

The effects of Section 179 deductions and bonus depreciation on farm financial investment

by

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## **Abstract**

The purpose of this thesis is to measure the effects of Section 179 deduction and bonus depreciation levels on investment and specific farm financial ratios. This thesis provides insight into Section 179 and bonus depreciation, key policies that have shaped these deductions as well as the use of these provisions in the state of Kansas. The study uses farm level data from the Kansas Farm Management Association (KFMA) to create a panel data set representing 518 farms, including variables for capital investment, Section 179 deductions, bonus depreciation, and multiple financial ratios. To estimate the effects, lag variables are used as independent variables in each model. The results indicate that higher Section 179 deduction use leads to a statistically significant increase in the working capital ratio, capital debt repayment capacity and owner equity percent and statistically significant decrease in the probability of default. As the use of Section 179 deduction level increases, the working capital ratio increases, the capital debt repayment capacity increases, the owner equity percent increases, and the probability of default decreases. The results are statistically significant for lagged values up to three years for Section 179 deductions for the working capital ratio, probability of default and capital debt repayment capacity and up to one year related to owner equity percent. The deduction increases the liquidity for farms, increases the ability to repay on capital investments, and decreases the probability of default for three years into the future. The deduction also increases the solvency for one year into the future. The amount of bonus depreciation and the amount of capital investment were not statistically significant in explaining the liquidity, repayment, leverage and probability of default measures.

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## Chapter 1 - Introduction

The agriculture industry uses high levels of capital investment. These investments include machinery, equipment, and other depreciable property. The size of the farm directly affects the decision to purchase capital assets or to outsource these needs via lease or custom hire.

Depreciation is used to recover the cost of these investments over time. Policies have been created to encourage farms and small businesses to invest in physical capital by modifying the structure of depreciation for these investments. Section 179 deductions and bonus depreciation encourage capital investment by reducing the after-tax cost of these investments. Reducing the cost encourages farms and small businesses to increase the amount or frequency of investment. Although these policies were created to increase farm and small businesses investment, does that investment impact farm financial positions?

Previous literature, including Williamson and Stutzman (2016) and Hadrich, Larsen and Olsen (2013) measured the impact of Section 179 deductions and bonus depreciation on capital investment. These studies examine the effect these deductions have on the intensity of capital investments rather than future financial position. To fill this gap, this research studies 2014 to 2019 capturing different levels of Section 179 deductions and bonus depreciation. Farm level data from the Kansas Farm Management Association (KFMA) are used to determine the effect capital investment, Section 179 deduction and bonus depreciation levels have on specific farm financial measures.

The research finds Section 179 deduction levels to have a statistically significant positive relationship with the working capital ratio, capital debt repayment capacity and owner equity percent and significant negative relationship with probability of default. As a farm's Section 179 deduction level increases, working capital ratio, capital debt repayment capacity and owner



equity percent increases and probability of default decreases. This is statistically significant for up to a three-year lag for Section 179 deductions related to working capital ratio, probability of default and capital debt repayment capacity and up to a one-year lag related to owner equity percent. Therefore, this deduction affects the working capital ratio, capital debt repayment capacity, and probability of default for at least three years and affects owner equity percent for one year. The amount of bonus depreciation and the amount of capital investment were not statistically significant in explaining the liquidity, repayment, leverage and probability of default measures.

## **Chapter 2 - Background and Literature**

### **Overview of Depreciation**

Depreciation is a reduction of the value of an asset over time to account for the use of the asset. Depreciation has been tax deductible for years. However, new policies have changed the methods used for depreciation over time. Recently, most property was depreciated using the Modified Accelerated Cost Recovery System (MACRS) barring some exclusions that are not discussed here. MACRS is comprised of the General Depreciation System (GDS) and the Alternative Depreciation System (ADS) (Internal Revenue Service 2020). These systems set alternative depreciation methods and recovery periods that can be used to determine deductions. There are multiple criteria to determine the system to be used based on property type. Under MACRS, there are four depreciation methods that can be used, one method is provided under ADS and three under GDS. The difference in the ADS and GDS methods are the recovery period used. The depreciation method under ADS is the straight-line method. The three methods under GDS are the straight-line method, the double-declining balance method and the one and one-half declining balance method. The benefit of using faster depreciation methods is that it lowers the after-tax cost of capital purchases and leads to increased demand in capital investments. For example, a \$100,000 investment with a 5-year useful life and \$10,000 salvage value would have a depreciable amount of \$18,000 under the straight-line method and \$40,000 under the double-declining balance method in year 1. The new taxable cost of the capital investment would be \$82,000 under the straight-line method and \$60,000 under the double-declining balance method for the first year.

## **Background of Section 179**

Section 179 is a section of the Internal Revenue Service (IRS) tax code. It was created to help small and medium-size businesses by reducing the cost of investment in asset purchases (Section 179 Deduction 2021). Businesses are able to deduct the full purchase price of qualifying assets they have purchased throughout the tax year from their gross income under Section 179. This includes purchased, financed or leased, new or used equipment, as long as the used equipment is new to the taxpayer. The qualifying asset must be placed into service between January 1 and December 31 of the respective tax year.

Section 179 is available for all businesses but was originally created to lower the cost of investment for small and medium-size businesses. This tax break is achieved by the limits included in the section. There are two key limits regarding Section 179: the deduction limit and total equipment purchase limit. The deduction limit places a maximum total amount of deduction a business can take in one year. This deduction limit is \$1.05 million for the tax year 2021. The total equipment purchase limit puts a maximum total dollar amount a business can spend on purchased equipment. The total equipment purchase limit is \$2.62 million for the tax year 2021. Once the total equipment purchase limit is reached, deductions begin phasing out on a dollar-for-dollar basis and are completely eliminated at a certain level. Most large businesses easily reach these limits within a given tax year. Thus, the limits outlined in Section 179 tailors the deductions to support small and medium-sized businesses.

## **Background of Bonus Depreciation**

Bonus depreciation is a method used to accelerate depreciation and elect additional deductions of a specific percentage to qualifying assets<sup>1</sup>. However, bonus depreciation is not always available and the allowable deduction percentage changes with tax law revisions. Bonus depreciation must be claimed within the first year of the assets' use and similar to Section 179, the asset must be dedicated to 50 percent or more use for business purposes (Murray 2020). Originally, bonus depreciation could only be applied to new assets. In 2017, a modification was made to include used assets. Bonus depreciation is generally used after the maximum Section 179 deduction has been applied, unless a taxpayer has no taxable profit. In that case, the taxpayer shifts to bonus depreciation leading to a key difference between these two methods. Unlike Section 179, bonus depreciation allows businesses with a net loss to deduct their depreciation and carry the loss forward. This method is useful for larger businesses that spend more than the specified limits in Section 179.

### **Key Policies for Section 179 and Bonus Depreciation**

There have been nine key tax law changes that have affected Section 179 and bonus depreciation from 2008 to 2017. These policies and their changes are outlined in Table 2.1. During President George W. Bush's term, there was growing concern for a slowing economy. In response, Congress shaped the Economic Stimulus Act of 2008 (Section 179 Amendments 2021). This act increased both the deduction limit and total equipment purchase limit under Section 179 from \$125,000 to \$250,000 and \$500,000 to \$800,000, respectively. The Economic Stimulus Act also introduced bonus depreciation, offering it at 50 percent. During the Obama

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<sup>1</sup> Bonus depreciation is outlined in Section 168(k) of the Internal Revenue Service tax code

administration, the American Recovery and Reinvestment Act of 2009 was passed. This act was a spending bill of \$787 billion meant to invigorate the stagnate economy after the financial crisis. The tax incentives for Section 179 extended the changes from the stimulus act in 2008. The Hiring Incentive to Restore Employment (HIRE) Act of 2010 kept the deduction limit from falling back to \$134,000 by extending the deduction and total equipment purchase limits from the previous acts but dropping bonus depreciation. Following the HIRE Act, the Small Business Jobs and Credit Act of 2010 passed and increased the two limits as well as extend the 50 percent bonus depreciation. In 2010, the Tax Relief, Unemployment Insurance Reauthorization, Job Creation Act extended and increased bonus depreciation to 100 percent. In 2012, the deduction limit fell back to \$25,000. Late in 2012, the American Taxpayer Relief Act of 2012 raised the deduction and equipment purchase limit back to \$500,000 and \$2 million respectively for both 2012 and 2013. The act also restored 50 percent bonus depreciation. In 2014, the Tax Extenders Bill was passed and in 2015, the Protecting Americans from Tax Hikes Act passed. Both of these brought the limits back up and extended bonus depreciation. However, an important note for 2015 is that the deduction and total equipment purchase limits are the new permanent limits. Therefore, the limits would no longer drop back to \$25,000 by default. Lastly, during President Trump's first year in office, the Tax Cuts and Jobs Act passed to increase the deduction limit to \$1 million and the total equipment purchase limit to \$2.5 million plus increase bonus depreciation to 100 percent. Along with these increases, the 2017 act modified bonus depreciation to include used equipment. More recently, increases for 2020 included a \$1.04 million deduction limit and \$2.59 million total equipment purchase limit was established. For 2021, a \$1.05 million deduction limit and \$2.62 million total equipment purchase limit. In both

of these years, 100 percent bonus depreciation was continued. Figure 2.1 illustrates the policy changes for Section 179 limits and bonus depreciation from 2007 to 2021.

Table 2.1 Policies Affecting Section 179 and Bonus Depreciation

Policy	Section 179 Deduction Limit	Section 179 Equipment Purchase Limit	Bonus Depreciation
Economic Stimulus Act of 2008	\$250,000	\$800,000	50%
American Recovery and Reinvestment Act of 2009	\$250,000	\$800,000	50%
Hiring Incentive to Restore Employment (HIRE) Act of 2010	\$250,000	\$800,000	-
Small Business Jobs and Credit Act of 2010	\$500,000	\$2,000,000	50%
Tax Relief Unemployment Insurance Reauthorization, Job Creation Act of 2010	\$500,000	\$2,000,000	100%
American Taxpayer Relief Act of 2012	\$500,000	\$2,000,000	50%
Tax Extenders Bill of 2014	\$500,000	\$2,000,000	50%
Protecting Americans from Tax Hikes Act of 2015	\$500,000	\$2,000,000	50%
Tax Cuts and Jobs Act of 2017	\$1,000,000	\$2,500,000	100%

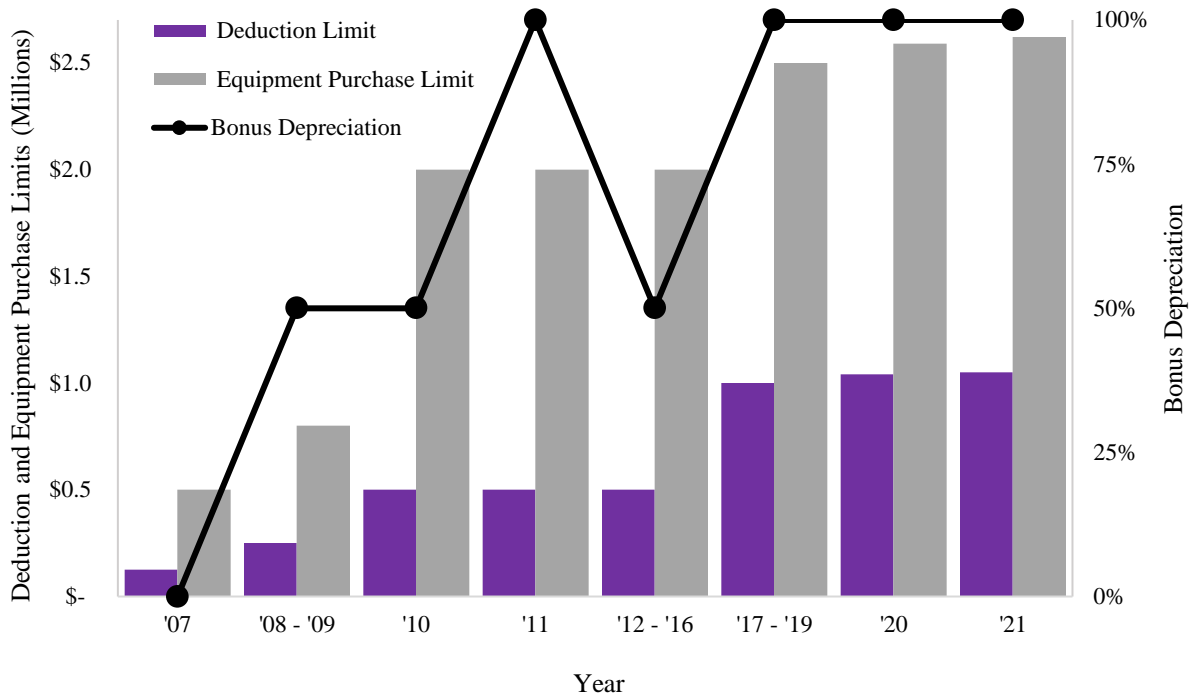


Figure 2.1 Changes in Section 179 limits and bonus depreciation

### Similar Research

Research has examined the impact of Section 179 and bonus depreciation on farm investment. Williamson and Stutzman (2016) used USDA’s Agricultural Resource Management Survey (ARMS) data from 1996 to 2012 and separated the data into pseudo panels and cohorts based on state and production specialization. Using pseudo panels, their model allowed for time effects, the effects of past investments on current investments and specific factors they were examining. Their model uses the annual investment of a cohort in a specific year as the dependent variable and the bonus depreciation percentage and the Section 179 deduction limit for that year as independent variables. They also include a time-specific, individual-invariant component, a random disturbance, a variable to indicate a fixed effect or a term for a random disturbance, and variables that indicate whether the cohort made investments that exceeded the



Section 179 limit(s). Williamson and Stutzman (2016) estimated a linear regression model and a maximum likelihood estimator to determine the effect. They found that farm investment amounts increased by \$0.32 for every dollar increase in the Section 179 deduction limit. When comparing past deduction limits with current investments, they found the cohorts that reached the limit made smaller investments in the current year even if the limit increased. Williamson and Stutzman (2016) examined the impacts based on farm size. They found a greater effect on investment for farms with a gross cash farm income (GCFI) of \$10,000 or greater.

Hadrich, Larsen and Olson (2013) conducted research on North Dakota farms to determine factors that affect the decision to purchase machinery. More specifically, they examine the probability of buying machinery and the intensity of the machinery purchased and whether financial, structural and tax policy factors affected these decisions. They look at the effect of different Section 179 deduction levels on purchase decision using a panel data set from 1993 to 2011. The theoretical model introduced Section 179 deduction into a present value equation that reduced the cost associated with machinery to determine when the machinery should be replaced. The introduction of Section 179 captured the immediate expense of a portion of the machinery before it is capitalized and depreciated.

Hadrich, Larsen and Olson (2013) analyzed 111 farms over an 18-year period. They included working capital, operating profit margin, debt-to-asset ratio and previous depreciation expense as financial characteristics. For structural characteristics, they included a variable to capture farm type. There were three farm types represented in the data: crop, livestock and combination farms. The type was determined by the category being 80 percent or more of gross sales. They also included an experience variable that represented the number of years of experience of the operator. For tax policy characteristics, they created a dummy variable to

capture Section 179 deduction limits. The data included 643 observations reaching Section 179 deduction limit(s). Hadrich, Larsen and Olson (2013) used a double hurdle model to analyze the two decisions (whether or not to purchase machinery and the intensity of the purchase) and evaluated the results using average partial effects. They found the following factors to be statistically significant factors in the decision to purchase machinery and the intensity of the purchase: operating profit margin, debt-to-asset ratio, type of farm, experience and Section 179 deduction. The variable with the largest, positive effect on machinery purchases was the Section 179 deduction.

The previous research focuses on the changes in capital investment amounts and uses dummy variables to represent whether a Section 179 limit is met. This paper shifts the focus to the changes in financial ratios and uses the amount of Section 179 and bonus depreciation farms elected to take in previous years to capture the effects. Although, this research covers a smaller number of years, the data used and the shift in focus fills a gap in the research related to Section 179 and bonus depreciation and their effects on farms.

## **Chapter 3 - Data**

### **Depreciation Data**

For this thesis, farm level data from the Kansas Farm Management Association (KFMA) were used. The data include capital investment purchases and the depreciation of investments from 2014 to 2019 (2014-2019a). The data examined observations on capital investments that were purchased and put into service in the same year. For example, if a farm purchased a tractor in 2014 and put the asset into service in 2014, the investment is included in the data set. However, if the farm purchased the tractor in 2014 but did not put the asset into service until 2015 or owned the asset in previous years, the investment is not included in the data set. Another modification was removing investments that were used for less than 50 percent business use. This process removed approximately 1.25 million observations from the data. Eliminating these observations eliminates an investment that does not qualify for Section 179 deductions or bonus depreciation. After the data was sorted, 1,830 farms were included with a total of 43,318 assets. Tractors include 5.47 percent of investment and combines include 2.88 percent of investment.

Key variables in the data are cost basis, purchase price, Section 179 deduction, and bonus depreciation. The cost basis represents the cost of the capital investment. Section 179 deduction and bonus are the dollar amounts of depreciation used for the investment. Table 3.1 reports summary statistics of the 1,830 farms. These statistics were calculated on a by farm basis. The table is broken down into three categories: all assets, tractors and combines. For each of these categories, statistics are shown for the total, those that used bonus depreciation and those that did not use bonus depreciation. Of the 1,830 farms, 25.8 percent used bonus depreciation during at least one year and 90 percent used Section 179 deduction during at least one year. Of the 1,020 farms that purchased tractors, 3.63 percent used bonus depreciation and 63.4 percent used

Section 179 deduction. Of the 662 farms that purchased combines, 2.42 percent used bonus depreciation and 59.4 percent used Section 179 deduction. In Figure 3.1, a steady decline is shown for all asset purchases between 2014 and 2016. All three categories saw an increase in capital investment from 2017 to 2018. The increase in capital investment is reflected by the Section 179 deduction and bonus depreciation shown in Figure 3.2. Section 179 deduction in Figure 3.2 mimics similar patterns to those found in Figure 3.1. However, bonus depreciation remains below \$2,000 for each category until 2018 when it reaches \$7,700 for all assets. Figure 3.3 illustrates the distribution of capital investment, Section 179 deduction and bonus depreciation by tractors, combines and other assets. Compared to combines, tractors contribute a larger percentage of total investment, Section 179 deductions and bonus depreciation. Together, tractors and combines represent between 20 to 30 percent of the share in these areas.

Of the 1,830 farms, 18 farms reached either the Section 179 deduction limit or equipment purchase limit. Six farms reached the Section 179 deduction limit in 2014 and four reached the limit in 2015. Four farms reached the equipment purchase limit between 2014 and 2016. The limits were reached when the deduction limit was \$500,000, the equipment purchase limit was \$2 million and 50 percent bonus depreciation was available. Within these years, five farms used bonus depreciation while nine chose not to use bonus depreciation. Between 2017 and 2019 when the deduction limit rose to \$1 million and the equipment purchase limit rose to \$2.5 million, zero farms reached the Section 179 deduction limit, but six farms reached the equipment purchase limit. Of these farms, only one farm chose to use bonus depreciation. Two of the 18 farms that reached a Section 179 limit reached a limit in more than one year.

Table 3.2 presents summary statistics of farms that did not reach Section 179 limit(s). The table shows the total farms, the farms that used bonus and the farms that did not use bonus.

Removing the farms that reached either of the Section 179 limits reduced the average capital investment by anywhere between \$500 and \$65,000 over the six-year period. The farms that reached the Section 179 limit(s) had an average capital investment ranging from \$1.3 million to \$5.4 million.

Table 3.1 Summary statistics of farms with assets put into service each year

Values	2014	2015	2016	2017	2018	2019	Total
<b>All Assets</b>							
<b>Total - 1,830 Farms</b>							
Average Capital Investment (\$)	126,954.12	106,205.08	86,488.36	85,126.19	103,135.70	102,627.02	610,536.46
Average Section 179 (\$)	44,890.83	31,679.47	21,672.35	22,236.79	26,956.08	25,643.17	173,078.68
Average Bonus (\$)	1,906.95	1,583.33	543.22	1,438.17	7,757.28	7,753.47	20,982.42
Average Bonus (%)	1.50%	1.49%	0.63%	1.69%	7.52%	7.55%	3.44%
<b>Used Bonus Depreciation - 473 Farms</b>							
Average Capital Investment (\$)	207,166.69	212,096.26	222,171.89	201,314.64	235,379.40	198,122.73	296,856.24
Average Section 179 (\$)	91,678.57	85,521.07	83,492.76	61,992.22	53,022.32	27,737.69	89,324.68
Average Bonus (\$)	23,579.15	30,182.28	18,074.52	37,597.80	105,154.24	89,802.86	81,179.35
Average Bonus (%)	11.38%	14.23%	8.14%	18.68%	44.67%	45.33%	27.35%
<b>Did not use Bonus Depreciation - 1,357 Farms</b>							
Average Capital Investment (\$)	119,896.17	100,342.60	82,284.08	80,505.05	92,603.01	93,602.90	719,873.78
Average Section 179 (\$)	40,773.96	28,698.62	19,756.78	20,655.61	24,880.00	25,445.24	202,272.23
Average Bonus (\$)	-	-	-	-	-	-	-
Average Bonus (%)	-	-	-	-	-	-	-
<b>Tractors</b>							
<b>Total - 1,020 Farms</b>							
Average Capital Investment (\$)	26,853.92	20,242.58	14,801.57	16,399.01	23,157.92	20,428.56	121,883.57
Average Section 179 (\$)	13,580.60	8,077.67	5,482.89	6,295.62	7,994.66	7,748.31	49,179.74
Average Bonus (\$)	117.98	89.77	24.08	56.30	2,675.43	1,270.23	4,233.80
Average Bonus (%)	0.44%	0.44%	0.16%	0.34%	11.55%	6.22%	3.47%
<b>Used Bonus Depreciation - 37 Farms</b>							
Average Capital Investment (\$)	69,038.75	61,042.89	49,127.00	24,983.10	206,319.08	109,886.54	150,607.66
Average Section 179 (\$)	18,534.67	-	-	125.00	28,028.61	-	15,897.15
Average Bonus (\$)	20,057.00	30,521.45	24,563.50	14,356.51	160,525.76	107,969.87	116,715.46
Average Bonus (%)	29.05%	50.00%	50.00%	57.46%	77.80%	98.26%	77.50%
<b>Did not use Bonus Depreciation - 983 Farms</b>							
Average Capital Investment (\$)	26,604.31	20,122.23	14,767.89	16,365.21	20,053.50	19,363.59	120,802.40
Average Section 179 (\$)	13,551.28	8,101.50	5,488.27	6,319.92	7,655.10	7,840.55	50,432.49
Average Bonus (\$)	-	-	-	-	-	-	-
Average Bonus (%)	-	-	-	-	-	-	-
<b>Combines</b>							
<b>Total - 662 Farms</b>							
Average Capital Investment (\$)	32,184.48	23,703.34	23,468.99	15,301.63	30,885.86	29,650.33	155,194.64
Average Section 179 (\$)	14,693.74	9,330.29	6,232.16	5,112.63	11,757.30	10,415.10	57,541.22
Average Bonus (\$)	128.19	186.56	37.76	154.41	2,003.03	2,252.77	4,762.71
Average Bonus (%)	0.40%	0.79%	0.16%	1.01%	6.49%	7.60%	3.07%
<b>Used Bonus Depreciation - 16 Farms</b>							
Average Capital Investment (\$)	122,354.89	247,000.00	50,000.00	102,218.18	189,428.96	445,031.49	269,840.19
Average Section 179 (\$)	43,396.67	-	-	-	-	146,764.20	54,000.69
Average Bonus (\$)	28,286.25	123,500.00	25,000.00	102,218.18	189,428.96	298,267.29	197,057.26
Average Bonus (%)	23.12%	50.00%	50.00%	100.00%	100.00%	67.02%	73.03%
<b>Did not use Bonus Depreciation - 646 Farms</b>							
Average Capital Investment (\$)	31,774.00	23,365.53	23,428.85	15,170.13	29,191.51	26,489.13	152,355.12
Average Section 179 (\$)	14,563.07	9,344.40	6,241.59	5,120.37	11,882.95	9,377.44	57,628.92
Average Bonus (\$)	-	-	-	-	-	-	-
Average Bonus (%)	-	-	-	-	-	-	-

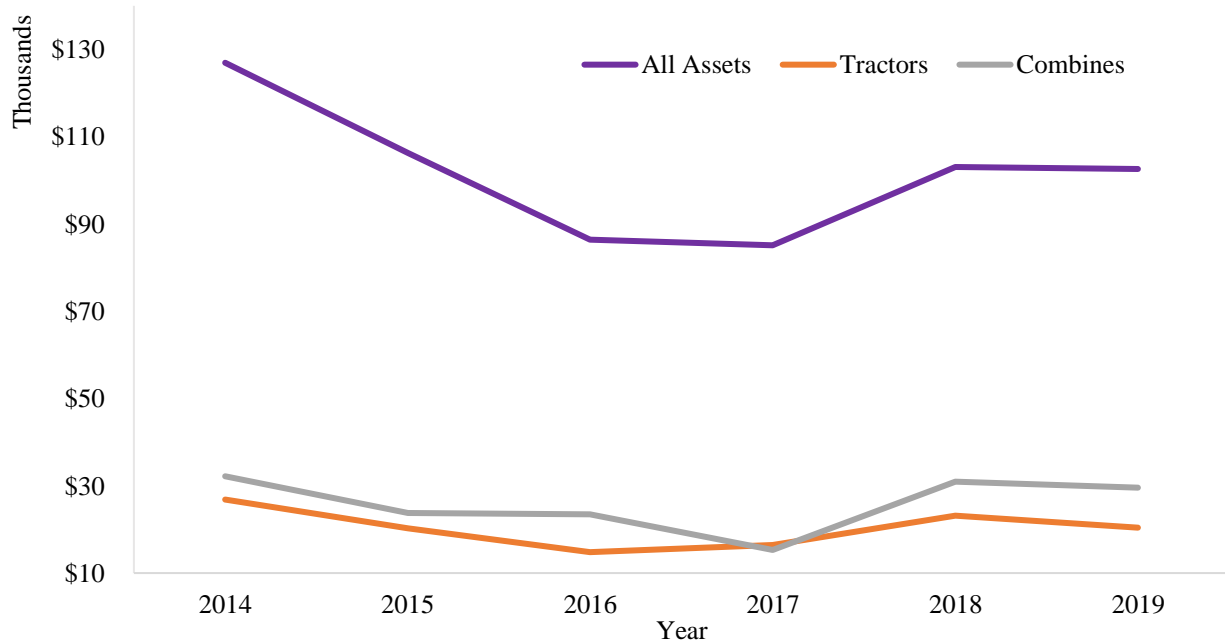


Figure 3.1 Average cost basis by type over time

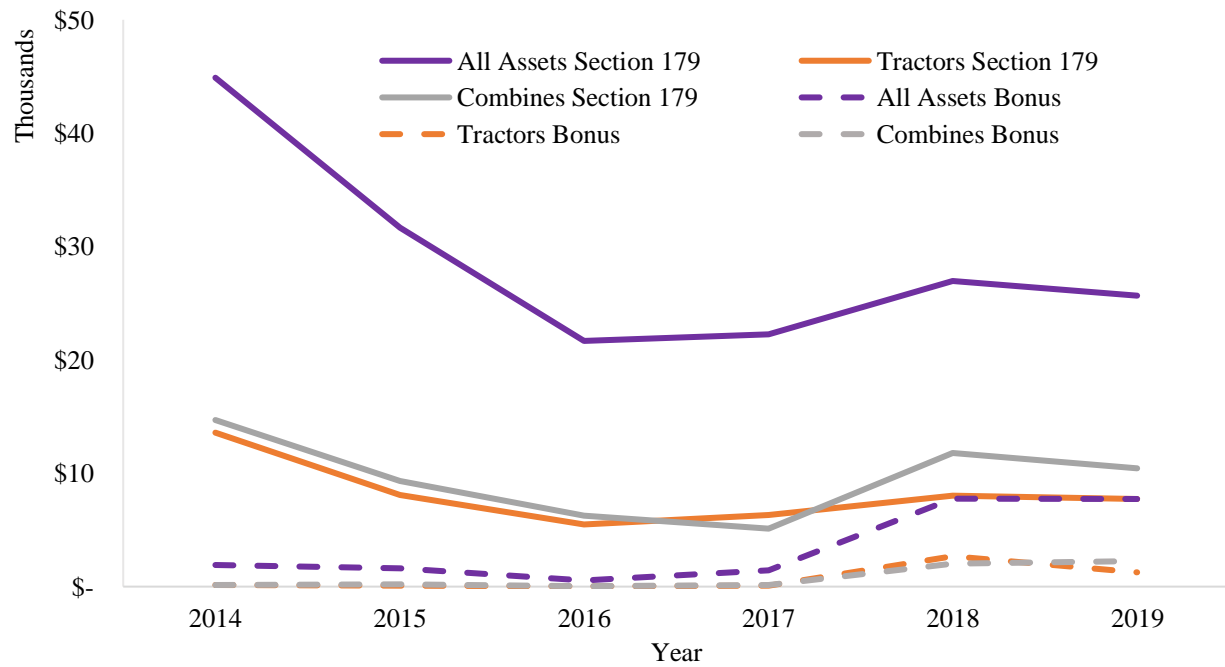


Figure 3.2 Average Section 179 and bonus depreciation by type over time

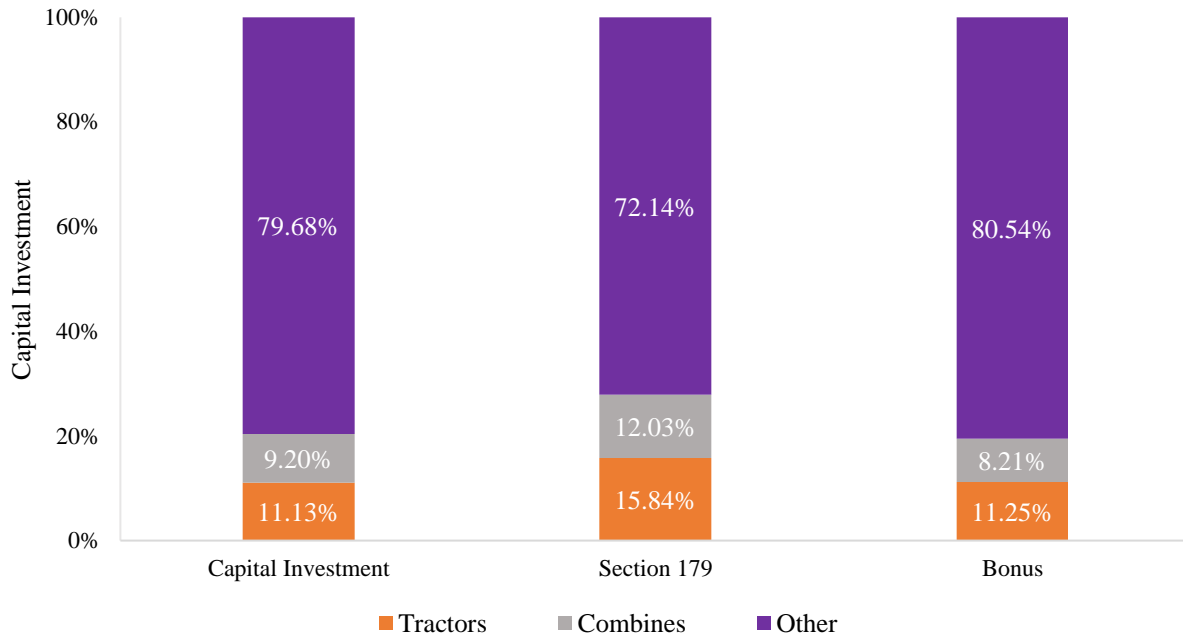


Figure 3.3 Percentage share of investment by type of investment



Table 3.2 Summary statistics of farms that did not reach Section 179 limit(s)

<b>Values</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Total</b>
<b>All Assets</b>							
<b>Total - 1,813 Farms</b>							
Average Capital Investment (\$)	120,521.24	103,483.09	86,020.38	81,927.93	101,135.69	96,658.11	589,746.42
Average Section 179 (\$)	43,189.07	30,778.88	21,875.56	22,233.02	27,208.84	25,757.96	171,043.33
Average Bonus (\$)	1,849.87	1,408.59	548.32	1,451.65	7,830.02	5,795.83	18,884.27
Average Bonus (%)	1.53%	1.36%	0.64%	1.77%	7.74%	6.00%	3.20%
<b>Used Bonus Depreciation - 467 Farms</b>							
Average Capital Investment (\$)	62,735.62	36,842.59	26,165.85	30,175.64	68,043.30	57,695.47	281,658.48
Average Section 179 (\$)	26,913.12	14,055.44	9,833.19	9,292.20	15,327.65	8,896.65	84,318.25
Average Bonus (\$)	7,181.60	5,468.47	2,128.69	5,635.65	30,397.91	22,500.72	73,313.03
Average Bonus (%)	11.45%	14.84%	8.14%	18.68%	44.67%	39.00%	26.03%
<b>Did not use Bonus Depreciation - 1,345 Farms</b>							
Average Capital Investment (\$)	140,674.70	126,698.41	106,866.53	99,957.85	112,700.95	110,258.26	697,156.70
Average Section 179 (\$)	48,872.39	36,608.34	26,073.08	26,742.76	31,354.35	31,631.56	201,282.48
Average Bonus (\$)	-	-	-	-	-	-	-
Average Bonus (%)	-	-	-	-	-	-	-

## Farm Financial Data

The depreciation data were merged with the KFMA financial information (2014-2019b). When the depreciation data and financial data were merged, the new data set consisted of 518 farms. Table 3.3 shows the summary statistics for the 518 farms. Figures 3.4 and 3.5 illustrate the movements in average over time for the 1,830 farms and the 518 farms. In Figure 3.4 the average cost basis for the 1,830 farms and 518 farms shows similar movements in level of investment until 2018 to 2019. The data set includes farms that spent more on average in capital investments than the data set including all farms. The same comparison is true for the average Section 179 deduction and average bonus depreciation shown in Figure 3.5. The data shows similar movements for the 1,830 farms and 518 farms until 2018 to 2019 when average investment increases for the 518 farms but decreases for the 1,830 farms. This would be expected for the Section 179 deduction, if the capital investment is higher the expense deduction would increase. However, the expectation is not true for bonus depreciation. Bonus depreciation would be expected to increase similar to the level of Section 179 deduction, but the opposite is shown in the graph for the 518 farms. The level of bonus depreciation dropped by nearly \$3,000 in the 518-farm data while there was a small change in the 1,830-farm data. Of the 518 farms, two farms reached a Section 179 limit.

Table 3.3 Summary statistics for farms in 518 farm data set

Values	2014	2015	2016	2017	2018	2019	Total
<b>All Assets</b>							
<b>Total - 518 Farms</b>							
Average Capital Investment (\$)	134,671.94	118,572.26	89,386.26	92,929.80	110,156.45	117,485.56	663,202.27
Average Section 179 (\$)	57,523.44	43,029.81	28,974.99	30,930.60	33,953.87	40,682.91	235,095.62
Average Bonus (\$)	2,425.59	930.28	452.40	564.63	9,651.83	3,506.47	17,531.20
Average Bonus (%)	1.80%	0.78%	0.51%	0.61%	8.76%	2.98%	2.64%
<b>Used Bonus Depreciation - 41 Farms</b>							
Average Capital Investment (\$)	286,763.46	205,637.72	267,245.61	240,111.54	243,613.99	192,748.53	1,025,224.85
Average Section 179 (\$)	117,696.83	90,860.85	130,539.72	111,852.80	47,284.09	54,332.46	359,017.16
Average Bonus (\$)	30,645.27	15,544.68	14,646.37	32,497.86	113,628.33	51,895.72	221,491.72
Average Bonus (%)	10.69%	7.56%	5.48%	13.53%	46.64%	26.92%	21.60%
<b>Did not use Bonus Depreciation - 477 Farms</b>							
Average Capital Investment (\$)	121,599.08	113,030.10	83,717.43	90,327.37	97,767.98	112,031.72	632,085.03
Average Section 179 (\$)	52,351.30	39,985.13	25,737.87	29,499.76	32,716.46	39,693.81	224,444.09
Average Bonus (\$)	-	-	-	-	-	-	-
Average Bonus (%)	-	-	-	-	-	-	-

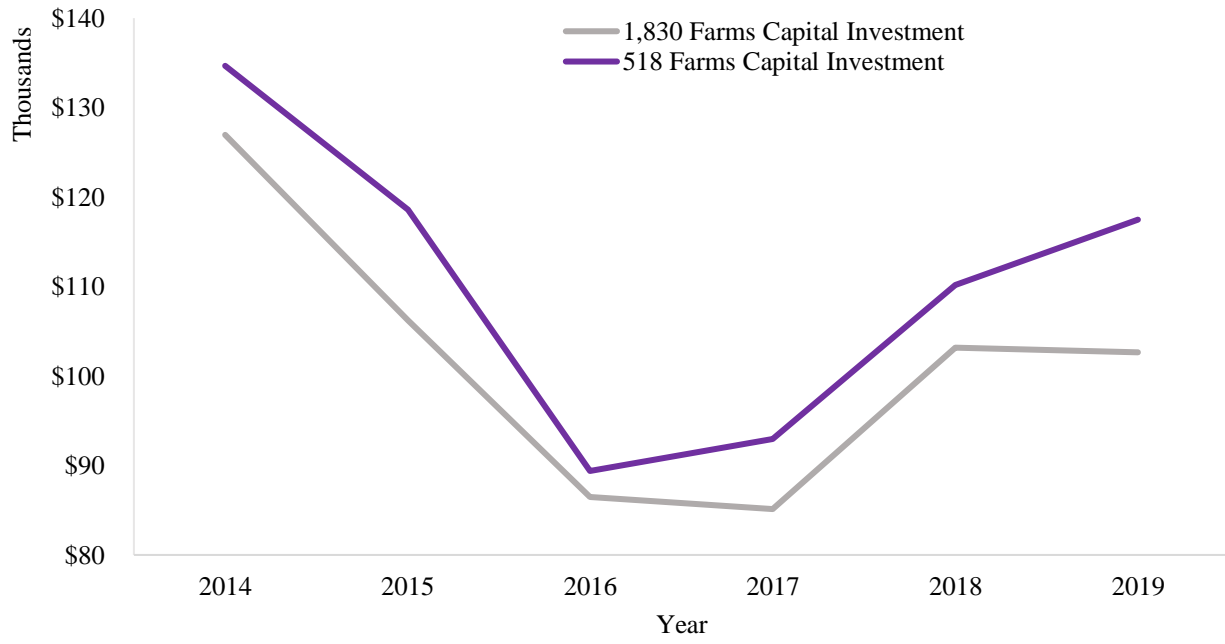


Figure 3.4 Average cost basis of 1,830 farms and 518 farms

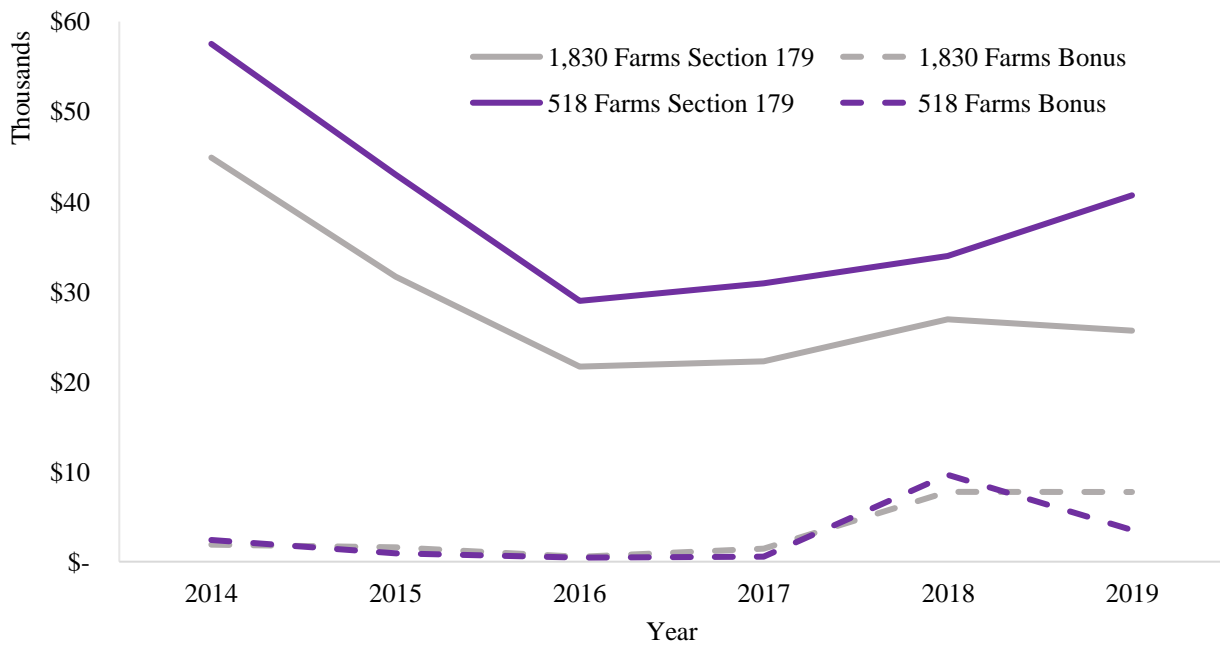


Figure 3.5 Average Section 179 deduction and bonus depreciation of 1,830 farms and 518 farms

Variables were created to measure the financial position of the farms. By creating these variables, the model examines the effect of farm investment level, Section 179 deduction and bonus depreciation on their financial measures in current and future years. These variables include the inverse current ratio, working capital, working capital ratio, working capital percent, owner equity percent, capital debt repayment capacity and probability of default. Table 3.4 shows summary statistics for the 518 farms financial variables.

The inverse current ratio is a liquidity measure that represents the amount of current liabilities relative to current assets. Working capital is another liquidity measure that shows the dollar value difference between current assets and current liabilities. Working capital alone is not easy to compare one farm to another since it is a dollar value and can be skewed by the size of the business. Therefore, the working capital ratio conveys that value relative to total assets and working capital percent explains that value as a percentage of income. These variables allow a comparison across different farm types and sizes. Owner equity percent is a measure of solvency defining the portion of assets that are owned by the investor. The closer the percentage is to 100 percent, the more solvent the business is. The capital debt repayment capacity characterizes the businesses' ability to repay their capital investment liabilities while the probability of default indicates the likelihood a business will default on a loan. Many factors are considered when calculating the probability of default, such as the type of borrower, loan size, payment frequency, underwriting variables and more. For this research, the probability of default calculation follows that of Featherstone, Roessler and Barry (2006). They used an equation derived from binary logit regression models, that used loan origination data, to predict the probability of default on a loan. This equation uses capital debt repayment capacity, owner equity percent and working capital percent within the calculations.

Table 3.4 Financial summary statistics for 518 farm data set

<b>Values</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>Total</b>
Net Farm Income	\$ 137,507.94	\$ 13,787.87	\$ 58,412.36	\$ 74,039.81	\$ 109,442.74	\$ 120,479.25	\$ 85,611.66
Inverse Current Ratio	0.6067	0.7074	0.8166	0.9191	0.7958	0.7124	0.7597
Working Capital Ratio	0.1021	0.0961	0.0858	0.0818	0.0833	0.0907	0.0900
Working Capital Percent	51.51%	56.48%	45.76%	42.32%	41.15%	44.24%	469.10%
Owner Equity Percent	80.74%	77.43%	76.34%	76.41%	762.08%	77.04%	77.36%
Capital Debt Repayment Capacity	103.8922	21.5538	43.5365	54.8892	73.1756	84.1792	63.5378
Probability of Default	1.4054	1.7034	1.8166	1.7960	1.7859	1.6985	1.7010

## Chapter 4 - Model and Results

Five models were estimated using regression analysis. The models examine the relationship between capital investment, Section 179 deduction and bonus depreciation and the following farm financial measures: working capital ratio, probability of default, working capital percent, capital debt repayment capacity and owner equity percent. Four of the models are statistically significant and presented below. The models and results are discussed in detail through this chapter. The remaining model and results are presented in Appendix A.

### Model

The goal of the regression is to measure the effect of capital investments, Section 179 deductions and bonus depreciation on farm financial measures over time. Since the data include farms' financial and depreciation data from 2014 to 2019, the data are panel data to capture the effects over time. Five models were estimated with nine variations for each model. Each model variation used a one-, two- and three-year lag variable for Section 179 deduction, bonus depreciation and capital investment levels as the independent variable.

The equations represent the variations of the working capital ratio model:

$$(1) \quad WCR_i = f(EXPDED_{i,t})$$

$$(2) \quad WCR_i = f(BONUS_{i,t})$$

$$(3) \quad WCR_i = f(COSTBASIS_{i,t})$$

where  $WCR$  is the working capital ratio,  $EXPDED$  is the Section 179 deduction amount,  $BONUS$  is the bonus depreciation amount, and  $COSTBASIS$  is the capital investment amount. Each independent variable is lagged three ways, denoted by subscript  $t$ , to create nine variations of the

model, denoted by subscript  $i$ . The following equations represent the variations of the probability of default, capital debt repayment capacity and owner equity percent models:

$$(4) \quad \text{PROB}_i = f(\text{EXPDED}_{i,t})$$

$$(5) \quad \text{PROB}_i = f(\text{BONUS}_{i,t})$$

$$(6) \quad \text{PROB}_i = f(\text{COSTBASIS}_{i,t})$$

$$(7) \quad \text{CDRC}_i = f(\text{EXPDED}_{i,t})$$

$$(8) \quad \text{CDRC}_i = f(\text{BONUS}_{i,t})$$

$$(9) \quad \text{CDRC}_i = f(\text{COSTBASIS}_{i,t})$$

$$(10) \quad \text{OEP}_i = f(\text{EXPDED}_{i,t})$$

$$(11) \quad \text{OEP}_i = f(\text{BONUS}_{i,t})$$

$$(12) \quad \text{OEP}_i = f(\text{COSTBASIS}_{i,t})$$

where  $PROB$  is the probability of default,  $CDRC$  is the capital debt repayment capacity,  $OEP$  is the owner equity percent, and the remaining variables are the same as above for the working capital ratio model with equivalent lags to create nine variations of the models. Explanations and results for the working capital percent model are in appendix A.

## Results

Table 4.1 provides the results of the nine variations for the working capital ratio model. The three lag variables for Section 179 deduction were statistically significant for the working capital ratio. As a farms' Section 179 deduction increases, the working capital ratio increases. This is expected because the farm is lowering their amount of taxable income through the Section 179 expense deduction which increases net farm income and therefore cash that



increases the amount of working capital available. Thus, the farm is more liquid. Since these results are statistically significant for each of the three lag variables for Section 179 deductions, the deduction affects the working capital ratio for at least three years. The bonus depreciation and investment amount variables were not statistically significant. However, the farther the lag on the investment amount variable the closer the p-value is to reaching a statistically significant level. The relationship for this variable would be expected because making a capital investment requires cash and therefore lower the amount of working capital available.

Table 4.2 shows the results of the nine variations for the probability of default model. The three lag variables for Section 179 deduction are also statistically significant in this model. These results suggest as farms' Section 179 deduction increases, probability of default decreases. The initial expectation was as the Section 179 deduction increases, the probability of default would increase. The assumption was that if a farm increases Section 179 deduction, they increase their capital investment and take on more liabilities in the form of loans. However, after further consideration, it could be suggested that increasing capital investment increases farm efficiency that could increase net farm income affecting other ratios related to probability of default. Since these results are statistically significant for each of the three lag variables for Section 179 deductions, the deduction reduces the probability of default for at least three years. The other variations in this model did not prove statistically significant.

Table 4.3 reports the results of the nine variations for the capital debt repayment capacity model. This model resulted in the three Section 179 deduction lag variables being statistically significant. Different than the probability of default model, Section 179 deductions have a positive relationship with capital debt repayment capacity. As Section 179 deduction increases, capital debt repayment capacity increases. Since each of the lag variables are significant, Section

179 affects capital debt repayment capacity for at least three years. Similar to the probability of default model, the initial expectation of the relationship between these two variables was the opposite. However, the same conclusion can be drawn that increasing capital investment could increase net farm income and increase capital debt repayment capacity.

Table 4.4 displays the results of the owner equity percent model which identified the first lag variable for Section 179 deduction being statistically significant. The Section 179 deduction lag variable has a positive relationship with owner equity percent. As Section 179 deduction increases, owner equity percent also increases making the business more solvent. The relationship between the Section 179 lag variable and owner equity percent would be expected due to the payments that would be made since the previous years' capital investment. Unlike the previous models, the Section 179 deduction affects owner equity more significantly one-year into the future instead of three years. The relationship between the second- and third-year Section 179 deduction lag variables and owner equity percent is the same as the first-year lag variable but is not statistically significant. Neither bonus depreciation nor capital investment were statistically significant in any of the models estimated.

Table 4.1 Effect of Section 179 Deduction, Bonus Depreciation and Capital Investment on Working Capital Ratio

Variables	Model 1: Working Capital Ratio								
	Section 179 Deduction			Bonus Depreciation			Capital Investment		
	Variation 1	Variation 2	Variation 3	Variation 4	Variation 5	Variation 6	Variation 7	Variation 8	Variation 9
Section 179 Deduction:									
Lag 1	0.0000003267*								
Lag 2		0.0000003282*							
Lag 3			0.0000003007*						
Bonus Depreciation:									
Lag 1				0.0000002041					
Lag 2					0.000000566				
Lag 3						0.0000004888			
Capital Investment:									
Lag 1							-0.0000000137		
Lag 2								-0.0000000002	
Lag 3									-0.0000000097
Number of Observations	2,590	2,072	1,554	2,590	2,072	1,554	2,590	2,072	1,554
Adjusted R-squared	0.0236	0.0246	0.0221	0.0013	0.0003	0.0001	-0.001	-0.0005	-0.0005

\*Significant at p<.0001

Table 4.2 Effect of Section 179 Deduction, Bonus Depreciation and Capital Investment on Probability of Default

Variables	Model 2: Probability of Default								
	Section 179 Deduction			Bonus Depreciation			Capital Investment		
	Variation 1	Variation 2	Variation 3	Variation 4	Variation 5	Variation 6	Variation 7	Variation 8	Variation 9
Section 179 Deduction:									
Lag 1	-0.00000268*								
Lag 2		-0.00000264*							
Lag 3			-0.00000246*						
Bonus Depreciation:									
Lag 1				-0.00000127					
Lag 2					-0.00000691				
Lag 3						-0.00000698			
Capital Investment:									
Lag 1							-0.0000000195		
Lag 2								0.0000000872	
Lag 3									0.0000002406
Number of Observations	2,590	2,072	1,554	2,590	2,072	1,554	2,590	2,072	1,554
Adjusted R-squared	0.0179	0.016	0.0148	0.0003	0.0007	0.0008	-0.0004	-0.0004	0.0002

\*Significant at p<.0001

Table 4.3 Effect of Section 179 Deduction, Bonus Depreciation and Capital Investment on Capital Debt Repayment Capacity

Variables	Model 3: Capital Debt Repayment Capacity								
	Section 179 Deduction			Bonus Depreciation			Capital Investment		
	Variation 1	Variation 2	Variation 3	Variation 4	Variation 5	Variation 6	Variation 7	Variation 8	Variation 9
Section 179 Deduction:									
Lag 1	0.00014407*								
Lag 2		0.00019004*							
Lag 3			0.00014778*						
Bonus Depreciation:									
Lag 1				0.00017174					
Lag 2					0.00047339				
Lag 3						0.00066788			
Capital Investment:									
Lag 1							0.00003037		
Lag 2								0.00002902	
Lag 3									0.00001636
Number of Observations	2,590	2,072	1,554	2,590	2,072	1,554	2,590	2,072	1,554
Adjusted R-squared	0.0101	0.0167	0.0101	0.0022	0.0007	0.002	0.0023	0.0019	0.0001

\*Significant at p<.0001

Table 4.4 Effect of Section 179 Deduction, Bonus Depreciation and Capital Investment on Owner Equity Percent

Variables	Model 4: Owner Equity Percent								
	Section 179 Deduction			Bonus Depreciation			Capital Investment		
	Variation 1	Variation 2	Variation 3	Variation 4	Variation 5	Variation 6	Variation 7	Variation 8	Variation 9
Section 179 Deduction:									
Lag 1	0.00002501*								
Lag 2		0.00002397							
Lag 3			0.00002307						
Bonus Depreciation:									
Lag 1				0.00000856					
Lag 2					0.00003457				
Lag 3						0.00004587			
Capital Investment:									
Lag 1							-0.00000747		
Lag 2								-0.00000915	
Lag 3									-0.00001085
Number of Observations	2,590	2,072	1,554	2,590	2,072	1,554	2,590	2,072	1,554
Adjusted R-squared	0.0078	0.0065	0.0061	-0.0002	-0.0003	-0.0003	0.0039	0.0056	0.0075

\*Significant at p<.0001

## Chapter 5 - Conclusion

This thesis examined the effects of capital investment, Section 179 deduction, and bonus depreciation levels on farm financial measures. Depreciation and financial data from the Kansas Farm Management Association were used to create a panel data set consisting of 518 farms over the years 2014 to 2019. Five models were estimated with nine variations included for each model to explain the effects of capital investment, Section 179 deduction and bonus depreciation variables. The variations comprised of one-, two-, and three- year lag variables for each financial measure.

A statistically significant, positive relationship between Section 179 deduction and working capital ratios was estimated. As farms increase their Section 179 deduction, their working capital ratio increases. This result was statistically significant for the one-, two-, and three- year lag variables for the Section 179 deduction. The Section 179 deduction increases liquidity up to at least three years after they are taken. A statistically significant negative relationship between Section 179 deductions and probability of default was estimated. As farms increase their Section 179 deduction, their probability of default decreases. These results were also significant for the one-, two-, and three- year lag variables for Section 179 deductions. A positive relationship was estimated between Section 179 deduction and capital debt repayment capacity that proved statistically significant. As the deduction increases, capital debt repayment capacity increases. The one-, two-, and three-year lag variables for Section 179 deduction were statistically significant in the model. Therefore, the deduction affects the business's ability to repay capital investments for up to three years. Lastly, a statistically significant positive relationship was estimated between Section 179 deduction and owner equity percent. As Section 179 deduction increases, owner equity percent increases. The one-year lag variable was

statistically significant in the model leading to Section 179 deduction increasing owner equity percent for two years into the future. Each of the models estimated provided relatively small coefficients and would need sizable changes in the Section 179 deduction to make a large impact on the farm financial ratios.

Section 179 deduction increases liquidity by lowering the amount of taxable income and increasing the amount of working capital available. The relationship between Section 179 and probability of default was not originally expected. A connection could be made that increasing capital investment increases farm income which lowers probability of default and increases capital debt repayment capacity. Section 179 deduction increases solvency as more payments are made over the years. The amount of bonus depreciation and the amount of capital investment were not statistically significant in explaining the liquidity, repayment, leverage and probability of default measures.

The research shows a statistically significant relationship between Section 179 deduction and multiple farm financial ratios in the five models. The deduction affects the ratios for one to three years. Although, a sizable change in Section 179 deduction would need to be made to make a large impact on farm financial position. The research could be extended to include some focus on the disposal of capital investments. Including this focus could identify if these deductions are encouraging the disposal of investments more frequently than normal and encouraging more frequent investments.



## References

- Association, Kansas Farm Management. 2014 – 2019a. “Depreciation Data.”
- Association, Kansas Farm Management. 2014 – 2019b. “Financial Summary Data.”
- Featherstone, Allen M., Laura M. Roessler, and Peter J. Barry. “Determining the Probability of Default and Risk-Rating Class for Loans in the Seventh Farm Credit District Portfolio.” *Review of Agricultural Economics* 28, no. 1 (2006): 4–23. <https://doi.org/10.1111/j.1467-9353.2006.00270.x>.
- Hadrich, Joleen C., Ryan Larsen, and Frayne E. Olson. “Impact of the Section 179 Tax Deduction on Machinery Investment.” *Agricultural Finance Review* 73, no. 3 (2013): 458–68. <https://doi.org/10.1108/afr-07-2012-0035>.
- Internal Revenue Service. “Publication 946 (2019), How to Depreciate Property: Internal Revenue Service.” Publication 946 (2019), How to Depreciate Property. 2020. <https://www.irs.gov/publications/p946>.
- Murray, Jean. “Bonus Depreciation and How It Affects Business Taxes.” *The Balance Small Business*, December 29, 2020. <https://www.thebalancesmb.com/what-is-bonus-depreciation-398144>.
- “Section 179 Amendments.” Section179.Org, 2021. [https://www.section179.org/stimulus\\_acts/](https://www.section179.org/stimulus_acts/).
- “Section 179 Deduction.” Section179.Org, 2021. [https://www.section179.org/section\\_179\\_deduction/](https://www.section179.org/section_179_deduction/).
- Williamson, James M, and Sarah Stutzman. “Tax Policy and Farm Capital Investment: Section 179 Expensing and Bonus Depreciation.” *Agricultural Finance Review* 76, no. 2 (2016): 246–69. <https://doi.org/10.1108/afr-07-2015-0031>.

## Appendix A - Additional Models

An additional model was estimated to measure the same effects for working capital percent. The equations for working capital percent were:

$$(13) \quad WCP_i = f(EXPDED_{i,t})$$

$$(14) \quad WCP_i = f(BONUS_{i,t})$$

$$(15) \quad WCP_i = f(COSTBASIS_{i,t})$$

where  $WCP$  is working capital percent and the remaining variables are the same as listed in the model section with equivalent lag times to create nine variations of each model.

Table A.1 reports the results of the working capital percent model. The model found one of the Section 179 variations to be statistically significant which was one-year lagged variable. This variation is positive, describing similar behavior to the working capital ratio, capital debt repayment capacity and owner equity percent models. As Section 179 deduction increases, working capital percent increases.

Table A.1 Effect of Section 179 Deduction, Bonus Depreciation and Capital Investment on Working Capital Percent

Variables	Model 5: Working Capital Percent								
	Section 179 Deduction			Bonus Depreciation			Capital Investment		
	Variation 1	Variation 2	Variation 3	Variation 4	Variation 5	Variation 6	Variation 7	Variation 8	Variation 9
Section 179 Deduction:									
Lag 1	0.00009219*								
Lag 2		0.00007578							
Lag 3			0.00007121						
Bonus Depreciation:									
Lag 1				0.00004853					
Lag 2					0.00010086				
Lag 3						0.0000662			
Capital Investment:									
Lag 1							-0.00001172		
Lag 2								-0.00001863	
Lag 3									-0.00002442
Number of Observations	2,590	2,072	1,554	2,590	2,072	1,554	2,590	2,072	1,554
Adjusted R-squared	0.0091	0.0058	0.0053	0.0001	-0.0004	-0.0006	0.0005	0.0018	0.0032

\*Significant at p<.0001