Pricing-to-Market Using EGARCH-Error Correction Model

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ABSTRACT

In this paper, the authors use an exponential generalized autoregressive conditional heteroscedastic (EGARCH) error-correction model (ECM), that is, EGARCH-ECM, to estimate the pass-through effects of foreign exchange (FX) rates and producers’ prices for 20 U.K. export sectors. The long-run adjustment of export prices to FX rates and producers’ prices is within the range of -1.02% (for the Textiles sector) and -17.22% (for the Meat sector). The contemporaneous pricing-to-market (PTM) coefficient is within the range of -72.84% (for the Fuels sector) and -8.05% (for the Textiles sector). Short-run FX rate pass-through is not complete even after several months. Rolling EGARCH-ECMs show that the short and long-run effects of FX rate and producers’ prices fluctuate substantially as are asymmetry and volatility estimates before equilibrium is achieved.

Keywords: Cointegration, Error Correction Model (ECM), Exchange Rates, Exponential Generalized Autoregressive Conditional Heteroscedastic (EGARCH), Pricing-to-market, Rolling Regressions

INTRODUCTION

Pricing-to-market (PTM) can be defined as the extent to which exporters adjust export prices to absorb the effects of foreign exchange (FX) rate changes. Under a PTM strategy, the full effects of a FX rate change will not immediately pass-through to export prices (Knetter, 1989). Some studies suggest (see e.g., Obstfeld & Rogoff, 1995) that since PTM limits exchange rate pass-through, this can in turn prevent the law of one price from holding. However, the time horizon for complete pass-through is not certain as this depends on the desire of exporters to retain foreign market share and maximize profits, amongst other factors (see also Gron & Swenson, 1996; Froot & Klemperer, 1989; Knetter, 1994). Furthermore, the export price adjustment will be time-varying, as over time, a monopolist is likely to adjust export prices more in response to permanent than to transitory FX rate changes (see e.g., Kasa, 1992; Taylor, 2000).

This study employs both cointegration technique and exponential GARCH (EGARCH) error-correction models (ECMs), hereafter, EGARCH-ECMs, to estimate PTM for 20 U.K. export sectors. Our study is motivated by a number of factors. First, we focus on U.K. export sectors since most prior studies at the sector level concentrate mainly on U.S., German and Japanese imports/exports. We use disaggregated export sector prices from a single source - the U.K. - as this approach is consistent

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with the idea that international competition can vary by export sector. Second, we want to focus on both the short- and long-term effects of PTM, and in particular, examine stickiness of the prices within an equilibrium framework. The use of ECMs enable us to deal with the econometric issues associated with equilibrium conditions for each export sector, whilst the EGARCH estimation method enables us to avoid the potential problems of ARCH and asymmetric effects that often arise when the standard OLS method is use for estimation. Finally, our PTM model incorporates export prices, FX rates and producers’ prices. Thus if exporters respond more strongly to increases in producers’ prices and FX rate appreciations than to decreases in those prices, the EGARCH-ECM is likely to capture the pricing asymmetry that follows from that behavior.

The empirical literature employs different approaches to estimate PTM. Bowe and Saltvedt (2004) use Johansen cointegration methodology to examine long-run price adjustments for Norwegian exports. They find evidence of variation in the magnitude of long-run FX rate effects by export sector and country of destination. Although their cointegration tests provide information about long-run equilibrium conditions, they do not tell how this long-run equilibrium is achieved.

In contrast, Sedgley and Smith (1994) and Mahdavi (2000) use both Johansen cointegration and standard OLS ECMs to estimate pass-through. These studies are more closely related to ours in terms of the modeling strategy, but they differ in terms of our estimation method and focus. Specifically, Sedgley and Smith’s (1994) simulated ECM estimates predict that following a sterling devaluation, the U.K. import share will be lower – a finding consistent with theory. Mahdavi (2000) also employs the standard OLS to estimate ECMs and shows that export prices, FX rates and input costs contain both short- and long-run dynamics.

The empirical literature provides relatively weak evidence of asymmetric pricing in export prices. Knetter (1994) could not reject the symmetric pricing hypothesis for the majority of the U.S. export sectors, he analysed. Similarly, Mahdavi (2002) finds limited evidence of asymmetric pricing for U.S. exports. Using standard OLS ECMs, Mahdavi (2000) also finds that Japanese exporters tend to increase export prices more, when the yen depreciates than when it appreciates. Whilst, German exporters dampened export prices when the Deutsch mark appreciated, U.S. exporters do not change export prices under changing exchange rate conditions. Tests of asymmetric pricing usually involve augmenting the PTM model with variables that separately capture periods of FX rate depreciation and appreciation. This approach is restrictive since it assumes that the only source of asymmetry is the direction of the FX rate change and that other input costs do not impact asymmetrically on export prices. When PTM models specified in differences are used (e.g., Knetter, 1994), such models will be misspecified if the level of the time series are cointegrated. PTM models in differences do not allow for the long-run steady state equilibrium condition that would be implied when exporters make decisions under changing economic conditions. In steady-state equilibrium, the parameters of the ECM will be consistently estimated from one period to the next until the system is disturbed.

A further weakness of prior studies is that they assume that the parameters of the standard OLS method are efficiently estimated and that those estimates are constant over time. Using the standard OLS method, Otani et al. (2006, p. 71) find evidence of time-variation in the pass-through coefficients of Japanese imports, whilst Baldwin (1988) finds instability in the U.S. imports prices. In practice, both the short- and long-run effects can change over time leading to ARCH and asymmetric effects. If exporters ignore disequilibria that are small in magnitude but react to large ones, export price adjustments will be non-linear and time-varying in line with the implications of theoretical models (e.g., Kasa, 1992; Taylor, 2000). Thus, failure to capture the ARCH and asymmetry effects in the data can lead to biased PTM coefficient estimates.
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