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Changes in the Farm Price of Milk Over the Last 100 Years

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For dairy farmers and others familiar with the dairy sector, it goes without saying that the current low price situation for farmers is among the worst, if not THE worst, in their memory. USDA has been collecting milk price data on a monthly basis since 1910. This brief paper simply shares a basic description of these data.

Some Caveats About the Data

Milk prices can be presented in a variety of ways. The so-called All Milk Price represents the weighted average of the prices paid by handlers of first receipt (processors) for any grade of milk (Grade A, Grade B, or ungraded). Today, virtually all milk produced is Grade A or Fluid Grade, but it was not so many years ago that the All Milk price was notably lower than the Grade A price, which is also routinely reported.

The All Milk price is perhaps the variable that best answers the question "how much do farmers get for milk" using data that are readily available and broadly applicable to the US.

This variable is FOB the plant, hence it does not subtract out transportation costs from the farm to the plant, promotion assessments, cooperative dues, or any other variable that might be considered a marketing cost. Thus, the All Milk price is higher, and probably significantly higher than what is typically called the Mailbox Price.

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The All Milk price does include any premiums paid by the processor (or deductions); so the All Milk price will typically be higher than the Statistical Uniform Price or Blend Price that is announced by a Federal or State milk marketing order.

The data presented here are nominal prices; that is, they are not adjusted for inflation. Of course, inflation is a huge factor when looking at prices over a 100-year span.   Rather than attempt to adjust these prices, which requires deciding what measure of inflation to use, the data are described in relative month-to-month changes, as well as the absolute change between months.

The US Average Price for All Milk, by Month, 1910 to 2009

Figure 1 is simply a graph of the monthly prices reported by the US Department of Agriculture. Many things could be said to describe these data and many more to explain the trends and ups and downs. The latter is not the purpose of this paper nor do we want to get carried away with a lot of detailed description.

A few things pop out regarding the basic patterns of this price over time. First, it is clear that inflation was not a particular notable factor before 1970. The run-up in prices around 1918 and 1946 were effects of the two World Wars. The decline in the early 1930s was related to the broad price deflation of the Great Depression.   It wasn't until the 1970s, with the US effects of large deficit spending related to the Vietnam War and the global effects of aggressive price setting activities of a young Organization of Petroleum Exporting Countries, that we became accustomed to prices increasing each year more for monetary reasons than for any fundamental changes in supply or demand for a particular product. The mid-1980s was a period of general price decline for milk, as the US backed down from a more aggressive price support policy from the late 1970s. The conclusion of that policy adjustment came in December 1989, when the support price for milk reached a level that would prove to be so low as to be almost, but not quite, meaningless. Since, 1990, as is obvious from the chart, the single most defining characteristic of the price of milk is its extreme volatility, including both the range and frequency of its monthly changes.

Not surprisingly, everytime the price of milk hits a local high or low point, people are tempted to ask, *has it ever been this high (or low), when was the last time…., is this the greatest change…*, and so on. The remaining charts provide simple answers to those basic questions.

Figure 2 looks simply at the absolute change in price from the preceding month. As noted above, this table is constructed from the nominal milk price data, without any adjustment for inflation. One needs to be a bit careful about interpreting too much from this figure, and the next set of charts attempts to address that limitation, at least in part. Nevertheless, we can make a few inferences from this figure.

All of the big price swings occurred since the late 1980s and only two months before 1980 are included in the smallest category of large increases and only two months are included in the smallest category of large decreases. Thus, Figure 2 is mostly telling us about price changes since the late 1980s. The three categories of increases or decrease are not chosen with any more care or reason involved than simply to pick round numbers for the boundaries.

The largest month-to-month increase, so far, occurred in April 2004, when the All Milk price was calculated to have increased $2.60 from March. The only other month with an increase greater than $2, $2.00 to be exact was June 2007. That April 2004 increase followed the third largest absolute increase, which was $1.900 in March 2004. In fact, 2004 was the year that stands out for having the most brisk and persistent increase in prices. In five months, the All Milk price advanced by 60¢ or more. The years 2007 and 2001 also have five months of large increases, although at a lower level than 2004. The years 1998 and 1989 also stand out as periods of large and persistent increases.

On the other side of the ledger, the big declining years were 2008, 1999, and 1990, each of which had 6 months of large declines. In fact, if one adds January and February 2009 to the end of 2008, this is a period of 8 months of declines that were, in total, the longest ever recorded and among the deepest. April 1999 was the month with the largest single recorded decline, of $2.60. Two other months in 1999 are tied for the second largest decline, of $2.20, joining January 2009 for that second-place distinction. The declines in 1990 were long but were nowhere near as deep as 1999 or 2008-09.

An adage sometimes heard among market analysts is that the best cure for high (low) prices is high (low) prices. In other words, markets are self-correcting. A period of high prices is sure to be followed by a period of low prices, and vice versa. Figure 1 reveals that cyclical pattern, but the late 2000s is the only period where the nosebleed highs (2007) were so quickly followed by a stomach churning low (2008-09).

Inflationary effects are compensated for in Figures 3 and 4. In Figure 4, the relative change in monthly prices is show for all months since 1910. This calculation simply takes the difference between one month and the preceding month, and then divides it by the value for the preceding month, expressed as a percentage. Thus, each number may be interpreted as the percentage by which a price changed relative to the preceding month. Using this method, which is a somewhat arbitrary choice, a 50¢ increase from, say $12.50 to $13.00 equals 4%, but the same 50¢ becomes a 3.85% decline from $13 when the direction is reversed. If one is concerned about this, one can take the average of the month and preceding month prices as the point of comparison. In this method, a 50¢ change, up or down equals a 3.9% change relative to $12.75. I have chosen to use the price change from the preceding month because I think this is the way a relative change is usually presented when it occurs. This caveat is perhaps worth keeping in mind when comparing the really big price swings.

As Figure 3 clearly illustrates, that seemingly flat price line in the early years of Figure 1, hides what were very significant relative price changes. Indeed the magnitude of the range of relative price swings from 1910 to the late 1920s rivals the big swings of the 2000s and are much larger than the range of the 1990s.

Figure 4, like Figure 2, focuses on the largest ups and downs, although in this case, it is the big relative swings. Using relative changes, there are many periods in the last century among the largest increases. Moreover, there is only one year with 5 months of large percentage increases – 1918, which was a clear boon for American agriculture following the conclusion of World War I. The years 1916 and 1911 had four months with large relative increases and there were a number of years in which three months of large percentage increases occurred. The largest percentage increase occurred in July 1946, which also was an effect of the brief boom in agricultural exports following the end of World War II.

In more recent times, the notable years are 2003 and 2004. Although prices moved up by large amounts in 2007, only two months that year are included in the list of largest months, the biggest of which, at 12.2% rivals the big months of the post WWI era. The largest recent months were April and March 2004, at 16.8% and 14.0% respectively.

Figures 2 and 4 show the number of months that occur in somewhat arbitrarily chosen categories of large increases and decreases. Needless to say, a change in the boundary points would result in a change in the numbers of months. Nevertheless, both figures suggest that 1) there are very few months of either stunning increases or decreases, 2) there are many more months in the smallest category of changes, both up and down, and 3) the number of up months is comparable to the number of down months in each of the three up and down categories. What these observation suggest is that there may be symmetry in the rising and falling of milk prices over time and that the pattern may look like a normal distribution, with lots of smallish changes, up or down and increasingly fewer big changes on both the up and down side. A statistical measure of symmetry is a distribution of numbers is called skewness. A distribution that has a skew value of 0 is perfectly symmetric. The large the measure of skew, the more skewed is the distribution. If the measure of skew is negative, the distribution skews "to the left" (negative). If it is positive, it skews "to the right".

The distribution of absolute changes in the monthly price of milk since 1910 has a skew value of -0.57. Thus, it is highly symmetric but skews to the left; that is, there is a slightly greater likelihood of a decline in a given month.

The distribution of relative changes in the monthly price of milk has a skew of +0.10. Thus, this distribution is almost perfectly symmetric and leans to the right. That is, in any given month the chance of a percentage increase isn't much greater than the chance of a decrease, but it is a wee bit more likely.

Conclusions

This short exposition on milk price data only answers question of fact – what has happened to milk prices over a long time period. If one is interested in knowing how milk prices today compare to early periods, this data tells the basic facts of the story. Of course, there is nothing here to explain why, or how prices might be improved or changed. Moreover, we only look at the price of milk. The story for dairy farmers in 2007-09 and perhaps beyond is as much, if not more, about changes in the prices of inputs and farm net revenues.

Figure 1. U.S. Average Monthly Price for All Grades of Farm Milk, 1910 to 2009
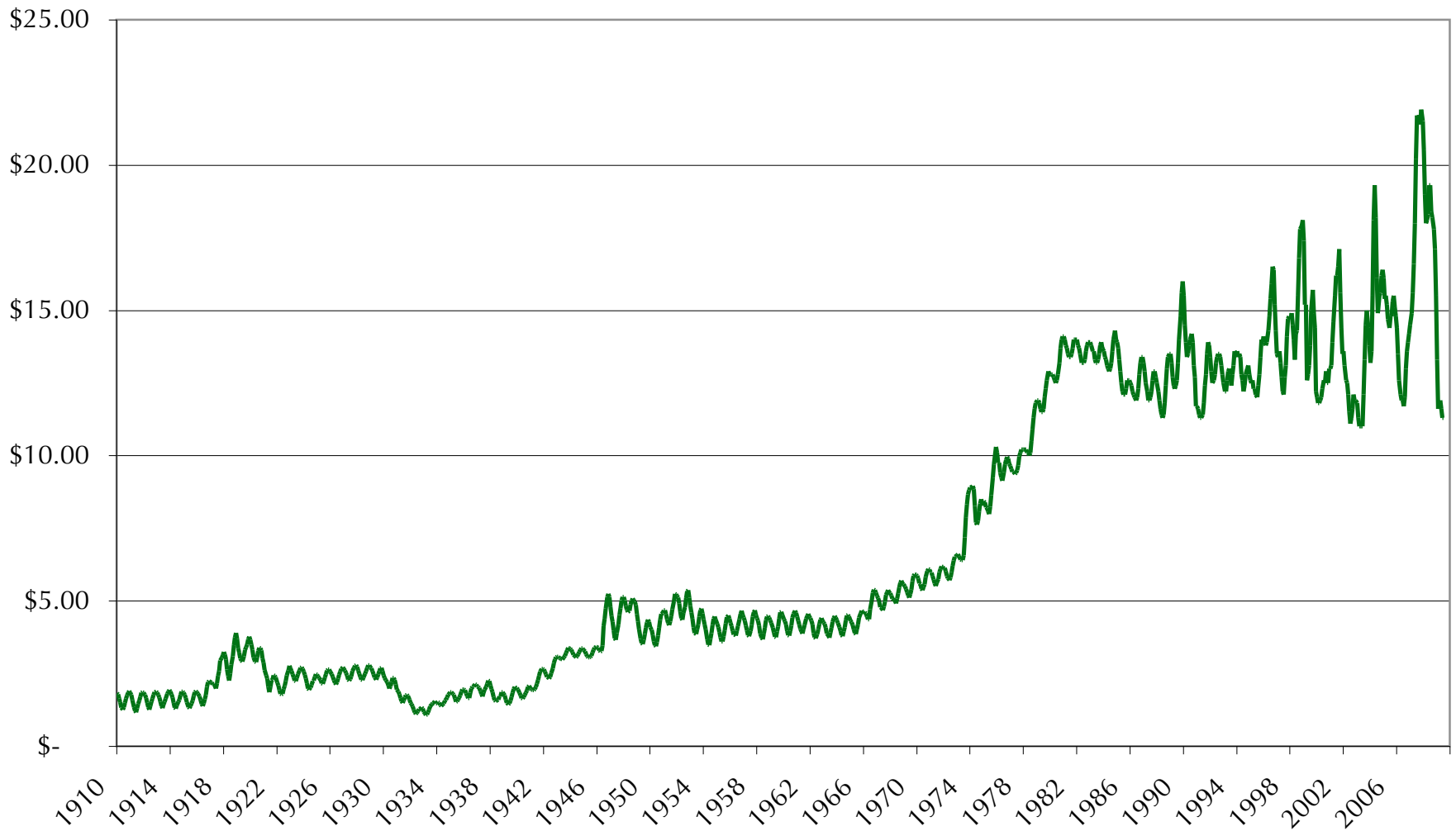(not adjusted for inflation)

Figure 2. Frequency of Large Increases or Decreases in the Price of Milk, 1910 to 2009
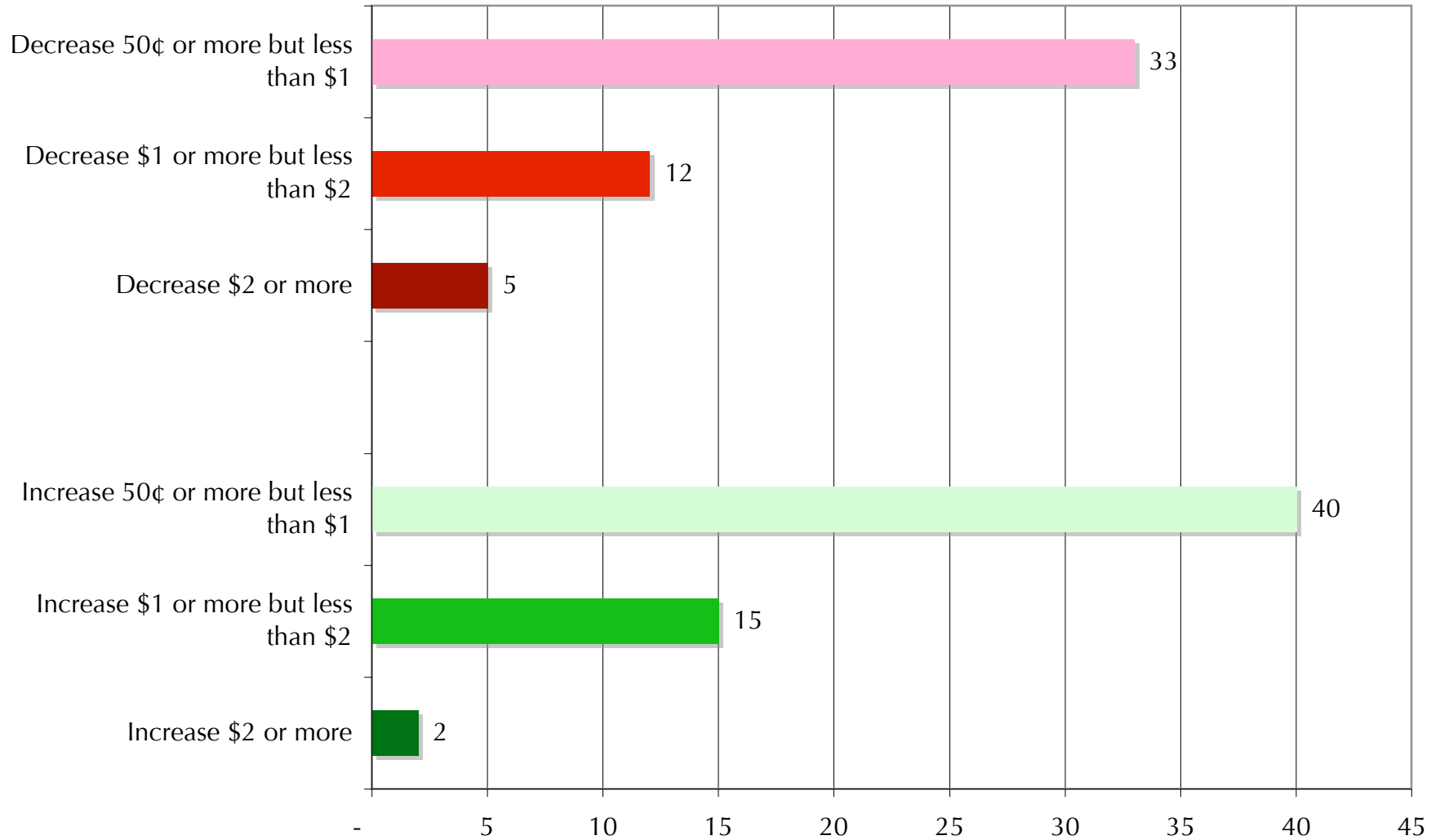(not adjusted for inflation)

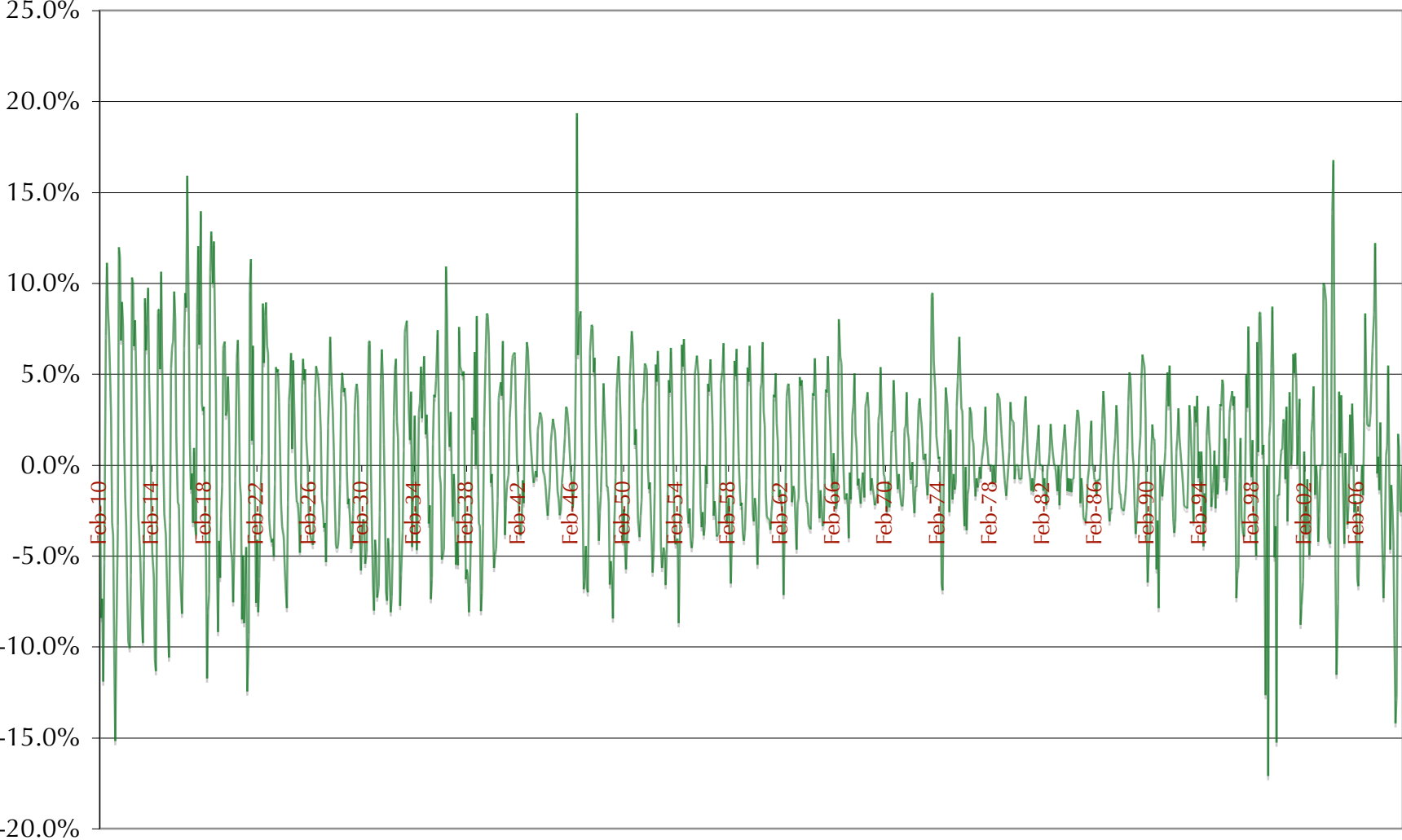Figure 3. Relative Change in the Monthly All Milk Price, 1910-2009

Figure 4. Frequency of Large Relative Increases or Decreases in the Monthly All Milk Price, 1910 - 2009