

**DOES THE EXCHANGE RATE  
REGIME AFFECT EXPECTATION  
FORMATION IN THE FOREIGN  
EXCHANGE MARKET? THE CASE OF  
A CURRENCY THAT IS PEGGED TO A  
BASKET**

Imad A. Moosa

**Working Paper 0219**

The ERF Working Paper Series disseminates the findings of research working progress to promote the exchange of ideas and encourage discussion and comment among researchers for timely revision by the authors.

The Working Papers are intended to make preliminary research results available with the least possible delay. They have therefore not been made subject to formal review and ERF accepts no responsibility for errors.

The views expressed in the Working Papers are those of the author(s). Unless otherwise stated, copyright is held by the author(s). Requests for permission to quote their contents should be addressed directly to author(s).

*As of August 1998, financial support towards the ERF Working Papers Series from the Commission of the European Communities (through the FEMISE Program) is gratefully acknowledged. The views expressed in the Working Papers are those of the authors and do not necessarily reflect the views of the European Commission.*

### **Abstract**

An attempt is made to identify the expectation formation mechanism dominating the foreign exchange market when the domestic currency is pegged to a basket, using the Kuwaiti Dinar (KD) as the pegged currency. The criterion used to identify the dominance or otherwise of a particular mechanism is the profitability of trading based on that mechanism. It is found that regressive expectations are dominant, which is unlike what is found for floating currencies. These results have implications for foreign exchange trading and for policy.

## 1. Introduction

Expectation formation in the foreign exchange market (and in financial markets generally) is an issue that has been preoccupying financial economists for a long time. Studies dealing with this issue (mostly based on survey data and to a lesser extent on the estimation of the demand for money function) have generally revealed that expectations tend to be extrapolative in the short run and regressive in the long run. The so-called “twist” in expectation means that if a currency is appreciating it would be expected to keep on appreciating in the immediate future and to depreciate further into the future.<sup>1</sup> This result, however, is by no means unanimous, as special circumstances may bring about changes and different findings. For example, Moosa (1999) found that expectations were predominantly extrapolative or adaptive rather than regressive throughout the German hyperinflation of the 1920s.

Most of the research on this issue has been carried out on the floating currencies of industrial countries. This project aims at examining the issue in the Kuwaiti dinar (KD) market. The KD is a currency that is pegged to a basket of currencies without revealing the components of the basket, the reason being the desire to curb speculation on the exchange rate. This case is interesting in its own right, as we will find out if the exchange rate arrangement makes any difference for the results. More important perhaps are the policy implications of the results. To maintain the exchange rate arrangement, the Central Bank of Kuwait (CBK) must intervene in the market by buying and selling the U.S. dollar (see Moosa and Al-Loughani, 1999, 2000). If expectations are predominantly extrapolative, and if the KD is under pressure, then the CBK may find itself facing an unstable foreign exchange market. If this is the case, then the CBK may be unable or unwilling to defend the KD by buying and selling currencies, and it may resort to devaluation. This is exactly what happened in 1986, when the CBK resorted to (undeclared) devaluation following the exposure of the KD to severe pressure arising from persistent capital outflows (see Moosa, 1989). The idea here is very simple: if expectations had been regressive, market forces would have done the job for the CBK.

The results of this study should also prove to be useful for foreign exchange trading. It should be interesting to find out how traders form their expectations about the future movements in exchange rates when the domestic currency is pegged to a basket. Do they, for example, just consider what happens to exchange rates of major currencies against the U.S. dollar and then simply extrapolate the expectation to the KD cross rates? And, how much weight do

they assign to the policy actions of the CBK? In general, expectation formation mechanisms can be used as exchange rate forecasting models (see Moosa, 2000).

## 2. The Empirical Evidence

As stated earlier, studies on expectation formation in the foreign exchange market follow two approaches. The first approach is based on survey data, whereas the second approach is based on estimating the demand for money function by incorporating various expectation formation mechanisms.

A large number of studies have used survey data, the results of most of which are summarised and reported in Takagi (1991) and MacDonald (2000). Various model specifications are estimated using observations from survey data to proxy expectations. The best model, and hence the most valid expectation formation mechanism, is then judged according to the diagnostics and goodness of fit measures of the estimated models.

Takagi (1991) surveyed the studies conducted by Dominguez (1986), Frankel and Froot (1987a, b), Bank of Japan (1989), Wakita (1989), Froot and Frankel (1990) and Ito (1990). He obtained what he calls the crucial result, that whereas short-run expectations tend to move away from some long-run “normal value”, long-run expectations tend to move back towards it. He calls this reversal in the direction of expectation a “twist”. The evidence, in general, supports extrapolative and regressive expectations, but not static expectations.

MacDonald (2000) surveyed some of the same studies surveyed by Takagi (1991) as well as more recent studies. These studies include Dominguez (1986), MacDonald and Torrance (1988), Frankel and Froot (1987a, 1989), Cavaglia et al. (1993), Chinn and Frankel (1994), Prat and Uctum (1996) and Kim (1997). He found evidence for a “twist” in expectation formation, concluding that forecasting at horizons longer than three months exhibit clear evidence for stabilising (regressive) expectation.

Most of the studies following the second approach of estimating a demand for money function incorporating the expectation formation mechanism impose rather than test for the mechanism. One exception is the study of Moosa (1999) in which he tests for expectation formation under the German hyperinflation using static, extrapolative, adaptive, regressive and rational expectations. Results of this analysis lend support to extrapolative and adaptive expectations, and reveals that expectation is destabilising under hyperinflation.

## 3. Some Theoretical Issues

Since 1975 CBK has adopted an exchange rate arrangement whereby the KD is pegged to a basket of currencies with unknown components. Given this arrangement, the exchange rate of the KD against the U.S. dollar is calculated

---

<sup>1</sup> There is no agreement on how long (or short) the short and the long run are. However, the “twist” phenomenon is typically perceived to take place within six months.

from the exchange rates of the currencies included in the basket. This can be represented formally by the equation:

$$S_0 = \alpha_0 + \sum_{i=1}^n \alpha_i S_i \quad (1)$$

where  $S_0$  is the KD/dollar exchange rates and  $S_i$  is the exchange rate of currency  $i$  against the U.S. dollar, such that  $i=1,2,\dots,n$  and  $n$  is the number of non-dollar currencies included in the basket. Thus,  $\alpha_0$  represents the weight assigned to the dollar in the basket, whereas  $\alpha_i$  represents the weight assigned to currency  $i$ . The exchange rate of the KD against currency  $i$  is measured as a cross rate according to the equation

$$S'_k = \frac{S_0}{S_i} \quad (2)$$

$$\text{Hence: } S'_k = \frac{\alpha_0 + \sum_{i=1}^n \alpha_i S_i}{S_k} \quad (3)$$

Which can be expanded to

$$S'_k = \alpha_k + \frac{1}{S_k} \left[ \alpha_0 + \sum_{i=1}^{k-1} \alpha_i S_i + \sum_{i=k+1}^n \alpha_i S_i \right] \quad (4)$$

Thus,  $S'_k$  would be expected to rise (fall) if  $S_i$  is expected to rise (fall) and/or  $S_k$  is expected to fall (rise). For example, if  $S'_k$  is the exchange rate of the KD against the pound, then this rate would be expected to rise (the pound would be expected to appreciate against the KD) if non-dollar currencies in the basket appreciate against the dollar, and vice versa. Thus, any expectation on the exchange rate of the KD against a non-dollar basket currency is effectively expectation of the performance of the dollar against the other currency.

#### 4. Expectation Formation Mechanisms

In this section we present the expectation formation mechanisms that are used in this study. Let  $s_t$  be the logarithm of the spot exchange rate (measured as the price of one unit of the foreign currency), so that  $\Delta s_t$  is approximately the percentage change in the exchange rate at  $t$ . Notice that if  $\Delta s_t > 0$  then this is an

indication of the appreciation of the foreign currency and vice versa. We will use four versions of extrapolative expectations, which are represented by the equation:

$$\Delta s_{t+1}^e = \delta \Delta s_t, \quad \delta > 0 \quad (5)$$

$$\Delta s_{t+1}^e = (1 - \theta) \Delta s_t + \theta \Delta s_{t-1}, \quad 0 < \theta < 1 \quad (6)$$

$$\Delta s_{t+1}^e = \frac{1}{n} \sum_{i=0}^n \Delta s_{t-i} \quad (7)$$

$$\Delta s_{t+1}^e = \sum_{i=0}^{\infty} \beta^i \Delta s_{t-i}, \quad 0 < \beta < 1 \quad (8)$$

where the superscript  $e$  indicates the expected value. Hence,  $\Delta s_{t+1}^e$  is the expected change in the exchange rate during the period extending between  $t$  and  $t+1$ , such that the expectation is made at time  $t$ . In general, we define extrapolative expectations to imply positive dependence of period-to-period changes in the exchange rate, such that a rise in the exchange rate is expected to be followed by another rise and vice versa. Equation (5) says that the expected change in the exchange rate is a positive fraction of the current change. Equation (6) tells us that the expected change in the exchange rate is a weighted average of the current change and the previous period's change, such that the higher the value of the parameter  $\theta$  the greater is the weight assigned to the previous period's change. Equation (7) simply postulates that the expected change in the exchange rate is an  $n$ -period moving average of the actual changes. Finally, equation (8) says that the expected exchange rate is a geometrically declining distributed lag of actual changes. The difference between (7) and (8) is that (7) assigns the same weight to all of the actual changes, whereas (8) assigns greater weights to the most recent changes.

We also use two versions of the regressive expectation formation mechanism, which are given by:

$$\Delta s_{t+1}^e = \alpha \Delta s_t, \quad \alpha < 0 \quad (9)$$

$$\Delta s_{t+1}^e = -\lambda (s_t - \bar{s}_t), \quad 0 < \lambda < 1 \quad (10)$$

Equation (9) tells us that the expected change in the exchange rate is a negative fraction of the current change, implying that a rise in the exchange rate is expected to be followed by a fall and vice versa. Equation (10) says that the exchange rate tends to converge on a long-run equilibrium value,  $\bar{s}_t$ . If the

current level of the exchange rate is above (below) the long run equilibrium value, then the exchange rate is expected to fall (rise) by a fraction of the gap between the two rates. This is the specification popularised by Dornbusch (1976) since he first introduced it as an element of the sticky price monetary model of exchange rate determination.<sup>2</sup>

It can be demonstrated that equation (8) may also represent adaptive expectations as follows. The adaptive expectations hypothesis may be written as:

$$\Delta s_{t+1}^e - \Delta s_t^e = \kappa(\Delta s_{t+1} - \Delta s_t^e), \quad 0 < \kappa < 1 \quad (11)$$

which can be re-written as

$$\Delta s_{t+1}^e = \kappa \Delta s_{t+1} + (1 - \kappa) \Delta s_t^e \quad (12)$$

By applying the lag operator to equation (12) period by period, while at the same time multiplying by  $(1 - \kappa)^j$ , where  $j$  is the number of periods involved in the lag process, we obtain

$$(1 - \kappa) \Delta s_t^e = \kappa(1 - \kappa) \Delta s_t + (1 - \kappa)^2 \Delta s_{t-1}^e \quad (13)$$

$$(1 - \kappa)^2 \Delta s_{t-1}^e = \kappa(1 - \kappa)^2 \Delta s_{t-1} + (1 - \kappa)^3 \Delta s_{t-2}^e \quad (14)$$

and so on. By substituting the resulting equation into (12) and combining the terms, we obtain

$$\begin{aligned} \Delta s_{t+1}^e &= \kappa[\Delta s_{t+1} + (1 - \kappa) \Delta s_t + (1 - \kappa)^2 \Delta s_{t-1} + \dots] \\ &= \kappa \sum_{j=0}^{\infty} (1 - \kappa)^j \Delta s_{t-j+1} \end{aligned} \quad (15)$$

<sup>2</sup>Some economists (e.g. Takagi, 1991) take equations (5) & (9) to represent extrapolative expectations such that equation (9) represents destabilising or bandwagon expectations, whereas equation (5) represents stabilising expectations. Furthermore, if  $\delta$  or  $\alpha$  is equal to zero, then we have static expectations, whereas if  $\delta > 1$  then we have explosive expectations. We prefer to distinguish between extrapolative and regressive expectations on the basis of whether a rise in the exchange rate is followed by a rise or a fall. This is why equation (9) in our view represents one version of regressive expectations. Apart from terminology, the classification makes no difference for the objective of this study. It is interesting to note that Takagi (1991, p 171) uses the term “extrapolative” for “the obvious reason that the expected currency movement for the next period is given by past currency movement for the most recent period”, implying that only equations (5) & (9) represent extrapolative expectations. However, he then argues that extrapolative expectations imply that the expected change in exchange rate is a weighted average of changes in the current and last period as represented by equation (6). If this is the case, then there is no reason why extrapolative expectations cannot be represented by an n-period moving average or by an exponentially weighted moving average as in (7) & (8) respectively.

which resembles the GDL model represented by equation (8). Hence, we find no reason to use the term “adaptive expectations”.

## 5. Methodology

In this study a different approach to evaluating the validity of various expectation formation mechanisms is adopted, the approach recently suggested by Moosa and Shamsuddin (2000a, b). This is because there is a great deal of doubt about the reliability and stability of the estimated demand for money functions. This is particularly true for a country like Kuwait where it is difficult to find appropriate scale and opportunity cost variables. On the other hand, survey data are not available, and even if they were available they suffer from severe problems.

One must not forget the benefits associated with the use of survey data. Takagi (1991, p 156) argues for the use of survey data for this purpose on the grounds that this procedure allows the investigator to avoid the joint nature of conventional hypothesis testing and to separate the testing of an underlying model of exchange rate determination and a hypothesis about expectations. MacDonald (2000, p 69) argues that “survey data is especially valuable in trying to unravel the importance of risk premia in financial markets and also for determining the kinds of expectation mechanisms that best characterise the evolution of expectations”. However, there are at least three arguments against using survey data. First, there is no guarantee that those who take part in a survey have adequate incentive to disclose their true expectations. Second, even if the participants in a survey disclose their true beliefs, there is no precise link between average (or individual) expectations and the actual exchange rate. Third, the expected changes in exchange rates as reported in survey data tend to underpredict consistently the extent of actual movements (Takagi, 1991, p 160).

What is used as a criterion for model evaluation in this study is the profitability of trading based on the underlying mechanism, a procedure that is based on a simple idea. If an expectation formation mechanism is used by the majority of market participants who base their buy and sell decisions on signals obtained from this mechanism, then by acting upon these signals, they change the forces of supply and demand and drive the exchange rate in a particular direction. For example, if the expectation formation mechanism that is followed by the majority of market participants indicates that a currency is going to appreciate, they will react (ignoring the interest rate factor) by buying the currency, and so it will appreciate. Hence, the dominant expectation formation mechanism is the one that gives the most profitable buy and sell signals. The underlying reasoning here rests on the proposition that expectations of market participants lead to actions, and these actions create events (Harvey, 1999, p 181) and Davidson (1982).

To find out which mechanism leads to the most profitable trading, we assume that traders start with KD1000, which they use to buy and sell the pound. A buy decision is taken if the mechanism indicates a positive change in the exchange

rate, whereas a sell decision is taken if the mechanism indicates a negative change. If a decision to buy a foreign currency is taken then the position is held until a sell signal emerges, in which case the trader sells the foreign currency against the KD and waits until a buy signal arises again, and so on. The profit or loss per KD from a single buy-sell operation is then calculated as the difference between the sell and buy exchange rates. The cumulative trading profit is used as the criterion to determine the superiority or otherwise of one expectation formation mechanism over another.

For the purpose of this exercise, we need to choose values for the parameters  $\delta$ ,  $\theta$ ,  $\beta$ ,  $\alpha$  and  $\lambda$ . One way that is used in the literature to assign values to these parameters is to estimate the equations using observed values of the exchange rate. We reject this procedure because while each equation represents the behaviour of a certain group of market participants, the observed exchange rates represent the resultant of actions taken by these different groups. We, instead, resort to making an arbitrary but reasonable choice of the values of these parameters. We did, however, conduct some sort of sensitivity analysis by experimenting with various values of the parameters and found the results to be qualitatively unchanged. Our choice falls on the following values of the parameters:  $\delta = 0.5$ ,  $\theta = 0.4$ ,  $\beta = 0.6$ ,  $\alpha = -0.3$  and  $\lambda = 0.2$ .

## 6. Data and Empirical Results

The expectation formation mechanisms described in the previous section will be applied to monthly data on the exchange rate between the KD and the pound covering the period 1993-99. The data series was obtained from the Dealing Room of the National Bank of Kuwait. The validity of each mechanism is then determined by the profitability of the buy/sell operations based on it.

Table 1 presents the results pertaining to the direction accuracy associated with each expectation formation mechanism. All of these results are based on the actual and predicted month-to-month percentage changes in the exchange rate. The mechanism producing the most accurate prediction of the direction of change in the exchange rate is regressive expectations as represented by equation (9), whereas extrapolative expectations produce the worst results.

Table 2 shows the total net profit generated on the initial KD1000 by basing trading on the various expectation formation mechanisms. It is obvious that regressive expectations, as represented by equation (9), produce the largest profit, whereas regressive expectations based on equation (10) produce the largest loss. This means that traders form expectations on the basis of the most recent change in the exchange rate, anticipating it to move in the opposite direction by a fraction of that change. It also means that they do not think in terms of deviations from a long-run equilibrium value of the exchange rate.

## 7. Conclusion

The objective of this paper is to identify the expectation formation mechanism dominating the foreign exchange market when the domestic currency is pegged to a basket. The criterion used to identify the dominance of a particular mechanism is the profitability of trading based on that mechanism.

The empirical results presented in this study suggest that regressive expectations are more dominant than extrapolative expectations and that there is no evidence for the "twist" phenomenon. This indicates that most market participants believe that a rise in the exchange rate will be followed by a fall and vice versa. The results also show that traders do not base their expectations on deviations from a long-run equilibrium value but rather on the current change in the exchange rate.

The results obtained in this study are different from what is obtained for floating currencies, which normally show that expectation tends to be extrapolative within a time horizon of one month. The difference is likely to be due to the exchange rate arrangement. Expectations are regressive rather than extrapolative in this case because the exchange rate arrangement does not allow the KD exchange rates to establish and maintain sustained trends. The implication for trading is that long or short positions should be reversed not long after they have been established to avoid trading losses. As for policy, the finding is positive. The dominant expectation formation mechanism leads to stabilising speculation: this requires less intervention by the CBK, as the possibility of a speculative bubble becomes rather remote, unless there are exceptional circumstances.

## References

- Bank of Japan (1989) "External Balance Adjustment and Monetary Policy Management Under International Private Capital Flows." Mimeo. Research and Statistics Department, Bank of Japan.
- Cavaglia, S., Verschoor, W.F.C. and Wolff, C.C.P. (1993) "Further Evidence on Exchange Rate Expectations." *Journal of International Money and Finance*, Vol. 12: 78-98.
- Chinn, M. and Frankel, J.A. (1994) "Patterns in Exchange Rate Forecasts for Twenty-Five Currencies." *Journal of Money Credit and Banking*, Vol 26: 760-767.
- Davidson, P. (1982) "Rational Expectations: A Fallacious Foundation for Studying Crucial Decision Making Processes." *Journal of Post Keynesian Economics*, Vol 5: 182-198.
- Dominguez, K. (1986) "Are Foreign Exchange Forecasts Rational? New Evidence from Survey Data." *Economics Letters*, Vol 21: 277-82.
- Dornbusch, R. (1976) "Expectations and Exchange Rate Dynamics." *Journal of Political Economy*, Vol 84: 1161-1176.
- Frankel, J.A. and Froot, K.A. (1987a) "Using Survey Data to Test Propositions Regarding Exchange Rate Expectations." *American Economic Review*, Vol 77: 133-53.
- Frankel, J.A. and Froot, K.A. (1987b) "Short-Term and Long-Term Expectations of the Yen/Dollar Exchange Rate: Evidence from Survey Data." *Journal of the Japanese and International Economies*, Vol 3: 249-274.
- Frankel, J.A. and Froot, K.A. (1989) "Interpreting Tests of Forward Discount Bias Using Survey Data on Exchange Rate Expectations." *Quarterly Journal of Economics*, Vol 104: 139-161.
- Froot, K.A. and Frankel, J.A. (1990) "Exchange Rate Forecasting Techniques, Survey Data, and Implication for the Foreign Exchange Market." IMF Working Papers, No. 90/43.
- Harvey, J.T. (1999) "The Nature of Expectations in the Foreign Exchange Market: A Test of Competing Theories." *Journal of Post Keynesian Economics*, Vol 21: 181-200.
- Hodgson, G. (1985) "Persuasion, Expectation and Limits to Keynes, in T. Lawson and H. Pesaran (eds)." *Keynes's Economics: Methodological Issues*, New York, M.E. Sharpe, 10-45.
- Ito, T. (1990) "Foreign Exchange Rate Expectations: Micro Survey Data." *American Economic Review*, Vol 80: 434-49.
- Kim, S-J. (1997) "Testing the Rationality of Exchange Rate and Interest Rate Expectations." *Applied Economics*, Vol 29: 1011-1022.
- MacDonald, R. (2000) "Expectations Formation and Risk in Three Financial Markets: Surveying What the Surveys Say." *Journal of Economic Surveys*, Vol 14: 68-100.
- MacDonald, R. and Torrance, T.C. (1988) "On Risk, Rationality and Excessive Speculation in the Deutschmark-US Dollar Exchange Market: Some Evidence Using Survey Data." *Oxford Bulletin of Economics and Statistics*, Vol 50: 544-61.
- Moosa, I.A. (1989) "Has the KD Been Devalued Against the Dollar?" *Arab Banker*, Vol 9: 26-28.
- Moosa, I.A. (1999) "Testing the Currency-Substitution Model under the German Hyperinflation." *Journal of Economics*, Vol 70: 61-78.
- Moosa, I.A. (2000) *Exchange Rate Forecasting: Techniques and Applications*, London: Macmillan.
- Moosa, I.A. (2002) "Exchange Rates and Fundamentals: A Microeconomic Approach." *Economia Internazionale* (forthcoming).
- Moosa, I.A. and Al-Loughani, N.E. (1999) "Testing Purchasing Power Parity when the Base Currency is Pegged to a Basket." *Accounting Research Journal*, Vol 12: 200-211.
- Moosa, I.A. and Shamsuddin, A. (2000a) "Expectation Formation Mechanisms, Profitability of Foreign Exchange Trading and Exchange Rate Volatility." La Trobe University Working Paper.
- Moosa, I.A. and Shamsuddin, A. (2000b) "Trader Heterogeneity as a Source of Exchange Rate Volatility." La Trobe University Working Paper.
- Prat, G. and Uctum, R. (1996) "FF/\$ Exchange Rate Expectations Formation: Analysis of the Hypothesis of Changes in Processes over Time." Paper presented at Proceedings of the Third International Conference, Forecasting Financial Markets: New Advances for Exchange Rates, Interest Rates and Asset Management. London, 27-29 March.
- Tagaki, S. (1991) "Exchange Rate Expectations: A Survey of Survey Studies." *International Monetary Fund Staff Papers*, Vol 38: 156-83.
- Wakita, S. (1989) "Are Survey Forecasts Trusted? American Trade Account Deficit and Yen/Dollar Rate." *Economics Letters*, Vol 29, No. 4: 339-44.

**Table 1: Direction Accuracy**

<i>Mechanism</i>	<i>Correct</i>	<i>Incorrect</i>
Extrapolative (5)	28	41
Extrapolative (6)	30	39
Extrapolative (7)	28	41
Extrapolative (8)	33	36
Regressive (9)	45	24
Regressive (10)	31	38

**Table 2: Net Profit (Loss) on KD1000**

<b>Mechanism</b>	<b>Profit in KD</b>
Extrapolative (5)	(65)
Extrapolative (6)	(67)
Extrapolative (7)	(52)
Extrapolative (8)	(47)
Regressive (9)	136
Regressive (10)	(119)