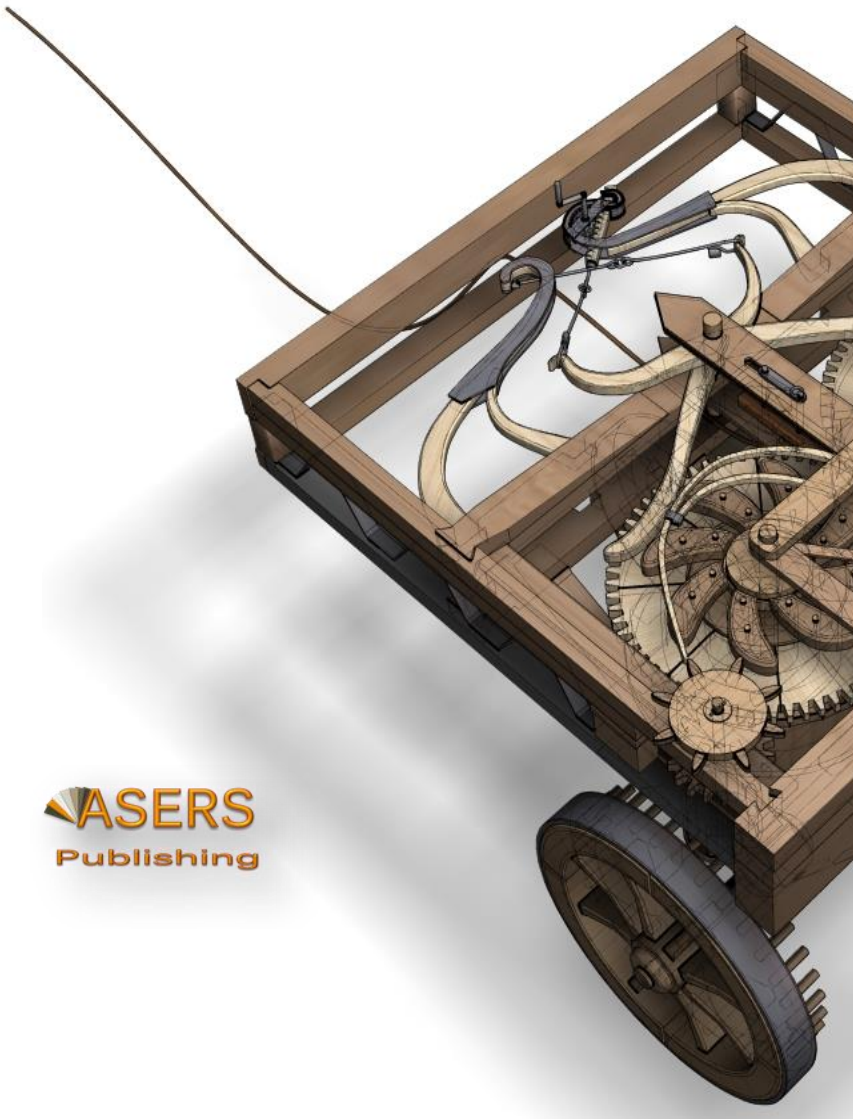
ASERS

Theoretical and Practical Research in Economic Fields



Biannually
Volume IX
Issue 1(17)
Summer 2018

ISSN 2068 – 7710
Journal **DOI**
http://dx.doi.org/10.14505/tpref

ASERS Publishing

Theoretical and Practical Research in Economic Fields

is an advanced e-publisher struggling to bring further worldwide learning, knowledge and research. This transformative mission is realized through our commitment to innovation and enterprise, placing us at the cutting-edge of electronic delivery in a world that increasingly considers the dominance of digital content and networked access not only to books and journals but to a whole range of other pedagogic services.

In both books and journals, ASERS Publishing is a hallmark of the finest scholarly publishing and cutting-edge research, maintained by our commitment to rigorous peer-review process.

Using pioneer developing technologies, ASERS Publishing keeps pace with the rapid changes in the e-publishing market.

ASERS Publishing is committed to providing customers with the information they want, when they want and how they want it. To serve this purpose, ASERS publishing offers digital Higher Education materials from its journals, courses and scientific books, in a proven way in order to engage the academic society from the entire world.

Volume IX
Issue 1(17)
Summer 2018

ASERS Publishing
http://www.asers.eu/asers-publishing
ISSN 2068 – 7710
Journal's Issue **DOI**:
http://dx.doi.org/10.14505/tpref.v9.1(17).00

Contents:

Call for Papers
Volume IX, Issue 2(18), Winter 2018
Theoretical and Practical Research in Economic Fields

Many economists today are concerned by the proliferation of journals and the concomitant labyrinth of research to be conquered in order to reach the specific information they require. To combat this tendency, **Theoretical and Practical Research in Economic Fields** has been conceived and designed outside the realm of the traditional economics journal. It consists of concise communications that provide a means of rapid and efficient dissemination of new results, models and methods in all fields of economic research.

Theoretical and Practical Research in Economic Fields publishes original articles in all branches of economics – theoretical and empirical, abstract and applied, providing wide-ranging coverage across the subject area.

Journal promotes research that aim at the unification of the theoretical-quantitative and the empirical-quantitative approach to economic problems and that are penetrated by constructive and rigorous thinking. It explores a unique range of topics from the frontier of theoretical developments in many new and important areas, to research on current and applied economic problems, to methodologically innovative, theoretical and applied studies in economics. The interaction between empirical work and economic policy is an important feature of the journal.

Theoretical and Practical Research in Economic Fields, starting with its first issue, it is indexed in EconLit, RePEC, EBSCO, ProQuest, Cabell Directories and CEEOL databases.

The primary aim of the Journal has been and remains the provision of a forum for the dissemination of a variety of international issues, empirical research and other matters of interest to researchers and practitioners in a diversity of subject areas linked to the broad theme of economic sciences.

All the papers will be first considered by the Editors for general relevance, originality and significance. If accepted for review, papers will then be subject to double blind peer review.

Invited manuscripts will be due till May 10th, 2018, and shall go through the usual, albeit somewhat expedited, refereeing process.

Deadline for submission of proposals: 10th November 2018

Expected publication date: December 2018

Website: http://journals.aserspublishing.eu/tpref

E-mail: tpref@aserspublishing.eu, asers.tpref@gmail.com

To prepare your paper for submission, please see full author guidelines in the following file: TPREF_Full_Paper_Template.docx, on our site.

DOI: http://dx.doi.org/10.14505/tpref.v9.1(17).03

TECHNICAL TRADING RULES AND TRADING SIGNALS IN THE BLACK MARKET FOR FOREIGN EXCHANGE IN SUDAN

Ibrahim A. ONOUR
School of Management Studies
University of Khartoum, Sudan
onour@uofk.edu

Suggested Citation:
Onour, I. A. (2018). Technical Trading Rules and Trading Signals in the Black Market for Foreign Exchange in Sudan, *Theoretical and Practical Research in Economic Field*, (Volume IX, Summer 2018), 1(17): 25-31. DOI:10.14505/tpref.v9.1(17).03. Available from: http://journals.aserspublishing.eu/tpref.
Article's History:
Received April 2018; *Revised* May 2018; *Accepted June* 2018.

Abstract:

This paper aims to assess the level of departure of the actual black-market rate from its real level. Our finding indicates divergence of the actual black-market rate from the real level, ranging from 7% in October 2016 to about 38% in November 2017. This result implies 38% of the foreign exchange price in the black-market rate in November 2017 was due to manipulative trading strategies exerted by a few powerful traders in the market. The study concludes that in the very short term to curb increasing depreciation of the domestic currency rate in the black market, it is essential to control domestic liquidity expansion, and raise the cost (risk) of dealing in the black market by imposing higher penalty cost on dealers in this market.

Keywords: black market; foreign exchange; technical trading; volatility; Sudan.

JEL Classification: E52; G14; C54

Introduction

It became obvious to many economists in recent years that effective foreign exchange policy should take into account the link between the black market for foreign exchange and the rest of the economy, if viable economic planning is to set forth. Here in Sudan, since separation of oil rich South Sudan from the rest of country in July 2011, and loss of about 75% of oil revenue, the black-market rate premium over the official rate expanded rapidly due increasing demand for hard currencies. To control speculative effects on foreign exchange trading, the Central bank of Sudan decided to tighten control on exchange bureaux by enforcing additional restrictions on foreign exchange sales and often cracking down on black marketers for foreign exchange. The expanding gap between black market rate and the official exchange rate in the past few years became a major concern for the authorities in Sudan. Some basic questions we would like to answer in this paper includes: Is the black-market rate for foreign exchange in Sudan is a free exchange rate that reflect change in fundamental macroeconomic variables? What are the major factors that nurture the black market foreign currencies in recent years? and finally, what is the best predictor of the black-market rate? To answer the first question, we assessed profitability of technical trading rules, to see if speculative trading rules can gain significant profit to currency dealers. To answer the second and third questions we investigated the association between high powered money and change in black market prices.

The remaining part of the paper is structured as follows. Section two highlights literature review. Section three illustrates technical trading rules and shows how simple trading rules can attract significant gains to traders. The final section concludes the study.

1. Literature Review

Studying volatility in asset markets in general can help controlling asset markets irregularities and detecting volatility boundaries (Bollerslev *et al.* 2003). The increasing sensitivity of major economic indicators in underdevolpoed economies to volatility in black market for foreign exchange highlights the importance of modeling volatility in these markets. The literature on black market for foreign exchange takes two approaches: the first approach adapts specification of determinants of black market rate premium. A partial list of articles in this tradition includes Dornbusch *et al.* (1983), Fishelson (1988), Culbertson (1989), Phylaktis (1992), and Shachmurove (1999). The second approach focuses on the impact of black market rate volatility on macroeconomic indicators. Musila and Al-Zyoud (2012) following the latter approach assess the relationship between black market volatility and volume of international trade in sub-Saharan African countries and indicate that reducing volatility in the black-market rate increase (though insignificant) international trade flow to these countries. But findings by Makochekanwa (2007) show the black-market rate has significant impact on hyperinflation in Zimbabwe, during 1999 -2006.

Caporale and Cerrato (2008) investigate the long-run relationship between black market and official exchange rates in a number of Asian emerging economies to show weak evidence of long-run equilibrium relationship between the two market rates. In study of exchange markets in India and Sri Lanka, Emran and Shilipi (2010) show black market rates are weak indicators of equilibrium exchange rate. Jayaratnam (2003) investigates the impact of black market premium on FDI to show that reduction in black market premium has little impact on FDI flows in a number of developing countries.

2. Technical Trading Rules and Trading Signals

In recent years more, research results unveiled the predictive power of technical trading rules in emerging stock markets. A number of research studies (Besseminder and Chan 1995; Ratner and Leal 1999; Ito 1999; Kho 1996; Levich and Thomas1993), indicated that trading rules showed significant predictive power of profits in a number of Asian markets including Malaysia, Thailand, and Taiwan, but less predictive in more developed markets of Hong Kong and Japan. In a more comprehensive study including Indonesia, Mexico, Taiwan, Canada, and U.S., stock markets, Ito (1999) found trading rules captures quite strongly trading patterns (buy and sell signals) in all these markets with exception of the U.S., stock markets. Similar conclusion supporting relevance of trading rules analysis in Latin America stock markets concluded by Ratner and Leal (1999).

Since efficient market hypothesis imply, prices in efficient markets reflect all available information to the extent that excess returns generated from any additional information cannot exceed transaction costs of trading on that stock (Fama and Blume 1966), then evidence of profit generation in stock or currency market using past price behavior entails indication of market inefficiency. Thus, investigation of technical trading analysis may have important implications on a market regulation, in addition to its benefit to investors with respect to availability of potential opportunities.

In the following we investigate whether technical analysis can be exploited to predict significant profit returns in the black market.

2.1. Simple Technical Rules:

Technical trading rules assume price change follow predictable patterns that can be exploited for trading strategies. While there are different specifications of trading rules, the simplest and more often employed by practitioners are the variable length moving average (VMA), and the trading-range break. To explain these two rules, let

s_{it} $(t = 1,2.....T)$ be the its daily stock price index, so that its return can be computed as: $r_{it} = \ln(s_{it}) - \ln(s_{i(t-1)})$. A buy and sell orders prescribed based on:

$$\textit{Buy if} \quad S_t \geq \frac{1}{n}\sum_{i=0}^{n-1} S_{t-i}$$

$$\textit{Sell if} \quad S_t < \frac{1}{n}\sum_{i=0}^{n-1} S_{t-i} \quad ,$$

where s_t is the stock price at time t.

Alternatively, to compute the variable moving average rule, a short-period moving average (SMA) and a long-period moving average (LMA) rules need to be computed, so that n is set equal to the number of trading days

in a week (*i.e.*, n = 3) for SMA, and n>10, for LMA. In this case a buy order can be signaled when $SMA_{it} > LMA_{it}$ by an amount larger than pre-specified band level; and a sell order when $SMA_{it} < LMA_{it}$ by an amount lower than the band. The trading-range break signals buy order when the price rises above its last local maximum (the resistance level), and a sell order when the price sink below its last local minimum (the support level).

The t-test statistics for the buys (sells) are defined as:

$$\frac{\mu_r - \mu}{\left[\frac{\sigma_r^{\,2}}{N_r} + \frac{\sigma^2}{N}\right]^{0.5}}$$

where $\mu_r, \sigma_r^{\,2}, N_r$ are the mean return, estimated variance, and the number of buy (sell) days; μ and N are the population mean and number of observations.

And the t-test statistics for the buy-sell are defined as:

$$\frac{(\mu_b - \mu_s) - \mu}{\left[(\frac{\sigma_b^{\,2}}{N_b} + \frac{\sigma_s^{\,2}}{N_s}) + \frac{\sigma^2}{N}\right]^{0.5}}$$

where μ_b , μ_s , N_b *and* N_s are respectively the buy and sell mean returns and the number of days for the buys and sells. In the table the term (1,20,0.01) refer to the short period is one day, the long period is 20 days, and the band is 1%.

Results in table (1) indicate profitability of variable length moving average trading rule by currency traders. The findings in the table show positive profits can be gained if traders practice simple trading rule of buying at the low-price levels and selling at higher prices in periods ranging from one day to three weeks. Such practice of buying and selling at different prices also supported by figure (1), which indicates the buying periods by the upward arrows, and the selling periods by the downward arrows. On the other hand, table (2) indicate trading rules in the black market for foreign exchange do not support a positive profit gains when support and resistance trading strategies are assumed.

In tables (3) and (4), we simulated a hypothetical example of three traders who are able to coordinate among them self as in the oligopoly models, under two scenarios. The first scenario in table (3) shows sustainability of the coordinated trading when traders have a fixed amount of domestic currency balance and trade a fixed amount of foreign currency among themselves (US$10). In such case the trading in FX is not sustainable even when they have a market power to set price at the levels they want. This can be indicated by the declining amount of foreign currency balance from US$ 33 in the initial period 1 to US$19 in the final period. However, under the second scenario it is assumed that traders have the same fixed amount of foreign currency, but they have access to increasing domestic currency balance. In this case the trading of FX in the black market becomes sustainable, as their total balance in foreign exchange increase from US$44 in the initial period to about US$ 100 in the final period. These results imply as long as traders in black market for foreign exchange have access to increasing domestic currency, via smuggling activities or whatever, black market activities may not disappear even when foreign currency amounts traded in the black-market for FX remained fixed.

Given that growth in domestic liquidity (money supply) is fundamental driver of change in black market rate (figure 2), to assess the size of over-pricing of the black market rate due to speculative trading of foreign exchange in the black market, we estimated the black market rate consistent with the growth in money supply (M2), and refer to it as realistic rate of the black market rate. As reported in table (5), the excess of the actual black-market rate over the estimated rate indicates the size of over-pricing due to speculative trading activities in the black market. Results in table (5) show increasing divergence between the estimated and the actual rates. This imply that the size of over-price in the black market increased from 7% in October 2016 to 38% in November 2017. This result shows the effect of speculative motives, as opposed to fundamental drivers, were more dominant in 2017, albeit in the last four months of 2017.

Table 1. Variable length moving average rule

	FX Mean	Std.dev	Min/Max
[1, 15; 0.01] Buy-Sell t-stat	 -0.86* -51.23	7.09	-8.0/8.2
[1, 20; 0.01] Buy-Sell t-stat	 -0.16* -57.80	7.14	-7.9/8.2
[5, 15; 0.01] Buy-Sell t-stat	 -1.44* -46.43	6.9	-8.0/8.2
[5, 20; 0.01] Buy-Sell t-stat	 -0.36* -43.40	7.13	-7.9/8.2

*significant at 1% significance level.

Table 2. Trading Range Break (support & resistance)

	Fx Mean	St.dev	Min/Max
Buy t-stat	7.8* 31.5	0.13	7.6/8.2
Sell t-stat	6.4* -18.7	0.18	6.0/6.7
Buy-Sell t-stat	1.04* -38.1	7.13	-6.7/8.2

*significant at 1% significance level.

Figure 1. Buy and sell strategies (2016)

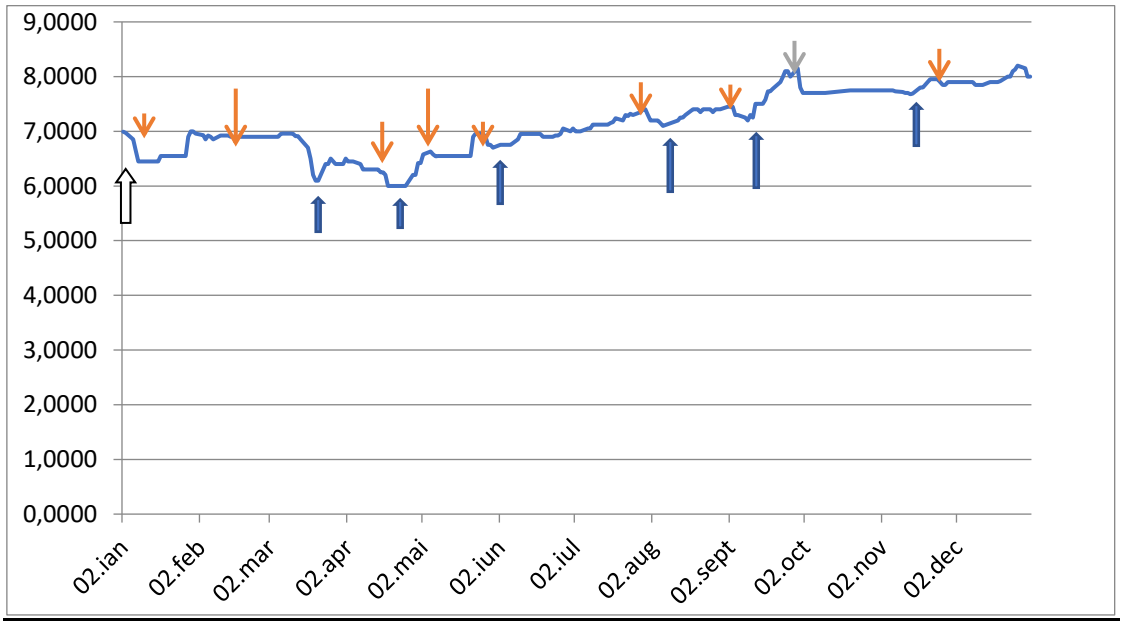


Table 3. Price setting and oligopolistic gains:

(Senario 1: restricted liquidity access)

Periods	FX Rate S£/ US$	Trader 1 S£	US$	Trader 2 S£	US$	Trader 3 S£	US$	Total balance For the 3 traders in US$
1	20	--	10	220	--	240	--	33
2	22	220	--	--	10	240	--	30
3	24	220	--	240	--	--	10	29
4	30	-80	10	240	--	300	--	25
5	40	320	--	240	--	-100	10	21
6	50	320	--	-260	10	400	--	19

Table 4. Price setting and oligopolistic gains:

(Senario 2: sufficient liquidity access)

Periods	FX Rate S£/ US$	Trader 1 S£	US$	Trader 2 S£	US$	Trader 3 S£	US$	Total balance For the 3 traders in US$
1	20	220	10	220	--	240	--	44
2	22	600	--	500	10	500	--	82
3	24	800	--	800	--	800	10	110
4	30	900	10	900	--	900	--	100
5	40	1020	--	1020	--	1020	10	86
6	50	1500	--	1500	10	1500	--	100

Figure 2. Prediction of the black market rate

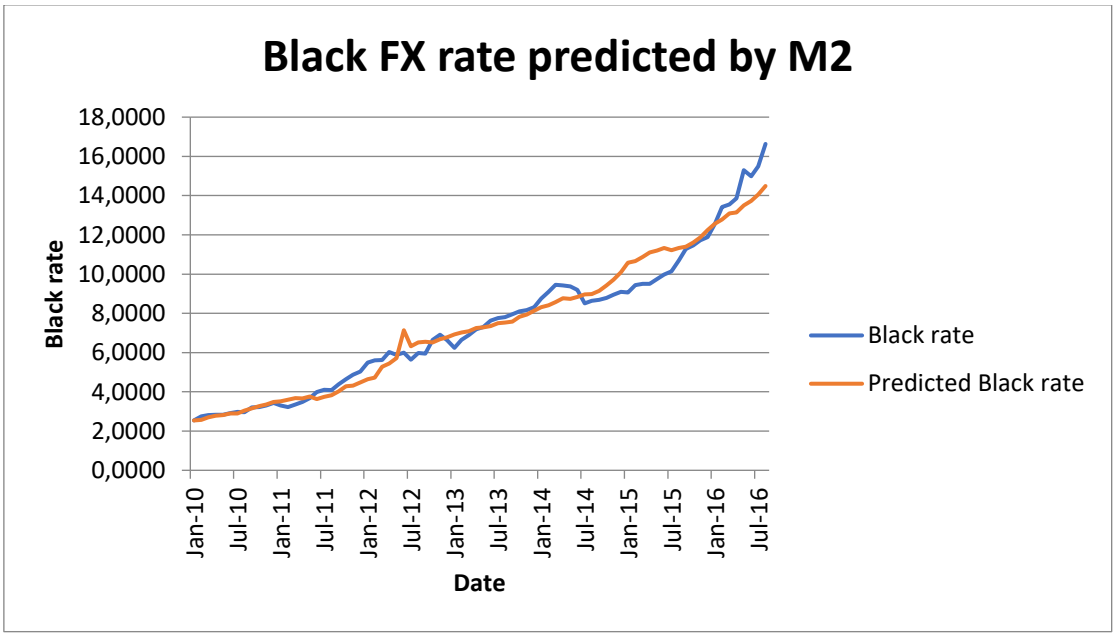


Table (5). Speculative trading effect

Date	Black FX Actual	Black FX (M2 based prediction)	Over-pricing (%)
Oct-16	15.49	14.47	7.02
Nov-16	16.63	14.30	16.26
Dec 16	16.98	14.51	17.05
Jan-17	17.50	14.64	19.52
Feb-17	17.67	14.81	19.31
Mar-17	17.89	15.02	19.08
Apr-17	18.40	15.24	20.75
May-17	18.90	15.46	22.29
Jun-17	19.41	15.67	23.84
Jul-17	19.69	15.89	23.89
Aug-17	19.98	16.11	23.99
Sep-17	20.12	16.34	23.15
Oct-17	21.89	16.56	32.17
Nov-17	23.23	16.79	38.37

Concluding Remarks

The findings in this research indicate profitability of variable length moving average trading rule by currency traders when traders practice simple trading rule of buying at low price and selling at higher price in periods ranging from one day to three weeks. However, such trading rule cannot support a positive profit gains when resistance and support trading strategies are assumed. To investigate further trading signals, we simulated a hypothetical example of three traders who are able to coordinate among themselves as oligopolistic, under two scenarios. The first scenario assumes monetary authority control domestic liquidity so that traders cannot increase their balance of domestic currency. In such case it is indicated that trading in foreign currency in a black market is not sustainable, as the balance of foreign currency declines over time, even when traders enjoy a market power to set prices. However, under the second scenario it is assumed that traders have the same fixed amount of foreign currency, but they have access to increase domestic currency balance, implying that monetary authorities unable to control domestic liquidity. In this case trading of foreign currency in the black market becomes sustainable, as trader's foreign currency balance increases continuously over time. These results imply as long as traders in black market for foreign exchange have access to increasing domestic currency, via gold smuggling, export under-invoicing, or import over-invoicing, then black market activities can not disappear if black market is controlled by a few powerful traders who set prices as oligopolistic.

Assuming growth in domestic liquidity (money supply) is fundamental driver of change in black market rate, we estimated the extent of over-price in the black-market rate due to speculative trading of foreign exchange. Our results indicate the size of over-price in the black market increased from 7% in October 2016 to 38% in November 2017, revealing expanding market power exerted by the black-market traders in the last four months of 2017.

References

[1] Bessembinder, H., and Chan, K. 1995. The Profitability of Technical Trading Rules in the Asian Stock Markets. *Pacific-Basin Finance Journal*, 3(2-3): 257-284. DOI: 10.1016/0927-538X(95)00002-3

[2] Caporale, G. M. and Cerrato, M. 2006. Black Market and Official Exchange Rates: Long-Run Equilibrium and Short-Run Dynamics (November 2006). CESifo Working Paper No. 1851. Available at: https://ssrn.com/abstract=949425

[3] Culbertson, W.P. 1989. Empirical Regularities in Black Markets for Currency, *World Development*, 17(12): 1907-1919.

[4] Dornbusch, R. *et al.* 1983. The Black Market for Dollars in Brazil. *Quarterly Journal of Economics*, 98: 25-40.

[5] Fama, E., and Blume, M. 1966. Filter Rules and Stock Market Trading Profits. *Journal of Business,* 39: 226-241.

[6] Fishelson, G. 1988. The Black Market for Foreign Exchange: An International Comparison. *Economics Letters* 27: 67-71.

[7] Gros, D. Dual Exchange Rate in the Presence of Incomplete Market Separation: Long-Run Effectiveness and Implications for Monetary Policy. *IMF, WP/87/45*,1987

[8] Gupta, S. 1984. Unrecorded Trade at Black Exchange Rates: Analysis, Implications, and Estimates. *Aussenwirtschaft*, 39: 75-90.

[9] Ito, A. 1999. Profits on Technical Trading Rules and Time-Varying Expected Returns: Evidence from Pacific-Basin Equity Markets. *Pacific-Basin Finance Journal*, 7(3-4): 283-330.

[10] Jadgeep, B., and Vegh C. 1990. Dual Exchange Markets under Incomplete Separation: An Optimizing Model," *International Monetary Fund Staff Papers*, 37(1): 146- 167.

[11] Jayaratnam A., Jayaratnam, A., and Mckinnon, A.R. 2003. How Does the Black-Market Exchange Premium Affect Foreign Direct Investment? http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.197.6736

[12] Kharas, H., and Pinto, B. 1989. Exchange Rate Rules, Black Market Premia, and Fiscal Deficits: The Bolivian Hyperinflation. *Review of Economic Studies*, 56: 435-47.

[13] Kho, B-C. 1996. Time-Varying Risk Premium, Volatility, and Technical Trading Rule Profits: Evidence from Foreign Currency Futures Markets, *Journal of Financial Economics* 41: 249-290.

[14] Kiguel, M., and O'Connell, S. 1995. Parallel Exchange Rate in Developing Countries. *The World Bank Research Observer*, 10(1): 21-52.

[15] Levich, R. M., and Thomas, L. R. 1993. The Significance of Technical Trading-Rule Profits in the Foreign Exchange Market: A Bootstrap Approach, *Journal of International Money and Finance,* 12: 451-474.

[16] Lizondo, J. S. 1987. Unification of Dual Exchange Market, *Journal of International Economics*, 22: 57-77.

[17] Makochekanwa, A. 2007. Zimbabwe's Hyperinflation Money Demand Model. University of Pretoria, department of economics, working paper series, 2007-12.

[18] Musila J., and AL-Zoud H. 2012. Exchange Rate Volatility and International Trade Flows in Sub-Saharan Africa: Empirical Evidence. *Journal of African Business*, 13(2): 115-122.

[19] Onour, I. 2000. Unification of Dual Foreign Exchange Markets. *Economics of Planning (Journal),* 33: 171-184.

[20] Onour, I., and Cameron, N. 1997. Parallel Market Premium and Real Official Exchange Rate Misalignment, *Journal of Economic Development,* 22(1): 25-41.

[21] Phylaktis, K. 1991. The Black Market for Dollars in Chile. *Journal of Development Economics*, 37(1-2): 155-172.

[22] Pinto B. 1989. Black Market Premia, Exchange Rate Unification and Inflation in Sub-Saharan Africa. *World Bank Economic Review*, 3: 321- 338.

[23] Pinto B. 1991. Black Markets for Foreign Exchange, Real Exchange Rates, and Inflation. *Journal of International Economics,* 30: 121-135. https://doi.org/10.1016/0022-1996(91)90008-T

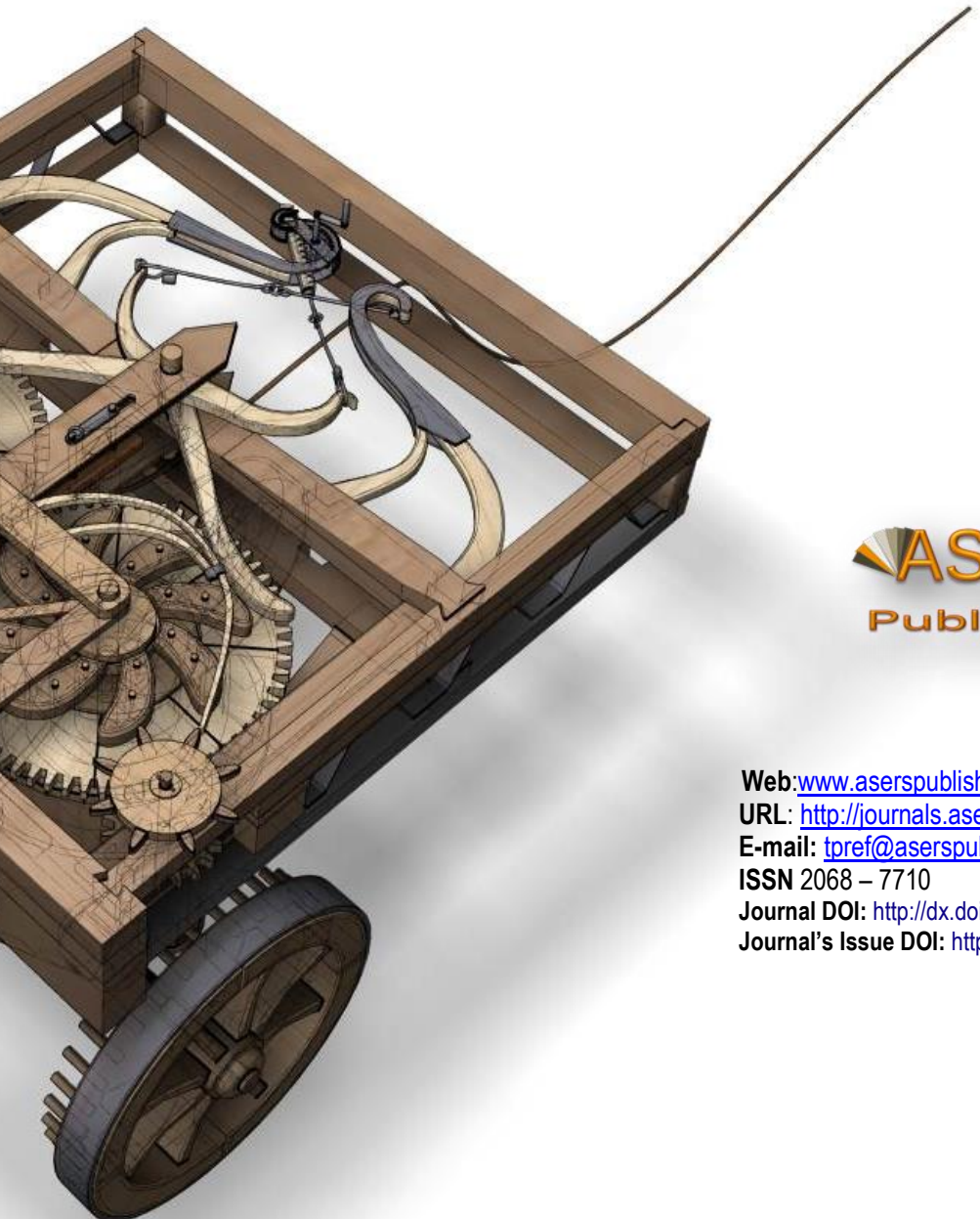
[24] Ratner, M., and Leal, R. P C. 1999. *Tests of Technical Trading Strategies in the Emerging Equity Markets of Latin America and Asia*, Journal of Banking and Finance, 23 (12): 1887-1905.

[25] Rodriguez, C. 1978. A Stylized Model of the Devaluation-Inflation Spiral. *IMF Staff Papers*, 25: 76-89.

[26] Shachmurove, Y. 1999. The Premium in Black Foreign Exchange Markets: Evidence from Developing, Countries. *Journal of Policy Modeling*, 21(1): 1-39.

[27] Shahe E. M. and Shilpi, F. 2010. Is Black Market Exchange Rate a Good Indicator of Equilibrium Exchange Rate? A Simple Test with Evidence from South Asia. Available at: https://ssrn.com/abstract=1552885 or http://dx.doi.org/10.2139/ssrn.1552885

ASERS



ASERS Publishing

Web:www.aserspublishing.eu
URL: http://journals.aserspublishing.eu/tpref
E-mail: tpref@aserspublishing.eu
ISSN 2068 – 7710
Journal DOI: http://dx.doi.org/10.14505/tpref
Journal's Issue DOI: http://dx.doi.org/10.14505/tpref.v8.1(17).00