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Identifying Lead-Lag Relationships in Illinois Soybean Basis

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IDENTIFYING LEAD-LAG RELATIONSHIPS IN ILLINOIS SOYBEAN BASIS

by

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Bachelor's of Science, University of Illinois Urbana-Champaign, 2009

A Research Paper

Submitted in Partial Fulfillment of the Requirements for the

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TITLE: Identifying Lead-Lag Relationships in Illinois Soybean Basis

MAJOR PROFESSOR: Dr. Dwight R. Sanders

The purpose of this paper is to identify soybean basis relationships between differing regions of the state of Illinois. Time-series analysis using a Granger Causality framework is conducted to identify lead-lag relationships between seven geographical regions of Illinois. The regions are identified as Northern, Western, North Central, South Central, Wabash, West-Southwest, and Little Egypt. There has been considerable research describing the factors that influence grain basis; the most consistently identified being local production and consumption, stocks, storage capacity and cost, and transportation costs. However, there has been minimal inquiry into tracking grain basis relationships through time in different marketplaces. This area of research has a high level of importance because if a lead-lag relationship is found between any two regions, the leading region soybean basis can be used as a tool to assist in predicting future soybean basis in the lagging region. The time-series analysis results indicate that lead-lag relationships do play a role in determining Illinois soybean basis. The Western and West-Southwest regions are the most dominant while the Southern Illinois regions of Wabash and Little Egypt are the least. These findings can help soybean basis users in making important decisions regarding expected basis levels during the marketing year.

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CHAPTER 1

INTRODUCTION

In reference to commodities, basis is defined as the cash price minus the futures price (Peterson, Cook, & Piszczor, 2004). The set of factors that have been consistently found to affect basis are local production and consumption, stocks, storage capacity and cost, and transportation costs (Adjemian, Kuethe, Breneman, Williams, Manfredo, & Sanders, 2011). Basis is the single most important market signal for grain producers to decide whether to store or not to store their grain (Siaplay, Anderson, & Brorsen, 2007). This is partially due to the fact grain markets have been proven to be mostly efficient and as a result, futures price levels are not expected to be a market signal (Jiang & Hayenga 1997). If the futures price is efficient then basis is the only variable in the cash price equation. Since basis is the most important factor in deciding whether or not to store grain, it is important to the industry as whole to understand as much as possible about its dynamics.

Information pertaining to grain basis is important to producers, processors, and end-users. Grain producers need an understanding of the basis in order to evaluate the profit potential of contracts offered to them and for making decisions regarding hedging. It is equally important for grain merchandisers and processors to have the capacity to forecast the basis to make offers for sales contracts and forward purchases. The Chicago Board of Trade illustrates this point by saying, “Without a knowledge of the usual basis and basis patterns for your particular community, it is impossible to make fully informed decisions about, for example, whether to accept or reject a given price; whether and when to store your crop; whether, when, and in what delivery month to hedge; when to close (or ‘lift) a hedge; or when and how to turn an unusual basis situation into a possible profit opportunity” (Jiang & Hayenga 1997, 125).

The main inspiration for my research comes from the ideas presented in recent papers by Manfredo and Sanders (2006) and Lewis, Kuethe, Manfredo, and Sanders (2010). In both papers researchers looked at the basis structure for corn and soybean markets in aggregate using locations from export terminals, interior river locations, processing centers, and interior markets. It was found that prices offered at one location might not be entirely local as some locations are used as sources of information to determine the basis at differing locations.

In my research I will be replicating the design of the previous studies. Specifically, I will be analyzing the soybean basis relationships (or lack thereof) of the seven different geographical regions of Illinois based on basis data readily available from the University of Illinois. These seven regions are: Northern, North Central, South Central, Western, West/Southwest, Wabash, and Little Egypt (Farmdoc, 2010). I would expect there to be a difference in basis prices within the regions due to logistic as well as supply and demand factors. For example, one of the factors affecting basis is transportation cost; the more remote a region is, the weaker the basis is expected to be. Likewise, the basis is also affected by local supply and demand conditions (i.e. production and consumption), which arise from variable factors such as yield and the presence of other agricultural industry. The purpose of this research is to identify if any of these expected differences have a dominant-satellite (lead-lag) relationship. If there proves to be an interrelationship between any of the regions, then this information can be used for future basis forecasting efforts (Manfredo & Sanders, 2006).

CHAPTER 2

LITERATURE REVIEW

There is a sizable body of literature that has examined and identified the traditional factors that influence the grain basis. They have been described as local production and consumption, stocks, storage capacity and cost, and transportation costs (Adjemian et al., 2011). Specifically, these factors can be called time, location, quality, and product. These factors have been closely scrutinized in order to further our understanding of basis forecasting. However, there has been little research done to analyze the basis relationships between various market locations throughout the livestock and grain marketing system (Manfredo & Sanders, 2006).

Pioneering time series analysis research was done in cattle markets to explore whether one market location leads another. Oellermann and Farris (1985) used a Granger Causality Framework to closely examine and identify the relationship between live cattle futures and live cattle spot prices in different physical market locations. This research was conducted to identify the center of price discovery between the aforementioned spot and futures markets. Koontz, Garcia, and Hudson (1990) conducted a second application of time-series analysis in live cattle price discovery to examine the spatial dimensions of the price discovery process. The researchers identified lead-lag relationships between the live cattle futures market and cash markets, and also between individual cash markets.

McKenzie (2005) published the first research done to identify basis relationships in grains. In the paper McKenzie (2005) investigates the response of soybean basis levels in the Arkansas Delta and Gulf regions, as a result of changes in barge rates. He found that basis levels have a negative reaction to an increase in the barge rate. He hypothesized since the soybean basis levels weakened with an increase in transportation costs then at least a portion of the costs are transmitted directly to the farmer. Furthermore, he found that the internal Arkansas Delta markets and external Gulf export market were highly integrated. An example of this relationship is given by a Gulf soybean shock. A Gulf soybean shock indicates an unexpected increase in soybean export demand. If a soybean shock is present in the Gulf, this information is simultaneously transmitted to interior markets such as the Arkansas Delta and results in higher basis levels.

Following the work of McKenzie (2005), Manfredo and Sanders (2006) conducted a similar study. Their research took McKenzie's (2005) idea of basis level interrelationships and expanded on the concept. Manfredo and Sanders (2006) hypothesized that local elevators look to the basis levels at other locations and then adjust their basis accordingly to take into account transportation costs. They believed that certain locations (export and terminal) could play an important role in determining the basis at local markets. The findings of this study indicated the corn basis levels calculated at certain export terminals (Toledo and U.S. Gulf) may indeed provide information leading to the establishment of basis levels at other river terminal and interior locations.

Lewis et al. (2010) published the most advanced study in the field of grain basis relationships. The research differs from the previous studies conducted by McKenzie (2005) and Manfredo and Sanders (2006) in the fact that it examines basis relationships over time and space. The study found that export location (Toledo and U.S. Gulf) soybean basis levels have a tendency to lead local levels. It also found that areas with processing centers showed the most independence in basis discovery. Through the use of spatial modeling, the study discovered that each local basis provides a "spillover" effect on the basis levels of its neighbors. The results of this research indicate export locations throughout the U.S. marketing system are the sole origin for soybean basis discovery and the relationships between these dominant and satellite locations are strongest during the spring.

There has been much previous work done to identify the influencing factors behind basis price levels and in the area of basis forecasting. This work has contributed to allowing producers, middlemen, and end-users to better understand and utilize basis patterns to maximize profits for their respective businesses. However, this sizable body of literature did not take into account the interrelationships between basis levels at different market locations. Until recently, this was an overlooked area. The research of McKenzie (2005), Manfredo and Sanders (2006), and Lewis et al. (2010) has provided the benchmark for further studies into the field of basis relationships.

The studies just mentioned have all broadened the knowledge in the field of basis research. Before these studies, there was little to no information regarding the relationships between market locations in regards to basis. Each of these studies, McKenzie (2005), Manfredo and Sanders (2006), and Lewis, et al. (2010), has increased our knowledge. They have built upon the theories presented in previous papers. However, all of their work was based on aggregate data. Up to this point, there has not been any research done on a strictly regional level. In this paper, I examine the regional lead-lag relationships for the Illinois soybean basis.

CHAPTER 3

DATA SECTION

The data is provided by the University of Illinois Farm Decision Outreach Central (Farmdoc) tool[1]. It is comprised of historical Thursday new crop[2] cash basis for soybeans. The data is broken down into seven geographical regions within the state of Illinois. The regions are identified as follows: Northern (Region 1), Western (Region 2), North Central (Region 3), South Central (Region 4), Wabash (Region 5), West Southwest (Region 6), and Little Egypt (Region 7). A graphical depiction of the regions with county boundaries is presented in Figure 1.

The basis is calculated by subtracting the cash price reported by the Illinois Ag Marketing Service[3] from the daily settlement price at the Chicago Board of Trade (Farmdoc, 2011). The data ranges from January 6, 2000 to August 25, 2011. Since it consists solely of new crop contracts, there is no data from the third week of November to the first of January; this time frame is the period from the end of one crop year until the beginning of the next. There are a total of 492 weekly observations of the soybean basis for each region.

The basis data is presented in Graphs 1 – 9. Graphs 1 – 7 illustrate the historical trends of the soybean basis for each individual region of Illinois. Each graph's number corresponds to the Region number. For example, Graph 1 consists of Northern (Region 1) data. Graphs 8 and 9 combine the regions to show the relative movements of the soybean

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[1] Special thanks go to Dr. Darrel Good and his team for providing the data.
[2] The November contract is the new crop contract for soybeans
[3] Cash price reported is the midpoint of the range for each individual region

basis. Graph 8 contains basis data for Regions 1 – 4 and Graph 9 contains data for Regions 5 – 7. These aggregate graphs show how the basis tends to move together over time, but differs throughout the state at each point in time.

CHAPTER 4

METHODS

I will be closely following the conceptual framework of previous studies that have identified dominant-satellite relationships for basis values in corn (Manfredo and Sanders 2006) and soybeans (McKenzie 2005; Lewis et al., 2010). I will be taking most of my conceptual framework from Lewis et al. (2010). This paper is a good model because it is current and utilizes modern concepts. The econometric models that I will use are adopted from those found in this paper.

The object of this study is to identify soybean basis relationships between different market locations within the state of Illinois. In order to do this, I will analyze data across time. This data will come from the USDA. I will be using a Granger Causality framework to conduct a time-series analysis (Lewis et al., 2010).

McKenzie (2005) first applied the concept of time series analysis to grain basis analysis, and then followed by Manfredo and Sanders (2006). McKenzie's study differed from Manfredo and Sanders's (2006) study in the fact that he used a multivariate time series approach as opposed to a bivariate approach. This study marked the first time that three locations were tested as opposed to two. For my research, I will be using the bivariate time series approach that is used by Manfredo and Sanders (2006) and Lewis et al. (2010). The time-series approach that I will be using is entitled the Granger test for causality. This test allows basis from two different market locations, market *X* and market *Y,* to be tested for causality (Manfredo and Sanders, 2006). An excerpt from

Lewis, et al. (2010, 3) sheds more light onto the topic, "In a Granger Causality framework, market X is said to *Granger cause* market Y if market X provides valuable information when forecasting market Y. The causality test is based on the equation:

(1)

$$y_t = \alpha + \sum_{t=1}^{m} \lambda_i \, y_{t-i} + \sum_{j=1}^{n} \theta_j \, x_{t-j}$$

where y_t is the basis value at time t in market Y, and m and n are the optimal lag lengths for y_t and x_t, respectively (Hamilton, 1994)." The null hypothesis that X does not cause Y is examined by a F-test on the restriction that $\theta_j = 0$ for all j. If the null hypothesis is rejected, the test suggests that market X plays a role in the determination of the basis at market Y. Through the use of this causal test, I will be able to see if locations are interrelated through time.

The specific lag lengths used are time periods of -1, -2, and -3 weeks. The software package IBM SPSS Statistics was used to construct a basic linear regression model. In this model the dependent variable (basis at y_t) is equal to the constant coefficient (α) plus the summation of the basis at Region Y at lagged times -1, -2, and -3 weeks plus the summation of the basis at Region X at lags of -1, -2, and -3 weeks. This is illustrated by the following:

(2)

$$y_t = \alpha + \beta_1 RegionY(-1) + \beta_2 RegionY(-2) + \beta_3 RegionY(-3) + \beta_4 RegionX(-1) + \beta_5 RegionX(-2) + \beta_6 RegionX(-3) + e^i$$

The lag values of the dependent variable need to be present in the equation to control for time-series properties. If they were not present, the model would incorrectly attribute predictive abilities to region X. The null hypothesis is the Region X basis at time periods -1, -2, and -3 weeks has no effect on the Region Y basis at time period t. This model was then ran to get results for two separate regressions. The null hypothesis is tested as an F-test on the restriction that $\beta_4 = \beta_5 = \beta_6 = 0$.

After construction of the linear regression model in SPSS, the same principles were applied to a program in Micro TSP. The Micro TSP program proved to be more efficient and provided more streamlined results. The SPSS results from the two regressions were compared to the Micro TSP results with the only differences being accounted for as rounding errors.

CHAPTER 5

RESULTS

The first regression was done to identify the soybean basis relationship between Region 7 (Little Egypt) and Region 1 (Northern). In this scenario, the dependent variable was Region 7 and the independent variable was Region 1. The regression model is shown in the following equation:

$$(3)\ Region\ 7\ basis = \alpha + \beta_1 Region7(-1) + \beta_2 Region7(-2) + \beta_3 Region7(-3) + \beta_4 Region1(-1) + \beta_5 Region1(-2) + \beta_6 Region1(-3) + e^i$$

The null hypothesis is tested as an F-test on the restriction that $\beta_4 = \beta_5 = \beta_6 = 0$. The results of this regression found the soybean basis of Region 1 does in fact play a leading role in the basis discovery of Region 7. The p-value was 0.000. The null hypothesis stating there is no relationship between Region 7 and Region 1 is rejected. The results of the regression are significant at the 5% level.

As another example, a regression model was computed to identify whether or not the basis in Region 1 (Northern) can be used to help predict the soybean basis in Region 2 (Western). The model is identical to the one shown above, except Region 7 data is replaced with Region 2 data. The results of this regression differ from the first model. In this regression, the null hypothesis is not rejected with a p-value of 0.0623. The results are consistent with our null that Region 1 does not lead Region 2 at a 5% significance level.[4]

Table 1 reports the F-statistic probability value that one region leads the other. If the probability value is less than or equal to 0.05 then the null hypothesis is rejected and one region is said to lead the other. The leading region (independent variable) is on the vertical axis and the lagging region (dependent variable) is on the horizontal axis of the table. The table was conditionally formatted to show values less than or equal to 0.05 as green and values larger than 0.05 as red. This was done to differentiate the regions with a lead-lag relationship from those without. The information on this table flows from row to column. For example, in order to identify whether Region 1 (Northern) leads Region 2 (Western), the lead region (row) must be located first. Then the row is followed to the corresponding column (lag region) and p-value is found at the cell where the row and column intersect. In this particular case, the p-value is 0.0623. This p-value was reported earlier in the second SPSS regression model.

Table 2 is similar to Table 1. It summarizes whether or not the null hypothesis that Region X does not lead Region Y is rejected at a significance of at least 5 %. The p-values in Table 1 are replaced with a Y or N. If there is a Y, then the null hypothesis is rejected and the regions that meet at that particular cell have a lead-lag relationship.

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[4] After generating the SPSS results as a check, the soybean basis data was analyzed using Micro TSP. The subsequent data was then compared to the original SPSS data with nearly identical results. The variations were small enough to be attributed to different rounding procedures within each program. All of the following results were generated using Micro TSP.

Table 2 is read the same as Table 1. The conditional formatting for Table 2 helps to illustrate the different relationships.

Table 3 shows the results of the Granger Causality Test in the simplest terms. In this table, the information flows from row to column and column to row. There are three different results presented in the table. This results are shown by the following symbols: →, ←, and ↔. The symbols indicate the flow of information from row to column and vice-versa. The → symbol indicates the region on the row has a one-way causality relationship with the column region. It is the lead region and the column is the lag. An example of this type of relationship is seen by Region 2 (row) and Region 5 (column). Region 2 is said to lead Region 5, so information flows from Region 2 to Region 5. The ← shows a one-way causality relationship in the opposite direction. Information flows from column to row. The column region leads the row region. This type of relationship is exhibited by Region 1 (row) and Region 2 (column). Regions 2 is said to lead Region 1, and thus information flows from Region 2 to Region 1. The final symbol ↔, represents the case of two-way causality or simultaneity. This means the row region leads the column region and vice-versa. This can be seen in the relationship between Region 1 and Region 3. In this instance, Region 1 and Region 3 share information simultaneously.

Table 4 summarizes the Granger Causality Results and breaks them down by region. It provides an alternative view of the interconnectivity of each individual geographical area. The table shows that two regions, Region 2 (Western) and Region 6 (West Southwest), exhibit more dominant characteristics than the other regions. These two regions each exhibit simultaneous causality with 3 other regions, but also have a one-way leading relationship with the other 3. The area of Illinois with the least amount of influence on other regions is Region 5 (Wabash). Wabash has a simultaneous causality relationship with Regions 1 and 3, but lag behind the other four regions of Illinois. The other geographical areas of Illinois (Regions 1, 3, 4, & 7) fall in the middle of the two extremes.

Figures 2 and 3 illustrate the flow of information where the relationship between the regions is one-way causality. An example is the arrow flowing from South Central (Region 4) to Wabash (Region 5). Two-way causality or simultaneity relationships are not marked. An example is the unmarked relationship between Northern (Region 1) and North Central (Region 3). Figure 2 is more detailed and shows the individual counties within each region; whereas, Figure 3 is an easier to read version with less accurate boundaries.

CHAPTER 6

SUMMARY AND CONCLUSIONS

This research was conducted to identify relationships and trends regarding the way Illinois soybean markets share information and set basis prices. Typically, grain basis is said to be a function of time, location, quality, and product. This study more closely examines other exogenous factors that are not included in the basis equation. Specifically, it uses time-series analysis to determine lead-lag relationships between different geographical regions within the state of Illinois.

The analysis demonstrates the extent to which geographical regions in Illinois are interrelated through time in determining soybean basis. It was found that the Western and West Southwest Regions of the state, Regions 2 and 6 respectively, are the dominant or leading regions. Through Granger Causality testing it was apparent these two regions exert the most influence on the others. It was also found that the Wabash Region (Region 5) had the least amount of influence and generally lagged behind the other regions. Little Egypt also exhibited a minimal amount of influence as it was found to lag behind both the Western and West Southwest Regions.

Possible explanations for these relationships could be due to differing geographical conditions (logistics) and supply and demand conditions. For example, the tendency for the Western and West Southwest Regions to have the most influence out of all the regions could be due to the fact that they have the easiest access to waterways. Figure 4 depicts a map of the rivers of Illinois. When compared to Figure 1, it is clear that the Western region is bordered by the Mississippi River to the West and the Illinois River to the East. These are the two most important waterways in Illinois. Intuitively it makes sense for this region to play a large part in basis discovery because if another region, such as North Central, needs to transport grain to the Gulf, the grain needs to be first transported to the Illinois River. Likewise, the West Southwest Region is equally important because it is consists of the area where the Mississippi and Illinois Rivers meet, as well as the large municipal area of St. Louis. There are river terminals near St. Louis that move extremely large amounts of grain and thus could serve as an area of price discovery. In addition, the Illinois River is also the delivering point for soybean contracts. This could also be a source of a small degree of price discovery. It is worth noting that Region 5 and Region 7 are both also bordered by rivers. Region 5 borders the Wabash River and Region 7 is bounded by the Ohio River in the Southeast and the Mississippi River on the Southwest.

Some geographic regions can also use supply and demand conditions to explain their lack of influence on other regions. For example, the Wabash and Little Egypt Regions have very little predictive capabilities. The only leading relationship between the two is the relationship Little Egypt has on Wabash. This could possibly be attributed to the lack of supply generated in those two regions compared to others in the state. They are both relatively small in size with a minimal number of counties as Figure 1 shows. Also, their average yields on a regional basis are smaller than other more productive regions. This is shown in Figure 5, which was taken from University of Illinois Farmdoc website. These two factors lead to less grain production than in other regions because production is a function of acreage and yields, which means less supply.

Another factor that could possibly be playing a role in regional soybean basis relationships is the presence of soybean crushing facilities. These facilities produce a large interior demand for soybeans, which compete with export markets. Decatur, which is located in Region 4 South Central, contains the corporate headquarters for Archer Daniels Midland, which crushes large amounts of soybeans. This internal demand could explain why South Central exhibits mostly simultaneous relationships, rather than lag behind other regions, which is seen in all other non-leading regions.

In the examples above, the relationships exhibited can be explained by a return to the original basis factors, where basis is said to be affected by local production and consumption, stocks, storage capacity and cost, and transportation costs. The identified relationships can be viewed as supporting data to the previously mentioned factors. The logistical explanation of the Western and West Southwest Region's dominant characteristics is directly related to the transportation costs element of the equation. Similarly, the supply and demand explanation is directly related to the local production element.

The soybean basis relationships identified in this research show that some geographic regions have predictive capacities in regards to other regions of Illinois. For example, a grain producer located in the Little Egypt Region of Illinois can look at current basis levels in the Western and West-Southwest Regions to predict the direction the Little Egypt basis will move in the coming weeks. The producer can then make a more profitable decision regarding whether to sell or store his or her grain.

The concept of regional soybean basis relationships within Illinois is a new idea that has not been previously examined. This discovery has many potential benefits. Soybean basis users, ranging from producers to processors, can utilize this information to make more informed decisions regarding grain-marketing strategies.

Table 1. F-statistic Probability Values

		Lag (Region Y)						
		Region 1 Northern	Region 2 Western	Region 3 North Central	Region 4 South Central	Region 5 Wabash	Region 6 West Southwest	Region 7 Little Egpyt
Lead (Region X)	Region 1 Northern		0.0623	0.0000	0.0000	0.0000	0.0046	0.0000
	Region 2 Western	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
	Region 3 North Central	0.0046	0.0034		0.0000	0.0000	0.0864	0.0024
	Region 4 South Central	0.0000	0.0049	0.0000		0.0061	0.0001	0.0196
	Region 5 Wabash	0.0000	0.3152	0.0003	0.0986		0.3311	0.9863
	Region 6 West Southwest	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000
	Region 7 Little Egpyt	0.0000	0.6754	0.0008	0.0256	0.0010	0.1116	

F-statistic Probability values that are statistically significant (less than or equal to 0.05) are highlighted in green
F-statistic Probability values greater than 0.05 are highlighted in red.

Table 2. Summary of Lead - Lag Relationships

		Lag (Region Y)						
		Region 1 Northern	Region 2 Western	Region 3 North Central	Region 4 South Central	Region 5 Wabash	Region 6 West Southwest	Region 7 Little Egpyt
Lead (Region X)	Region 1 Northern		N	Y	Y	Y	Y	Y
	Region 2 Western	Y		Y	Y	Y	Y	Y
	Region 3 North Central	Y	Y		Y	Y	N	Y
	Region 4 South Central	Y	Y	Y		Y	Y	Y
	Region 5 Wabash	Y	N	Y	N		N	N
	Region 6 West Southwest	Y	Y	Y	Y	Y		Y
	Region 7 Little Egpyt	Y	N	Y	Y	Y	N	

Yes (Y) indicates null hypothesis that Region X does not lead Region Y is rejected at sigificance of at least 0.05.
No (N) indicates failure to reject null hypothesis.

Table 3. Granger Causality Results

Region 1 Northern	Region 2 Western	Region 3 North Central	Region 4 South Central	Region 5 Wabash	Region 6 West Southwest	Region 7 Little Egpyt
Region 1 Northern	<--	<-->	<-->	<-->	<-->	<-->
	Region 2 Western	<-->	<-->	-->	<-->	-->
		Region 3 North Central	<-->	<-->	<--	<-->
			Region 4 South Central	-->	<-->	<-->
				Region 5 Wabash	<--	<--
					Region 6 West Southwest	-->
						Region 7 Little Egpyt

Results are interpreted from row to column. For example, there is a simultaneous causality relationship in that there is a rejection of the null hypothesis that Northern does not lead North Central, and a rejection of the null that North Central does not lead Northern. Illustrated by a double arrow (<-->). Similarly, for Western and Wabash, Western leads (-->) Wabash as there is a rejection of the null hypothesis that Western does not lead Wabash, but there is a failure to reject the null that Wabash leads Western. For Northern and Western, there is a failure to reject the null that Northern leads Western, but the null is rejected that Western leads Northern (<--).

Table 4. Summary of Granger Causality Results

	Simultaneous Causality	Lead only	Lag	No Causality
Region 1 Northern	5	0	1	0
Region 2 Western	3	3	0	0
Region 3 North Central	5	0	1	0
Region 4 South Central	5	1	0	0
Region 5 Wabash	2	0	4	0
Region 6 West Southwest	3	3	0	0
Region 7 Little Egpyt	3	1	2	0

Figure 1: Seven Regions of Illinois

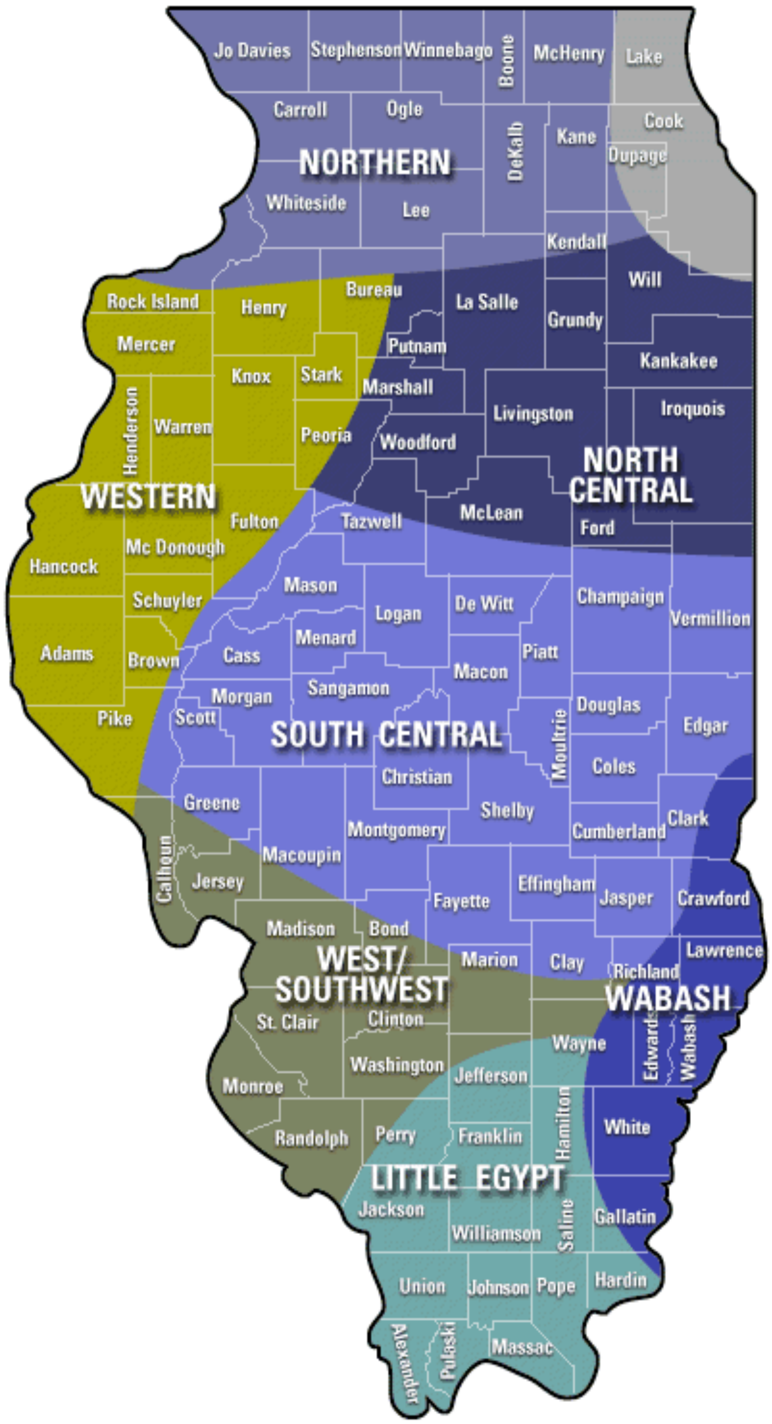


Figure 2: Regional Flow of One-Way Causality

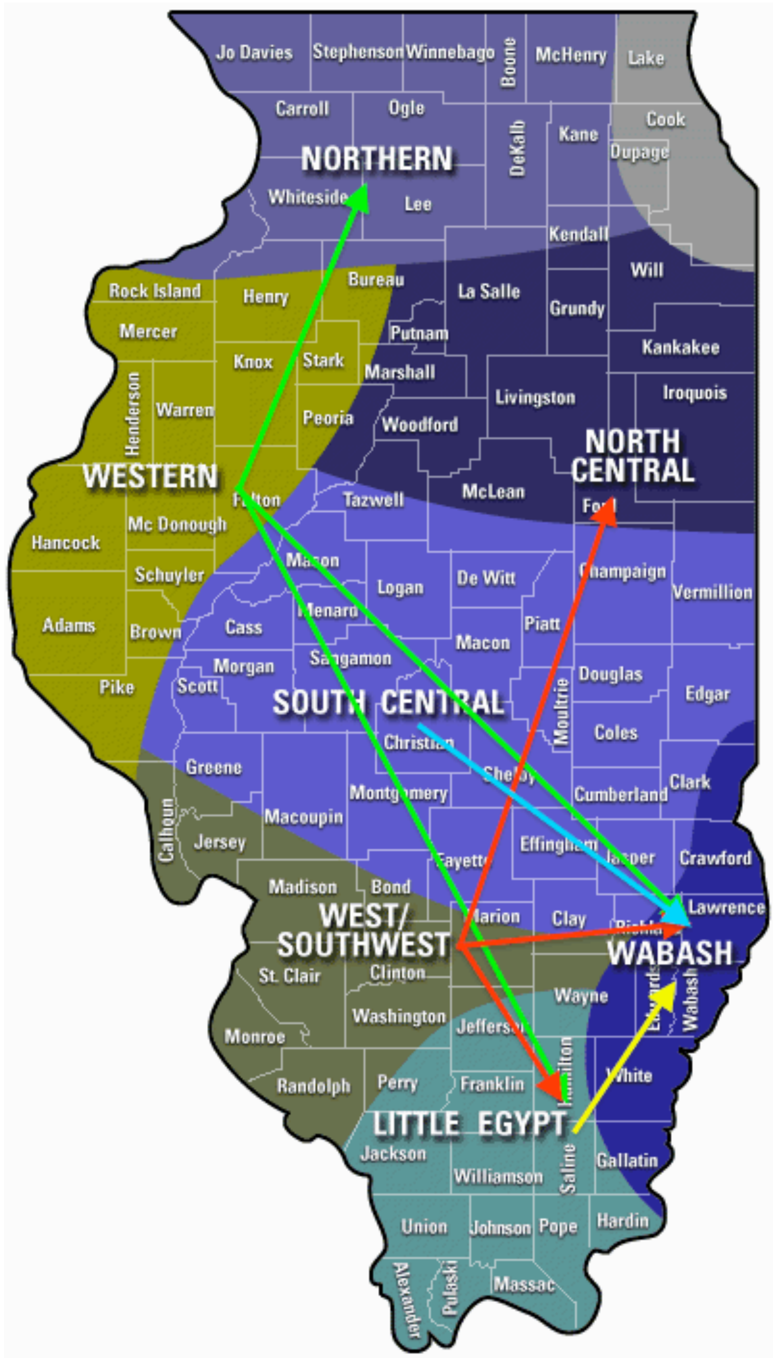


Figure 3: Simplified View of Regional Flow of One-Way Causality

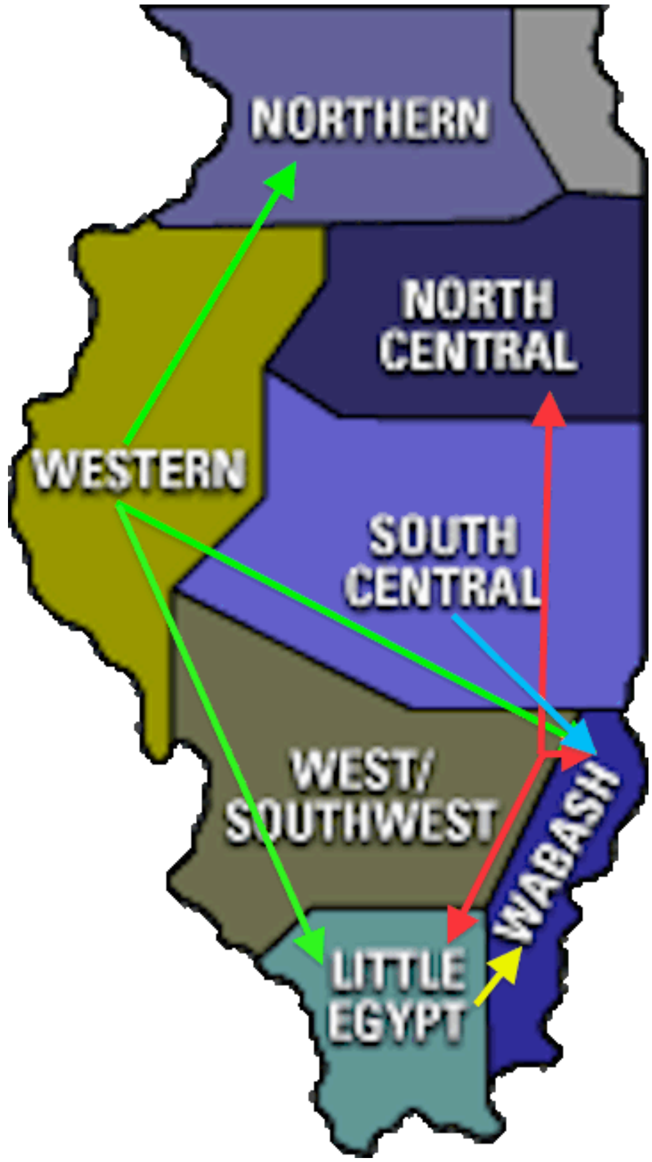
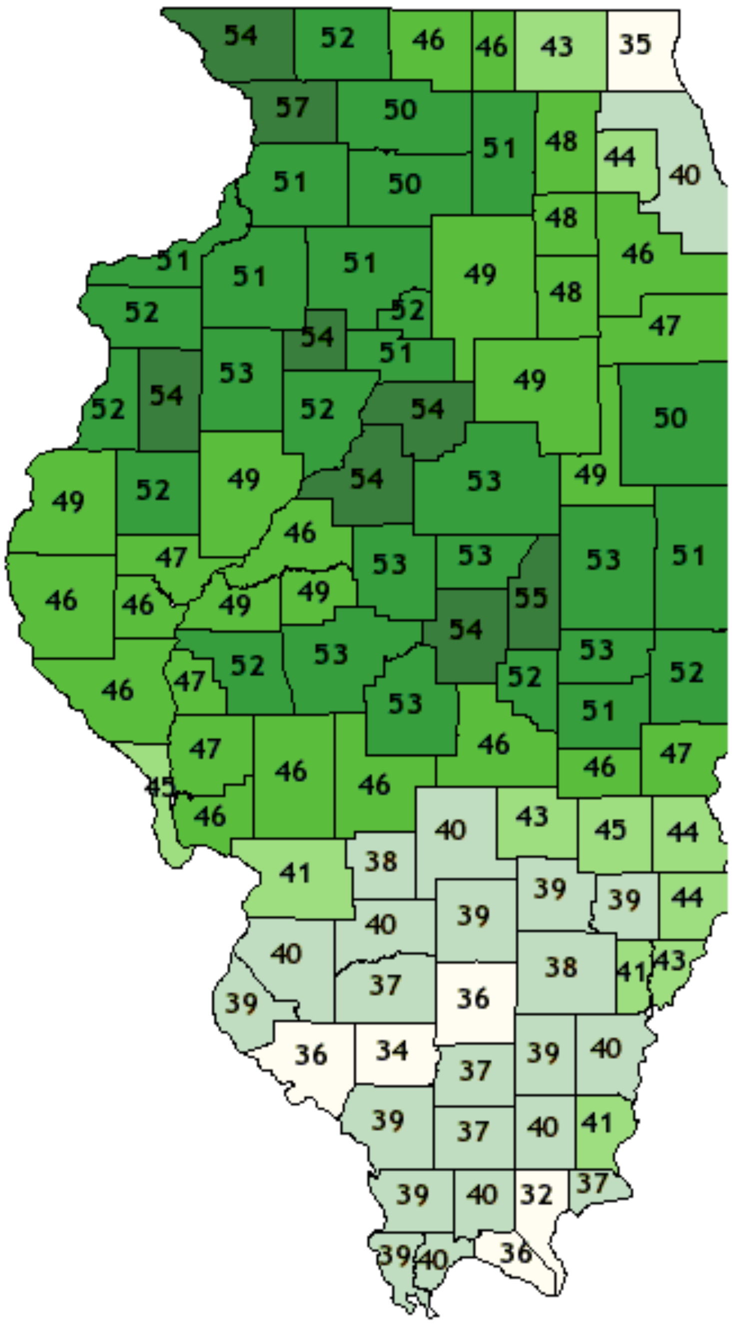


Figure 4: Illinois Waterways[5]

[5] Map taken from River Books, Maps & Programs. http://www.riverlorian.com/illinoiswaterways.htm

Figure 5: Expected 2010 Soybean Yields in Illinois[6]



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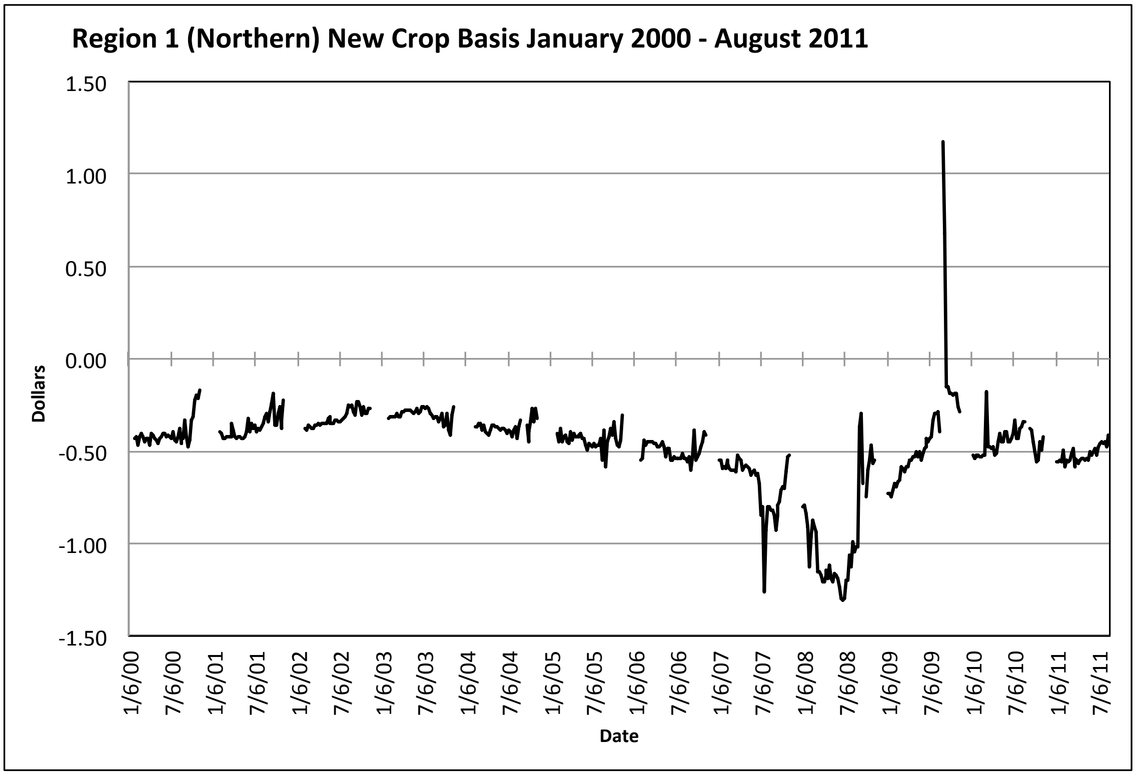
[6] Graphic taken from Farmdoc website.

Figure 6:



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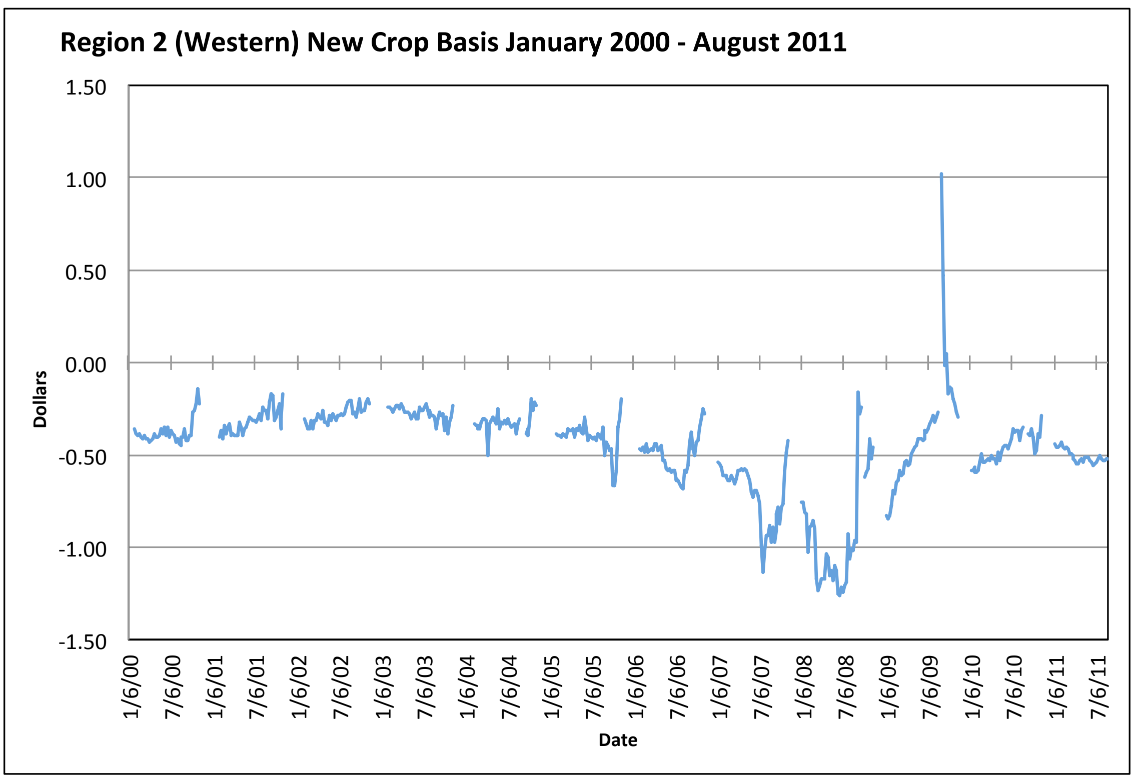


Figure 8:

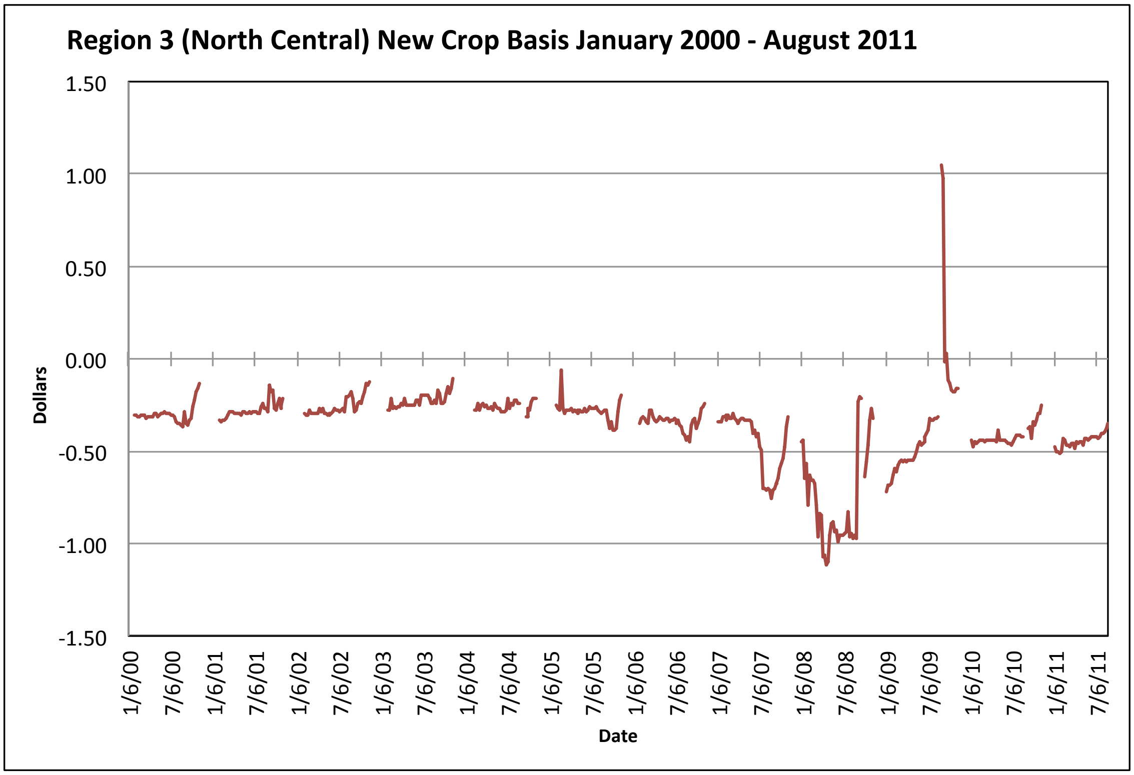


Figure 9:

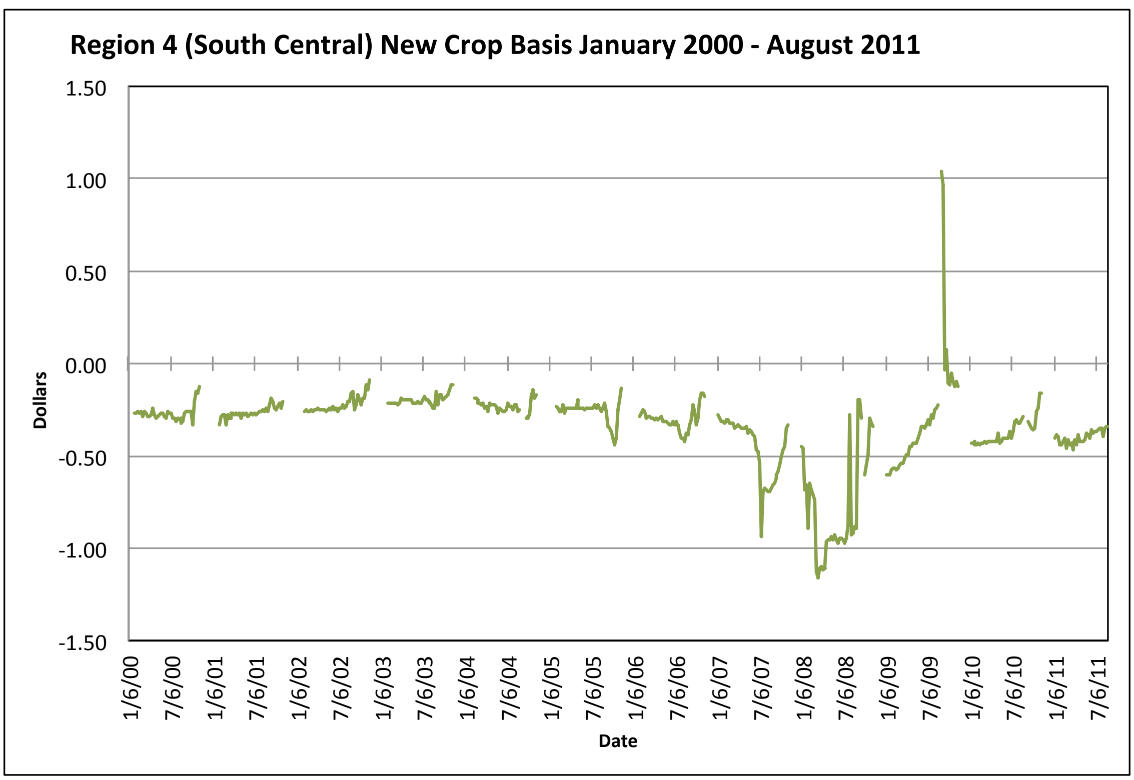


Figure 10:

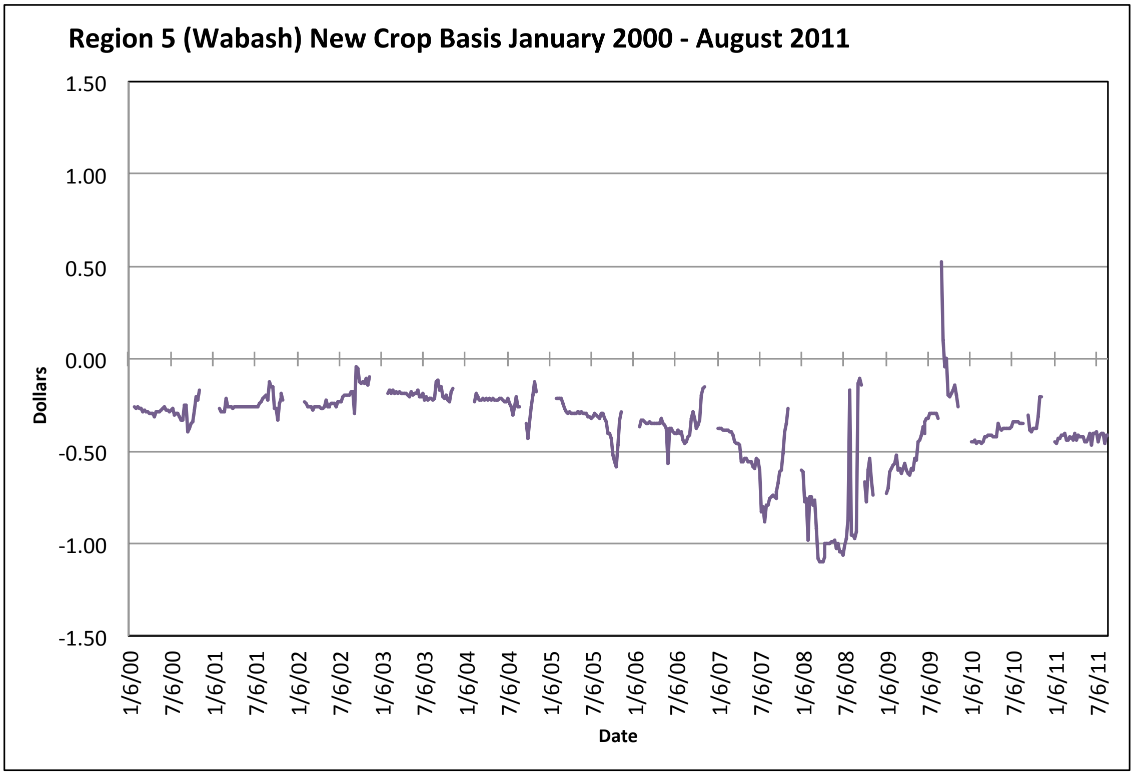


Figure 11:

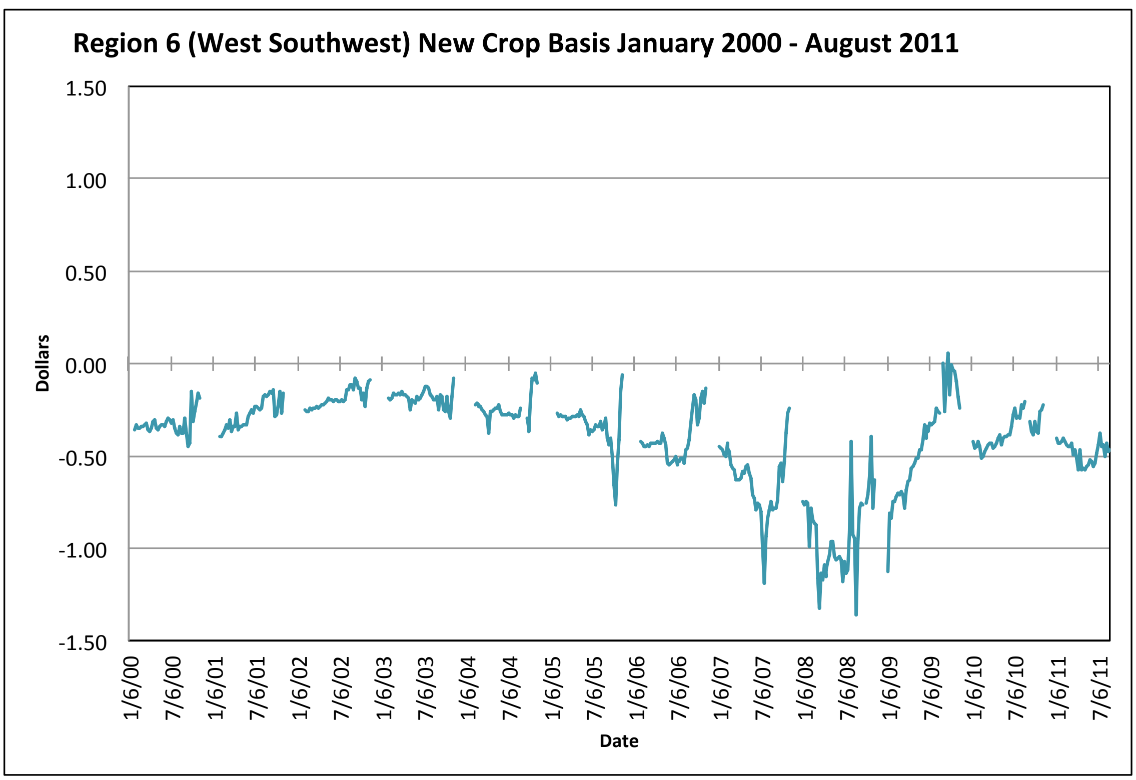


Figure 12:

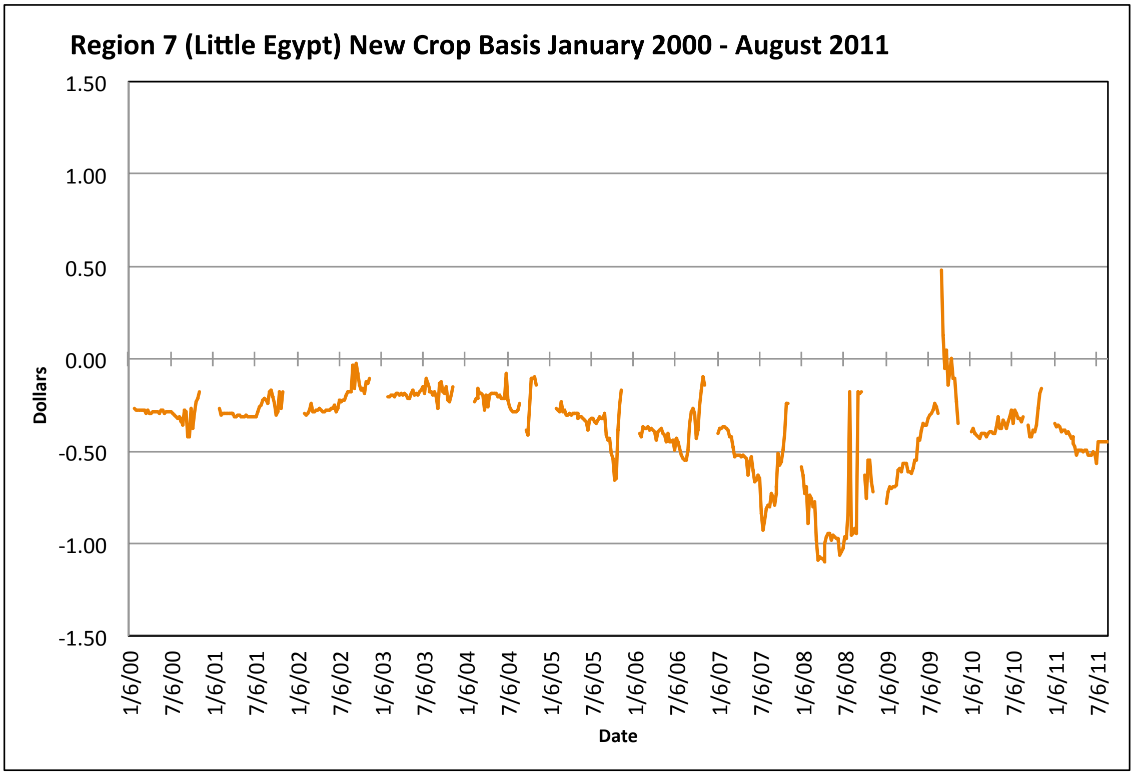


Figure 13:

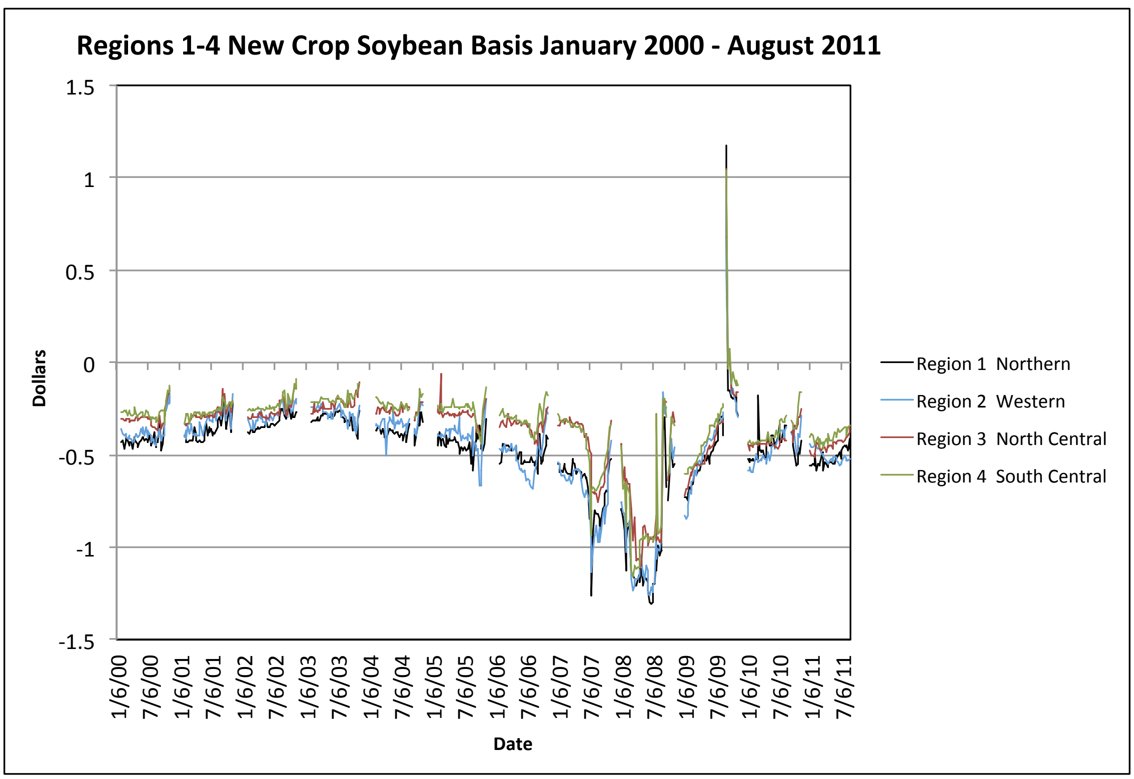
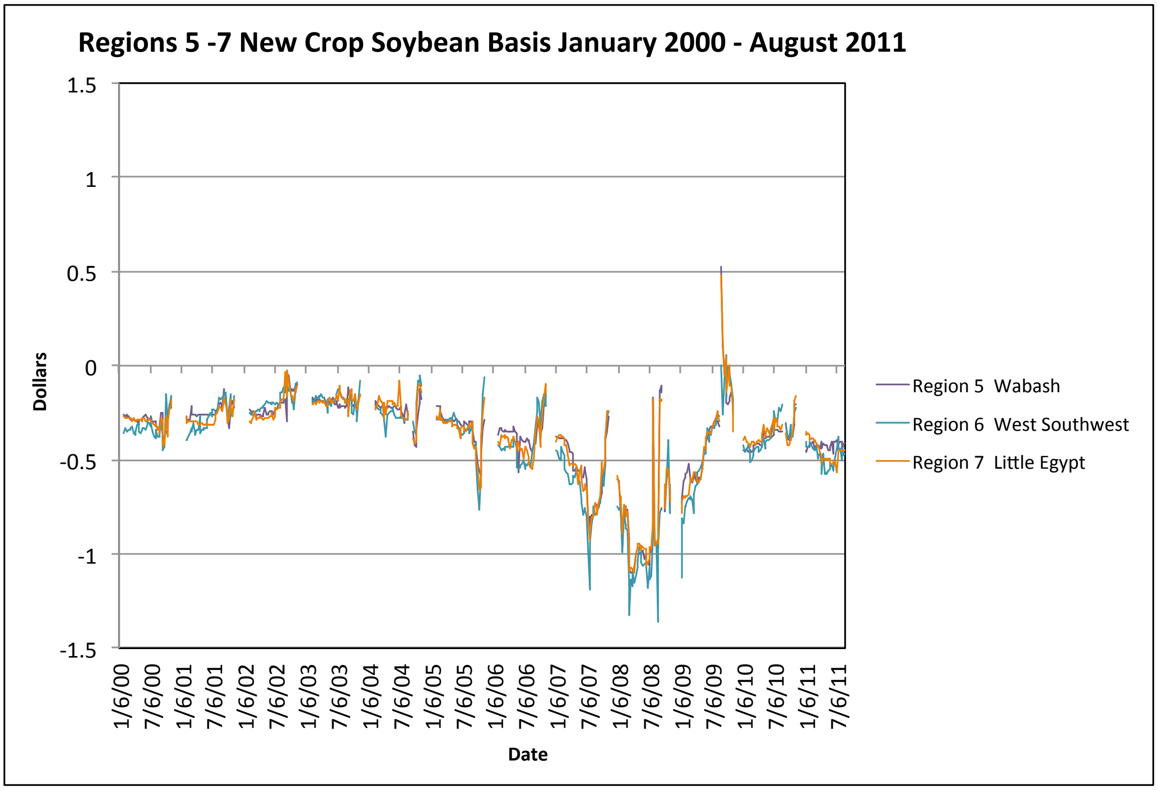


Figure 14:


Regions 5 -7 New Crop Soybean Basis January 2000 - August 2011
1.5
1
0.5
0
-0.5
-1
-1.5
Dollars
1/6/00
7/6/00
1/6/01
7/6/01
1/6/02
7/6/02
1/6/03
7/6/03
1/6/04
7/6/04
1/6/05
7/6/05
1/6/06
7/6/06
1/6/07
7/6/07
1/6/08
7/6/08
1/6/09
7/6/09
1/6/10
7/6/10
1/6/11
7/6/11
Date
Region 5 Wabash
Region 6 West Southwest
Region 7 Little Egypt

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