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Long Memory in Mergers and Acquisitions: Sectoral Evidence for an Emerging Economy

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Abstract

The paper aims at testing for the presence of long memory in domestic and cross border mergers and acquisitions in Brazil along the 2002-1/2011-4 period. The evidence from the estimation of fractional ARIMA models at the sectoral level provided scant evidence of the presence of persistent long memory processes. The results display contrast with previous aggregate evidence and sectoral evidence for developed countries. In fact, except for a few cases, with a strong example in financial institutions, one cannot detect salient persistent patterns.

Keywords: mergers and acquisitions; long memory; persistence

JEL Classification: C12; M2.

1 Introduction

The time series empírical literature on mergers and acquisitions (M&A) attempted to uncover features of the underlying data generation process. Representative works include linear models [Melicher et al. (1983), Shughart and Tollison (1984) and Clark et al. (1988)], non-linear Markov switching models [Town (1992) for the U.S., and Resende (1999) for the U.K on a sectoral basis] and simple tests for wave detections [Golbe and White (1987,1993)].

Two salient issues of interest pertain the prevalence of M&A waves and the persistence of processes. Even though the existence and identification of wave patterns still warrant further investigation [see e.g. Gärtner and Halbheer (2009)], it appears that some stylized facts are gradually emerging as for example: (a) simpler random walk specifications tend to be rejected; (b) some common sectoral patterns of merger waves appear to exist; (c) a non-negligible degree of persistence appears to prevail in terms of the detected waves. The issue of persistence has been previously addressed in terms of high staying probabilities in a given M&A regime and yet alternative approaches that assess the long-run dependence of M&A and not the persistence in waves [as considered by Resende (1996) for sectoral data in the U.K. and Barkoulas et al. (2001) for aggregate data in the U.S.].

The present paper intends to investigate for the presence of long memory in M&A in Brazil for domestic and cross-border operations at the sectoral level. The focus of the previous literature on developed countries further motivates the work as M&A have become increasing important in emerging countries in general [see Rothenbuecher and Hoyningen-Huene (2008)] and in Brazil in particular after the 90s [see Miranda and Martins (2000)]. That tendency in part reflects the reduction of macroeconomic uncertainty and more stable institutional rules that provided a more favorable business environment.

The paper is organized as follows. The second section makes a brief digression on long memory in the context of ARFIMA models. The third section discusses data sources and presents the empirical results. The fourth section brings some final comments.

2 Long Memory: Basic Aspects

Persistence is often a salient feature in various economic settings. The class of Fractional ARIMA models (ARFIMA) naturally accomodates that feature by allowing a slower decay in the autocorrelation function. The ARFIMA (p,d,q) model advanced by Granger and Joyeux (1980) and Hosking (1981) can be summarized as:

$$\phi(L)(1-L)^d y_t = \theta(L)\varepsilon_t \ , \ \varepsilon_t \sim WN(0,\sigma_\varepsilon^2) \qquad (1)$$

where L denotes the lag operator, d the potentially fractional integration parameter, $\phi(L) = 1 - \phi_1 L - \phi_2 L^2 - ... - \phi_p L^p$, $\theta(L) = 1 - \theta_1 L - \theta_2 L^2 - ... - \theta_q L^q$. Following a binomial expansion one has:

$$(1-L)^d = 1 - dL + \frac{d(d-1)}{2!}L^2 + \frac{d(d-1)(d-2)}{3!}L^3 + ... \qquad (2)$$

One needs d < 0.5 for stationarity and d > - 0.5 for invertibility and a long memory process is characterized by d ≠ 0 and as indicated by Brockwell and Davis (1987) give rise to two possibilties: (i) for - 0.5 < *d* < 0 the process is antipersistent; (b) for 0 < *d* < 0.5 the process is persistent.[1]

3 Empirical Analysis

3.1 Data sources

The paper relies on quarterly data on the number of domestic and cross border mergers and acquisitions (M&A) in Brazil during the 2002-1/2011-4 period. Those could be obtained upon reports from *KPMG Corporate Finance*. The sectoral data were somewhat more aggregated than analagous data used in studies for the U.K. and the analysis developed in the present paper tend to focus more on service industries. In fact, in some industries the occurence of M&A was very rare and in a very few cases there were changes in the classification of sectors. Thus, one could proceed the estimation of ARFIMA models for 14 sectors as later reported in table 1.

[1] Useful overviews on long memory processes are provided by Lardic and Mignon (1997) and Guégan (2005).

3.2 Empirical results

The estimations were carried out with Stata 12.0 taking as reference maximum likelihood procedures advanced by Sowell (1992a,b). We consider all the combinations of specifications for p and q ranging from 1 to 4, though in some cases the maximum likelihood function was misbehaved and no convergence was achieved. The selection criterion was based on the minimization of the Akaike Information Criterion (AIC). The estimated values for the fractional integration parameter are reported in table 1.[2]

Table 1 Mergers and Acquisitions in Brazil [2002-1/2011-4]-Fractional Integration Parameter

Sector	Domestic			Cross Border		
	coefficient	p-value	Selected model (p,q)	coefficient	p-value	Selected model (p,q)
Mining	0.163	0.554	(2,1)	- 0.489	0.044	(1,1)
Food, beverages and tobacco	- 0.098	0.000	(2,1)	- 0.260	0.386	(1,2)
Metallurgy and steel	0.248	0.226	(2,1)	- 0.003	0.905	(1,2)
Electrical and electronic eq.	- 0.206	0.000	(2,2)	0.170	0.305	(1,1)
Chemical and petrochemical products	- 0.058	0.926	(1,2)	- 0.500	0.000	(3,1)
Chemical and pharmaceutical products	0.077	0.517	(2,3)	0.017	0.887	(1,1)
Hygiene	0.113	0.000	(2,2)	0.115	0.734	(2,3)
Advertising and publishing houses	- 0.465	0.298	(1,4)	0.131	0.485	(1,4)

[2] The simulation results by Lieberman et al. (2000) on smaller samples for ARFIMA models provide additional confidence on the consideration of moderate size samples like in this study.

Transportation	0.244	0.207	(1,2)	- 0.320	0.018	(2,3)
Company services	- 0.392	0.000	(2,2)	- 0.069	0.725	(3,1)
Retail outlets	0.236	0.173	(1,1)	- 0.214	0.773	(2,4)
Shopping centers	0.197	0.000	(2,2)	- 0.014	0.951	(3,1)
Insurance	0.126	0.446	(1,4)	0.056	0.832	(1,2)
Financial institutions	0.249	0.000	(2,2)	0.200	0.000	(2,2)

Notes: p-values are reported in parentheses; (p,q) orders of the model selected in accordance to the Akaike Information Criterion (AIC)

The results for domestic M&A indicate the presence of long memory only in 6 of the 14 considered sectors and was associated with both antipersistent pattern [as in food, beverages and tobacco; electrical and electronic equipment; company services] and persistent patterns [as in hygiene; shopping centers; financial institutions]. As for cross border M&A, in principle, one should expect more cautious underlying decisions and it should be stressed that even with sound macroeconomic fundamentals the ratings for the Brazilian economy were not always completely positive. The results for that case were somewhat weaker and from the total of 14 sectors one observes antipersistent patterns in 2 sectors [mining; transportation] whereas 1 sector exhibited a persistent pattern [financial institutions], With this last notable exception, one sees a contrast in terms of the sectors involved under the two types of M&A.3 How do those results compare with previous evidence? In that sense, Barkoulas et al (2001) had provided aggregate evidence for the U.S, case that displayed strong robustness with respect to estimation methods and indicated a long-range dependence in the data. A possible interpretation could favor, as suggested by the authors, the "economic disturbance" theory advanced by Gort (1969) and that later motivated contributions like Mitchel and Mulherin (1996). Nevertheless, one would need have in mind possible propagation mechanisms of sector-specific shocks that could give rise to aggregate effects.

[3] In the case of chemical and petrochemical products there was evidence of a non-stationary process.

At the sectoral level some relevant intuitive examples include deregulation and foreign trade shocks.[4] However, the evidence from M&A studies is more limited. Resende (1996) considered sectoral data at a more disaggregated level than in the present application and the evidence, based on the variance-ratio statistic, indicated a consistently low degree of persistence across sectors that could possibly reflect short-termism.

The above evidence for Brazil, as stressed before, favored long memory only in a small number of cases. Interestingly, a strong result was obtained for financial institutions both in domestic and cross-border M&A. That sector constitutes, of course, a more expectation-sensitive case and prone to more frequent shocks, most notably following the frequent and substantial international crises.

4 Final Comments

The paper aimed at investigating the presence of long memory in the case of M&A in Brazil. The evidence obtained for domestic and cross-border M&A favored long-run dependence only in a few cases what contrasted with the previous aggregate evidence for the U.S. A possible interpretation could be that despite the lower economic uncertainty following macroeconomic stabilization and more stable institutional rules, that short-termism by decision makers still prevails.

Future avenues for research include the detection of merger waves and the asssessment of co-movements across sectors. For that purpose, Markov switching models can provide an useful approach.

[4] One observed significant M&A activity in regulated sectors under more stable institutional rules, in particular for energy companies but for the totality of combinations of the ARFIMA models the maximimum likelihood was mis-behaved and no convergence was reached in the estimations.

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