The Costs of Growing Energy: An Econometric Analysis of Timber Prices in the Southeastern US

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**Introduction:**

Currently, the vast majority of the energy produced in the U.S. (nearly 80%) is the result of the burning of fossil fuels (EIA, 2018), with negative implications for human health, the environment, and the earth’s climate (Mukhopadhyay and Forssell, 2005) (EPA, 2014) (IPCC, 2014). Consequently, there has been a push to switch from traditional fossil fuel combustion to renewable energy sources, including energy created from natural, biological sources (bioenergy). One option is woody bioenergy, which is produced from timber products.

This increase in the production of woody bioenergy has raised concerns about potential impacts both on the environment and on timber markets. In this paper, I focus on whether and how increased demand for bioenergy affects the prices of wood feedstocks. Economic theory would tell us that if the demand of a product increases (in this case, woody bioenergy feedstock created from timber products), the price of the product will increase as a result (Figure 1).

![Figure 1: A supply and demand graph illustrating what happens when the demand for a product experiences a sudden increase, from D1 to D2. Prices would then also increase from P1 to P2. This is assuming a constant supply. Image source: Intelligent Economist.](image-url)
Should the prices of woody bioenergy feedstock increase, the rest of the timber market would be affected as a result. Therefore, it is important to understand these relationships and how they will further develop as woody bioenergy production continues to increase.

The U.S. South is the world’s dominant timber producer and also the location of over 80% of pellet production for the EU. It is ninety percent privately owned with a documented history of management and land use response to market changes. It is the ideal location to look at market impacts of increased bioenergy demand.

**Woody Bioenergy and the Southeastern US Timber Market:**

**Policy Drivers of the Bioenergy Market:**

The southeastern United States boasts a robust supply of timber and a flourishing timber market with easy access to ports for the export of chips. Demand for wood pellets to be used in energy production has been largely driven by European demand. European countries are some of the biggest consumers of wood pellets, as they are part of the European Union’s (EU) strategy to meet a goal of 20% renewable energy by the year 2020. In response to the EU mandate, the UK passed the 2008 Climate Change Act. The Climate Change Act commits the UK government by law to reduce greenhouse gas emissions by at least 100% of 1990 levels (net zero) by 2050 and details the steps to be taken to achieve this goal (CCC, 2015). These steps include the conversion of coal power plants to cofiring plants with the capability to burn woody biomass alongside coal. This has led to European countries, and the UK in particular, to be some of the biggest importers of U.S. wood pellets (Figure 2).
Pellet Mill Presence in the US South:

As the demands for wood pellets have grown, so too has the presence of the wood pellet industry in the southern US. To meet the demand for wood pellets, companies began building wood pellet plants in the US around 2008. Many of the plants were completed and began operating in 2011, with new plants being planned and built since that time. Between 2012 and 2016, 16 new pellet mills were installed in the region, greatly increasing the production capacity and timber usage by pellet mills overall. (F2M, 2015) As of early 2018, pellet mills in the US South made up 78.5% of the total US pellet mill capacity. (Forisk Consulting, 2017)
Figure 3: U.S. pellet mill capacity over time from 2000-2015, with 2016-2022 projections. Here we can observe a steep increase in capacity and exports starting in 2008. Image Source: Forisk Consulting.

There have been some concerns about the impact of this growing industry in the southern US timber market. As the demand for wood pellet feedstock and wood pellet production increases, some worried that this would in turn cause timber prices to rise. One study estimated that, as woody bioenergy demands continue to increase, timber prices would rise approximately 25% from 2008 levels by 2020 (Rafal et al 2013). Non-profit organizations such as the Dogwood Alliance, whose focus is to “protect Southern (US) forests and communities from destructive industrial logging”, worried this increase in timber prices in the southern US would cause traditional lumber and wood product manufacturers to be forced to import cheaper wood from other regions (Phillips, 2015). Publications such as National Geographic reported that the rising wood pellets demand would result in “higher pulpwood prices and an increase in wood harvesting” (Nunez, 2014).
Bioenergy can be derived from a variety of feedstocks including corn starch, sugarcane juice, crop residues such as corn stover and sugarcane bagasse, purpose-grown grass crops and woody plants. They can be used to produce fuels such as butanol, ethanol, and biodiesel. These same feedstocks can also be utilized to produce electrical power and heat (Energy.gov 2019). Energy from woody plants is often derived from the burning of wood pellets and wood pellets can be created from a number of different sources.

Key sources include mill and logging residues. Mill residues include sawdust and off-cuts from logs produced in the process of sawmilling timber. They are clean, dry, and a highly sought-after feedstock. Logging residues are the leftover wood by product from logging processes that are typically left onsite to decay and emit carbon. Logging residues are dirty, green, and typically the cheapest feedstock available for the production of energy and pellets. Secondly, wood pellets can also be made from both hardwood and softwood pulpwood. The hardwood category includes tree species such as oak and birch and while softwood includes trees such as pine and spruce. (Alakangas, 2016) Hardwood and softwood pulpwood are another common feedstock for wood pellet production, though pulpwood consumption has been traditionally dominated by the Pulp and Paper and Composite Panel industries. Chip-n-saw is a term used to describe a type of lumber produced from medium-sized softwood trees that are then processed into boards and other lumber products. Some viable but somewhat less popular feedstocks for wood pellet production include hardwood and softwood roundwood (timber which is left as small logs that must then be chipped), hardwood and softwood sawtimber (trees that have deemed suitable to cut into planks and boards), (a term which can cover recovered building materials, construction and demolition debris, pruning and tree removal waste). (Lyon and Bond, 2014)
Econometric Analysis:

Project Goals:

For this project, our goal was to use data from the southeastern US region to observe timber pricing trends since the introduction of wood pellet production. We decided to use two methods to test two different hypotheses. Our first hypothesis involved testing feedstock prices as they related to the passage of the UK’s 2008 Climate Change Act. In reaction to the passage of this legislation, we noted that a large number of wood pellet mills were planned to be built in the US south in 2008 and began operation in 2011. As a result, we hypothesized that significant increases in feedstock prices would be observable in those two years. The second hypothesis involved testing the impacts the opening of pellet mills had on wood pellet feedstock prices on a micro-market level. We believed that the opening of a wood pellet mill would cause the price of the timber product being used by the mill of interest to increase within the micro-market the mill was located.

We investigated the three most common wood pellet feedstocks (as observed through the data): hardwood and softwood pulpwood, hardwood and softwood sawtimber, and Chip-N-Saw. The geographic area was limited to the region encompassed by the 39 micro-markets that make up the southeastern timber market. The time scope was limited to the years that were available through the data, 2005-2018.

Data:

In order to test our two hypotheses, we required data on the prices of the feedstocks used for wood pellet production and the dates and locations where pellet mills were established. The first source of data is the Timber Products Output (TPO) mill surveys available online via the USDA Forest Service. Compiled by the Forest Inventory and Analysis (FIA) program, these
tables contain the volume and type of wood consumed to produce various products. The biannual data is available at the county level. The second is the Forest 2 Market (F2M) data that is collected by the Forest2Market company. These data were purchased and contains information about timber prices at the micro-market level. The data is reported by bimonthly averages (Jan/Feb, March/April, etc) starting in January 2005 and ending January 2018.

Lastly, data were compiled on pellet mill locations by combining data obtained from the Forest Service and the Southern Environmental Law Center (SELC). The combined data contained information such as mill name, address, feedstock types, year mill began operating, and the company the mills was operated by.

**Methodology:**

To test for a price effect we needed to combine the F2M price and TPO consumption data. Since the raw datasets were in different time scales (biannual and bimonthly, respectively), the mean function was used on the F2M bimonthly data to create annual means for each year. The TPO and F2M data were formatted to different geographic scales (by county and by micro-market, respectively). Since each micro-market is comprised of clusters of counties to begin with, this process was relatively simple. To combine them, a spatial join was performed using ArcMap software, which is a part of the ArcGIS software suite. This caused all of the data that was in the TPO dataset at the county level to be aggregated by micro-market (Figure 4). With this data combined, we now had data of yearly averages of timber product volumes and yearly averages of their prices at the micro-market level.
Figure 4: The 39 micro-markets that make up the southeastern US timber market. Each market is comprised of clusters of counties, that sometimes cross over state boundaries.

The next step was to examine the pricing data over time. Using Stata, time series graphs were created for each feedstock of interest for visual analysis (Figure 5). Wald tests were used to identify structural breaks of unknown date for each feedstock within the time frame. Wald tests produce an estimated break date representing the most significant break found within a time series (Stata, 2019). The timing of these breaks were compared to the initiation of pellet production.
Figure 5: An example of a time series graph created from F2M pricing data for the feedstock type Pine Chip-N-Saw. Some patterns can be examined through visual analysis, but few conclusions can be drawn as a result.

The second set of tests used data from smaller regions around pellet mills to identify breaks in prices associated with local consumption. Our criteria was to find regions that contained a higher concentrations of pellet mills. We identified clusters where multiple mills were under the same ownership to test for any additional effects due to feedstock choice or shared procurement strategies.

The spatial analysis required a map of operating pellet mills based on SELC and USFS location data. An excel file of the pellet mill addresses was uploaded to ArcMap and, using the Geocoding tool, a point layer of each pellet mill was created. An illustrative 60-mile sourcing radii was then added to each point (Figure 6). Under our criteria we were able to identify 2 regions of interest that we labelled the southeast Georgia regions and North Carolina/Virginia coastal regions (Figure 7).
Figure 6: The map created to identify where higher concentrations of wood pellet mills are located.

The SE Georgia region was found to have a high concentration of pellet mills owned by the company Fram. From our data, we could observe that pellet mills under this company favored mill residuals and pulpwood as their primary feedstock. Therefore, for this region, we would be testing for structural breaks in pine pulpwood pricing. The NC/VA coastal region has a high concentration of pellet mills owned by Enviva, whose primary feedstock was found to be hardwood pulpwood. So likewise, the tests for structural breaks in this region would be performed on the prices for hardwood pulpwood.
Figure 7: Each of the regions on interest for the second hypothesis. High concentrations of pellet mills were found in both regions, with overlapping sourcing areas.

To test for structural breaks at this level, Wald tests were again performed within Stata. The SE Georgia region is comprised of 3 micro-markets and the NC/VA coastal region of 4 micro-market, so Wald tests were performed for each micro-market for their respective feedstocks of interest. Structural break dates were then compared to the dates that the pellet mills began operations.

Results:

Our first step was to examine time series graphs of woody bioenergy feedstock prices over time. Through visual analysis, we could not identify any clear, meaningful patterns in the pricing data. Our second step was to perform Wald tests for structural breaks, but the identified
breaks also showed no clear pattern or relation to the years of interest. For example, consider micro-markets numbers 6 and 38, which are located adjacent to one another (western North Carolina and eastern Tennessee, respectively). Wald tests were performed on each market for Chip-N-Saw, and the date of the most significant structural breaks were found to be in 2009 and 2015 in markets 6 and 38 respectively (Figure 8). Figures and statistical tests for structural breaks in each market are presented in the appendix.

![Figure 8: Structural breaks found in the prices of chip-n-saw in two adjacent micro-markets.](image)

Analysis of the second hypothesis showed similar results. The structural breaks found in each micro-market seemingly did not exhibit the correlation with pellet mill opening date that we had hypothesized would be present. This remains consistent for both of the regions of interest (Figures 9,10).
Figure 9: NC/VA coastal region structural break dates (represented as the orange line) compared with the dates that the pellet mills in the region began operation.
Discussion and Conclusion:

Neither visual inspection nor Wald tests suggest that the bioenergy market (as represented by region-wide policy and market shifts in 2008 or 2011, or by the installation of pellet mills in particular sub-markets) has affected prices for timber. There are several possible explanations. First, the other industries that consume wood pellet feedstocks, such as pulp and paper, can switch to substitutes, i.e. alternative sources of wood. For example, if the wood pellet industry begins to consume the majority of the available logging and sawmill residues,
paper mills may switch to roundwood. This could explain why residue prices do not change after introduction of new demand from pellet mills. This form of “leakage” (from one feedstock market to another) is not captured by our analysis of single feedstocks. There could also be spatial leakage as well. While we built in a theoretical sourcing area around each of the pellet mills in question, in practice, they may source their feedstocks from larger or just different areas.

Another possible explanation is that increased demand for bioenergy feedstock has been offset by decreasing demand for other products. For example, as the use of electronic media has increased, the demand for paper has decreased. Demand for newsprint, for example, experienced a plateau and has been steadily declining since the 2000s (Latta, 2015). This could have led to less competition for woody bioenergy feedstock and therefore dampened any effect on prices.

The effect of pellet mills on feedstock markets could be more precisely estimated with production data at the mill level. To protect the privacy of pellet mills, which are privately owned, data on the quantities and prices of feedstocks used by individual mills are not publicly available. Because pellet mills use a wide variety of feedstock types, this lack of data makes it difficult to examine the impacts the industry is having on one specific feedstock.

In sum, our analysis of price data did not reveal any effect of the pellet mill industry on timber prices in the US South, as has been widely predicted and feared. This does not rule out effects through leakage across products or space, or possible future effects. Continual monitoring and evaluation of the impacts that the wood pellet industry on the forest economy is important for informing and crafting effective forest policies.
Future Research Recommendations:

There are many different avenues that can be explored and expanded upon utilizing the data collected and the results of this project. A good deal of the research involved in this project ended up focusing on the pricing data, as opposed to the volumetric data. Trends in pellet mill feedstock consumption over time may be easier to observe. This could provide a better understanding of how much feedstock pellet mills have been consuming in comparison to other sectors that have traditionally used the same timber feedstocks.

Also, there are hypotheses that came up towards the end of the project that could be explored further with additional research. Rather than structural breaks in prices occurring as result of pellet mill openings, could it be that pellet mills are opening intentionally in areas that have already experienced a structural break? If, for example, prices in the desired feedstock drop significantly, would that area then be more attractive to the parent company? The costs of feedstocks for that pellet mill would then be cheaper, lowering their overall operation costs. In order to test this hypothesis, tests for structural breaks would have to be focused on the time period prior to the opening of the individual pellet mills. The tests would also have to be tests focused specifically on the downward shifts in prices.
Appendix:

i.) Time series graphs by timber type, all micro-markets

All prices are in USD$/ton.

Each colored line represents one of the 39 micro-markets.
ii.) Time series graphs of prices for all feedstocks, divided by micro-market
All prices are in USD$/ton.

- **P_Sawtimber**
  - Average bi-monthly price for pine sawtimber.
- **P_CNS**
  - Average bi-monthly price of pine Chip-N-Saw.
- **P_Pulpwood**
  - Average bi-monthly price of pine pulpwood.
- **H_Pulpwood**
  - Average bi-monthly price of hardwood pulpwood.
- **H_Sawtimber**
  - Average bi-monthly price of hardwood sawtimber.
- **Micro-market**
  - Denotes the micro-market location for the prices for all 1-39 micro-markets.

![Micro-market 1 chart](chart.png)
ii.) Stata output for Wald tests for CNS in all micro-markets:

Micro-region: 1
(3,002 observations deleted)
  time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

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<th>MS</th>
<th>Number of obs = 157</th>
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<td>Model</td>
<td>655.50414</td>
<td>4</td>
<td>163.876035</td>
<td>Prob &gt; F = 0.0000</td>
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<tr>
<td>Residual</td>
<td>41.4122723</td>
<td>152</td>
<td>.27244916</td>
<td>R-squared = 0.9406</td>
</tr>
<tr>
<td>Total</td>
<td>696.916412</td>
<td>156</td>
<td>4.4674129</td>
<td>Root MSE = .52197</td>
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| P_CNS_i        | Coef.   | Std. Err. | t    | P>|t|  | [95% Conf. Interval] |
|----------------|---------|-----------|------|------|---------------------|
| P_Sawtimber_i | .5708845 | .0131019  | 43.57| 0.000 | .5449991 - .5967698 |
| P_Pulpwood_i  | -.4087096 | .0351851 | -11.62| 0.000 | -.4782246 - -.3391946 |
| H_Sawtimber_i | .2102294 | .0215533  | 9.75 | 0.000 | .1676467 - .2528122 |
| H_Pulpwood_i  | .7531423 | .0550825 | 13.67 | 0.000 | .6443161 - .8619684 |
| _cons          | -4.9507 | .6173401 | -8.02 | 0.000 | -6.170375 - -3.731024 |

---+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5
 .................................................. 50
 .................................................. 100

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2007m12
Ho: No structural break

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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons

Micro-region: 2
(3,002 observations deleted)
  time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

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<td>152</td>
<td>2.5640498</td>
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<tr>
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<td>156</td>
<td>11.6594801</td>
<td>Root MSE = 1.6013</td>
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<tr>
<td></td>
<td>Coef.</td>
<td>Std. Err.</td>
<td>t</td>
<td>P&gt;</td>
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<tr>
<td>P_Sawtimber_i</td>
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<td>P_Pulpwood_i</td>
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<td>.1018043</td>
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Test for a structural break: Unknown break date

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Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2014m4
Ho: No structural break

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Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 3
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS     | df  | MS      | Number of obs = 157
-------+--------+-----+---------+------------------
Model  | 1387.84389 | 4   | 346.960973 | Prob > F = 0.0000
Residual | 296.189373 | 152 | 1.94861429 | R-squared = 0.8241
Total   | 1684.03326 | 156 | 10.795085 | Root MSE = 1.3959

|                      | Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|----------------------|-------|-----------|-------|------|----------------------|
| P_Sawtimber_i        | .4959769 | .020852 | 23.79 | 0.000 | .4547797 .5371741 |
| P_Pulpwood_i         | .2491519 | .0903308 | 2.76  | 0.007 | .070686 .4276179 |
| H_Sawtimber_i        | .1554711 | .0510731 | 3.04  | 0.003 | .0545662 .256376 |
| H_Pulpwood_i         | -.0539093 | .1155019 | -0.47 | 0.641 | -.2821058 .1742871 |
| _cons                | -1.708567 | 1.192272 | -1.43 | 0.154 | -4.064132 .6469988 |

----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5
.................................................. 50
.................................................. 100

..
Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2008m6
Ho: No structural break

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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 4
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS      | df | MS        | Number of obs = 157
-------|---------|----|-----------|-----------------|
Model  | 1164.7186 | 4  | 291.179715 | F(4, 152) = 190.28
Residual | 232.604942 | 152 | 1.53029567 | R-squared = 0.8335
Total   | 1397.3238 | 156 | 8.95720385 | Root MSE = 1.2371

|   | Coef.   | Std. Err. | t     | P>|t|   | [95% Conf. Interval] |
|---|---------|-----------|-------|-------|---------------------|
P_Sawtimber_i | .5372819 | .0207826 | 25.85 | 0.000 | .4962217 -.578342 |
P_Pulpwood_i | .4680926 | .049417  | 9.47  | 0.000 | .3704597 .5657255 |
H_Sawtimber_i | .1213443 | .0247046 | 4.91  | 0.000 | .0725356 .1701529 |
H_Pulpwood_i | .0582342 | .066686  | 0.87  | 0.384 | -.073517 .1899854 |
_cons    | -5.890456 | 1.184278 | -4.97 | 0.000 | -8.230228 -3.550685 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2013m10
Ho: No structural break

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Exogenous variables: P_Sawtimber_i H_Sawtimber_i P_Pulpwood_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 5
(3,002 observations deleted)
  time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS   df      MS      Number of obs   =   157
----------------+-----------------------------------   F(4, 152)       =     92.87
Model | 1301.95262         4  325.488155   Prob > F        =    0.0000
Residual | 532.741975       152  3.50488142   R-squared       =    0.7096
----------------+-----------------------------------   Adj R-squared   =    0.6987
Total | 2672.27513       156  17.1299688   Root MSE        =     1.329

P_CNS_i |   Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+----------------------------------------------------------------
P_Sawtimber_i |   .6012857   .0171527    35.05   0.000     .5673972    .6351741
P_Pulpwood_i |   .3214653   .0653084     4.92   0.000     .1924359    .4504946
H_Sawtimber_i |   .1527     .0367378     4.16   0.000     .0801173    .2252827
H_Pulpwood_i |  -.3466267   .1147331    -3.02   0.003    -.5733041   -.1199493
    _cons |  -4.967306    1.03759    -4.79   0.000    -7.017266   -2.917345

Test for a structural break: Unknown break date

Number of obs =        157
Full sample:                  2005m1 -  2018m1
Trimmed sample:               2007m1 -  2016m2
Estimated break date:         2007m1
Ho: No structural break

    Test   Statistic   p-value
----------------+-----------------------------------
    swald       76.6313     0.0000

Exogenous variables: P_Sawtimber_i H_Sawtimber_i P_Pulpwood_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 6
(3,002 observations deleted)
  time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS   df      MS      Number of obs   =   157
----------------+-----------------------------------   F(4, 152)       =     92.87
Model | 1301.95262         4  325.488155   Prob > F        =    0.0000
Residual | 532.741975       152  3.50488142   R-squared       =    0.7096
----------------+-----------------------------------   Adj R-squared   =    0.6987
Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2008m10
Ho: No structural break

<table>
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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 7
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS       | df | MS       | Number of obs = 157 | F(4, 152) = 235.69 | Prob > F = 0.0000 |
--------+---------|----|---------|---------------------|-------------------|-------------------|
Model   | 1354.90271 | 4  | 338.725676 |                      | 0.8612            |                   |
Residual| 218.449505  | 152| 1.4371678  |                      |                   |                   |
--------+---------|----|---------|-------------------|-------------------|-------------------|
Total   | 1573.35221 | 156| 10.0855911  | Root MSE = 1.1988  |                   |                   |

| P_CNS_i | Coef. | Std. Err. | t    | P>|t| | [95% Conf. Interval] |
|---------|-------|-----------|------|-------|----------------------|
| P_Sawtimber_i | .5041013 | .0226964 | 22.21 | 0.000 | .4592601 .5489425 |
| P_Pulpwood_i  | .3165431 | .0761847 | 4.15  | 0.000 | .1660254 .4670607 |
| H_Sawtimber_i | .1614174 | .0487656 | 3.31  | 0.001 | .0650714 .2577634 |
| H_Pulpwood_i  | .2019476 | .0694955 | 2.91  | 0.004 | .0646459 .3392494 |
| _cons        | -4.493977 | 1.311897 | -3.43 | 0.001 | -7.085884 -1.902071 |

---+- 1 ---+- 2 ---+- 3 ---+- 4 ---+- 5
Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2009m2
Ho: No structural break

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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 8
(3,002 observations deleted)
    time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS     | df | MS | Number of obs = 157
-------|--------|----|----|-------------------------|
Model   | 1048.8238 | 4  | 262.20595 | F(4, 152) = 113.13
Residual | 352.304443 | 152 | 2.31779239 | R-squared = 0.7486
Total | 1401.12824 | 156 | 8.98159131 | Root MSE = 1.5224

| P_CNS_i | Coef. | Std. Err. | t    | P>|t| | [95% Conf. Interval] |
|---------|-------|-----------|------|-----|---------------------|
| P_Sawtimber_i | .4490517 | .032319    | 13.89 | 0.000 | .3851992    .5129043 |
| P_Pulpwood_i | .0114944 | .1735754   | 0.07  | 0.947 | -.3314375   .3544263 |
| H_Sawtimber_i | .0986677 | .0376401   | 2.62  | 0.010 | .0243024    .1730329 |
| H_Pulpwood_i | -.0505191 | .1364367 | -0.37 | 0.712 | -.3200763   .2190381 |
| _cons | 2.524541 | 1.904583   | 1.33  | 0.187 | -1.238332   6.287414 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2007m4
Ho: No structural break
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Exogenous variables:  
\[ P_{\text{Sawtimber}_i} \ P_{\text{Pulpwood}_i} \ H_{\text{Sawtimber}_i} \ H_{\text{Pulpwood}_i} \]
Coefficients included in test:  
\[ P_{\text{Sawtimber}_i} \ P_{\text{Pulpwood}_i} \ H_{\text{Sawtimber}_i} \ H_{\text{Pulpwood}_i} \ _{\text{cons}} \]
Micro-region: 9  
(3,002 observations deleted)  
\text{time variable: time, 2005m1 to 2018m1, but with gaps}  
\text{delta: 1 month}  

Source | SS | df | MS | Number of obs = 157  
|-------|----|----|----|----------------------|
Model | 1971.18096 | 4 | 492.79524 | Prob > F = 0.0000  
Residual | 421.451565 | 152 | 2.77270767 | R-squared = 0.8239  
Total | 2392.63253 | 156 | 15.337388 | Root MSE = 1.6651  

| P_{\text{CNS}_i} | Coef. | Std. Err. | t | P>|t| | [95% Conf. Interval] |
|------------------|-------|-----------|---|--------|----------------------|
| P_{\text{Sawtimber}_i} | .5420851 | .0351268 | 15.43 | 0.000 | .4726853 | .6114849 |
| P_{\text{Pulpwood}_i} | .0406996 | .0872567 | 0.47 | 0.642 | -.131693 | .2130922 |
| H_{\text{Sawtimber}_i} | .2583912 | .05033 | 5.13 | 0.000 | .1589545 | .3578278 |
| H_{\text{Pulpwood}_i} | -.0353293 | .133803 | -0.26 | 0.792 | -.2996832 | .2290245 |
| _{\text{cons}} | -5.430347 | 1.95672 | -2.78 | 0.006 | -9.296226 | -1.564467 |

Test for a structural break: Unknown break date

Source | SS | df | MS | Number of obs = 157  
|-------|----|----|----|----------------------|
F(4, 152) = 177.73  
F(4, 152) = 138.82

50
Model | 971.832132  4 242.958033 Prob > F = 0.0000
Residual | 266.02802  152 1.75018434 R-squared = 0.7851
----------+-------------------------------------------------------------------
Total | 1237.86015  156 7.93500097 Root MSE = 1.3229

-------------------------------------------------------------
|                 | Coef.   Std. Err.   t    P>|t|   [95% Conf. Interval] |
-------------------------------------------------------------
P_CNS_i |        |
P_Sawtimber_i | .3698376   .0252074  14.67  0.000   .3200354    .4196397 |
P_Pulpwood_i |  .039342   .1052744   0.37  0.709  -.1686481    .247332 |
H_Sawtimber_i | .2276622   .0549208   4.15  0.000   .1191554    .3361689 |
H_Pulpwood_i | -.0279454  .0975074  -0.29  0.775  -.2205901   .1646994 |
_cons |  1.362931   1.528484   0.89  0.374  -1.656886    4.382747 |
-------------------------------------------------------------

Test for a structural break: Unknown break date

Number of obs = 157
Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2011m2
Ho: No structural break

<table>
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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 11
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS     df  MS     Number of obs  = 157
----------+----------------------------------
Model | 1404.47986  4 351.119966 Prob > F  = 0.0000
Residual | 359.328718 152 2.36400472 R-squared  = 0.7963
----------+----------------------------------
Total | 1763.80858 156 11.3064653 Root MSE  = 1.5375

-------------------------------------------------------------
|                 | Coef.   Std. Err.   t    P>|t|   [95% Conf. Interval] |
-------------------------------------------------------------
P_Sawtimber_i | .5535395   .0282256  19.61  0.000   .4977744    .6093047 |
P_Pulpwood_i |  .15365   .0689596   2.23  0.027    .017407     .289893 |
H_Sawtimber_i | .1444924   .041406   3.60  0.000   .065187    .2237979 |
H_Pulpwood_i |  .4404741   .0870578  5.10  0.000   .2720745    .6160736 |
_cons | -7.362081  1.312446   -5.61  0.000   -9.955073   -4.769089 |
Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2007m3
Ho: No structural break

<table>
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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 12
(3,002 observations deleted)
  time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS      | df | MS | Number of obs |
-------|---------|----|----|---------------|
Model   | 2101.32363 | 4  | 525.330908 | F(4, 152) = 289.60 |
Residual | 275.725819  | 152 | 1.81398565 | R-squared = 0.8840 |
Total    | 2377.04945  | 156 | 15.2374965 | Root MSE = 1.3468 |

| P_CNS_i | Coef. | Std. Err. | t    | P>|t| | [95% Conf. Interval] |
|---------|-------|-----------|------|------|----------------------|
| P_Sawtimber_i | .5774587 | .0206168 | 28.01 | 0.000 | .5367262 - .6181912 |
| P_Pulpwood_i  | .3302756 | .0992441 | 3.33  | 0.001 | .1341996 - .5263516 |
| H_Sawtimber_i | .1512317 | .0249778 | 6.05  | 0.000 | .1018831 - .2005803 |
| H_Pulpwood_i  | .1863955 | .0617272 | 3.02  | 0.003 | .0644414 - .3083495 |
| _cons        | -7.269642 | 1.322493 | -5.50 | 0.000 | -9.882483 - -4.6568 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2013m1
Ho: No structural break

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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 13
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS | df | MS | Number of obs = 157
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<tr>
<td>Model</td>
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<td>F(4, 152) = 368.56</td>
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<tr>
<td>Residual</td>
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<td>152</td>
<td>2.02791938</td>
<td>R-squared = 0.9065</td>
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<tr>
<td>Total</td>
<td>3297.85877</td>
<td>156</td>
<td>21.1401203</td>
<td>Root MSE = 1.4241</td>
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</table>

| P_CNS_i | Coef. | Std. Err. | t | P>|t| | [95% Conf. Interval] |
|--------|-------|-----------|---|-----|------------------|
| P_Sawtimber_i | .7529708 | .0258537 | 29.12 | 0.000 | .7018917 .8040498 |
| P_Pulpwood_i | .4012076 | .0416389 | 9.64 | 0.000 | .3189419 .4834734 |
| H_Sawtimber_i | .2996742 | .0786476 | 3.81 | 0.000 | .1442906 .4550578 |
| H_Pulpwood_i | .091217 | .0690361 | 1.32 | 0.188 | -.0451772 .2276111 |
| _cons | -14.99416 | 1.232716 | -12.16 | 0.000 | -17.42963 -12.55869 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2009m3
Ho: No structural break

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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 14
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month
### Regression Results

Source | SS   | df  | MS   | Number of obs = 157
---+-----+-----+-----+---------------------
Model | 2477.44484 | 4  | 619.36121 | F(4, 152) = 193.63
Residual | 486.201863 | 152 | 3.19869647 | R-squared = 0.8359
Total | 2963.6467 | 156 | 18.9977353 | Root MSE = 1.7885

**P_CNS_i | Coef. Std. Err. t P>|t| [95% Conf. Interval]**
---+------------------+-+---------+-------------------+
P_Sawtimber_i | .8657799 .0347596 24.91 0.000 .7971055 .9344543
P_Pulpwood_i | .8116052 .0700599 11.58 0.000 .6731883 .9500221
H_Sawtimber_i | .5262387 .0718445 7.32 0.000 .384296 .6681814
H_Pulpwood_i | -.0641944 .1072415 -0.60 0.550 -.2760707 .147682
_cons | -27.92615 1.980454 -14.10 0.000 -31.83892 -24.01338

---+-----+-----+-----+---------------------
Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2013m2
Ho: No structural break

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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i

Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons

Micro-region: 15
(3,002 observations deleted)

- time variable: time, 2005m1 to 2018m1, but with gaps
- delta: 1 month

Source | SS   | df  | MS   | Number of obs = 157
---+-----+-----+-----+---------------------
Model | 1554.51013 | 4  | 388.627534 | F(4, 152) = 206.72
Residual | 285.749634 | 152 | 1.8799318 | R-squared = 0.8447
Total | 1840.25977 | 156 | 11.796537 | Root MSE = 1.3711

**P_CNS_i | Coef. Std. Err. t P>|t| [95% Conf. Interval]**
---+------------------+-+---------+-------------------+
P_Sawtimber_i | .5984882 .0228712 26.17 0.000 .5533016 .6436748
P_Pulpwood_i | .7208002 .0639541 11.27 0.000 .5944464 .847154
H_Sawtimber_i | .1756547 .0333799 5.26 0.000 .1097061 .2416032

54
H_Pulpwood_i |  -.0224325    .069625    -0.32   0.748    -.1599902    .1151252
_cons |  -11.08575    1.29905    -8.53   0.000    -13.65228   -8.519228

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2013m10
Ho: No structural break

Test        Statistic          p-value
-----------------------------------------------
swald       114.6621           0.0000
-----------------------------------------------

Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 16
(3,002 observations deleted)

time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source |       SS           df       MS      Number of obs = 157
-------------+----------------------------------   F(4, 152)       = 157.18
Model |  960.657351         4  240.164338   Prob > F        = 0.0000
Residual |  232.251289       152    1.527969   R-squared       = 0.8053
-------------+----------------------------------   Adj R-squared   = 0.8002
Total |  1192.90864       156  7.64685025   Root MSE        = 1.2361

P_CNS_i |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+----------------------------------------------------------------
P_Sawtimber_i |   .4677658   .0217967    21.46   0.000     .4247021    .5108295
P_Pulpwood_i |  -.028756   .0720521    -0.40   0.690    -.1711089     .113597
H_Sawtimber_i |   .4134345   .0537526     7.69   0.000     .3072358    .5196333
H_Pulpwood_i |   .2853398   .0588856     4.85   0.000         .169    .4016797
  _cons |  -6.481465   1.772055    -3.66   0.000    -9.982503   -2.980426

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2013m11
Ho: No structural break

<table>
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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 17
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS    df MS      Number of obs = 157
-------------+----------------------------------
Model | 1511.47345 4 377.868362 Prob > F = 0.0000
Residual | 205.26516 152 1.35042868 R-squared = 0.8804
-------------+----------------------------------
Total | 1716.73861 156 11.0047347 Root MSE = 1.1621

<table>
<thead>
<tr>
<th>P_CNS_i</th>
<th>Coef. Std. Err. t P&gt;</th>
<th>t</th>
<th>[95% Conf. Interval]</th>
</tr>
</thead>
</table>
P_Sawtimber_i | .4669878  .0165856    28.16   0.000     .4342199    .4997558 |
P_Pulpwood_i | -.1113323  .0947034    -1.18   0.242    -.2984372    .0757727 |
H_Sawtimber_i | .1244716  .0282754     4.40   0.000     .0686081    .1803351 |
H_Pulpwood_i | .3612558  .0670908     5.38   0.000     .2287049    .4938067 |
_cons | -.5485845  1.307309    -0.42   0.675    -3.131428    2.034259 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2009m11
Ho: No structural break

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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 18
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

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<td>Prob &gt; F = 0.0000</td>
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<tr>
<td>Residual</td>
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<td>1.82951634</td>
<td>R-squared = 0.9058</td>
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<td>Total</td>
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<td>18.9184085</td>
<td>Root MSE = 1.3526</td>
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| P_CNS_i | Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|---------|-------|-----------|-------|------|----------------------|
| P_Sawtimber_i | .5793378 | .0194203 | 29.83 | 0.000 | .5409693 .6177064 |
| P_Pulpwood_i | .0065362 | .1205123 | 0.05 | 0.957 | -.2315592 .2446316 |
| H_Sawtimber_i | .1382479 | .036241 | 3.81 | 0.000 | .0666467 .2098491 |
| H_Pulpwood_i | .165072 | .070913 | 2.33 | 0.021 | .0249697 .3051743 |
| _cons | -4.204695 | 1.509496 | -2.79 | 0.006 | -7.186996 -1.222393 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2013m11
Ho: No structural break

<table>
<thead>
<tr>
<th>Test</th>
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<tr>
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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 19
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

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<th>MS</th>
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<tr>
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<td>795.596518</td>
<td>Prob &gt; F = 0.0000</td>
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<tr>
<td>Residual</td>
<td>315.50627</td>
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<td>2.07569915</td>
<td>R-squared = 0.9098</td>
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<tr>
<td>Total</td>
<td>3497.89234</td>
<td>156</td>
<td>22.4223868</td>
<td>Root MSE = 1.4407</td>
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</tbody>
</table>

| P_CNS_i | Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|---------|-------|-----------|-------|------|----------------------|
| P_Sawtimber_i | .6319748 | .0183016 | 34.53 | 0.000 | .5958164 .6681331 |
Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2013m9
Ho: No structural break

<table>
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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 20
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS     | df  | MS         | Number of obs = 157
--------+--------+-----+------------+-----------------
Model   | 2241.41804 | 4   | 560.35451  | F(4, 152) = 311.28
Residual| 273.626234 | 152 | 1.80017259 | Prob > F = 0.0000
Total   | 2515.04427  | 156 | 16.1220787 | R-squared = 0.8912
--------+--------+-----+------------+-----------------

| P_CNS_i | Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|---------|-------|-----------|-------|-------|----------------------|
| P_Sawtimber_i | .4893688 | .0164867 | 29.68 | 0.000 | .4567962 .5219414 |
| P_Pulpwood_i | .0813649 | .086285  | 0.94  | 0.347 | -.0891079 .2518377 |
| H_Sawtimber_i | .138959  | .0272005 | 5.11  | 0.000 | .0852191 .1926988 |
| H_Pulpwood_i | -.2923148 | .0848399 | -3.45 | 0.001 | -.4599325 -.124697 |
| _cons      | .9080909 | 1.015416 | 0.89  | 0.373 | -1.09806 2.914241 |

Test for a structural break: Unknown break date

Number of obs = 157
Test            Statistic          p-value
-----------------------------------------------
swald           166.8274           0.0000
-----------------------------------------------
Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 21
(3,002 observations deleted)

time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS       df      MS     Number of obs =  157
-------------+---------------------------------- F(4, 152)  =  177.55
Model | 1123.8679       4  280.966974   Prob > F  =  0.0000
Residual | 240.536074      152  1.58247417   R-squared  =  0.8237
-------------+---------------------------------- Adj R-squared  =  0.8191
Total | 1364.40397      156  8.7461793   Root MSE  =  1.258

| P_CNS_i | Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
|--------|----------|------------|------|---------|------------------|--|-----------------|------------------|
P_Sawtimber_i |   .5050042   .0250564    20.15   0.000     .4555004     .554508
P_Pulpwood_i |   .6055272   .0873957     6.93   0.000       .43286    .7781944
H_Sawtimber_i |  -.0137829   .0279711    -0.49   0.623    -.0690453    .0414795
H_Pulpwood_i |  -.4072187   .1354927    -3.01   0.003    -.6749109   -.1395266
_cons |   .5264655   1.375295     0.38   0.702    -2.190697    3.243628

Test for a structural break: Unknown break date

Number of obs =  157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2008m12
Ho: No structural break

Test            Statistic          p-value
-----------------------------------------------
swald           215.3396           0.0000
-----------------------------------------------
Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 22
(3,002 observations deleted)

Source | SS   df  MS  Number of obs =  157
-------+----------------------------------
Model  | 2129.44489  4  532.361222  F(4, 152) =  419.93
Residual | 192.697777  152  1.26774853  R-squared =  0.9170
-------+----------------------------------
Total  | 2322.14267  156  14.8855299  Root MSE =  1.1259

P_CNS_i |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
---------+---------------------------------------------------------------
P_Sawtimber_i |   .5062411   .0159503    31.74   0.000     .4747281    .5377541
P_Pulpwood_i |   .3069659   .0698598     4.39   0.000     .1689443    .4449874
H_Sawtimber_i |   .0085232   .0203263     0.42   0.676    -.0316354    .0486817
H_Pulpwood_i |  -.1056619   .0430147    -2.46   0.015    -.1906457    -.020678
     _cons |  -.6320223   .9051369    -0.70   0.486    -2.420296    1.156251

Test for a structural break: Unknown break date

Number of obs =  157

Full sample:  2005m1 - 2018m1
Trimmed sample:  2007m1 - 2016m2
Estimated break date:  2011m5
Ho: No structural break

Test                Statistic          p-value
-------------------------------
swald            76.8744           0.0000
-------------------------------

Exogenous variables:       P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 23

(3,002 observations deleted)

Source | SS   df  MS  Number of obs =  157
-------+----------------------------------
Model  | 1027.37718  4  256.844295  F(4, 152) =  109.38
Residual | 356.924086  152  2.34818478  R-squared =  0.7422
-------+----------------------------------
Total  | 1384.30127  156  8.87372607  Root MSE =  1.5324

P_CNS_i |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2007m4
Ho: No structural break

Test Statistic p-value
-----------------------------------------------
swald 67.3755 0.0000

Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 24
(3,002 observations deleted)

time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source SS df MS Number of obs = 157
-------------+---------------------------------- F(4, 152) = 248.44
Model 1613.49621 4 403.374052 Prob > F = 0.0000
Residual 246.787598 152 1.62360262 R-squared = 0.8673
-------------+---------------------------------- Adj R-squared = 0.8638
Total 1860.28381 156 11.9248962 Root MSE = 1.2742

P_CNS_i Coef. Std. Err. t  P>|t| [95% Conf. Interval]
-------------+----------------------------------+
P_Sawtimber_i .3515264 .0144172 24.38 0.000 .3230424 .3800104
P_Pulpwood_i -.0955655 .0622061 -1.54 0.127 -.2184657 .0273348
H_Sawtimber_i -.1626574 .032525 -5.00 0.000 -.2269167 -.098398
H_Pulpwood_i .2544424 .0488746 5.21 0.000 .1578811 .3510037
_cons 7.881194 1.015347 7.76 0.000 5.87518 9.887208
-------------+----------------------------------+

Test for a structural break: Unknown break date
Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2011m11
Ho: No structural break

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Exogenous variables: P_Sawtimber_i, P_Pulpwood_i, H_Sawtimber_i, H_Pulpwood_i

Coefficients included in test: P_Sawtimber_i, P_Pulpwood_i, H_Sawtimber_i, H_Pulpwood_i, _cons

Micro-region: 25

(3,002 observations deleted)

time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS       | df | MS     | Number of obs = 157
-------+----------+----+--------+-----------------------
Model  | 1973.20754| 4  | 493.301884 | F(4, 152) = 183.89
Residual | 407.748263| 152 | 2.68255436 | R-squared = 0.8287
Total  | 2380.9558 | 156 | 15.2625372 | Root MSE = 1.6379

| P_CNS_i | Coef. | Std. Err. | t    | P>|t| | [95% Conf. Interval] |
|---------|-------|-----------|------|------|-----------------------|
| P_Sawtimber_i | .4249633 | .0224742 | 18.91 | 0.0000 | .3805611 .4693655 |
| P_Pulpwood_i | -.3069819 | .1335774 | -2.30 | 0.0230 | -.57089 -.0430739 |
| H_Sawtimber_i | -.1657571 | .0374542 | -4.43 | 0.0000 | -.2397553 -.091759 |
| H_Pulpwood_i | .2951694 | .0791467 | 3.73 | 0.0000 | .1387997 .451539 |
| _cons         | 6.279914 | 1.127839 | 5.57 | 0.0000 | 4.051648 8.508179 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2007m4
Ho: No structural break

<table>
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Exogenous variables: P_Sawtimber_i, P_Pulpwood_i, H_Sawtimber_i, H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 26
(3,002 observations deleted)
  time variable: time, 2005m1 to 2018m1, but with gaps
  delta: 1 month

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<td>Residual</td>
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<td>2.30243336</td>
<td>R-squared = 0.7899</td>
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<tr>
<td>Total</td>
<td>1665.66114</td>
<td>156</td>
<td>10.677315</td>
<td>Root MSE = 1.5174</td>
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</tr>
</tbody>
</table>

| P_CNS_i | Coef. | Std. Err. | t    | P>|t| | [95% Conf. Interval] |
|---------|-------|-----------|-----|------|----------------------|
| P_Sawtimber_i | .464663 | .0226788 | 20.49 | 0.000 | .4198567 .5094694 |
| P_Pulpwood_i | -.2740167 | .1074921 | -2.55 | 0.012 | -.4863882 -.0616452 |
| H_Sawtimber_i | .0024857 | .0289672 | 0.09 | 0.932 | -.0547447 .0597161 |
| H_Pulpwood_i | .0855968 | .0867499 | 0.99 | 0.325 | -.0857944 .256988 |
| _cons | 4.756183 | 1.521839 | 3.13 | 0.002 | 1.749494 7.762871 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2007m1
Ho: No structural break

<table>
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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 27
(3,002 observations deleted)
  time variable: time, 2005m1 to 2018m1, but with gaps
  delta: 1 month

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<tr>
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<td>234.571875</td>
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<td>4.17800083</td>
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<tr>
<td>Total</td>
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<td>Root MSE = 2.044</td>
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</table>
Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2007m2
Ho: No structural break

<table>
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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 28
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS  | df | MS   | Number of obs = 157
F(4, 152) = 71.88
Model | 643.022412 | 4 | 160.755603 | Prob > F = 0.0000
Residual | 339.930308 | 152 | 2.2363836 | R-squared = 0.6542
Adj R-squared = 0.6451
Total | 982.95272 | 156 | 6.30097897 | Root MSE = 1.4955

P_CNS_i | Coef. Std. Err. t P>|t| [95% Conf. Interval]
---------|-------------------------|-------|--------|------------------|------------------|------------------|------------------|------------------|
P_Sawtimber_i | .3715787 | .0225488 | 16.48 | 0.000 | .3270292 | .4161282 |
P_Pulpwood_i | .114839 | .107065 | 1.07 | 0.285 | -.0966887 | .3263667 |
H_Sawtimber_i | .002011 | .0448959 | 0.04 | 0.964 | -.0868895 | .0907115 |
H_Pulpwood_i | -.1407165 | .0695014 | -2.02 | 0.045 | -.2780299 | -.003403 |
_cons | 4.700956 | 1.150247 | 4.09 | 0.000 | 2.42842 | 6.973492 |
Test for a structural break: Unknown break date

   Number of obs =        157

Full sample:                  2005m1 - 2018m1
Trimmed sample:               2007m1 - 2016m2
Estimated break date:         2007m1
Ho: No structural break

Test            Statistic          p-value
-----------------------------------------------
swald            72.1811           0.0000
-----------------------------------------------

Exogenous variables:           P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 29
(3,002 observations deleted)
   time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source |       SS           df       MS      Number of obs   =       157
-------------+----------------------------------   F(4, 152)       =    143.76
Model |  942.276403         4  235.569101   Prob > F        =    0.0000
Residual |  249.063108       152  1.63857308   R-squared       =    0.7909
-------------+----------------------------------   Adj R-squared   =    0.7854
Total |  1191.33951       156  7.63679174   Root MSE        =    1.2801

-------------------------------------------------------------------------------
P_CNS_i |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+----------------------------------------------------------------
P_Sawtimber_i |   .3480169     .01664    20.91   0.000     .3151413    .3808924
P_Pulpwood_i |  -.0081841   .0870122    -0.09   0.925    -.1800936    .1637254
H_Sawtimber_i |  -.1458537   .0221042    -6.60   0.000    -.1895248   -.1021826
H_Pulpwood_i |   .0389241    .058968     0.66   0.510    -.0775786    .1554268
   _cons |   7.991934   .8896878     8.98   0.000     6.234184    9.749685
-------------------------------------------------------------------------------

Test for a structural break: Unknown break date

   Number of obs =        157

Full sample:                  2005m1 - 2018m1
Trimmed sample:               2007m1 - 2016m2
Estimated break date:         2008m5
Ho: No structural break

Test            Statistic          p-value
-----------------------------------------------
swald            77.8407           0.0000
Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 30

(3,002 observations deleted)

time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS      df    MS      Number of obs = 157
-------------+----------------------------------
Model | 1551.31227  4    387.828068   Prob > F = 0.0000
Residual | 333.186099 152  2.19201381   R-squared = 0.8232
-------------+----------------------------------
Total | 1884.49837 156 12.0801178   Root MSE = 1.4805

P_CNS_i | Coef.  Std. Err.      t    P>|t|      [95% Conf. Interval]
----------+----------------------------------------------------------------
P_Sawtimber_i | 0.2575162  0.0195763   13.15  0.000    0.2188395    0.2961929
P_Pulpwood_i | 0.6956621  0.066143    10.52  0.000    0.5649838    0.8263404
H_Sawtimber_i | 0.0517489  0.0224333    2.31  0.022    0.0074275    0.0960704
H_Pulpwood_i | -0.1008994  0.0556481   -1.81  0.072   -0.2108429    0.0090442
       _cons | 2.900933   0.922134    3.15  0.002    1.079078    4.722787

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2008m5
Ho: No structural break

Test            Statistic          p-value
-------------+----------------------------------
swald           117.7571           0.0000

Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 31

(3,002 observations deleted)

time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS      df    MS      Number of obs = 157
-------------+----------------------------------
Model | 1209.61216  4    302.403039   Prob > F = 0.0000
Residual | 250.660401 152  1.64908158   R-squared = 0.8283
-------------+----------------------------------
Total | 1459.27257 156 9.35559973   Root MSE = 1.2953

66
|        | Coef. | Std. Err. |  t    | P>|t| | [95% Conf. Interval] |
|--------|------|----------|------|-----|-----------------|
| P_CNS_i |      |          |      |     |                 |
| P_Sawtimber_i | .3543409 | .0166527 | 21.28 | 0.000 | .3214402 | .3872415 |
| P_Pulpwood_i | .220439 | .0572049 | 3.85 | 0.000 | .1074196 | .3334583 |
| H_Sawtimber_i | .0141241 | .0278593 | 0.51 | 0.613 | -.0409173 | .0691656 |
| H_Pulpwood_i | -.0226024 | .0468628 | -0.48 | 0.630 | -.1151891 | .0699842 |
| _cons | 4.247645 | .8719899 | 4.87 | 0.000 | 2.524859 | 5.97043 |

Test for a structural break: Unknown break date

<table>
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<tr>
<th>Test</th>
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Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 32
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

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<tr>
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<td>Prob &gt; F = 0.0000</td>
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<tr>
<td>Residual</td>
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<td>152</td>
<td>1.42546597</td>
<td>R-squared = 0.6194</td>
</tr>
<tr>
<td>Total</td>
<td>569.313078</td>
<td>156</td>
<td>3.64944281</td>
<td>Root MSE = 1.1939</td>
</tr>
</tbody>
</table>

|        | Coef. | Std. Err. |  t    | P>|t| | [95% Conf. Interval] |
|--------|------|----------|------|-----|-----------------|
| P_Sawtimber_i | .1783937 | .0140905 | 12.66 | 0.000 | .1505552 | .2062321 |
| P_Pulpwood_i | .3679125 | .0718953 | 5.12 | 0.000 | .2258693 | .5099557 |
| H_Sawtimber_i | .005196 | .0199417 | 0.26 | 0.795 | -.0342028 | .0445947 |
| H_Pulpwood_i | .2055564 | .0405331 | 5.07 | 0.000 | .1254754 | .2856375 |
| _cons | 6.066616 | .9561947 | 6.34 | 0.000 | 4.177468 | 7.955764 |

----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5

..................................................  50
.................................................. 100

...........
Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2008m6
Ho: No structural break

Test            Statistic          p-value
-----------------------------------------------
swald            81.8898           0.0000
-----------------------------------------------

Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 33
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source | SS        df      MS              Number of obs = 157
-------------+---------------------------------- F(4, 152) = 76.50
Model | 308.598868 4  77.1497171   Prob > F = 0.0000
Residual | 153.281657 152  1.00843196  R-squared = 0.6681
-------------+---------------------------------- Adj R-squared = 0.6594
Total | 461.880525 156  2.9607726   Root MSE = 1.0042

|         | Coef.  | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|---------+--------+-----------+-------+-------+-------------------|
P_Sawtimber_i | 0.2197176 0.0136775 16.06 0.000 | 0.1926951 - 0.2467401 |
P_Pulpwood_i | 0.4473698 0.1087145 4.12 0.000 | 0.2325832 0.6621564 |
H_Sawtimber_i | 0.1586498 0.0323038 4.91 0.000 | 0.0948273 0.2224723 |
H_Pulpwood_i | 0.1339739 0.0620067 2.16 0.032 | 0.0114677 0.2564802 |
_cons | 1.282662 1.047656 1.22 0.223 | -0.7871858 3.352511 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2011m9
Ho: No structural break

Test            Statistic          p-value
-----------------------------------------------
Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 34
(3,002 observations deleted)
   time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source |       SS           df       MS      Number of obs   =       157
-------------+----------------------------------   F(4, 152)       =     46.54
Model |   427.36376         4   106.84094   Prob > F        =    0.0000
Residual |  348.915999       152  2.29549999   R-squared       =    0.5505
-------------+----------------------------------   Adj R-squared   =    0.5387
Total |  776.279759       156   4.9761523   Root MSE        =    1.5151

P_CNS_i |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+----------------------------------------------------------------
P_Sawtimber_i |   .2824993   .0219887    12.85   0.000     .2390564    .3259422
P_Pulpwood_i |  -.1723189   .1759516    -0.98   0.329    -.5199454    .1753076
H_Sawtimber_i |    .141036   .0263064     5.36   0.000     .0890627    .1930093
H_Pulpwood_i |   .1883442   .1688897     1.12   0.267    -.1453301    .5220185
   _cons |   3.079474   1.302816     2.36   0.019     .5055095    5.653439

Test for a structural break: Unknown break date

Number of obs =        157

Full sample:                  2005m1 -  2018m1
Trimmed sample:               2007m1 -  2016m2
Estimated break date:        2013m10
Ho: No structural break

Test   Statistic   p-value
----------+----------------+-------
   swald   240.3477   0.0000

Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 35
(3,002 observations deleted)
   time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source |       SS           df       MS      Number of obs   =       157
-------------+----------------------------------   F(4, 152)       =     71.53
Model |   943.83904         4   235.95976   Prob > F        =    0.0000
### Residual Analysis

|             | Coef. Std. Err. | t | P>|t| [95% Conf. Interval] |
|-------------|-----------------|---|-----------|
| P_CNS_i     |                 |   |           |
| P_Sawtimber_i | 0.3527865 0.0278266 | 12.68 | 0.000 | 0.2978098 0.4077633 |
| P_Pulpwood_i | 0.5724512 0.0994875 | 5.75 | 0.000 | 0.3758943 0.769008 |
| H_Sawtimber_i | 0.0977459 0.0308904 | 3.16 | 0.002 | 0.0367159 0.1587759 |
| H_Pulpwood_i | -0.1347697 0.0829979 | -1.62 | 0.106 | -0.2987481 0.0292088 |
| cons | -0.2223818 1.316419 | -0.17 | 0.866 | -2.823222 2.378458 |

---

### Test for a Structural Break

**Number of obs =** 157

**Full sample:** 2005m1 - 2018m1

**Trimmed sample:** 2007m1 - 2016m2

**Estimated break date:** 2009m9

**Ho:** No structural break

**Test** | **Statistic** | **p-value**
---|---|---
swald | 177.8399 | 0.0000

**Exogenous variables:** P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i

**Coefficients included in test:** P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i cons

**Micro-region:** 36

(3,002 observations deleted)

**time variable:** time, 2005m1 to 2018m1, but with gaps
delta: 1 month

**Source | SS df MS Number of obs =** 157
---|---|---|---|---
Model | 604.695483 4 151.173871 Prob > F = 0.0000
Residual | 227.672498 152 1.49784538 R-squared = 0.7265
Total | 832.367981 156 5.33569219 Root MSE = 1.2239

---

### P_CNS_i

|             | Coef. Std. Err. | t | P>|t| [95% Conf. Interval] |
|-------------|-----------------|---|-----------|
| P_Sawtimber_i | 0.3208249 0.017246 | 18.60 | 0.000 | 0.2867521 0.3548977 |
| P_Pulpwood_i | 0.1393994 0.0700011 | 1.99 | 0.048 | 0.0010987 0.2777 |
| H_Sawtimber_i | 0.41915 0.040757 | 1.01 | 0.313 | -0.0392323 0.1218152 |
| H_Pulpwood_i | -0.664281 0.0721877 | -0.92 | 0.359 | -0.2090488 0.0761926 |
| cons | 4.741916 1.004064 | 4.72 | 0.000 | 2.758192 6.725639 |
Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2013m5
Ho: No structural break

<table>
<thead>
<tr>
<th>Test</th>
<th>Statistic</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>swald</td>
<td>53.6925</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 37
(3,002 observations deleted)
time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source |       SS           df       MS      Number of obs   =       157
-------------+----------------------------------   F(4, 152)       =    149.59
Model |  1032.60976         4   258.15244   Prob > F        =    0.0000
Residual |  262.313663       152  1.72574778   R-squared       =    0.7974
-------------+----------------------------------   Adj R-squared   =    0.7921
Total |  1294.92342       156  8.30079117   Root MSE        =    1.3137

| P_CNS_i | Coef. | Std. Err. | t     | P>|t| | [95% Conf. Interval] |
|---------|-------|-----------|-------|-------|----------------------|
| P_Sawtimber_i | .4259871 | .0212841 | 20.01 | 0.000 | .3839363 .468038 |
| P_Pulpwood_i  | .0796921 | .0648278 | 1.23  | 0.221 | -.0483879 .2077721 |
| H_Sawtimber_i | -.0961634 | .0287731 | -3.34 | 0.001 | -.1530102 -.0393166 |
| H_Pulpwood_i  | .0844937 | .0662813 | 1.27  | 0.204 | -.0464579 .2154452 |
| _cons         | 3.85767   | .8958024 | 4.31  | 0.000 | 2.087839 5.627501 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2015m7
Ho: No structural break
Test            Statistic          p-value  
-----------------------------------------------
swald           112.0662           0.0000  
-----------------------------------------------

Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 38
(3,002 observations deleted)
  time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source |       SS           df       MS      Number of obs   =       157
-------------+----------------------------------   F(4, 152)       =     93.70
Model |  324.335734         4  81.0839334   Prob > F        =    0.0000
Residual |  131.530409       152  .865331637   R-squared       =    0.7115
-------------+----------------------------------   Adj R-squared   =    0.7039
Total |  455.866142       156  2.92221886   Root MSE        =    .93023

-------------------------------------------------------------------------------
P_CNS_i |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
--------------+----------------------------------------------------------------
P_Sawtimber_i |    .280225   .0148706    18.84   0.000     .2508452    .3096047
P_Pulpwood_i |   .2698197   .1169614     2.31   0.022     .0387397    .5008997
H_Sawtimber_i |   .1164177   .0228771     5.09   0.000     .0712195    .1616159
H_Pulpwood_i |  -.1040266   .0751853    -1.38   0.169    -.2525698    .0445166
    _cons |   3.078454   1.092109     2.82   0.005     .9207795    5.236128
-------------------------------------------------------------------------------

Test for a structural break: Unknown break date

Number of obs =        157
Full sample:                  2005m1 -  2018m1
Trimmed sample:               2007m1 -  2016m2
Estimated break date:        2014m12
Ho: No structural break

Test            Statistic          p-value  
-----------------------------------------------
swald           105.3821           0.0000  
-----------------------------------------------

Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons
Micro-region: 39
(3,002 observations deleted)
  time variable: time, 2005m1 to 2018m1, but with gaps
delta: 1 month

Source |       SS           df       MS      Number of obs   =       157
| P_CNS_i | Coef. | Std. Err. | t    | P>|t|   | [95% Conf. Interval] |
|---------|-------|-----------|------|------|----------------------|
| P_Sawtimber_i | .3085876 | .0288319 | 10.70 | 0.000 | .2516245 .3655506 |
| P_Pulpwood_i | -.173117 | .1280157 | -1.35 | 0.178 | -.4260369 .0798029 |
| H_Sawtimber_i | .1679136 | .0466753 | 3.60  | 0.000 | .0756974 .2601297 |
| H_Pulpwood_i | .8444271 | .1212017 | 6.97  | 0.000 | .6049696 1.083885 |
| _cons | -.0778212 | 1.792222 | -0.04 | 0.965 | -3.618703 3.463061 |

Test for a structural break: Unknown break date

Number of obs = 157

Full sample: 2005m1 - 2018m1
Trimmed sample: 2007m1 - 2016m2
Estimated break date: 2009m6
Ho: No structural break

Test Statistic p-value
-------------------------------
wald 111.6923 0.0000

Exogenous variables: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i
Coefficients included in test: P_Sawtimber_i P_Pulpwood_i H_Sawtimber_i H_Pulpwood_i _cons .}
References:


