Renminbi's misalignment: a meta-analysis

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Abstract

This paper presents results of a meta-regression analysis on empirical estimates of Renminbi misalignments. Seventeen articles and 130 observations dealing with empirical measures of misalignment of Chinese currency are collected. Data characteristics, dissemination procedures as well as real exchange rate measures and theoretical models that are adopted have significant impacts on measures of misalignment of Chinese Yuan. However, more than the theoretical model of real equilibrium exchange rate, the choice of the empirical methodology exerts a major part in the supposed misalignment of Chinese currency. It is not possible to be satisfied with only one empirical estimate to have a significant understanding of the misalignment of the Renminbi. It should be useful to cross at the same time all the theoretical models of real equilibrium exchange rates with various econometric methods to assess misalignment of the Chinese currency.

KeyWords: Renminbi, Equilibrium exchange rate, Misalignment, Meta-analysis, Statistical Methods.

JEL Classification: C10, C49, C82, F21, F32.

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1. Introduction

For many years, empirical studies about the Chinese Renminbi have been growing to try to estimate real misalignments of this currency. There is an extensive literature that addresses this issue. The amplitude of the deviations of Chinese currency compared to its fundamentals is very large because most of the studies show a significant misalignment of Chinese currency ranging from -50% to almost 170%. Dunaway, Leigh and Li (2006) show that reasons to explain such misalignment ranges are related to numerous factors such as real equilibrium exchange rate models, econometric methodologies, samples of countries, choices of variables, methods of construction and the data's frequency.

This present study is a review of this literature addressing misalignment of Chinese currency. Instead of a narrative review of this literature that might fail to give some powerful arguments about so large misalignments, a rigorous synthesis of this literature is carried out by using meta-analysis techniques. Meta-analysis is the subject of a particularly frequent use in medicine and in behavioural sciences as education and psychology. According to Stanley and Jarrell (2005), meta-analysis makes it possible to explain the differences in the results obtained from multiple researches. Florax, de Groot and Mooij (2002) argue that the objective of this quantitative synthesis is to obtain general conclusions from the multiplicity of the results of the whole sets of studies which were published on a specific topic. Meta-analysis is a significant instrument of understanding of the main reasons of the diversity of the results obtained since it combines the results of the other studies to provide an explanatory capacity larger than the narrative review of the literature.

In economics, the first meta-analysis is applied to the environmental economics. Stanley (2001, table 1); Abreu, Groot and Florax (2005); Dalhuisen, Florax, de Groot and Nijkamp (2003) as well as Jarrell and Jarrell (2004) has made recent presentations. Lately, *Journal of Economic Surveys* devotes a special publication to this theme (2005, 19, 3, pp.295-533). This set of themes arouses a keen interest but among the most recent studies applied to the international economics, some are linked to multinational firms (Görg and Strobl, 2001), to the real exchange rate or to business cycles correlation among Central European Eastern Countries (Égert and Halpern, 2006; Fidrmuc and Korhonen, 2006), to the effects of a single currency on international trade (Rose 2004), to monetary policy (de Grauwe and Costi Storti,

2004), to the analysis of the effect of fiscal policies on the long-run growth (Nijkamp and Proot, 2004).

The objective of this article is to synthesize information about Yuan misalignment since the application of this statistical technique makes it possible to detect the systematic influence of the characteristics of the studies on estimated misalignments of Chinese currency. This article is organized as follows. The next section details the methodology for this meta-analysis. Section 3 presents and discusses the results of the meta-analysis. Section 4 concludes.

2. Methodology of meta-analysis

Stanley (2001) describes three steps to conduct a meta-analysis. First, the database is constructed. During the second step, meta-regression equation is defined. It leads to the data coding as last step.

2.1. The studies include in the sample

The first step of a meta-analysis is to collect the largest available population of studies. We must take into account a maximum number of empirical studies on the covered subject. Three main sources are available. First, several searches on EconLit and Ebsco databases are made in May-June 2008. Keywords are: Renminbi, Yuan, misalignment, undervaluation; Chinese currency. Those requests are complemented by searches on the web sites of major publishers of academic journal (Elsevier, Kluwer, Springer, Taylor & Francis, and Wiley). These requests reflect the summary of the published results, rather than the synthesis of reality. A second interrogation is carried out on standard internet databases and web sites of universities or research institutes known to be working on these topics (CEPR, IMF, NBER, Peterson Institute…). As last step, those computer searches are supplemented by an examination of the references at the end of each study in order to identify additional data, in particular book chapters or Phd thesis. It makes it possible to ensure a certain balance between the stock of articles published in academic journals and those which are extracted from unpublished literature.

After reading, some of these articles are excluded because information is extracted from presentations carried out in other articles. It is in particular the case if this refers to literature

reviews' which take information from other studies but appears insufficiently detailed then to be exploited within a meta-analysis framework. Some other excluded papers discuss about Renminbi values without empirical and/or econometric treatment. Then it possible to highlight 19 articles published between 1998 and 2008 for a total of 187 estimates of real and nominal equilibrium exchange rate misalignment of the RMB covering a period from 1975 to 2008.[1]

== = = Figure 1= = =

Fifty-seven observations refer to nominal values of RMB compared to American dollar, European currency or Japanese Yen. Those observations are then excluded from sample. The final sample includes 130 observations for 17 different studies and Figure 1 reports summary statistics from this sample. RMB point estimates range from -66.70% to 161.70%. Even if the median of the point estimates is 12.70%, this sample shows that average value of real misalignment of RMB is 13.70%. If we consider uncertainty of such measure, this average is quite lower than usual range presented is literature (Dunaway and Li 2006; Coudert and Couharde, 2007, Cline and Williamson 2008a). Figure 1 shows that point estimates of positive real misalignments are mostly ranging from 0% to 50% and few very significant positive misalignments are ranging from 50% to 170%.

2.2. Model of meta-regression

Meta-regression analysis allows synthesizing all results in a common framework. The adopted expression of the meta-regression analysis is similar to the relation describes by Stanley and Jarrell (1989). The equation is as follows:

$$Y_j = Y_0 + \sum_{k=1}^{K} \gamma_k Z_{jk} + \nu_j \qquad (1)$$

Letter Y_j is the estimated point for each study j (j = 1, 2,…, N) from a total of N studies. Letters Z_{jk} (k = 1, 2, …, K) are the meta-independent variables who are likely to explain the

[1] Complete list of studies and articles are available upon request from the author.

variations of Y_j between the studies. They describe characteristics of each empirical study in the sample so as to explain the variation in Y_j s across studies in our sample. They describe empirical method, period and data used by different studies. The error term is ν_j. Letter γ_k is the estimated impact of each of these characteristics in the estimated value of Y_j. The constant of the meta-regression Y_0 describes the real observed effect of the complete sample, corrected by all individual effects. Then, Y_0 is the true value of the misalignment of Chinese currency.

2.3. Explanatory variables

The third step supposes to define and to code the explanatory variables after reading all the selected articles. Examination of the articles induces to define five main groups of explanatory meta-variables. Their definition supposes to make the distinction among numerous criteria which appear important. This coding is carried out by using dummy variables that take the value of either 0 or 1. Codes are given in parentheses and Table 1 shows the coding of the variables used.

- *Functional form of theoretical equilibrium exchange rate model*. First class of dummy variables describes the theoretical model of real equilibrium exchange rate. IMF (2006), Isard (2007) among other, show in recent presentations of main models of equilibrium exchange rate that five main theoretical models of real equilibrium exchange rate are available. The first theoretical model employed in the literature is the standard Purchasing Power Parity approach (hereafter referred as the following dummy variable: PPP), whereas in some cases PPP approach is extent to incorporate the Balassa (1964) and Samuelson (1964) effect (hereafter referred as the following dummy variable: BS). Other dummy variables take into consideration the quantity based methodologies of real exchange rate model. One of them refers to the econometric concepts of Behavioural Equilibrium Exchange Rate (BEER). This model tries to link real exchange rate to its main economic fundamentals (MacDonald 1997, Clark and MacDonald 1998, 1999, 2000). The Fundamental Equilibrium Exchange Rate from Williamson (Williamson 1994) is the fourth model of real equilibrium exchange rate (FEER). The FEER is a medium term concept. It is the real effective exchange rate at which a country could simultaneously achieve both internal balance and external balance. Then, one dummy

variable shows cases where current account targets of this real equilibrium exchange rate are derived from a partial equilibrium model of trade flows or from simulating a multi-equation macroeconomic model[2] (Cline and Williamson 2008b). The macroeconomic balance model is described by the last dummy variable (MB). In those models, equilibrium current account targets are derived from panel data econometric estimations of a model of saving-investment balances as inspired from studies of Faruqee and Isard (1998), Chinn and Prasad (2003) or Jeong and Mazier (2003). Natural Real Exchange Rate model (NATREX) as presented by Stein (1995) is not presented in any study.

= = = **Table 1= = =**

- *Data period, data type and exchange rate definition.* Other meta-variables detail the data characteristics'. This includes the time interval (Annual (AD) or Quarterly data (QD)), and whether the data was cross section (CS); time series (TS) or panel data (PD). Lastly, two measures of the real exchange rate are used by the studies. Some of them use a CPI-based real effective exchange rate (REFER). Other studies prefer a CPI-based real exchange rate against the US dollar (RER).

- *Dissemination of results.* Another category of dummy variables describes how dissemination of results is made by authors. Two dummy variables are used. One dummy variable considers articles published in peer reviewed academics journals (P1). The other dummy variable refers to working papers, book chapters and conferences proceedings (P2).

- *Econometric method*. Last dummy variables detail the estimation method. Eight different econometric techniques were retained: Ordinary least squares (OLS), Dynamic OLS (DOLS), Fully Modified OLS (FMOLS), Engle-Granger (1997) two steps procedure (EG) and Maximum Likelihood estimator of Johansen (1988) (JOHA), Panel Dynamic OLS (PDOLS) and Panel Fully Modified OLS (PFMOLS). A last dummy variable takes into consideration other econometric methods (OTHER).

3. Discussion of meta-results

[2] Such methodologies are adopted by International Monetary Fund (IMF, 2006) for its assessments of exchange rates or by Peterson Institute for International Economics.

This section will present the methods used in this article. The resulting empirical findings will be introduced. Table 1 shows that some econometric techniques include a small number of observations. To increase significance of parameters, number of dummy variable is reduced, one can conclude too frequently in favour of null hypothesis because it could be the consequence of an identification problem. Then, econometric methods classification is modified. One adds DOLS and FMOLS together, as well as PDOLS with PFMOLS. Such new categories are then called DFMOLS and PDFMOLS respectively. Also, meta-variables EG and JOHA are added together to give dummy variable as follows: COINT.

Before meta-regression analysis, an OLS regression is run between 130 observations and each respective year of estimation less 1975. This latter year is the first year adopted for estimation. Results are reported below:

$$Y_j = \underset{(4.831)}{-46.543} + \underset{(0.290)}{3.039\ (\text{Year of Estimation} - 1975)} \qquad (2)$$

Number of panel: 17, number of observations: 130, R^2=0.515, Fisher statistics F=136.068.

The numbers in brackets are White robust standard errors of coefficients. Regression indicators show that the model is significant. This linear model fits quite well as each of parameters are significant at the $p<0.01$ level. Constant is negative and significant. The slope is positive and significant. The rate of depreciation of Chinese real currency has been of 3% per year since 1975.

Now, if one turns to meta-regression analysis, some discussions must be made about the choice of the estimation method.

Some studies from the selected sample present repeated estimations whereas some other show only one estimation. Then, sample is an unbalanced panel data. In most of the cases, estimations within panel are done with similar data. A strong redundancy of the used statistical sources might appear since all papers, but three (Funke and Rahn 2005, Chen 2007, Yajie, Xiafeng and Soof 2007)[3] make use of IMF data sources. Because most of the studies repeat their estimates with different econometric methods whereas the data are similar, errors

[3] This represents five observations.

of the relation (1) do not necessarily respect the standard assumptions. The error terms of the meta-regression are highly dependant. The use of the OLS method which is a standard statistical technique produced estimators who do not have any longer the property of minimal variance, since the risk of heteroscedasticity of the errors of the meta-regression appears significant. Then, heteroskedasticity correction methods of White (1980) and clustered methods are used to give robust standard errors.

Table 2 presents the results for various specifications of the meta-regression model when OLS and Genealized Least Squares (GLS) methods are used. Columns (2-1) and (2-4) present OLS results and columns (2-2), (2-3), (2-5) and (2-6) repeat regressions with GLS method. Columns (2-3) and (2-6) draw robust standard errors from OLS' clustered methods. All exogenous variables of this model are dummy variables. If all dummy variables are included in the regression of the relation (1), this linear relation between all variables is perfect. It becomes impossible to estimate coefficients of the relation, since regression falls in the dummy variables trap. To avoid this situation, one dummy variable from each category is excluded from regressions. Excluded dummy variables have the highest number of observations. Table 1 shows that those excluded dummy variables are BS, AD, TS, OLS, Q1 and REFER. These omitted variables are summarized in the constant of the regression, which defines the real misalignment of Chinese currency corrected by individual effects. Interpretation of parameters of regression is carried out with comparison to excluded variables. Positive coefficient estimates indicate that the variable induces increase in undervaluation of real Yuan compared to the reference framework. A negative parameter estimate suggests the opposite.

= = = Table 2 = = =

Regression indicators described in Table 2 show that the model is significant. Fisher and Wald χ^2 statistics are always significant at the $p<0.01$ level and R^2 figures show that model explain at least more than 50% of the variance's model. The constant of regression describe positive misalignment of the real Renminbi, corrected by individual effects. Between 1975 and 2008, this significant undervaluation ranges from 30.54% to 34.30%. Those figures are different from the arithmetic average, but on line with misalignment estimations from Goldstein (2006) and Cline and Williamson (2008a).

If a study uses, as measure of real exchange rate, a CPI-dollar-based real exchange rate (RER), this will lead to a negative and significant misalignment from the reference framework. As reference currency, the American dollar is adopted in all studies, for construction of CPI-real exchange rate (RER) and CPI-real effective exchange rate (REFER). Some studies use other reference currencies, as Japanese Yen or European euro, but they use such currencies for bilateral nominal equilibrium exchange rate. Latter are not considered in this study. Even if exchange rate policy has been modified since July 2005 in favour of more exchange rate flexibility, evolutions of Chinese currency are linked with American dollar. Then lasting misalignments of American dollar compared to its fundamentals can influence and affect valuation of real misalignment of Renminbi.

Data frequency has no lasting consequences on a real misalignment because estimated coefficients are not significant. In all cases, results also show that studies using cross section data (CS) or even panel data (PD) lead to significant positive misalignments larger than studies using time series data (TS). Studies using panel data has advantage to include a larger number of countries and to take into consideration more precisely interactions between countries' currencies and increase simultaneously power of inference's tests. In the same time, heterogeneity between countries increases and this will affect estimations of currency misalignments. If the study is not published in a peer academic journal, then, one should observe a significant positive misalignment, compared to reference framework.

Now let us turn to the theoretical model of real equilibrium exchange rate. The results indicate that the choice of theoretical model strongly conditions the direction and extent of estimated real misalignment. Compared to Balassa-Samuelson approach (BS), a significant real misalignment of the RMB is obtained if one uses a Purchasing Power Parity model (PPP). This result confirms the assumption of absence of BS effect in China that leads to a rather reduced link between the real exchange rate and the productivity evolutions (Coudert and Couharde, 2007). One of the reasons to this result might come from the difficulties to obtain prices and labour productivity series which are sufficiently relevant and cover sufficient long time period. Balassa-Samuelson effect supposes restrictive assumptions which are not checked in China, since domestic labour mobility is not completed since many constraints are still undergoing and the capital account is not freely opened and financial markets are imperfectly integrated to ensure sufficient internal capital mobility.

All columns except (2-3) and (2-6) show that BEER model is unable to produce significant misalignments that remain quite different from reference framework. Then, those results reinforces the limits of this model which defines the extent of the currency real misalignment according to the historical chronicle of disequilibrium on the foreign exchange market, without strong links with internal and external balances within the economy being explicitly taken into account.

The approaches using FEER model lead to misalignments estimates that are significantly positive compared to BS framework. In the same time, macroeconomic balance models (MB) show significantly negative misalignments. In absolute value, misalignments of FEER and MB models appear twice to four times more important, compared to reference framework. A possible explanation might come that FEER models suppose various methodological choices, in particular for the values of the current account balances targets and outputs gaps. Their width varies according to the preliminary analysis from the authors of the study. They can then adjust their values to respect the country's intertemporal budgetary constraint in order to stabilize the debt/GBP ratio over a given period. Thus some authors (Cline, 2005, Cline 2007, Bénassy-Quéré, Béreau and Mignon 2008a) modify current imbalances to 1% or even 3% of the GDP because "in general, imbalances should not exceed 3 percent of GDP in the intermediate run. This has become a standard figure" (Cline and Williamson 2008, p. 3) and acts as commonly accepted figures. The current account targets are adjusted ex-ante and can appear ad hoc figures. They are particularly reduced and seem rather conservative. Misalignments, which although significant, remain weak compared to other models. This approach appears also very sensitive to the values of foreign trade elasticities, which are taken into consideration.[4] Macroeconomic balance model (MB) indicates a significant misalignment but of contrary sign to those resulting from the PPP model and the FEER model. MB model deduces the values from structural currents accounts targets from econometric estimations on the supposed determinants of the saving- investment gap, as output per capita, the depending ratios and structural fiscal positions.

Estimates of Renminbi misalignments appear particularly sensitive to the econometric method choices. All coefficients of the "econometric methods" category are significant. In all cases,

[4] See Bénassy-Quéré, Béreau and Mignon (2008b) and Cline and Williamson (2008a) for various evaluations of the exchange rates with various scenarios of foreign trade elasticities.

the econometric methods result is reverse from the estimated extent of misalignment compared to the reference framework. Extent of the correction strongly differs according to the econometric method. The most important correction is obtained when the panel DOLS or panel FMOLS methods are used (PDFMOLS). The weakest misalignment compared to the reference framework comes from studies which uses other methods, in particular simulation methods using partial equilibrium model or even macro-econometric models (OTHER).

To sum up this above discussion, this leads to wonder about the procedure to adopt when one wishes to evaluate the Chinese currency misalignment since according to the choice of the econometric method, the estimated extent of Renminbi misalignment will be necessarily different from reference framework.

4. Conclusions

This article uses meta-analysis to carry out an empirical review of studies and articles which tries to estimate misalignments of the Chinese currency. Meta-analyzes has the advantage to be less subjective than a narrative survey. Meta-analysis concentrates, within a unified framework, on the chosen models, estimations methods and to the data used. A data basis is constructed that includes articles and studies dealing with an empirical measure of misalignment of Chinese currency. This selected data includes 17 articles and 130 observations.

A consensus on what should be “the real” value of the Renminbi undervaluation does not occurred because measures of currency misalignment span from -50% to more than 160%. This study shows that data characteristics, dissemination procedures as well as real exchange rate measures that are adopted have significant effect on measures of current misalignments of Chinese Yuan. Theoretical model that motivates general argumentation on how misalignment should be measured and economics’ policies that should be implemented to correct those misalignments exert a significant influence on econometric results. However, more than the theoretical model of real equilibrium exchange rate, the choice of the empirical methodology exerts a large part in the supposed misalignment of Chinese currency.

This paper reveals that it is not possible to be satisfied with only one empirical estimate to have a significant measure of the misalignment of the Chinese currency. This study shows

clearly that it is useful to cross at the same time several theoretical models of real equilibrium exchange rates with various econometric methods.

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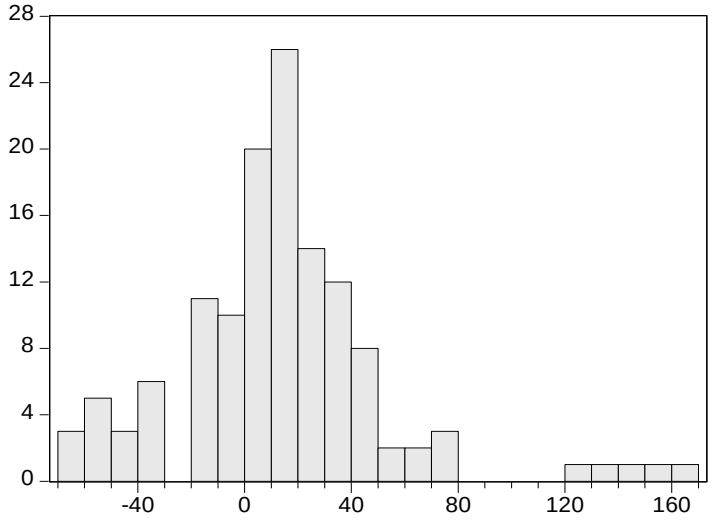
Figure 1: Real misalignment of RMB



Series:Real misalignement of RMB
Sample 1 130
Observations 130

Mean	13.70985
Median	12.70000
Maximum	161.7000
Minimum	-66.70000
Std. Dev.	39.06281
Skew ness	1.062061
Kurtosis	6.276247
Jarque-Bera	82.58083
Probability	0.000000

Table 1 : Codes of Dependent and Independent Variables

Variable	Description of Codes	Observations
A. Dependent variable		
Y_i	Size of the real misalignment of the Chinese Renminbi	130
B. Independent variables		
1. Functional form of theoretical exchange rate model		
PPP	= 1, if the paper uses standard purchasing power parity model	17
BS	= 1, if the paper introduces PPP model enhanced by Balassa-Samuelson effect	48
BEER	=1, if the paper adopts the Behavioural Equilibrium Exchange rate model or the Permanent Equilibrium Exchange rate model	27
FEER	=1, if the paper uses the Fundamental Equilibrium Exchange rate model.	13
MB	=1, if the paper uses the Macroeconomic balance-based model.	25
2. Data period and data type		
AD	= 1, if a study uses annual data	101
QD	= 1, if a study uses quarterly data	29
CS	= 1, if a study uses cross section data	35
PD	= 1, if a study uses panel data	28
TS	= 1, if a study uses times series data	67
3. Econometrics method		
OLS	= 1, if a study adopts Ordinary Least Squares	67
DOLS	= 1, if a study adopts Dynamic Ordinary Least Squares	10
FMOLS	= 1, if a study adopts Fully Modified Ordinary Least Squares	1
EG	= 1, if the paper uses the two steps procedure of Engle and Granger (1987)	9
JOHA	= 1, if the paper uses the Maximum Likelihood estimator of Johansen (1988)	22
PDOLS	= 1, if a study adopts Panel Dynamic Ordinary Least Squares	7
PFMOLS	= 1, if a study adopts Panel Fully Modified Ordinary Least Squares	2
Other	= 1, if study adopts other methods as simulations from a macro-econometric model	12
3. Real exchange rate definition		
REFER	= 1, if a study uses CPI-based real effective exchange rate definition	69
RER	= 1, if a study uses CPI-dollar-based real exchange rate	61
4. Dissemination of results		
P1	= 1, if the study is published in an peer-reviewed academic journal	67
P2	= 1, if the study is published elsewhere	63

Table 2: Meta-regression results for real RMB's misalignments

Econometric method	OLS	GLS	GLS	OLS	GLS	GLS
	(2-1)	(2-2)	(2-3)	(2-4)	(2-5)	(2-6)
Constant	17.030 (17.985)	30.541 (23.264)	30.541*** (7.830)	24.615 (17.325)	34.300* (21.049)	34.300*** (7.417)
QD	-2.604 (11.611)	-4.199 (12.450)	-4.199 (14.539)	22.350 (12.119)*	18.906 (12.881)	18.906 (15.302)
CS	27.442 (18.129)	33.998 (24.170)	33.998 (20.076)*	26.559 (18.666)	33.766 (23.021)	33.766* (20.784)
PD	81.517*** (14.191)	74.415*** (14.642)	74.415*** (20.678)	80.200*** (14.776)	74.614*** (14.961)	74.614*** (21.738)
Q2	31.753*** (9.907)	32.328*** (11.379)	32.328*** (11.923)	24.167*** (8.757)***	24.476*** (8.885)	24.476** (9.654)
RER	-46.718*** (20.510)	-53.127** (21.676)	-53.127** (21.676)	-52.987*** (21.566)**	-57.086*** (21.692)	-57.086** (23.468)
PPP	48.602** (21.544)	56.605*** (23.896)	56.605** (26.376)	52.342** (21.161)	57.379** (22.327)	57.379** (25.706)
BEER	17.868 (11.654)	17.868 (15.494)	17.868*** (9.57^{e}-07)	17.868 (11.603)	17.868 (14.362)	17.868*** (6.98^{e}-07)
FEER	19.378* (11.888)	15.755 (16.131)	15.755*** (5.260)	19.378* (11.837)	15.932 (14.977)	15.932*** (5.044)
MB	-42.324*** (15.331)	-66.930*** (23.614)	-66.930*** (15.274)	-42.826** (15.283)	-61.451*** (21.286)	-61.451*** (13.862)
EG	-68.894*** (12.715)	-82.980*** (20.02)	-82.980*** (7.830)			
JOHA	-33.898** (15.620)	-47.409*** (19.738)	-47.409*** (7.830)			
COINT				-63.910*** (12.896)	-71.089*** (17.580)	-71.089*** (9.765)
DFMOLS	-118.579*** (18.541)	-130.680*** (22.763)	-130.680*** (22.763)	-117.262*** (18.960)	-125.867*** (20.986)	-125.867*** (21.899)
PDFMOLS	-26.574** (15.750)	-39.301* (20.898)	-39.301** (15.270)	-51.529 (16.098)***	-58.079*** (20.475)	-58.079*** (17.594)
OTHER	-28.569* (16.112)	-39.301* (21.002)	-39.301** (19271)	-29.175** (15.930)	-36.270** (19.284)	-36.270** (17.393)
R^2	0.613	0.558	0.558	0.605	0.562	0.562
Cluster		17	17		17	17
Fisher statistics	13.014***			13.671***		
Wald χ^2		96.95***	96.95***		91.30***	91.30***

White Heteroskedasticity-robust standard errors are given in parentheses for columns (2-1), (2-2), (2-4) and (2-5). Clustered robust errors are given in parentheses underneath coefficient estimate for columns (2-3) and (2-6). ***, ** and * indicate 1%, 5% and 10% levels of significance.