.⁴ Then we calculated out-of-sample forecasts for the calf stock and calf prices for the period 1986 through 1997 and contrasted them with the actual series. The actual and forecasted prices for calves are displayed in Figure 2. Think of a typical producer in 1985 who is considering a countercyclical strategy. Based on the given forecasts, the producer expects that prices will reach a peak in 1987, begin to decline and

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³Before calculating the simple correlation coefficient, the series were detrended using the Hodrick Prescott filter. See Mundlak and Huang (1995) for more details.

⁴We recognize that we are only using a small portion of the information available to producers, but do not think that it is entirely unreasonable to think that when producers forecast future calf prices that they focus most acutely on the historical pattern of the calf stock and calf prices.
reach a low point in 1992, and then rise again until reaching another peak in 1996. Using a countercyclical strategy, the producer would elect to sell a higher than average numbers of heifer calves and/or cows during the period of relatively high expected prices (1986-89), then begin to retain and/or purchase heifers during the period of relatively low expected prices (1990-94), and then sell the higher than average number of calves during the ensuing peak period (1995-97). Clearly this strategy would not bring about the returns expected – the producer would be purchasing and/or foregoing the sale of females during a period (1990-94) when prices were at or near the peak of a price cycle and would be selling a larger than average number of calves during a period (1995-97) when prices were at an historical low.

In this note, we are not advocating any particular management strategy for producers over the cattle cycle. Rather, we are simply pointing out that cattle prices do not follow a regular cycle that mirrors the regular cycle in cattle stocks. This is due to the concurrence of supply and demand shocks over time in the cattle market. As a result, producers who do not adopt countercyclical management strategies may not be acting irrationally. However, at the same time, there is a weak cycle in cattle prices and some producers may attempt to forecast future prices and time the market. To capture and quantify market-timing effects on cattle dynamics within a theoretical model of cattle supply (such as that in Rosen et al., 1994) will require the introduction of rancher heterogeneity. We know of no such published research but believe that it would be a valuable contribution and would shed some light on the ongoing debate over countercyclical behavior in the cattle market.
References


Figure 1. Calf Stock vs. Real Calf Prices
Figure 2. Actual vs. Forecasted Real Calf Prices

- Real Calf Price
- Forecasted Price
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