

Interest Rate Effects On The United States Agricultural Sector

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Prepared for
Senator Harkin

by
Food and Agricultural Policy Research Institute

Introduction and Procedure

Senator Harkin's office requested that the Food and Agricultural Policy Research Institute and its consortia Universities examine the effects of increased interest rates on the agricultural sector. Recent Federal Reserve System efforts to control inflation through higher interest rates have renewed interest in the effects of monetary policy on the sector as a whole.

To develop an answer to this question, the group of Universities started a process with the staff at Texas A&M University. There, the Agriculture and Food Policy Center (AFPC) operates a modeling system of the general economy of the United States capable of demonstrating the effects on a variety of variables associated with changes in monetary policy. The system has the capability of giving measures of gross domestic product, deficit levels, market interest rates, employment, exchange rates and a host of other factors when changes in monetary policy are imposed. Impacts on these variables were generated from the AFPC model assuming a 50 basis point and a 100 basis point increase in the short term interest rate. Discussion of the macro-economic effects associated with the interest rate change are contained in an AFPC report, "Interest Rate Effects on the United States Agricultural Sector With Emphasis at the Farm Level."

The export markets for agricultural products are very important and a change in exchange rates could have an effect on the ability of the United States to sell product in other markets. From the work by AFPC, the changes in exchange rates were subsequently imposed on the international models maintained by Iowa State University. Exchange rate effects were found to be negligible, so the results reported here were driven by changes in domestic markets. The changes in macro-economic variables, along with the impacts at the ag sector level, have been used as input by AFPC into the representative farm models.

Macro-economic Effects

Raising short term interest rates has a variety of effects on the general economy. First there are the direct effects such as investment or debt service. Some of this debt service would be related to the federal government and its servicing of the federal debt. With higher short-term rates, the Treasury would be required to spend more in interest payments, and thus would likely run a higher deficit level than would be the case without the rise in short-term rates, assuming that there is no other change in federal policies to offset the higher deficit. Higher deficits tend to create higher longer term interest rates as the federal government must come into the market for additional funds. Thus the hike in short-term rates translates into higher rates of interest across the spectrum over time.

With lower investment created by the higher rates, the overall economy does not grow as fast as would be the case with lower rates. In 1999, the real GDP is expected to be 0.47% below baseline levels. As the overall economy adjusts to the interest rate change, real GDP shows a smaller decline relative to the baseline by 2002. This reduced level of general economic growth naturally creates a somewhat slower rate of job creation and thus, higher rates of unemployment. As mentioned earlier, higher interest rates also tend to attract foreign monies to the dollar, thereby increasing demand for the dollar and bidding up the value of the dollar. Higher exchange rates also make it somewhat more difficult for the United States to trade, also adding to the reduction in the level of economic activity.

There are also other countervailing effects associated with interest rate hikes. The primary reason for raising rates is to reduce the general level of inflation. Higher rates of inflation will obviously have a negative effect on a host of variables, including the general economy and the agricultural sector as well. Raising interest rates is an action directly aimed at slowing the general economy enough to keep inflation at some target level. With rising inflationary expectations, long-term interest rates turn up, production costs escalate and the economy will slow down in the longer run. The experience in the late 1970's gives a host of examples of problems associated with sustained high inflation. The main positive then associated with raising rates is to reduce the overall level of price inflation. Under the 100 basis point scenario, the producer price index is 0.8% lower than baseline levels in 2002.

The Agricultural Sector

The agricultural sector also has a series of direct and indirect effects associated with the interest rate change. First, the sector as a whole is fairly capital intensive. From the land investment to the money tied up in breeding stock, it takes a significant investment for the sector to produce. While overall debt levels are not nearly as large as was the case in the early 1980's, the sector is operating currently with roughly \$160 billion in short and long-term debt. Consequently, an increase in interest rates directly affects the level of debt service payments required by the sector.

This rise in interest rates directly translates into higher interest costs on the production side of agriculture. For an average corn producer, it is expected that a 100 basis point rise in short term rates and other associated interest rate changes will pull interest costs up by nearly \$2.00 per acre, compared to total variable production costs of \$191 per acre under the baseline. Looking at pork, the 100 basis point rise would bump interest costs by \$0.14 per cwt., with total costs of \$40.72 per cwt. under the baseline. Consequently, the rise in interest rates is a factor in production decisions, but should be placed in context relative to overall production costs.

The lower inflation rate effects are more noticeable on production costs for crops than livestock as the crops sector has a relatively higher proportion of inputs from non-farm sources than is the case for livestock. Non-interest costs are expected to fall by \$0.18 per acre for corn production, while pork production costs net of interest *and feed costs* fall by \$0.06 per cwt.

Within the crops sector, the relative effect of the interest rate shock will depend on the overall production cost level for the crop in question. Wheat and soybeans have lower production costs when compared to cotton or rice. Consequently, there would likely be marginal shifts from the higher production cost commodities to lower cost crops, but again, these are very marginal changes. Under the analysis, corn area is expected to decline relative to the baseline by 100,000 acres under the 100 basis point shock. Soybean plantings on the other hand are expected to be unchanged. Wheat area also falls by 100,000 acres.

These changes in production or supply levels are offset to a certain extent by marginal shifts in demand. With slightly lower GDP and income levels, demand for agricultural products also declines slightly, so that on net, the price effects are negligible. Corn, bean and wheat prices all adjust by \$0.01 per bushel or less.

Livestock production also declines due to the higher interest costs that are somewhat offset by lower variable costs for non-feed inputs. Again, the effects are marginal. Beef production changes the most, declining by 0.2% from baseline levels in 2002 under the 100 basis point shock. With livestock products being closer to the consumer, the reduction in economic activity is sufficient to offset the marginal reduction in supplies of meat products and leads to an overall reduction in meat prices. For example, beef prices are down by 1% under the 100 basis point run in the short term, but are actually higher than baseline levels by 2002 as the herd adjusts.

In total, livestock cash receipts are expected to decline marginally in the short run, and actually run slightly above baseline levels in the longer run under both scenarios. Crop receipts follow a similar pattern, although the changes are smaller. Interest expenses are clearly higher under both options. Under the 100 basis point increase, interest costs are up by \$1.05 billion in the last year of the analysis and on average over the six years are up by \$780 million. Again, changes in some of the purchased input costs will offset some of the interest costs due to lower inflation. In total, these other costs are expected to decline by \$170 million relative to the baseline in the last year of the analysis under the 100 basis point scenario.

Net farm income in nominal terms is lower relative to the baseline throughout the six year period. On average over the six years, nominal farm income is off by \$780 million under the larger interest rate change option. In the initial years, income is down by more than \$1 billion, but by the end of the period as the livestock sector adjusts, income is down by only \$120 million compared to the baseline. To place these factors in context, the \$780 million reduction is measured against an average total net farm income of \$50.0 billion under the baseline. Thus, the 100 basis point increase in interest rates translates into a 1.6% reduction in nominal net farm income.

Real, or inflation-adjusted, net farm income exhibits slightly different impacts under the scenarios. As discussed earlier, the increase in interest rates causes lower rates of inflation. Accounting for the lower inflation, real net farm income declines from baseline levels in the early years of the analysis, but actually exceeds baseline levels in 2002, as the slight decline in nominal farm income is more than offset by a larger decline in the general price level. In 2002, real net farm income exceeds baseline levels by \$130 million, but averages \$450 million below the baseline for the six year analysis period.

Higher interest rates are also expected to lower land values. As was the case in farm income, land values are expected to be down by an average of 1.6% over the six years when compared to baseline levels. Unlike farm income however, it is clear that the prices of land are expected to move lower and stay lower. In 2002, land prices are down by 3% under the 100 basis point scenario compared to baseline levels.

Conclusions

Raising interest rates will clearly have an effect on the agricultural sector. On average, farm income is expected to decline by 0.8 and 1.6% under the 50 and 100 basis point scenarios, respectively. However, it is clear that the sector is also adjusting to these changes in production costs, and in the later years the farm income measures are off much less than was the case in the early years. The decline in asset values however is of longer-term concern. The drop in land prices will reduce the

asset base from which the sector operates. In the last year of the analysis, land prices are down by 1.5 and 3.0% for the two scenarios, respectively. This is a notable, but not large effect, but larger changes in rates could have even more of an effect.

In general, the sector will notice the change in rates, but the size of the effect should definitely be placed in context with the size of production agriculture as a whole. The effects will also vary according to the financial conditions of particular operations. Operations with higher debt levels will experience the most effect, while farmers with interest-bearing assets could actually benefit from the higher rates.

Impacts of Interest Rate Scenarios on Key Aggregates

	1997	1998	1999	2000	2001	2002	6-Yr Avg.
Crop Receipts (Billion Dollars)							
Baseline	103.00	100.56	102.57	104.41	107.24	109.87	104.61
50 Point Increase	102.99	100.52	102.53	104.39	107.25	109.92	104.60
Change from Baseline	-0.02	-0.04	-0.04	-0.02	0.01	0.05	-0.01
% Change	-0.0%	-0.0%	-0.0%	-0.0%	0.0%	0.0%	-0.0%
100 Point Increase	102.97	100.48	102.49	104.37	107.26	109.97	104.59
Change from Baseline	-0.03	-0.08	-0.08	-0.04	0.02	0.10	-0.02
% Change	-0.0%	-0.1%	-0.1%	-0.0%	0.0%	0.1%	-0.0%
Livestock Receipts							
Baseline	92.33	94.49	97.64	101.60	104.53	102.00	98.77
50 Point Increase	92.20	94.20	97.33	101.45	104.60	102.29	98.68
Change from Baseline	-0.13	-0.29	-0.32	-0.15	0.07	0.29	-0.09
% Change	-0.1%	-0.3%	-0.3%	-0.1%	0.1%	0.3%	-0.1%
100 Point Increase	92.10	93.89	96.99	101.28	104.66	102.58	98.58
Change from Baseline	-0.23	-0.60	-0.65	-0.32	0.13	0.58	-0.18
% Change	-0.2%	-0.6%	-0.7%	-0.3%	0.1%	0.6%	-0.2%
Interest Expenses							
Baseline	11.71	11.39	11.31	11.51	11.79	12.12	11.64
50 Point Increase	11.93	11.69	11.69	11.94	12.27	12.64	12.03
Change from Baseline	0.22	0.30	0.38	0.43	0.48	0.53	0.39
% Change	1.9%	2.6%	3.3%	3.7%	4.1%	4.4%	3.4%
100 Point Increase	12.13	12.00	12.07	12.37	12.76	13.17	12.42
Change from Baseline	0.42	0.61	0.76	0.87	0.97	1.05	0.78
% Change	3.6%	5.3%	6.7%	7.5%	8.2%	8.7%	6.7%
Total Production Expenses							
Baseline	178.50	178.63	181.33	184.71	187.86	190.59	183.60
50 Point Increase	178.97	178.87	181.59	185.01	188.22	191.03	183.95
Change from Baseline	0.47	0.24	0.25	0.30	0.36	0.44	0.34
% Change	0.3%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%
100 Point Increase	179.20	179.11	181.83	185.31	188.58	191.47	184.25
Change from Baseline	0.70	0.48	0.50	0.59	0.72	0.88	0.65
% Change	0.4%	0.3%	0.3%	0.3%	0.4%	0.5%	0.4%
Net Farm Income							
Baseline	45.60	46.29	49.00	52.06	54.80	52.37	50.02
50 Point Increase	45.18	45.73	48.40	51.62	54.55	52.31	49.63
Change from Baseline	-0.41	-0.56	-0.60	-0.45	-0.25	-0.05	-0.39
% Change	-0.9%	-1.2%	-1.2%	-0.9%	-0.5%	-0.1%	-0.8%
100 Point Increase	44.83	45.14	47.78	51.13	54.28	52.24	49.24
Change from Baseline	-0.76	-1.15	-1.22	-0.93	-0.52	-0.12	-0.78
% Change	-1.7%	-2.5%	-2.5%	-1.8%	-1.0%	-0.2%	-1.6%
Real Net Farm Income (1987 \$)							
Baseline	33.56	33.23	34.29	35.52	36.43	33.93	34.49
50 Point Increase	33.26	32.84	33.91	35.27	36.35	34.00	34.27
Change from Baseline	-0.30	-0.39	-0.38	-0.24	-0.08	0.07	-0.22
% Change	-0.9%	-1.2%	-1.1%	-0.7%	-0.2%	0.2%	-0.6%
100 Point Increase	33.00	32.44	33.52	35.01	36.26	34.05	34.05
Change from Baseline	-0.55	-0.79	-0.77	-0.51	-0.17	0.13	-0.45
% Change	-1.6%	-2.4%	-2.3%	-1.4%	-0.5%	0.4%	-1.3%
U.S. Land Values (Dollars per Acre)							
Baseline	935	980	1,034	1,066	1,092	1,104	1,035
50 Point Increase	935	977	1,027	1,055	1,078	1,088	1,026
Change from Baseline	-0	-3	-7	-11	-14	-17	-9
% Change	-0.0%	-0.3%	-0.7%	-1.0%	-1.3%	-1.5%	-0.8%
100 Point Increase	934	974	1,020	1,044	1,064	1,071	1,018
Change from Baseline	-0	-6	-14	-22	-28	-34	-17
% Change	-0.0%	-0.6%	-1.3%	-2.0%	-2.6%	-3.0%	-1.6%

Impacts of Interest Rate Scenarios on U.S. Crops

	97/98	98/99	99/00	00/01	01/02	02/03	6-Yr Avg.
Corn Planted Acreage							
	(Million Acres)						
Baseline	80.7	80.0	80.9	81.4	81.2	82.1	81.0
50 Point Increase	80.7	80.0	80.9	81.3	81.1	82.1	81.0
Change from Baseline	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
% Change	-0.1%	-0.0%	-0.1%	-0.0%	-0.0%	-0.0%	-0.0%
100 Point Increase	80.7	79.9	80.8	81.3	81.1	82.0	81.0
Change from Baseline	-0.1	-0.1	-0.1	-0.1	-0.1	-0.0	-0.1
% Change	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
Soybean Planted Acreage							
Baseline	65.0	65.3	63.7	63.2	63.4	63.0	63.9
50 Point Increase	65.0	65.2	63.7	63.2	63.4	63.0	63.9
Change from Baseline	0.0	-0.0	-0.0	-0.0	-0.0	0.0	-0.0
% Change	0.0%	-0.0%	-0.0%	-0.0%	-0.0%	0.0%	-0.0%
100 Point Increase	65.0	65.2	63.7	63.2	63.4	63.0	63.9
Change from Baseline	0.0	-0.0	-0.0	-0.0	-0.0	0.0	-0.0
% Change	0.0%	-0.0%	-0.0%	-0.0%	-0.0%	0.0%	-0.0%
Wheat Planted Acreage							
Baseline	70.2	73.6	73.1	75.4	74.6	75.3	73.7
50 Point Increase	70.2	73.5	73.1	75.4	74.6	75.3	73.7
Change from Baseline	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0
% Change	-0.0%	-0.1%	-0.1%	-0.1%	-0.1%	-0.0%	-0.0%
100 Point Increase	70.2	73.5	73.0	75.3	74.6	75.2	73.6
Change from Baseline	-0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
% Change	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
Corn Farm Price							
	(Dollars per Bushel)						
Baseline	2.72	2.35	2.33	2.39	2.42	2.52	2.46
50 Point Increase	2.72	2.35	2.33	2.39	2.42	2.53	2.46
Change from Baseline	-0.00	-0.00	-0.00	-0.00	0.00	0.00	0.00
% Change	-0.0%	-0.0%	-0.0%	-0.0%	0.0%	0.1%	0.0%
100 Point Increase	2.72	2.35	2.33	2.39	2.42	2.53	2.46
Change from Baseline	-0.00	-0.00	-0.00	-0.00	0.00	0.01	0.00
% Change	-0.1%	-0.1%	-0.1%	-0.0%	0.1%	0.2%	0.0%
Soybean Farm Price							
Baseline	6.89	6.27	5.86	5.83	5.96	6.02	6.14
50 Point Increase	6.89	6.26	5.86	5.83	5.96	6.02	6.14
Change from Baseline	-0.00	-0.01	-0.01	-0.00	0.00	0.01	-0.00
% Change	-0.0%	-0.1%	-0.1%	-0.1%	0.0%	0.1%	-0.0%
100 Point Increase	6.89	6.25	5.85	5.83	5.96	6.02	6.13
Change from Baseline	-0.00	-0.01	-0.01	-0.01	-0.00	0.01	-0.00
% Change	-0.0%	-0.2%	-0.2%	-0.1%	-0.0%	0.1%	-0.1%
Wheat Farm Price							
Baseline	3.93	3.05	2.97	3.29	3.29	3.43	3.33
50 Point Increase	3.93	3.05	2.98	3.29	3.29	3.44	3.33
Change from Baseline	-0.00	-0.00	0.00	0.00	0.00	0.00	0.00
% Change	-0.0%	-0.0%	0.0%	0.0%	0.1%	0.1%	0.0%
100 Point Increase	3.93	3.05	2.98	3.29	3.30	3.44	3.33
Change from Baseline	-0.00	0.00	0.00	0.00	0.01	0.01	0.00
% Change	-0.0%	0.0%	0.0%	0.1%	0.2%	0.3%	0.1%

Impacts of Interest Rate Scenarios on U.S. Livestock

	1997	1998	1999	2000	2001	2002	6-Yr Avg.
Beef Production							
	(Million Pounds)						
Baseline	25,635	25,327	25,055	24,726	24,533	24,805	25,014
50 Point Increase	25,640	25,326	25,051	24,713	24,514	24,782	25,005
Change from Baseline	6	-0	-4	-13	-20	-23	-9
% Change	0.0%	-0.0%	-0.0%	-0.1%	-0.1%	-0.1%	-0.0%
100 Point Increase	25,642	25,329	25,049	24,704	24,496	24,760	24,997
Change from Baseline	7	2	-6	-22	-37	-44	-17
% Change	0.0%	0.0%	-0.0%	-0.1%	-0.2%	-0.2%	-0.1%
Pork Production							
Baseline	17,477	18,503	19,420	19,524	19,570	20,271	19,127
50 Point Increase	17,477	18,500	19,412	19,511	19,558	20,266	19,121
Change from Baseline	-0	-3	-8	-13	-12	-5	-7
% Change	-0.0%	-0.0%	-0.0%	-0.1%	-0.1%	-0.0%	-0.0%
100 Point Increase	17,477	18,497	19,404	19,498	19,546	20,261	19,114
Change from Baseline	-1	-5	-16	-25	-24	-10	-13
% Change	-0.0%	-0.0%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
Milk Production							
Baseline	155,936	158,330	160,552	162,448	164,369	166,083	161,286
50 Point Increase	155,897	158,219	160,373	162,232	164,154	165,904	161,130
Change from Baseline	-39	-111	-179	-216	-216	-179	-156
% Change	-0.0%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%
100 Point Increase	155,857	158,108	160,194	162,015	163,938	165,727	160,973
Change from Baseline	-78	-222	-358	-432	-431	-356	-313
% Change	-0.1%	-0.1%	-0.2%	-0.3%	-0.3%	-0.2%	-0.2%
NB Direct Steer Price							
	(Dollars per Hundredweight)						
Baseline	65.63	70.20	75.18	79.41	82.31	78.50	75.20
50 Point Increase	65.44	69.89	74.83	79.22	82.31	78.69	75.06
Change from Baseline	-0.19	-0.31	-0.35	-0.18	-0.00	0.19	-0.14
% Change	-0.3%	-0.4%	-0.5%	-0.2%	-0.0%	0.2%	-0.2%
100 Point Increase	65.30	69.53	74.45	78.99	82.28	78.87	74.90
Change from Baseline	-0.33	-0.67	-0.72	-0.42	-0.03	0.37	-0.30
% Change	-0.5%	-1.0%	-1.0%	-0.5%	-0.0%	0.5%	-0.4%
IA-So. MN Barrow & Gilt Price							
Baseline	53.81	46.36	42.04	45.42	49.03	46.08	47.12
50 Point Increase	53.76	46.23	41.96	45.42	49.10	46.16	47.11
Change from Baseline	-0.05	-0.12	-0.08	0.00	0.07	0.08	-0.02
% Change	-0.1%	-0.3%	-0.2%	0.0%	0.1%	0.2%	-0.0%
100 Point Increase	53.71	46.12	41.87	45.42	49.16	46.24	47.08
Change from Baseline	-0.10	-0.24	-0.17	0.00	0.13	0.15	-0.04
% Change	-0.2%	-0.5%	-0.4%	0.0%	0.3%	0.3%	-0.1%
All Milk Price							
Baseline	13.69	13.53	13.39	13.00	12.98	13.01	13.27
50 Point Increase	13.68	13.50	13.37	13.00	13.02	13.09	13.27
Change from Baseline	-0.01	-0.03	-0.03	0.00	0.04	0.08	0.01
% Change	-0.1%	-0.2%	-0.2%	0.0%	0.3%	0.6%	0.1%
100 Point Increase	13.67	13.47	13.34	13.00	13.06	13.16	13.28
Change from Baseline	-0.02	-0.06	-0.05	0.00	0.08	0.15	0.02
% Change	-0.1%	-0.4%	-0.4%	0.0%	0.6%	1.2%	0.1%