

Forecasting the Demand for Craft Beer
In the State of Kansas

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Abstract

America is within a “Beer Renaissance”. This *Golden Age of Brew* brings with it some very interesting, and what some would call important, economic impacts. In recent years, there have been a number of craft breweries open their doors and start producing. This production leads to increased awareness of this new renaissance as well increased output of those same breweries. When focusing on the smaller market of Kansas, we can draw conclusions about the future of the craft brewing in the sunflower state and provide guidance for new brewers as they consider starting an establishment of their own. This will inevitably lead to an increase in both brewing establishments and employment within the sprawling industry. Both the total market share and production of domestic specialty brews have increased substantially as of late (beginning, for the most part, in 1990), and this can attributable to a number of factors.

For the purpose of this research, it was chosen to specifically focus on how per capita income correlates with craft beer consumption. This is consistent with what other researchers have done with consistent results.¹ Although there are other factors that have a strong impact on the production of craft brewing, it has been found that these two variables show a strong correlation with the total consumption of craft beer – which will be elaborated on more within this paper. Using these variables, a regression analysis was completed that forecasts a bright future for the craft brewing industry in Kansas.

With an R-squared value of 0.86, the regression can be interpreted in such a way that 86% of the variability in craft beer production can be explained by changes in the real per capita income of the consumer base. Craft beer is part of the beer industry known as “High End” beers.² This particular market is made up of craft beers, imported beers, and super-premium domestic beers. Although both the import and super premium beers have been shown to be somewhat volatile, the craft beer portion has seen steady increases though the last few decades.³

The outcome of this regression shows that as per capita income continues to rise there will also be an increase in craft beer consumption. As demand increases over time, Kansas will likely see a steady increase in craft microbreweries and brewing industry jobs. By year 2020, a forecast can be made that shows an increase in both craft beer demand, and craft beer production, of roughly 19%.

Introduction and History

The “beer renaissance” is somewhat of a new development with America. In fact, the history of the American brewing industry has been somewhat of a rollercoaster. From early exploration and colonization to prohibition, the consumption of beer has varied substantially. Global preferences led to new techniques being incorporated into the brewing process as well as the transportation and storage of the treasured brew.

As Europeans moved to colonize parts of the world, the initial thought was that the water (which is the primary ingredient in beer) of the new areas was unfit to use to brew.⁴ As the Tremblay’s put it, “. . . the European discovers took beer as a very important cargo on their ships. [They] also introduced beer-brewing methods into the regions they conquered.”⁵ It was not until these adventurers moved into some parts of southwestern North America and Latin America that it was soon discovered that certain groups of Native Americans had already fostered their own methods of brewing primitive forms of beer by fermenting types of kernels of maize.⁶

It was in 1612 when the first brewery was founded in North America, in what is known as New Amsterdam.⁷ Throughout the 17th, 18th, and 19th centuries, brewing in America faced new challenges as increased competition from other non-alcoholic beverages began to sway consumer preferences away from beer.⁸ It was not until the late 19th century that American breweries began to gain competitive advantage over their foreign counterparts. For the most part, it was German immigrants, moving in mass to America, who began brewing lighter German-style lagers, which quickly rose in popularity among the nation’s beer drinkers.⁹ One can thank some very familiar names for this increase of American brewing: Anheuser-Busch, Coors, Miller, Pabst, and Schlitz to name a few.

Times were not always as bright as they are now, however. During the late 19th century, a dark cloud began to grow over the American brewing industry. This ominous threat to American beer would continue to grow until 1920, when the 18th Amendment was ratified. Thus began the *Dark Ages of American Brewing*. This new law made the possession, production, transportation, and sale of alcoholic beverages illegal within the United States.¹⁰ Known as Prohibition, this era of history was witness to more than 1,500 American breweries closing their doors, only close to half of which would ever open again as beer producers.¹¹ Other than negative economic impact of forcing so many businesses to close, there was also an increase in crime due to the new bootlegging of illegal liquors. It is common knowledge that many prominent criminals of the day made their stake in this new black market. Several larger breweries were able to stay afloat by moving production to the manufacturing of syrups, dairy products, and a variety of soft drinks.¹²

The saying that “the night is always darkest just before the dawn” also hold true for the American brewing industry. Upon the ratification of the 21st Amendment, the 18th

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Amendment was nullified. Thus began an era of sustained long run growth for the American brewing industry. From 1935 to 1990, total production of beer grew to more than triple the pre-prohibition rates.¹³ In terms of per capita consumption, it took until the mid 1970s to return to pre-prohibition rates.¹⁴

In 1980, the total number breweries in the United States clocked in at a measly 101.¹⁵ This is because there was a strong consolidation of breweries within the United States during the later half of the 20th century. To give some perspective to the consolidation, Poelmans and Swinnen point out that “the five largest American breweries’ share in total USA beer production rose from 19% in 1947 to 75% in 1981.¹⁶ During the mid 1980’s consumers began to tire of the consolidated brands and thus began the shift to the “high end” beers that entails the focus of this paper. Smaller breweries began to establish themselves offering “older style” beers. Thus began the “microbrewery movement.”¹⁷

Kansas has historically been somewhat behind the times in terms alcohol sales. From 1881 through 1947, there was a statewide prohibition law, although strong regulations continued until as recent as 1987 when Kansas finally nullified a “buy the drink” ban.¹⁸ During this same year, the Kansas Legislature also created a license category for microbreweries, thus allowing the “microbrewery movement” to make its way into the Sunflower State.¹⁹ Later, in 1992, Kansas approved a regulatory action that allowed microbreweries to be registered as caterers. This act allowed small breweries to serve directly to their customers, given the beer was brewed on site.²⁰ However, laws still remain that prevent the sale of beer from microbreweries to other bars or liquor stores without going through a distributor.²¹

It is doubtful that this *semi deregulation* of the brewing industry in Kansas coincidentally occurred alongside the beginning of the “microbrewery movement.” Some inference can be made that legislators were aware of the ongoing movement outside of their state and took actions to allow Kansas to participate in the economic boom that comes along with a state welcoming producers. As reported by the U.S. Treasury Department, Bureau of Alcohol, Tobacco, and Firearms, within the *Brewer’s Almanac*, there has been a steady rise of Kansas breweries in recent years.²² After Kansas allowed microbreweries to establish themselves within the state in 1987, a slow but steady increase in beer producers caused the total number of brewing permits to increase to 10 by 2004. As of 2011, that number grew to 18.²³ It should be expected that this number would continue to rise as the *Golden Age of Brewing* makes itself more prevalent within Kansas.

The intention of this paper is to make a case for just that – show the increasing demand for craft beer within Kansas and forecast the future of this microcosm of the industry. By drawing data from numerous sources, it is possible to show the increasing trend of craft beer production and how this correlates with important macroeconomic variables for Kansas. The primary source of beer industry data is the *Brewer’s Almanac*, an annual publication by the U.S. Treasury which tracks significant variables concerning

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the brewing industry (www.beerinstitute.com).²⁴ For data concerning the Kansas economy, and more specifically, per capita income, data was drawn from the Federal Reserve Bank of St. Louis's economic research website – the FRED.²⁵ Additional, anecdotal data and information has been drawn from a private publication of the Demeter Investment Group.²⁶ Market share of the craft beer industry and historical anecdotes were taken from both Swinnen's *Economics of Beer*²⁷ and the work of the Tremblay's on the U.S. brewing industry.²⁸

Using a simple ordinary least squares regression (OLS), a model was constructed showing the correlation of the increase of craft beer sales in Kansas and real per capita income, adjusted to 2011 dollars. This model shows a strong relationship between the two variables. It can certainly be inferred that the future of the craft brewing industry within Kansas is largely tied with the economic future of the state. This, itself, is not immediately noteworthy, because intuitively that would be the case with any business category. The aspect that is of more concern is that microbreweries tend to be locally owned and operated, so a movement of consumer preferences towards these hometown breweries means that the revenues generated by these businesses generally stay within local communities and benefit the State as a whole. This cannot be said of the revenues of larger corporate breweries whose larger business goals are for the benefit of shareholders.

Literature Review

There has been a significant amount of studies completed on the history and impacts of the brewing industry of not only the United States, but also the world as a whole. Several studies have focused on specific countries or regions, while others focused on determinants of alcohol production – such as advertising expenditures, income, culture, and regulation.

George Franke and Gary Wilcox, published in the *Journal of Advertising*, completed one such study on advertising expenditures in 1984.²⁹ What sparked this venture was the growing concern that increased advertising by alcoholic beverage companies had led to an increase in alcohol abuse. If it were possible to statistically tie advertising to consumption, then an inference could be made that the multi-million dollar advertising campaigns by alcohol producers partially was to blame to increased incidents involving alcohol. Many organizations began calling for a ban on alcoholic beverage advertisements while producers maintained the stance that advertising only led to brand switching rather than increased consumption.³⁰

While focusing specifically on the impact of advertising on beer consumption, rather than alcohol as a whole, Franke and Wilcox found that advertising dollars are in fact not significant.³¹ They discovered that 94% of the variability in beer consumption could be explained using only personal income, time trends, and seasonality.³² They were able to make the conclusion that “... these analyses support the conclusion that aggregate beer advertising has no relationship with levels of primary demand for beer.”³³ Although this does not specifically support the stance that beer advertising leads to brand switching, it does at least partially help the beer advertisers stance that advertising does not lead to increased consumption.

Franke and George’s study do not immediately agree with other studies. In 2004, David Grigg released a study regarding global patterns of alcoholic beverage consumption.³⁴ Grigg’s findings were that consumption was largely related to four factors: production, ethnicity, income, and culture.³⁵ Production, as Grigg states, “... is of great importance. Most discussions of food choice emphasize the wide range of products available to consumers...”, however he goes on to say that in western countries this factor is less important to transportation capabilities leading to wider availability of products outside of where they were produced.³⁶ Ethnicity also plays a key role in alcohol consumption. Due to the history of some countries and their greater prevalence towards alcohol production, certain ethnic groups have, over time, developed tendencies leading to increased consumption.³⁷

According to Grigg’s study, the third factor influencing global consumption was income. His conclusion was that as income increased though out the world, as did alcohol consumption as a whole.³⁸ It is worth noting, however, that he found income was more influential on wine and spirits, rather than beer. In terms of global beer consumption,

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Grigg found that income seemed to have “relatively little influence on consumption.”³⁹ This does not immediately discount income a determinant of beer consumption, however, because his conclusion was relative to the entire global alcoholic beverage market. Particular segments of that market, a single country for example, may behave differently. One reason for this could be concentrated economic prosperity leading to income being a more important factor than it is on a global scale.

Grigg’s last factor on consumption, cultural factors, draws its importance from the fact that he was writing from the perspective of geography. He specifically calls out religion as one particular cultural aspect that will be heavily influential on alcohol consumption.⁴⁰ Certain religions and philosophies specifically forbid the consumption of alcoholic beverages so to ignore culture in a discussion of global alcohol consumption would be to leave out a very important variable.

During the recent Great Recession, there was a movement centered on studying the impacts of the macro economy on alcohol consumption. One such study by Barry Anderson and Mirko Moro in 2008 sought to determine if alcohol as a whole is a normal or an inferior good.⁴¹ The theory inspiring this study was that an economic downturn could lead to increased alcohol consumption – meaning that alcohol, as a whole, is an inferior good. Anderson and Moro’s conclusions were, in fact, that alcohol consumption does increase as economic prosperity decreases.⁴² Intuitively, this would mean that economic depression leads to psychological depression, which in turn leads to self-destructive activities such as increased alcohol consumption.

Is beer really an inferior good? More comprehensive works have been done encompassing much larger aspects of the brewing industry, rather than specific studies cited thus far. There are actually consistent conclusions that refute the findings of Anderson and Moro’s study. One such study by Donald Freeman, as compiled in Swinnen’s *The Economics of Beer*, finds that beer is a normal good.⁴³ The principal findings of his study find that beer is highly pro-cyclical – meaning that as a whole, people drink less beer recessions (it is worth noting that Anderson and Moro’s study focused on alcoholic beverages as whole, not just beer).⁴⁴ Freeman’s conclusion was that age distribution had a broader impact on beer consumption, and in fact saw the peak consumption occurs between the 35-45 age category.⁴⁵

What about craft beer: does craft beer follow the same patterns described by either Anderson and Moro or Freeman? In a later chapter within Johan Swinnen’s (authored by Carol and Victor Tremblay⁴⁶) *Economics of Beer*, it is discussed that since the mid 1980’s there has been steady increases in craft beer consumption, despite several recessions during the time period.⁴⁷ This does not, however, align with the idea that craft beer is an inferior good. Within the study, it is discussed that craft beer is in fact a normal good with special characteristics that prevent its demand from falling during economic downturns. Recessions will have two impacts on the demand for beer:

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“(1) it causes income to fall, which puts downward pressure on demand for normal goods such as import, craft, and super premium beer; (2) it puts upward pressure on the demand for craft brands because they are generally produced locally. This may explain why the share of share of imports, but not the share of crafts, fell during recessions.”⁴⁸

Later within this study, it is discussed that tendency of craft brewers to provide a large variety of products to the consumer helps ensure the resiliency of craft brands. The Tremblays go on to say that these factors have a high positive correlation with income – meaning “... import and craft beers gained market share as income rose over time.”⁴⁹ It is important to make the distinction, though, that imports did not share the same success of crafts due to the large negative impacts recessions had on imports on a macro level. The Tremblay’s conclusion is that they expect the market share of import and craft brewers to increase in the future as income rises and consumer preferences continue to move towards variety and quality.⁵⁰

Outside of the Tremblay’s contribution to Swinnen’s *The Economics of Beer*, Carol and Victor also authored their own extensive work on the U.S. Brewing Industry entitled *The U.S Brewing Industry: Data and Economic Analysis*.⁵¹ Consistent with the findings of Franke and Wilcox discussed earlier, the Tremblays note that crafter breweries tend to not spend much on advertising.⁵² They also go on to say that is an opportunity for craft beer to gain a little ground in the overall market by moving into the void created by the decline in imports.⁵³

All of these are consistent with first hand accounts from brewers such as Sam Calagione, the founder of Dogfish Head Brewing Company. Calagione comments on the sustainable growth of his brewery and is extremely optimistic of the future of the craft beer industry. His statement that “Craft beer is *growing* during a recession” is in line with what these economic studies have found.⁵⁴ He attributes craft beer’s ability to do this to the consumer – who has been consistently moving towards the support of local companies.⁵⁵ Dogfish Head has also been somewhat of a pioneer in terms of social media. They internally operate all websites and social ventures so as to minimize advertising expenditures. This opposition to begin multi-million dollar advertising campaigns has not hindered their ability to grow into the 25th largest brewery in the United States.⁵⁶

All of these findings can be summed together in one phrase: *craft beer is booming*. Despite the economic theory that as conditions worsen during economic downturns, the demand for craft beer (a normal good) should also decrease, there are special characteristics of craft beer that make it semi-recession proof. The sustained growth of the industry bodes well for both producers and consumers. Producers need not spend a large sum on advertising as long as they maintain a close relationship with their consumer base. This should not be a problem considering the local and social relationship that many beer producers have with consumers.

Analysis and Discussion

Do all of these findings align with the craft beer market in Kansas? Using data sets taken from several sources, a regression analysis will tend to say that the Kansas craft beer market is indeed moving in the same direction.

Sample and Statistics

The primary source for beer industry data is the *Brewer's Almanac*. Statistics of particular interest include: number of breweries in the United States, U.S. and State populations, beer shipments by state, as well historical price indices. Within Swinnen's *Economics of Beer*, data is available for the total market share of the craft beer segment over time, and information regarding per capita personal income is available from the Federal Reserve Bank of St. Louis (FRED). The *Brewer's Almanac* has been used as a resource in almost all research referred to within this work.

One shipment of craft beer constitutes a 31-gallon barrel of craft beer, as this is the most common measurement for beer production in the United States. In other nations, a barrel can actually vary somewhat in terms of volume, so this common US standard was the basis chosen for this analysis. "Craft Beer" is generally defined as belonging to the group of "High End" beers.⁵⁷ The general consensus is that the "High End" group contains craft, import, and super premium brands. Imports are self-explanatory, however the difference between a craft and super premium brand is significant. A super-premium beer is a higher quality beer brewed by macro-brewers; Michelob, by Anheuser-Busch, would be an example of a super-premium beer. Craft beer is produced by smaller microbrewers and tends to exceed premium and super-premium beers in price, color, and heartiness; Ad Astra, by Free State Brewing, is an example of a craft beer.⁵⁸

A sample from the years 1990-2011 was used as a focus for this analysis for a few reasons; unfortunately, the data is only published on an annual basis with the *Brewer's Almanac*. The first reason was that this time period captures almost all effects of the "microbrewery movement", which began in the mid 1980s and has continued ever since. Secondly, since Kansas did not allow microbreweries to establish themselves within the state until 1987, the time period after 1990 should encompass all long run effects that Kansas microbreweries would have on the model. The *Brewer's Almanac* also does not have much data prior to 1990 that would be relevant to determining a correlation with Kansas's craft beer demand.

The time period in question shows a very large increase in craft beer demand. This is largely due to the fact that the market share for craft beer has significantly increased during these years.⁵⁹ In 1990, the craft beer market share amounted to less than 0.5% of the total market. However, in 2011, it was well on its way to surpassing 6%. That means in a little more than 20 years, the craft beer market share increased by a factor of 12! When starting out at such a low percentage, that large of a factor may not seem large, but it is quite significant. When coupled with the slightly

increasing total shipments of beer in Kansas, this means that the total number of craft beer shipments actually increased by a factor of almost 17! To say that consumption of a product will increase to 17 times its original value, in such a small period, is astounding.

The tale of per-capita personal income in Kansas is also interesting, although maybe not as much as increased beer consumption. After transforming the annualized figures to 2011 dollars, the comparison is more straightforward. During this time period, per-capita personal income creased roughly \$10,000 in 2011 dollars, moving from just above \$31,000 to just below \$41,000. This is still a significant increase (roughly one third of the 1990 value).

Model and Methodology

In terms of methodology, Ordinary Least Squares (OLS) was chosen for its ability to provide a relatively simple output. By taking the shipments of beer for Kansas (in 31 gallon barrels) during this time (see figure 1) and applying the historical market share of craft beer (figure 2), the estimated total shipments of craft beer for Kansas (KCBS) can be arrived at (figure 3). This will be the dependent variable in this regression. The independent variable of the regression will be per capita income (KPCI), transformed into 2011 dollars (figure 4). Including a constant (c), as well as an error term (e), the regression model is now as such:

$$KCBS = c + B_{KPCI} \times KPCI + e$$

The data within Table 1 is applied and a regression is giving the results as displayed in Table 2. Figure 5 will show the Eviews output denoting the residuals of the regression. Because the immediate results show an R-squared value of .86, the interpretation is that roughly 86% of the variability of craft beer sales in Kansas can be explained by changes in the per capita personal income in Kansas, as well as the presence of a constant in the model. The new equation is now as such with the constant and beta terms complete:

$$\hat{KCBS} = -198,761.2 + 7.045798 \times KPCI$$

At this point, it is important to test the residuals of this model for autocorrelation. Figure 10 represents the Eviews output of a test of the residuals. The dashed vertical lines represent a 95% confidence interval. Judging from the results of this output, we can likely not reject the null hypothesis that no autocorrelation is present in the regression. This could mean that this model will be inefficient, although it will still be unbiased. This is concerning because it would mean that the model is no longer BLUE – the best linear unbiased estimator.

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One possible solution to this would be to use a AR(1) correction in an attempt to correct for the autocorrelation. The outcome of doing so can be seen in Table 4. Although it does increase the R-squared to near .98, making this change drops the significance level of KCPI to the point where is almost insignificant. This is likely because the type of autocorrelation is unknown, therefore remedying it can be a bit foolhardy. The preferred solution would likely be to modify the regression. Some possible modifications will be discussed later.

Forecasts

Over the time period of 1990-2011, the per capita personal income rose at an average rate of 1.3% per year; this is attained by calculating the mean of all the percent changes of KPCI during the time period. If we then take this average growth and apply to the last known KPCI in 2011, we can forecast personal income through 2020 – a forecasted graph of the results can be found in figure 6. Within figure 6, an upper bound and lower bound are included to show a realm of possibilities. These bounds represent 2 standard deviations from the forecast, meaning that it can be concluded that the forecast will be within these bounds with 95% probability, assuming no major fluctuations in the economy cause this growth rate to significantly far from the truth.

This potential forecast for per capita personal income in Kansas could be used to calculate a prediction for the Kansas craft beer market. Applying the results of the regression model to the forecasted values of personal income through 2020, a new projection is arrived at. The results of this prediction for craft beer in Kansas can be seen in figure 7. There seems to be a bit of an anomaly in the forecast, because it acts as if the increase in years 2009-2011 will be followed by a decrease. This is because the most recent years show a somewhat odd growth pattern. Because craft beer consumption actually increased during the latest recession, it did not seem to follow the mathematical models. Any kind of prediction would likely suggest that craft beer consumption would decrease. It has already been discussed that the likely reason for the erroneous increase is due to changing consumer preferences toward more local producers and brewers as the recession continued on.

What does forecast mean for the state of Kansas? One possible answer is there is a possibility for more Kansas breweries as the “microbrewery movement” continues to flourish. Economic theory suggests that as the craft beer market continues to become more and more profitable, there should be an influx of producers into the market trying to take part in that profitability. Using the “brewer permits by state” data (2004-2012) as provided in the *Brewer's Almanac*⁶⁰, it is possible to calculate an average number of barrels shipped as related to the number brewer permits in the state. We can find that, on average, roughly 6000 barrels of craft beer were shipped in Kansas, per brewery. Assuming this number will hold true in the future, it is possible to predict there will be likely be 21 brewer permits in Kansas by 2020. In 2012, this number was 18, so over an

8-year period Kansas should expect new breweries to become established throughout the state.

Forecasts, in general, tend to be wrong. As the Tremblay's put it, one can only hope to be "intelligently wrong, or fortunately correct" when making economic predictions.⁶¹ To ensure that the forecast is, at a minimum, intelligently wrong we must take into account the possible issues with the regression model.

Possible Issues

The most obvious issue is that the annual data over a relatively small period in time leads to small sample size – only 22 observations were actually used within the regression analysis. Because of this, any regression run will inevitably have high standard errors. Only by expanding the dataset would be able to rid the regression of any issues resonating from large standard errors.

One of these issues is in the difficulty of testing for non-stationarity of the dependent variable. Since the sample size is small, and the standard errors relatively large, tests for unit roots do not allow us to reject the null hypothesis that non-stationarity exists. Thus we cannot say that dependent variable, Craft Beer Shipments in Kansas, does not have a unit root. The output of Dickey-Fuller can be found within Table 3. As can be seen, we are unable to say with any kind of statistical significance that craft beer shipment is a stationary variable. If the time series were truly non-stationary this would make the results of the regression useless, because it will show bias, however because of the small sample size, one should not come to that conclusion so quickly. Since the craft beer industry has been changing dramatically in recent years, and the sample size is relatively small, the standard errors should be expected to inordinately large. This is likely causing issues in determining the stationary of variables.

In order to completely discern whether or not issues such as autocorrelation or non-stationarity are present, the most reasonable option would be to obtain an expanded data set. If this data were corrected on a monthly basis, or even quarterly, some of these issues could be identified with a higher level of statistical significance. At that point, we could say with a higher level of certainty what issues are actually present within the regression.

For the non-stationarity issue specifically, we can run a regression using the first differences. This outcome of this regression can be seen in table 5. Obviously this regression is markedly different from the outcome of the initial regression. This would lead us to believe that non-stationarity is even more likely of an issue, although we cannot say with absolute certainty.

Since we can conclude that both autocorrelation and non-stationarity are likely issues within the regression, the results and conclusions may be flawed. So although the outcome is similar to what other researchers have found (income to be correlated with beer consumption), it may not be wholly consistent. As previously stated, the best remedy for this would be to expand the sample size and address these issues once we

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have at least some level of certainty that the problems are not symptoms of a small sample.

Conclusions

Craft Beer is very special development of the 20th century. The American Brewing Industry was booming before legislation attempted to thwart the efforts of American producers. It is remarkable that prohibition was not able to stifle the entire industry. It may have taken some time, but eventually American brewers regained their footholds. At this a new enemy entered into the equation: consolidation. By 1980 there were only a few breweries within the borders of the United States. This may have actually had a great deal to do with the eventual explosion of the craft beer market. As consumers began to desire new tastes, there was a movement away from traditional brands and towards more specialty brews. This was the beginning of the *Beer Renaissance*. In order to visualize how this movement has affected to the total numbers of breweries in the United States, please view figure 9.

The basic economic theories that govern most markets somehow seem to breakdown within the craft beer industry. It has been shown by some studies that the dollars alcohol producers spend on advertising do not necessarily correlate with any kind of increase in demand for their product. Other studies show that where the alcohol was produced, and income of the consumer base have a larger impact on the demand. Then there have also been studies focusing on the impacts of the larger macro economy. Although there is somewhat of a dispute on whether or not beer is a normal good, the majority of economists agree that it is. This would lead to the conclusion that beer is indeed highly correlated with changes in income over time. It is this fact that leads us to the conclusion that craft beer in Kansas will likely follow the same patterns.

Although the model used is not perfect, it does in fact show a strong correlation between per capita income and craft beer shipments. One possible way to determine if the model is robust would be to use monthly data, rather than annual. This would require much further research and data gathering, as this would not easily be attainable. There could also be further research on culture and preferences within Kansas, as well as regulatory changes within the state. For the purpose of this paper, regulation and taxation was left out for the most part. This is because during the time period sample, there have no changes in Kansas excise taxes on beer.

In hopes to show a glimpse into the future of Kansas as the *Golden Age of Brewing* continues to unfold, this paper attempted to put a big of spotlight on a market not commonly studied. In short, the future is bright and both beer drinkers and beer brewers should rejoice in the fact that as we come close to the 100th anniversary of prohibition, its effects have long since warn off. The United States is now a proud beer-drinking nation, and perhaps Kansas can be a proud beer-drinking state.

Figures

Figure 1

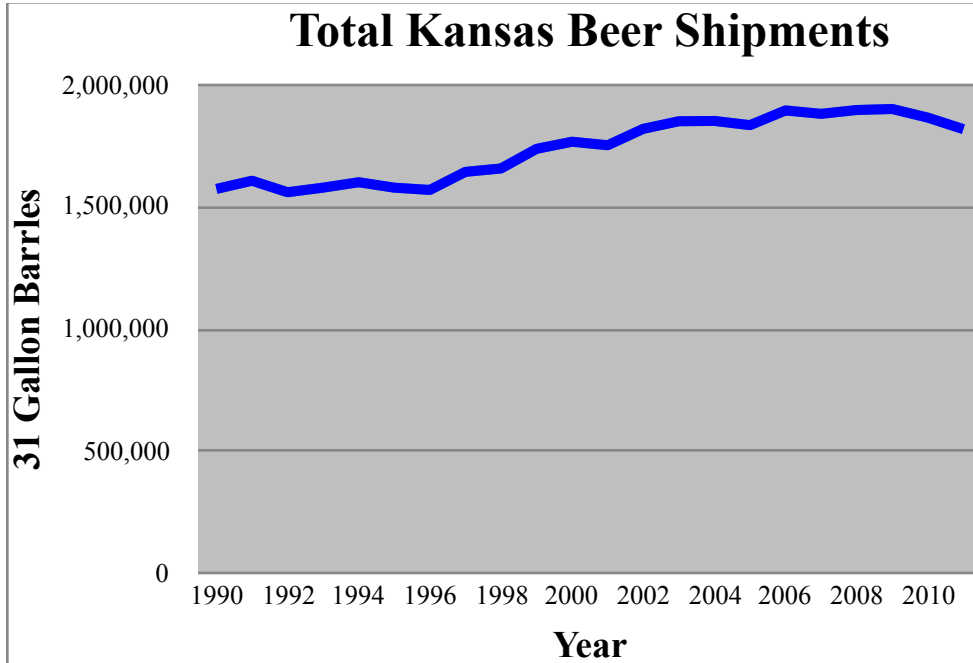


Figure 2

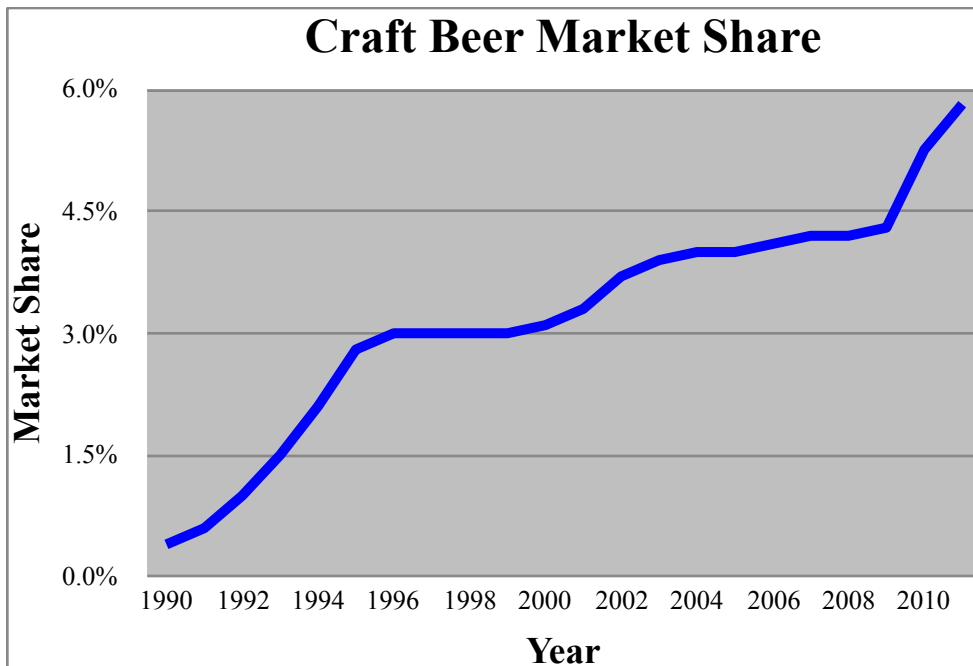


Figure 3

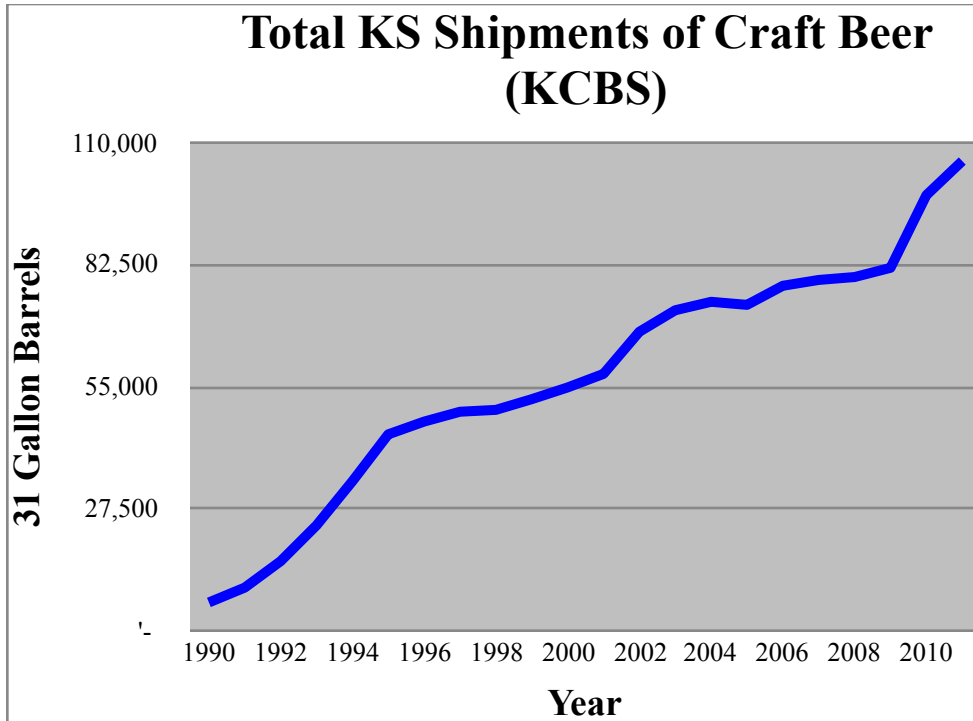
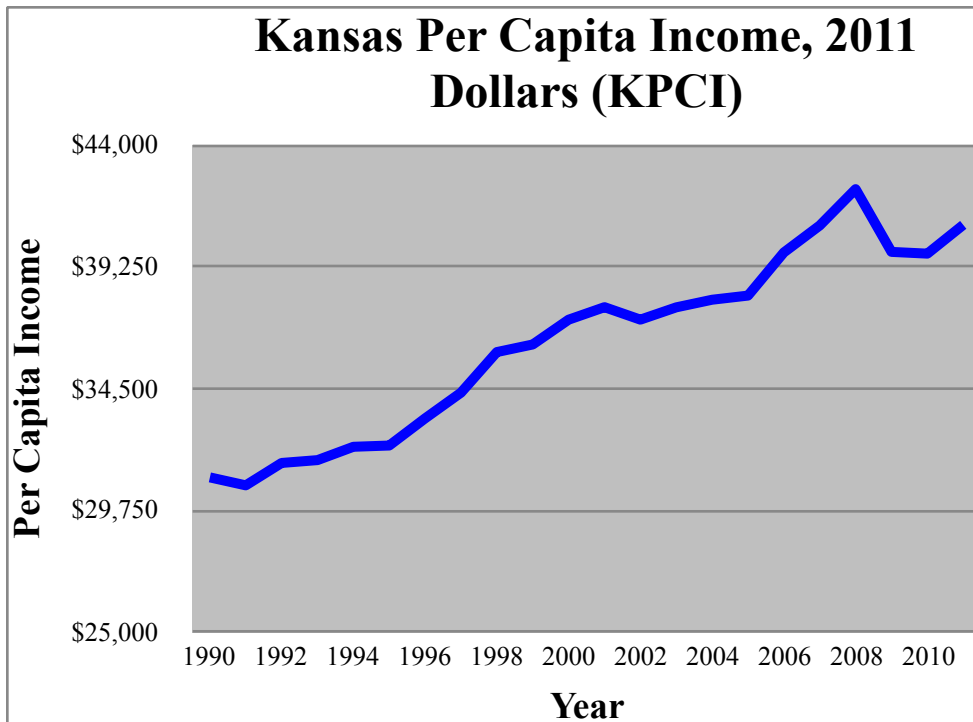


Figure 4



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Figure 5

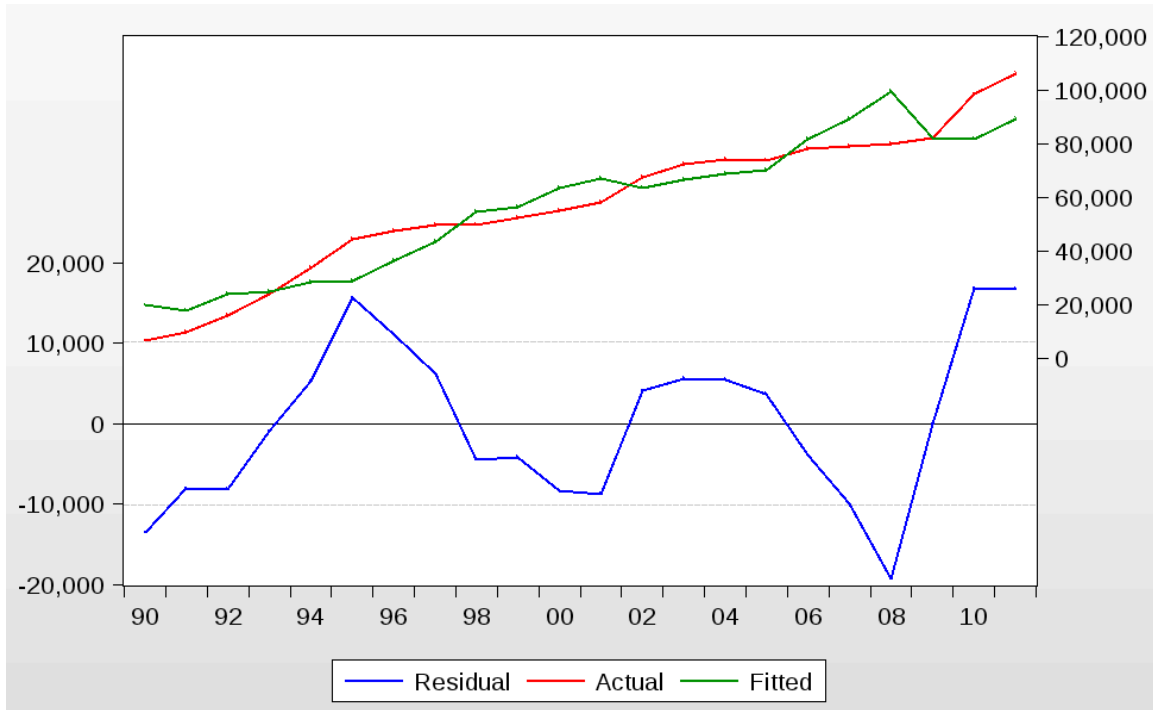


Figure 6

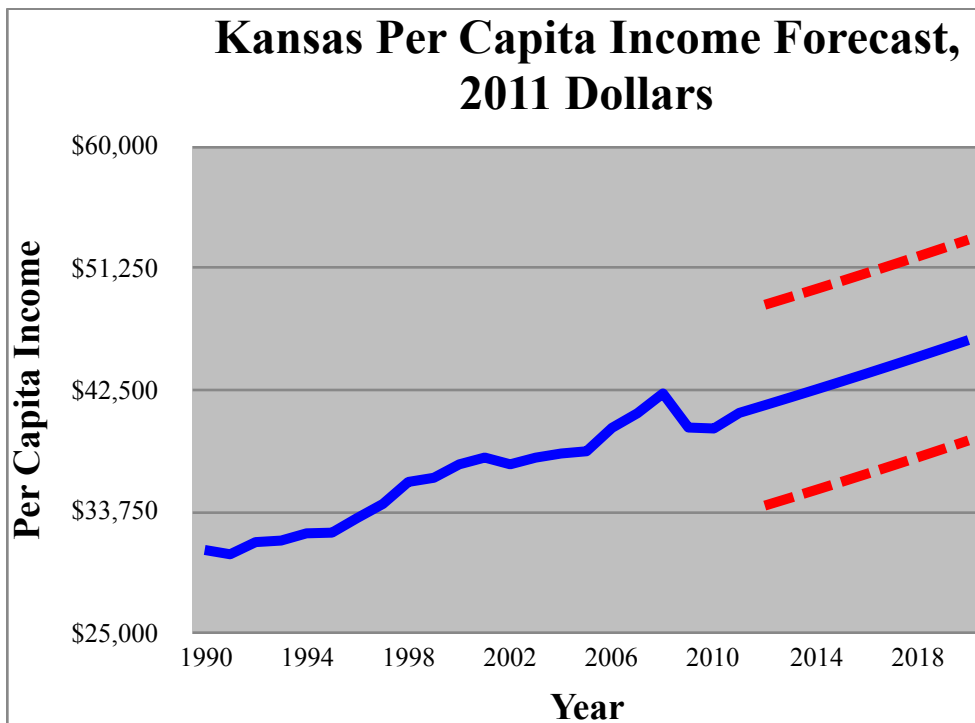


Figure 7

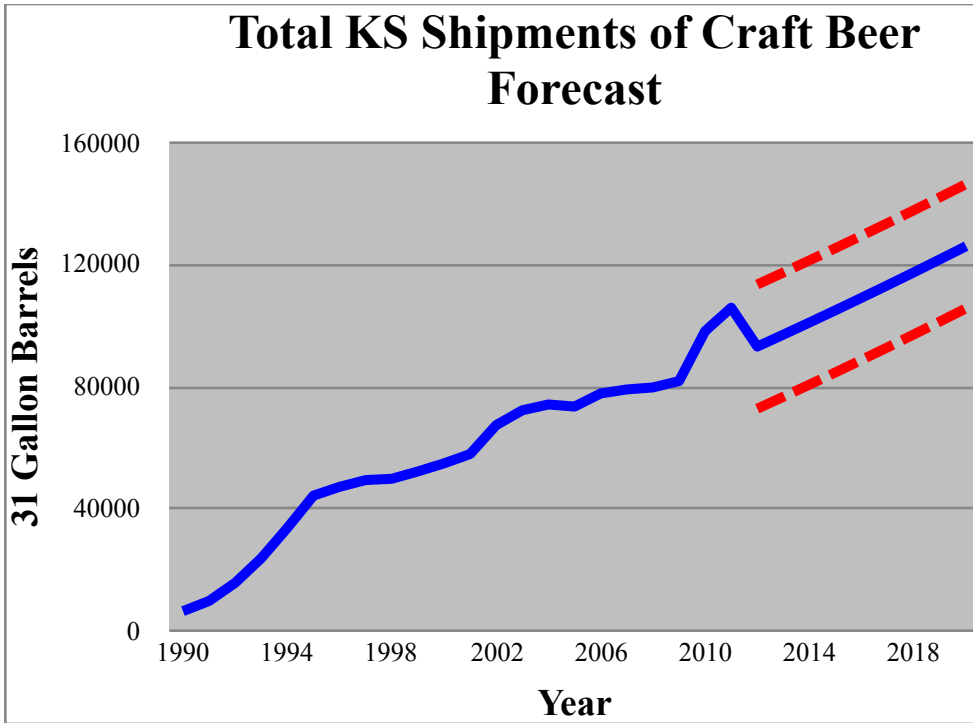
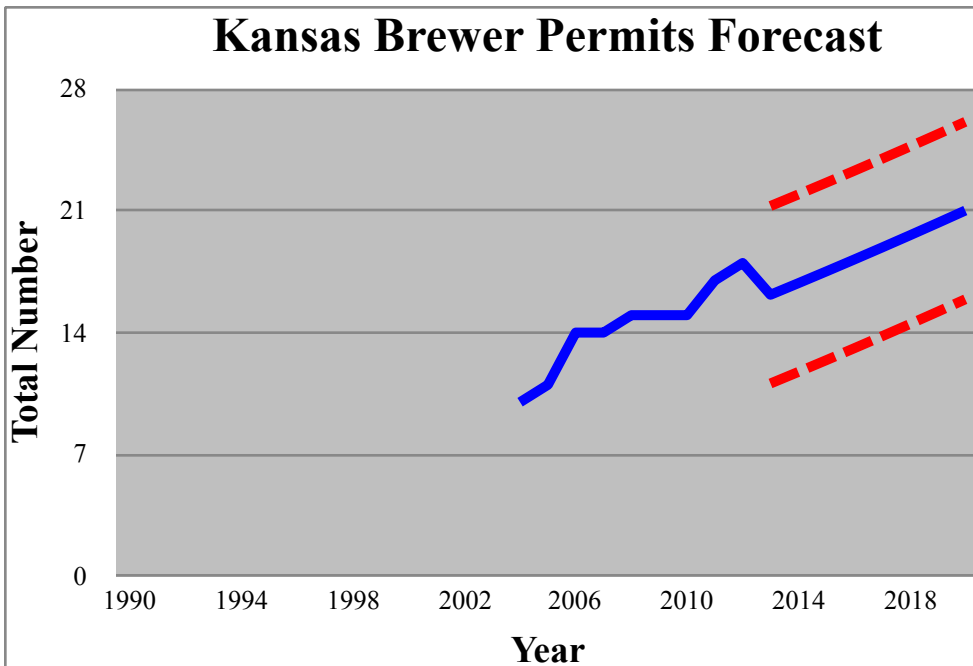
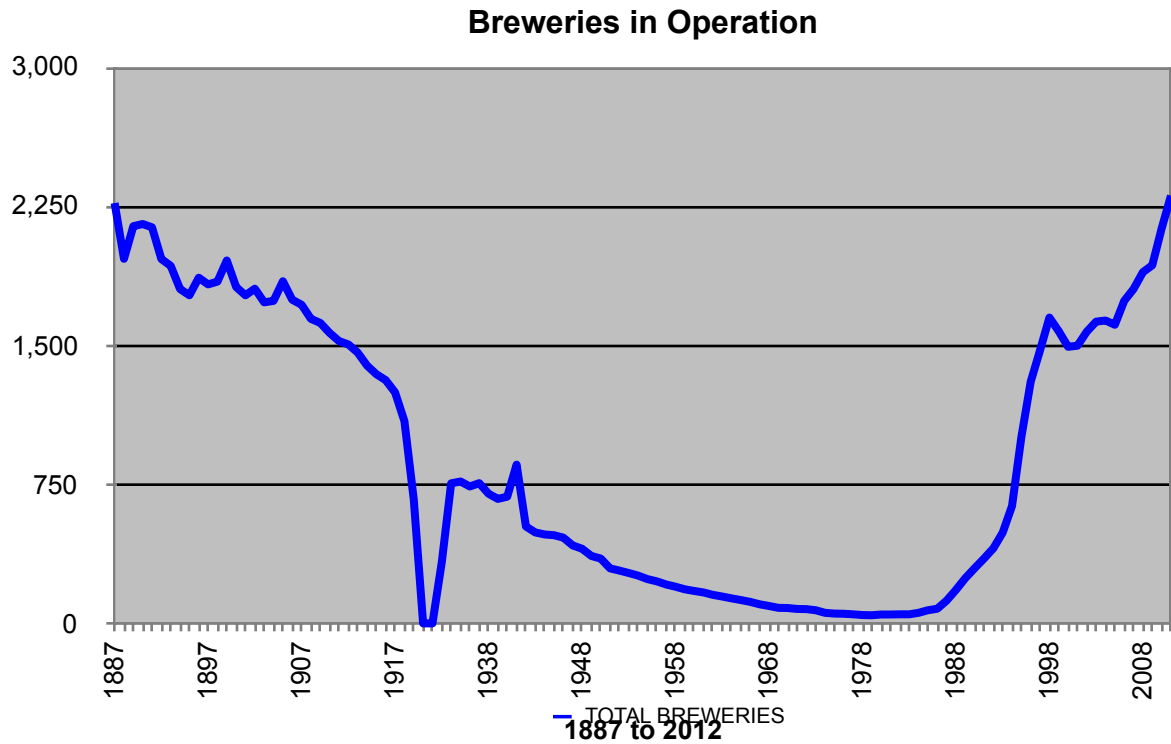


Figure 8



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Figure 9



Source: *Brewer's Almanac*, 2013.

Figure 10

Sample: 1990 2011
Included observations: 22

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
		1	0.548	0.548	7.5446	0.006
		2	-0.065	-0.521	7.6545	0.022
		3	-0.481	-0.279	14.097	0.003
		4	-0.512	-0.098	21.772	0.000
		5	-0.371	-0.313	26.052	0.000
		6	-0.051	0.037	26.138	0.000
		7	0.264	0.042	28.594	0.000
		8	0.362	-0.110	33.547	0.000
		9	0.180	-0.110	34.861	0.000
		10	-0.035	0.024	34.916	0.000
		11	-0.216	-0.176	37.145	0.000
		12	-0.331	-0.255	42.927	0.000

Tables

Table 1

Year	Total Craft Beer Market Shipments, KS (31 Gallon Barrels)	Per Capita Personal Income (2011 Dollars)
1990	6,300	\$31,037
1991	9,652	\$30,727
1992	15,615	\$31,600
1993	23,705	\$31,711
1994	33,653	\$32,231
1995	44,247	\$32,280
1996	47,127	\$33,339
1997	49,352	\$34,342
1998	49,769	\$35,924
1999	52,186	\$36,220
2000	54,832	\$37,187
2001	57,892	\$37,674
2002	67,403	\$37,188
2003	72,259	\$37,668
2004	74,165	\$37,965
2005	73,474	\$38,126
2006	77,787	\$39,808
2007	79,100	\$40,859
2008	79,757	\$42,277
2009	81,835	\$39,830
2010	98,240	\$39,762
2011	105,942	\$40,883

Table 2

May 9th, 2014

Dependent Variable: KCBS
 Method: Least Squares
 Date: 04/25/14 Time: 15:12
 Sample (adjusted): 1990 2011
 Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-198761.2	22507.28	-8.830976	0.0000
KPCI	7.045798	0.617107	11.41747	0.0000
R-squared	0.866985	Mean dependent var		57013.19
Adjusted R-squared	0.860334	S.D. dependent var		27287.27
S.E. of regression	10197.78	Akaike info criterion		21.38424
Sum squared resid	2.08E+09	Schwarz criterion		21.48342
Log likelihood	-233.2266	Hannan-Quinn criter.		21.40760
F-statistic	130.3586	Durbin-Watson stat		0.681959
Prob(F-statistic)	0.000000			

Table 3

Null Hypothesis: KCBS has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=4)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.551472	0.8617
Test critical values:		
1% level	-3.788030	
5% level	-3.012363	
10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

May 9th, 2014**Table 4**

Sample (adjusted): 1991 2011
 Included observations: 21 after adjustments
 Convergence achieved after 16 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	365559.7	509339.6	0.717713	0.4821
KCPI	-0.950327	1.091487	-0.870672	0.3954
AR(1)	0.981234	0.033761	29.06428	0.0000
R-squared	0.973880	Mean dependent var		59428.09
Adjusted R-squared	0.970978	S.D. dependent var		25438.39
S.E. of regression	4333.633	Akaike info criterion		19.71776
Sum squared resid	3.38E+08	Schwarz criterion		19.86698
Log likelihood	-204.0365	Hannan-Quinn criter.		19.75015
F-statistic	335.5681	Durbin-Watson stat		1.525502
Prob(F-statistic)	0.000000			
Inverted AR Roots	.98			

Table 5

Sample (adjusted): 1991 2011
 Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5181.891	1052.367	4.924033	0.0001
D(KCPI)	-0.932162	1.057081	-0.881826	0.3889
R-squared	0.039318	Mean dependent var		4744.845
Adjusted R-squared	-0.011244	S.D. dependent var		4230.539
S.E. of regression	4254.257	Akaike info criterion		19.63962
Sum squared resid	3.44E+08	Schwarz criterion		19.73910
Log likelihood	-204.2160	Hannan-Quinn criter.		19.66121
F-statistic	0.777618	Durbin-Watson stat		1.519576
Prob(F-statistic)	0.388891			

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¹ Johan F.M. Swinnen, *The Economics of Beer* (Oxford University Press, 2011), page 143-144.

² Ibid, page 143.

³ Ibid.

⁴ Ibid, 12.

⁵ Ibid.

⁶ Ibid.

⁷ Victor J. Tremblay and Carol Horton Tremblay, *The U.S. Brewing Industry: Data and Economic Analysis* (MIT Press, 2005), 1.

⁸ Swinnen, *Beer*, 12, Eline Poelmans and Johan F.M. Swinnen, *A Brief Economic History of Beer*.

⁹ Tremblay and Tremblay, *U.S. Brewing*, 1.

¹⁰ Ibid.

¹¹ Ibid.

¹² Ibid.

¹³ Ibid, 9.

¹⁴ Ibid, 10.

¹⁵ Poelmans and Swinnen, *History*, 20.

¹⁶ Ibid, 23.

¹⁷ Ibid, 25.

¹⁸ Kansas Legislative Research Department, *Kansas Liquor Laws* (http://skyways.lib.ks.us/ksleg/KLRD/Publications/Kansas_liquor_laws_2003.pdf, 2003), 4.

¹⁹ Ibid.

²⁰ Ibid.

- ²¹ Division of Alcoholic Beverage Control, *Handbook for Microbreweries* (Kansas Department of Revenue, revised 2012), 13.
- ²² Bureau of Alcohol, Tobacco, and Firearms, *Brewer's Almanac* (U.S. Treasury Department, 2013) brewer permits by state.
- ²³ Ibid.
- ²⁴ Ibid.
- ²⁵ Federal Reserve Bank of St. Louis, *Per Capita Income for the State of Kansas*, (FRED, 2014).
- ²⁶ Demeter Group Investment Bank, *State of the Craft Beer Industry* (http://www.demetergroup.net/docs/perspective/Craft_Beer.pdf, 2013).
- ²⁷ Swinnen, *Beer*.
- ²⁸ Tremblay and Tremblay, *U.S. Brewing Industry*.
- ²⁹ George Franke and Gary Wilcox, *Alcoholic Beverage Advertising and Consumption in the United States* (Journal of Advertising, Vol. 16, No. 3, pp 22-30,1987).
- ³⁰ Ibid, 22.
- ³¹ Ibid, 25.
- ³² Ibid.
- ³³ Ibid.
- ³⁴ David Grigg, *Wine, Spirits, and Beer: World Patterns of Consumption* (Geographical Association, Vol. 89, No. 2, pp 99-110, 2004).
- ³⁵ Ibid, 108.
- ³⁶ Ibid.
- ³⁷ Ibid.
- ³⁸ Ibid.
- ³⁹ Ibid.
- ⁴⁰ Ibid.
- ⁴¹ Barry Anderson and Mirko Moro, *Depression Economics and Alcohol Consumption – draft copy* (University College Dublin, Dublin, Ireland, 2008).

⁴² Ibid, 13.

⁴³ Swinnen, *Beer*, Donald G. Freeman, 107-122, *Cold Comfort in Hard Times: Do People Drink More Beer during Recessions?*.

⁴⁴ Ibid, 119.

⁴⁵ Ibid.

⁴⁶ The Tremblay's have been a large proponent of studying the macroeconomic history of the brewing industry, as seen in their 2005 book. In fact, in writing this paper, I contacted Carol Tremblay and she was able to provide the data sets that were used in the construction of their own analysis. This resource is available to all purchasers of their book. Although the data sets were not immediately used in this analysis, a special thanks goes out to them.

⁴⁷ Swinnen, *Beer*, 123-160, Carol Horton Tremblay and Victor J. Tremblay, *Recent Economic Developments in the Import and Craft Segments of the U.S. Brewing Industry*.

⁴⁸ Ibid, 144.

⁴⁹ Ibid, 159.

⁵⁰ Ibid.

⁵¹ Tremblay and Tremblay, *U.S. Brewing*.

⁵² Ibid, 127.

⁵³ Ibid, 133.

⁵⁴ Sam Calagione, *Brewing Up A Business*, (John Wiley & Sons, New Jersey, 2011).

⁵⁵ Ibid, xxi.

⁵⁶ Ibid, xxii.

⁵⁷ Swinnen, *Beer*, 142.

⁵⁸ Ibid.

⁵⁹ Note – the craft beer market share as described in this analysis is the U.S. national average. Although there may be some fluctuations from state to state, this variation is assumed to be negligible. Since the many variables that could have an effect on craft beer demand do not necessarily vary that much within any one given country, it is assumed that the variables that could cause any extreme swings are absent. However, since Kansas has a relatively unique history with beer, this is an important point to bring up. If Kansas were to have a significantly different craft beer market share then the outcome of this regression would most likely be incorrect. However, it is my hypothesis that although Kansas has a unique history, the specifics of that history would most likely have more of an impact on the alcohol industry as a whole, not necessarily the market shares within that history. This would be interesting topic for research in the future.

May 9th, 2014

⁶⁰ Bureau of ATF, *Brewer's Almanac*.

⁶¹ Tremblay and Tremblay, *U.S. Brewing*, 280.