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汇率波动与南非对中国出口贸易：基于 ARDL 边界检验方法

EXCHANGE RATE VOLATILITY AND SOUTH AFRICA'S EXPORTS TO CHINA: AN ARDL BOUNDS TESTS APPROACH

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摘 要

本文主要研究外汇波动对南非出口到中国的贸易影响，实证分析基于Peseran（2001）等人所提出的协整ARDL边界检验理论。本文首先采用一系列短期汇率模型分析，然后利用模型选择准则来选择一个最优的模型分析南非对中国的汇率波动。本文的数据主要是月度和季度的南非出口贸易数据，月度数据从1992年1月到2010年7月，季度数据从1995年第1季度到2010年第3季度。我们发现，从总量水平来说，南非对中国贸易出口对收入缺乏弹性，对相对价格比较有弹性，并且短期汇率对其影响不大。但是，当我们采用分部门的出口贸易数据时，发现贸易出口对收入是有弹性的，出口与汇率波动有显著的联系，对有些部门是正的影响，有些部门是负的影响。这些结论可以推广到南非与中国汇率波动对南非与中国贸易的影响。

关键词：汇率波动，ARDL边界检验，MASD，ARCH，EGARCH，协整

ABSTRACT

This paper empirically investigates the impact of exchange rate volatility on trade in the context of South African exports to China by means of ARDL bounds testing procedure to cointegration developed by Pesaran, et al. (2001). Several alternative measures of short-term exchange rate risk were employed in which we selected for each equation, the 'optimal' ZAR/CYN volatility measure on the basis of relevant model selection criteria. Using both monthly and quarterly data disaggregated by sectors for the period 1992M1 to 2010M7 and 1995Q1 to 2010Q3 respectively, our results indicate that South African exports to China, at aggregate level, are generally income inelastic, relative price elastic, and largely unaffected by short-term exchange rate volatility. However, when data are disaggregated by sector, the demand for South African exports tends to be income elastic; and in the case where a significant relationship exists between exchange rate volatility and exports, such a relationship is either positive or negative. These results can be generalized to how ZAR/USD volatility impacts on South African-China trade. Finally, a major policy implication advanced by the study is that: if policymakers which to target exports, it is likely that policies which affect the level of economic activity should be most effective.

Keywords: Exchange rate volatility, ARDL bounds tests, MASD, ARCH, EGARCH, Cointegration

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CHAPTER 1

INTRODUCTION AND REVIEW OF LITERATURE

1.1 Overview

Owing to the enormous importance of the potential impact of exchange rate risk on international trade, it is not surprising that the analysis of the nature and magnitude of the relationship between exchange rate volatility and exports remains a subject of key empirical concern to economists. After the collapse of the Bretton Woods system of fixed exchange rates in 1973, South Africa amongst several other countries adopted floating exchange rates system in order to reduce protectionist tendencies and promote trade as well as to gain overall macroeconomic independence; by bearing the burden of adjustment vis-à-vis imbalances in the current and capital accounts of the balance of payments. The countries adopted flexible exchange rates regime despite its exposure to exchange rate volatility, which is a threat to the growth of international trade and macroeconomic stability; because of the presence of hedging facilities that would be employed to protect one against exchange rate risk. However, the birth of this new system of exchange rate has engendered a 'hot' and extensive theoretical and empirical debate regarding the impact of exchange rate variability on foreign trade (Johnson, 1969; Kihangire, 2004). Questions and issues concerning the impact of exchange rate volatility on exports continue to arise.

For instance, it is commonly believed that high exchange rate volatility leads to high uncertainty which eventually increases the trading risk. As a matter of fact, the literature of exchange rate volatility contains a lot of inconsistent theoretical results. Hooper and Kohlhagen (1978), Clark (1973), etc. has been cited as theoretical studies with conclusion that volatility decreases trade. These economists believe that one reason why this may occur is because of imperfect markets situation especially in less developed countries.

Contrary to this conclusion, some other theoretical models show that high exchange rate volatility (to the extent that it increases risk) should increase trade. Aziakpono, et al. (2005), believes that this may occur because if exporters are sufficiently risk-averse a rise in exchange rate variability leads to an increase in expected marginal utility of exports revenue which acts as an incentive to exporters to increase their exports in order to maximize their revenues. This ambiguity in the theoretical literature causes similar ambiguity and inconsistencies in the empirical investigation of the effects of exchange rate volatility on exports flows

According to De Vita and Abbott (2004), this lack of a clear and consistent pattern of results resonates with a number of contentious issues that the empirical literature has brought to the fore. The first of these issues relates to the specification of the exchange rate volatility measure to be adopted and, in particular, over whether such a measure should be based on the nominal or the real exchange rate. Whilst it can be argued that the nominal series better captures the volatility driven uncertainty faced by exporters (Bini-Smaghi, 1991), it has also been suggested that because of the offsetting role that movements in costs and prices play with respect to fluctuations in the nominal exchange rate, the real exchange rate is the most appropriate measure (Gotur, 1985).

A second question concerns the statistical technique to be used to generate estimates of exchange rate volatility. Early studies employed the sample standard deviation of the exchange rate (see, for example, Akhtar and Hilton, 1984), a measure subsequently criticised because the statistical distribution of the exchange rate may be non-normal (Boothe and Glassman, 1987). The most common approach adopted in later work has involved the moving average standard deviation of the growth of the exchange rate (see Arize et al., 2000; Chowdhury, 1993; Fountas and Aristotelous, 1999; Lastrapes and Koray, 1990). The use of the moving average formulation, however, has also been questioned (see Arize, 1997; Du and Zhu, 2001) since it is likely to underestimate the effect of exchange rate risk, allows for an ad hoc specification of the order of the moving average process and, unlike conditional

volatility models such as ARCH (Engle, 1982), is inconsistent with the rational behaviour of economic agents. Evidently, despite the abundance of research, there is still no consensus on what technique should be used to construct the optimal exchange rate volatility measure. Given the many alternatives available, there is clearly a scope for considering and comparing multiple definitions.

Another contentious issue relates to the time series properties of the regressors included in the estimated export function. Most of the early studies ignored the need for investigating the order of integration of relevant variables and used standard OLS regressions under the erroneous assumption of stationarity of all the series. In the presence of nonstationarity, the Johansen cointegration procedure (Johansen, 1988, 1991) allows testing for the existence of a long-run relationship but it does so under the equally restrictive assumption that all the variables entering the model are integrated of order one, or I(1). Yet, the few studies that have investigated the time-series properties of relevant regressors have produced conflicting inferences. For example, while Arize (1995, 1997) and Aristotelous (2001) found that the exchange rate volatility series was the realisation of a stochastic process containing a unit root, Kroner and Lastrapes (1993) found the volatility measure to be stationary, thus making conventional cointegration tests unreliable.

A further concern is that most of the empirical work on the effect of volatility on exports has made use of aggregate trade data.[1] As noted by Bini-Smaghi (1991), data aggregation constrains the volatility estimates to be similar across countries, and indeed sectors of the economy. It follows that, as suggested by McKenzie (1999), the effect of exchange rate volatility should be tested in the context of disaggregated export markets, and making use of sector-specific data.

As an open and middle income country in Sub-Saharan Africa, South Africa is not an exception to this debate because ever since it adopted flexible exchange rates system in the mid 1990's to complement its outward looking trade policy which ensued export-led growth, its currency, Rand with over half of the South African

[1] For a comprehensive review of this literature, see Mckenzie (1999).

transactions taking place offshore, has been very volatile. 'It has witnessed consistent depreciation against the Chinese RMB to the lowest level in January 2002 and has experienced a sharp appreciation henceforth therefore subjecting South African importers and exporters to uncertainty regarding their payments and receipts in home currency terms.

In estimating this relationship (exchange rate volatility and exports), the approach followed in our study is some how close to that of Todani and Munyama (2005) and Sekantsi (2007), which adapts the empirical framework of De Vita and Abbott (2004). This framework involves estimating an encompassing equation linking exchange rate volatility (and other variables) to export performance making use of cointegration analysis. While cointegration procedures used in previous studies are only applicable when the regressors entering the determination of the dependent variable are all I(1), the recently developed ARDL bounds testing approach to cointegration (Pesaran and Shin, 1999; Pesaran et al., 2001) that we employ is applicable irrespective of whether the underlying regressors are purely I(0), purely I(1) or mutually cointegrated. Given the uncertainty concerning the order of integration of the volatility measure, we consider this econometric procedure to be the most appropriate in this context. In addition to our focus on the nature of nonstationarity apparent in various time series data, our paper is different from previous papers in several ways. In other words, our contribution adds to what has gone before in the following ways:

First, unlike previous studies conducted in the South African context (including Munyama, 2005 and Sekantsi**,** 2007), our paper focuses on exports in terms of the Chinese market. Given the importance of exports to the growth of the South African economy, this market is worth considering since in fact China has taken over the United States to become South Africa's largest regional trading partner (for both imports and exports) since October 2009.

Second, unlike most empirical studies (including Munyama, 2005 and Sekantsi**,** 2007), we make use of 'optimal volatility measures' using both nominal and real exchange rates. As was earlier mentioned, this is an important factor in addressing

some of the contentious issues and gaps in the literature of exchange rate volatility and exports.

Third, unlike most of the empirical literature (including Munyama, 2005 Sekantsi**,** 2007, and De Vita and Abbott, 2004), we make use of both market disaggregated data (in this case Chinese market) and sector disaggregated data (export by chapters), thus avoiding the pitfalls of data aggregation outlined earlier. We also pay special attention to sample period selection, for exchange rate regime switches as well as changes in the structure of trade, and the way in which trade data are compiled, represent important sources of potential bias.

Fourth, unlike previous studies (including Munyama, 2005 Sekantsi**,** 2007, and De Vita and Abbott, 2004), our study goes beyond investigating the long-run and short-run relationships between exports and their determinants by employing the CUSUM and CUSUM of Squares tests. These tests are necessary for establishing whether the regressors are in fact long-run forcing, and hence confirm the uniqueness and stability of the cointegrating relations.

Finally, unlike the studies by Munyama (2005) and Sekantsi **(**2007), we gauge the impact of exchange rate volatility on South African exports to China by using the fitted values for export volumes accounted for by the $\beta_3 V(h)_t$ component of (1), to restimate the volume of exports that would have taken place had exchange rate volatility not been present. This analysis is important as it helps to test the robustness of our results.

The rest of this thesis is organized as follows: The remainder of chapter 1 covers motivation for the research and review of the relevant literature. Chapter 2 considers the methodology and estimation technique. In chapter 3, we present our empirical results and analysis. Chapter 4 concludes the work providing some policy implication and direction for future research. This chapter is followed by references, acknowledgments and appendices.

1.2 Motivation

First, the fact that China has taken over the United States to become South Africa's largest regional trading partner (for both imports and exports), makes it necessary to investigate the impact of exchange rate volatility on South African exports to China. The acquisition of such knowledge is in fact crucial for the design of both exchange rates and trade policies.

Second, witnessing the importance of exports to the growth of South Africa's GDP implies that the effects of volatility of the Rand should not be taken for granted but should be carefully considered by policy makers. Hence, this suggests a need for empirical research that provides further insight into whether this variability of the exchange rate impacts on exports or not and if so, to what extent.

Third, research undertaken in this area is important for developing countries like South Africa. Since these countries suffer research vacuum in which there is insufficient empirical evidence to substantiate the impact of exchange rate volatility on exports, this can help to counter some prevalent inconsistency in the literature and most especially narrow the research gap in less developed countries.

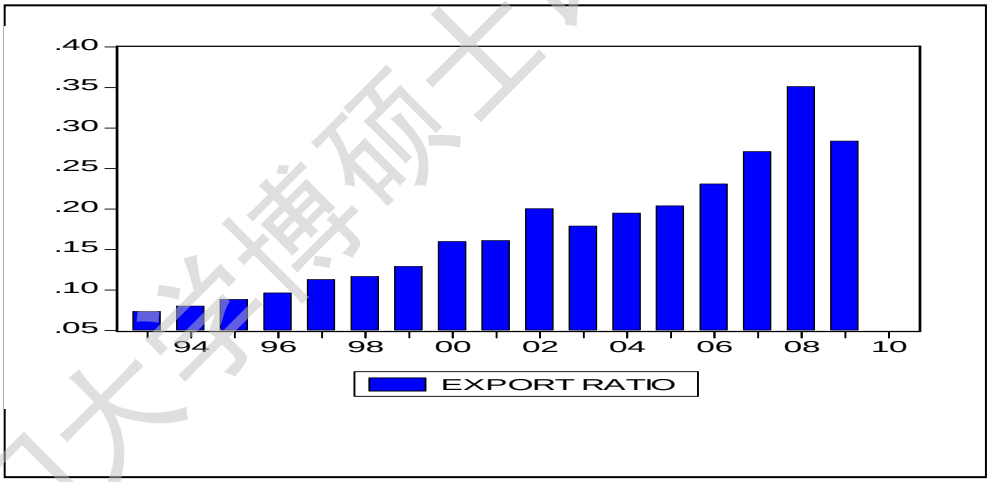
Finally, a comprehensive understanding of how the fluctuation Rand affects South African exports is a necessary requirement that can help the government to promote exports in such an environment of flexible exchange rates. For instance, policy-makers would be able to safe-guard the country from balance of payment crises by ensuring that the intending effect of trade liberalization policy is protected from volatile exchange rates.

1.3 South African exports performance

As an open and middle income country, South Africa considers exchange rate as a key macroeconomic policy instrument that ensures export promotion and

economic growth. The South African Reserve Bank exchange rate policy aims at providing an environment that promotes exchange rate stability and assists the government's objective of accomplishing export-led growth (Bah & Amusa, 2003).In line with this, the adoption of outward-looking trade policy ensured export growth that lead to long-term economic growth. The increased liberalisation of trade and foreign exchange controls, exports promotion policies like General Export Incentive Scheme (GEIS) and multilateral trade agreements such as African Growth and Opportunity Act (AGOA) have led to greater penetration of South Africa exporters to the international markets. As a result, the ratio of exports to GDP has accelerated substantially from 7.38% in 1993 to about 35.1% in 2008.This is shown in figure 1 below:

Figure 1: South African Exports as a Percentage of GDP



Source: South African Department of Trade and Industry

1.4 Review of related literature

The literature of exchange rates volatility and trade is diverse. A lot of studies on this subject have been conducted internationally both theoretically and empirically. Over the years, two popular approaches have emerged. One approach is to estimate a simple export demand equation generally with real exports as a dependent variable