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The long-run determinants of U.S. lumber imported from Canada revisited

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ABSTRACT

This paper examines the effects of the lumber price, the housing starts, and the bilateral exchange rate on U.S. softwood lumber imports from Canada in a cointegration framework. To that end, the Phillips–Hansen fully-modified cointegration (FM-OLS) procedure is applied to monthly data for the period from January 1994 through June 2009. Results show that there exists the long-run equilibrium relationship between the U.S. lumber imports from Canada and the selected macroeconomic and market variables. We also find that the U.S. lumber price and housing starts are more important than the bilateral exchange rate in influencing U.S.–Canada softwood lumber trade.

1. Introduction

In the case of the U.S. softwood lumber industry, many researchers believe that in addition to market variables (e.g., domestic and imported prices of softwood lumber) macroeconomic variables (e.g., exchange rate and income growth and housing activity in the U.S.) are important factors affecting U.S. lumber trade with Canada. Accordingly, the effects of macroeconomic (and market) variables on the bilateral lumber trade has been studied extensively (e.g., Buongiorno et al., 1979, 1988; Chen et al., 1988; Jennings et al., 1991; Wear and Lee, 1993; Myneni et al., 1994; Sarker, 1996; Zhang, 2001, 2006; Baek and Yin, 2006; Bolkesjo and Buongiorno, 2006; Baek, 2007). Buongiorno et al. (1988), for example, examine the effects of changes in the bilateral exchange rate and U.S. domestic lumber price on U.S. lumber imports from Canada using standard Granger causality tests; they find that while the U.S. price of softwood lumber is a dominant force in affecting Canadian lumber imports, the exchange rate has a negligible effect on imports. Sarker (1996) analyzes the effects of major excess demand side factors on Canadian lumber exports to the U.S. using Johansen cointegration analysis; he shows that U.S. lumber price, U.S. disposable income and U.S. housing starts are found to be the major determinants of Canadian softwood lumber export to the United States. More recently, Baek (2007) investigates the dynamic relationships between macroeconomic variables (i.e., exchange rate and U.S. income) and U.S.–Canada trade in forest products including softwood lumber using an autoregressive distributed lag (ARDL) model; he concludes that the U.S. income growth is a more powerful factor than the exchange rate.

An important point frequently overlooked in the literature, however, is that studies have mostly used time-series methods with little cognizance of the unit root problems associated with level variables (e.g., Buongiorno et al., 1979, 1988; Chen et al., 1988; Jennings et al., 1991; Wear and Lee, 1993; Myneni et al., 1994). In other words, most past studies use the level of each variable in their regression analysis without taking into account the nonstationarity in the data. When data are not stationary, standard critical values used in determining the significance of estimated coefficients are not valid (Wooldridge, 2006).[1] Another shortcoming of most previous studies evaluating U.S.–Canada lumber trade is that not enough attention has been given to the import price of softwood lumber (e.g., Sarker, 1996; Zhang, 2001, 2006; Baek and Yin, 2006; Baek, 2007). As Buongiorno et al. (1979) point out (pp. 642–643), U.S. and Canadian softwood lumber are not perfect substitutes in the U.S. lumber market mainly for the following two reasons; (1) the species composition of lumber imported from Canada is not the same as that of domestic lumber, and (2) U.S. consumers tend to perceive Canadian lumber as a different commodity simply because it originates from a foreign country. As such, excluding the Canadian import price in an empirical model may yield biased estimates, known as the omitted variable bias (Wooldridge, 2006). Hence, these shortcomings could raise questions about the validity of the results of previous studies. Furthermore, for several decades Canada has been the principal source of softwood lumber in the U.S. market, providing more

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[1] A stationary series is defined as a series that tends to return to its mean value and fluctuate around it within a more or less constant stage, whereas a nonstationary series is defined as a series that has a different mean at different points in time and its variance increases with the sample size (Harris and Sollis, 2003; Wooldridge, 2006).

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than 90% of U.S. total imports and more than 30% of U.S. consumption. Given heavy dependence of U.S. lumber consumption on Canadian imports, it is very important to fully understand the macroeconomic and market factors that contribute to the ever-changing pattern of the bilateral lumber trade.

The objective of this paper is to re-examine the effects of macroeconomic and market factors on U.S. lumber imports from Canada with enhanced models and variables. The empirical focus is on identifying the long-run relationship between U.S. lumber imports from Canada and macroeconomic aggregates such as exchange rate and housing starts and lumber market variables such as domestic and import prices of softwood lumber. To achieve the objective, we employ the fully-modified cointegration technique (FM-OLS) developed by Phillips and Hansen (1990).[2] Since the FM-OLS method is less sensitive to changes in lag structure and performs better for finite sample size than other cointegration techniques (e.g., Engle and Granger, 1987; Johansen, 1988), it is a fully efficient method of estimating long-run equilibrium relationships among the selected variables (Hargreaves, 1994). This dynamic analysis will enhance the understanding of U.S.–Canada lumber trade and contributes to the literature on forest products trade.

The remainder of the paper is organized as follows. The next section discusses the theoretical model related to the U.S. import demand equation for softwood lumber imported from Canada, as well as the empirical method associated with the FM-OLS estimation. The following section describes the dataset used in the analysis. The last two sections discuss the empirical results, and make some concluding comments.

2. The model

2.1. A theoretical model of the U.S. demand for softwood lumber imported from Canada

In examining macroeconomic and lumber market factors affecting U.S. lumber imports from Canada, we rely on a theoretical framework developed by Buongiorno et al. (1979) and Chen et al. (1988). Based on derived demand theory, the reduced-form equation for U.S. lumber imports from Canada (IM_t) is specified as follows:

$$IM_t = f\left(P_t^d, P_t^m, HS_t, ER_t\right) \tag{1}$$

where P_t^d is the domestic price of softwood lumber; P_t^m the import price of softwood lumber; HS_t is the housing starts; and ER_t is the exchange rate. Since lumber produced in Canada is assumed to be a distinct commodity that is not a perfect substitute for domestic lumber (imperfect competition), demand for imported lumber in this model is specified as a function of two different prices such as domestic price and import price. In other words, U.S. demand for Canadian lumber cannot be simply represented by an excess demand function measuring the difference between domestic demand and supply for softwood lumber. Further, differentiability of domestic and imported lumber implies that domestic supply affects imports only through its impact on domestic prices, but not directly (Buongiorno et al., 1979; p. 643). In addition, an increase in the scale of U.S. economic activity through economic growth leads to a rise in demand for new homes and other new construction, thereby boosting the lumber demand for construction purposes; thus, an index of new construction such as housing starts is used as a shifter in the demand for import equation (Uri and Boyd, 1990). Finally, U.S. import demand for Canadian lumber tends to rise with an appreciation of U.S. dollar against Canadian dollar via a decline in prices of Canadian lumber imports; hence, the bilateral exchange rate is another important factor determining lumber imports from Canada (Buongiorno et al., 1988).

It is worth mentioning that in addition to Canada, Europe, Latin America (i.e., Chile and Brazil) and New Zealand have been exporters of softwood lumber to the United States. Because of the relatively small share of lumber trade (less than 10% of U.S. lumber imports), however, U.S. import demand from those countries are not considered in this study.

2.2. Modeling the FM-OLS

To illustrate the FM-OLS modeling approach, we then express Eq. (1) in a log linear form as follows:

$$ln(IM_t) = \alpha + \beta_1\, ln\left(P_t^d\right) + \beta_2\, ln(P_t^m) + \beta_3\, ln(HS_t) + \beta_4\, ln(ER_t) + \varepsilon_t \tag{2}$$

where ln is natural logarithmic form; and ε_t is an error term. In the literature on international economics, studies have relied mostly on the standard import demand model developed by Houthakker and Magee (1969) and Kreinin (1973) in which the quantity of imports is regressed on the relative price defined as the ratio of domestic price to import price and other factors such as exchange rate and income. One of the major reasons for using the price ratio is that it is insensitive to the choice of a price index; in other words, regardless of the price index used the ratio will not be altered. In addition, the ratio can narrow down the range of the variable to make it less susceptible to outlying or extreme observations (Wooldridge, 2006). Hence, we use the relative price in the empirical model as is done in other studies (e.g., Buongiorno et al., 1979). The U.S. lumber import demand Eq. (2) now becomes

$$ln(IM_t) = \alpha + \beta_1\, ln(P_t) + \beta_2\, ln(HS_t) + \beta_3\, ln(ER_t) + \varepsilon_t \tag{3}$$

where P_t is the relative price of softwood lumber defined as the ratio of the domestic price to the import price ($P_t = P_t^d / P_t^m$). When the domestic–import price ratio is greater (less) than 1.0, it indicates that domestic price has increased faster (slower) than import price, thereby increasing (decreasing) Canadian lumber imports; hence, it is expected that $\beta_1 > 0$. Since an increase in the number of housing starts in the U.S. leads to an increase in demand for softwood lumber and boosts lumber imports, it is expected that $\beta_2 > 0$. Finally, it is expected that $\beta_3 > 0$, since an appreciation of the U.S. dollar causes an increase in U.S. imports of Canadian lumber through a decline in import prices. Exchange rates (ER_t) is here assumed to be defined in a way that an increase reflects a real appreciation of the U.S. dollar against the Canadian dollar.

As Baek and Yin (2006) point out, demand for lumber in the U.S. is mainly derived from demand for new housing, and repair and remodeling. New housing is determined by housing starts, while repair and remodeling is decided by disposable income; hence, these two factors are key measures of the likely effects of a stronger economy on lumber consumption and imports. Inclusion of both variables in the model, however, would yield unacceptable coefficient estimates, due mainly to multicollinearity between them; for example, the correlation coefficient between housing starts and disposable income over the sample period is 0.67. For this reason, we drop the disposable income from the final model. To some, a correlation of approximately 0.67 would seem to be a bit low to exclude a variable from an empirical model as we did. In the econometrics literature, however, the problem of multicollinearity is

[2] Nonstationary time-series data can be said cointegrated, if a linear combination of them is stationary. When it comes to dealing with nonstationary data series in an econometric model, therefore, the long-run equilibrium is identical to the concept of cointegration, indicating that time-series variables will move closely together over time and the difference between them will be stable, or stationary (Harris and Sollis, 2003; Wooldridge, 2006).