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The exchange rate exposure puzzle: The long and the short of it

Stuart Snaith [a,*], Santi Termprasertsakul [b], Andrew Wood [c]

[a] *Peter B. Gustavson School of Business, University of Victoria, Canada*
[b] *Department of Business Administration, Srinakharinwirot University, Bangkok, Thailand*
[c] *Essex Business School, University of Essex, UK*

HIGHLIGHTS

- Exchange rate exposure tested across different time horizons (1 month to 5 years).
- The estimation method used is appropriate when using overlapping data.
- Literature: Evidence of transaction (short horizon) exposure is difficult to find.
- Literature: Evidence of economic (long horizon) exposure is more easily found.
- We do not find evidence of economic exposure. The exposure puzzle is more puzzling.

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ABSTRACT

The exchange rate exposure puzzle has remained robust to empirical scrutiny however evidence suggests the puzzle abates when longer horizons are considered. This paper applies inference that is appropriate in a long horizon setting and finds this evidence is illusory.

1. Introduction

Financial theory indicates that there should be a relationship between exchange rate movements and firm returns. The failure to find this relationship empirically has been termed the exchange rate exposure puzzle (for a review of the literature see Bartram and Bodnar, 2007). For the most part, the literature has examined the puzzle from a short horizon perspective but there is a branch of the exchange rate exposure literature that suggests the puzzle is less pervasive at longer horizons (for example see: Chow et al., 1997; Dominguez and Tesar, 2006; Aggarwal and Harper, 2010). The rationale here is that it may be possible to hedge against transaction exposure (exposure at shorter horizons) but hedging economic exposure (exposure at longer horizons) is far more difficult. While the effort to understand transaction exposure continues in the literature, the evidence of economic exposure has become a stylized fact cited by many studies (for example see: Jongen et al., 2012; Joseph et al., 2015). By deploying the transformed regression (TR) method of Britten-Jones et al. (2011) this paper goes further than the extant literature in addressing the empirical difficulties surrounding the estimation of long horizon exposure regressions, and in doing so provides new evidence that shows that economic exchange rate exposure is illusory and therefore the puzzle is worse than previously thought.

Section 2 presents the TR method, Section 3 discusses the data and results, while Section 4 concludes.

* Correspondence to: Peter B. Gustavson School of Business, PO Box 1700 STN CSC, Victoria BC, V8W 2Y2, Canada
E-mail address: ssnaith@uvic.ca (S. Snaith).

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Table 1
Exchange rate exposure: overlapping data.

	Transaction exposure			Economic exposure		
	1 month	3 months	12 months	2 years	3 years	5 years
Australia						
OLS	29.48	51.29	61.53	69.23	76.93	85.9
HAC	25.64	38.46	38.46	50.00	56.41	69.23
Canada						
OLS	18.18	40.9	68.19	81.81	80.00	81.82
HAC	12.73	29.09	51.82	54.55	63.63	59.09
China						
OLS	2.40	9.58	51.49	75.45	90.42	94.01
HAC	3.00	7.19	22.76	53.89	83.84	86.83
India						
OLS	7.05	21.58	38.17	54.36	65.98	78.43
HAC	9.13	13.69	14.94	27.38	48.14	65.14
Indonesia						
OLS	62.79	69.19	73.26	74.42	68.61	72.09
HAC	52.91	58.14	65.70	61.05	53.49	52.90
Japan						
OLS	23.14	44.31	78.82	81.18	84.32	83.92
HAC	18.04	27.84	51.38	60.00	65.10	65.89
South Africa						
OLS	53.73	59.70	70.15	73.14	77.61	83.58
HAC	53.73	50.75	49.26	53.74	65.67	62.69
Thailand						
OLS	38.27	51.85	59.26	55.96	66.66	77.37
HAC	28.39	27.99	36.63	31.28	45.67	58.02
United Kingdom						
OLS	22.74	41.74	63.24	73.83	79.13	83.49
HAC	19.63	23.36	31.78	49.53	58.26	67.92
United States						
OLS	24.93	41.46	64.43	70.87	77.59	84.88
HAC	23.81	28.85	45.38	52.10	62.19	73.39
All countries						
OLS	25.96	41.42	62.26	70.16	76.38	82.35
HAC	22.43	27.75	39.34	48.23	59.28	66.78

This table presents the exchange rate exposure results using Eq. (1) with OLS and Newey and West's (1987) (HAC) standard errors. The results show the percentage of firms with significant exposure at the 5% level.

2. Exchange rate exposure regression and the transformed regression method

Exchange rate exposure for horizon k is typically tested using the following regression (for example see Dominguez and Tesar, 2006):

$$r_{i,t,t+k} = \beta_{0,i} + \beta_{1,i} r_{m,t,t+k} + \beta_{2,i} \Delta s_{t,t+k} + \epsilon_{i,t+1}, \tag{1}$$

where $r_{i,t,t+k}$ is the k-period return for firm i, $r_{m,t,t+k}$ is the k-period return on the market index and $\Delta s_{t,t+k}$ is the k-period change in the relevant exchange rate. Controlling for the movement in the market, exchange rate exposure is found when $\beta_{2,i}$ is significant.

When testing for long horizon exposure the issue of overlapping data needs to be addressed. This paper does this by applying the TR method of Britten-Jones et al. (2011) to Eq. (1). This method aggregates the matrix of explanatory variables transforming the original (overlapping) regression into an equivalent representation of non-overlapping variables.[1]

Adopting the notation of Britten-Jones et al. (2011) we re-express Eq. (1) as the following overlapping regression:

$$Ar = X\beta + u, \tag{2}$$

where r denotes the $T \times 1$ vector of one period log firm returns, A the $(T - k + 1) \times T$ transformation matrix with 1's on the main diagonal and the first $k - 1$ right off-diagonals and 0's otherwise, and X a matrix of explanatory variables and constant from Eq. (1). Britten-Jones et al. (2011) show that $\hat{\beta}$ from Eq. (2) can be rewritten in terms of the one period non-overlapping returns, and be estimated using standard OLS on the following TR with transformed explanatory variables $\tilde{X}$:

$$r = \tilde{X}\beta + \tilde{u}, \tag{3}$$

$$\tilde{X} \equiv A'X(X'AA'X)^{-1}X'X. \tag{4}$$

It can be shown that $\hat{\beta}$ using OLS from Eqs. (2) and (3) are identical and is shown in Eq. (5):

$$\hat{\beta} = (X'X)^{-1}X'Ar. \tag{5}$$

Crucially while $\hat{\beta}$ from the overlapping and transformed regressions are the same, using the transformed regression should result in improved inference as $\hat{\beta} - \beta$ from the latter depends on the autocorrelation structure of noise from the transformed regression ($\tilde{u}$) as opposed to the noise in the overlapping regression (u). Britten-Jones et al. (2011) shows that inference for the TR can be garnered by estimating regression (3) using conventional standard errors. Further, their finite sample analysis indicates substantial improvements in inference when using the TR with inference from conventional OLS, White (1980), and Newey and West (1987) standard errors as compared with the same inference on the untransformed data.

[1] In this setting the main issue is the proper calculation of standard errors when using overlapping data as the use of such data results in strong serial correlation in regression residuals. As discussed in the literature, commonly used methods to deal with this are inadequate given the strength of the serial correlation.