Monday Effect on Exchange Rates when Working Days are Different from those of International Markets: The Case of Kuwait+

Ahmad S. A. ALREFAI* and Ali ARIFA
Kuwait University

Abstract: The Monday effect on exchange rates was investigated within the context of a small-open economy with working days that are different from those of international markets. The model was estimated as a GARCH(1,1)-M. Results reveal that the domestic currency appreciates when volatility increases, indicating that the market is dominated by risk stemming from international factors. Further, the domestic currency depreciates on Mondays once risk is controlled for; and a high volatility in domestic interest rates leads to currency depreciations. It is suggested that policymakers minimise the mismatch in the working days, and steps be taken towards enhancing the efficiency of the domestic money market.

1. Introduction

Finance literature has examined extensively the so-called weekend effect and Monday effect. Much of it has been concerned with the stock market. Empirical studies in this area commonly find significant negative market returns on Mondays. For instance, French (1980), Gibbons and Hess (1981), and Lakonishok and Levi (1982) who have all examined the Monday effect on stock prices find evidence to suggest that on average the rates of return tend indeed to be negative on Mondays. Likewise, Jaffe *et al.* (1989) using stock market data from the US, UK, Japan, Canada and Australia reach similar conclusions. Kim and Park (1994) document the holiday effects in the US, UK and the Japanese stock markets, taking into consideration the differences in institutional arrangements in these countries.

There are several explanations advanced by researchers in explaining this seemingly peculiar phenomenon. For example, Lakonishok and Levi (1982) attribute this puzzling phenomenon to the delay between the times of trade and settlement, as well as the delay in check-clearing processes. On the other hand, Jaffe *et al.* (1989) link the returns on a given Monday to previous week's returns. Their findings reveal that negative returns usually occur on a Monday when the returns on the week before were negative as well (i.e. there would be no Monday effect in case the market had previously risen). Liano and Gup (1989) on their part attempt to relate this phenomenon to the business cycle. In essence, they have advanced the argument that negative returns occur on Mondays particularly in times of low economic activity. Other studies have attributed the Monday effect to the types of investors that dominate the market on Mondays. Miller (1988), for example, hypothesises that self-initiating sell orders exceed self-initiating buy orders over the weekend and argues that

* Coresponding Author: Department of Economics, College of Business Administration
Kuwait University, State of Kuwait, P.O. Box 5486, Safat, Kuwait, 13055.
Email address:*refai@kuc01.kuniv.edu.kw*
+ The authors are grateful to an anonymous referee for valuable comments that improved an earlier version of this paper. All remaining errors are the authors' responsibility.

broker-initiated buy orders exceed the sell orders in the remaining days of the week, which would produce a Monday effect. Lakonishok and Maberly (1990) show that non-institutional investors dominate the market on Mondays with a tendency for their transactions to be dominated by sell orders. Kamara (1995) argues that individual traders primarily cause the Monday effect. He utilised the S&P 500 index for the period from 1962 to 1993, during which the dominance of institutional investors had increased significantly. His evidence reinforces the hypothesis that the Monday effect has declined significantly during the period under study.[1] On the other hand, Sias and Starks (1995) examined the Monday effect, controlling for returns and trading volume, with their findings indicating that negative returns on Mondays are more significant for stocks that are dominated by institutional investors.

Clearly, the debate on what might be a solid explanation to this phenomenon in the stock market is not settled in the literature. While most of this literature has dealt with this phenomenon as it occurs in the stock market, there is a substantially smaller number of resembling studies in the literature with exchange rates as a main theme. Indeed, there have been relatively few attempts to examine the likes of holiday- and weekend-effects on exchange rates. As examples of investigations of either the holiday effect or the weekend effect in the context of exchange rates, Glassman (1987) attempted to examine the bid-ask spreads of exchange rates of six major currencies using a framework involving a seemingly unrelated regression model. His results indicate that the second moment of exchange rates is an important factor in explaining variations in the volatility of spreads. The findings also reveal that the volatility of spreads is significantly higher prior to the weekend, which is attributed to the longer period of time an open position would need to be held. Hertzel *et al.* (1990) explored the trends in the ratio of the hourly return variance during trading-times to the hourly return variance during non-trading-times for five currency futures contracts. The findings reveal that the hourly return variance is greater during trading-times. Copeland and Wang (1993) found evidence to suggest lower returns and higher volatility on the dollar-pound exchange rates on Mondays and Thursdays relative to other days of the week. More recently, Bessembinder (1994) found evidence to support the proposition that bid-ask spreads in the wholesale foreign exchange market increase before non-trading periods, which he attributes to inventory costs. But overall, the relevant literature review seems to indicate that there are not many published studies with a main theme of the Monday effect on exchange rates, particularly in settings involving countries with an uncommon arrangement of working days.

It is worth mentioning that studies focusing on the impact of the Monday effect on exchange rates, however sporadic they may be, have mostly scrutinised the bid-ask spreads involving a transaction cost approach, or examined the unconditional variance of returns during trading and non-trading periods. Furthermore, these studies are exclusively limited to investigations pertaining to highly diversified developed economies. The present paper proposes an investigation of the Monday effect on the exchange rate in a small and not so diversified economy, Kuwait. Two main objectives are pursued in this paper. First, an effort is made to provide further evidence of the Monday effect as extended to the analysis of exchange rate volatility. Also, focusing the analysis on Kuwait, a country with many

[1] The Monday effect might have become less severe over time due to the communication revolution and liberalisation policies that have been adopted worldwide over the last few decades. These changes have made it easier to transfer funds, monitor prices, and transact across countries.

different features from those in commonly investigated countries, would make it possible to obtain additional insights into different possible causes of the Monday effect.

The rest of the paper is structured as follows: the next section offers brief background information on relevant features of the Kuwaiti economy, its exchange rate regime, and its current arrangement of working days. A description of the empirical model and the data set used in the investigation are presented in the third section. The results are presented in the fourth section. Policy recommendations and concluding remarks are summarised in the final section.

2. The Economy, Exchange Rate and Current Arrangement of Working Days

Kuwait is a wealthy country with an economy heavily dependent on oil. Nearly 80 per cent of budget revenues are from oil. Despite the latest attempts to stimulate privatisation, the private sector remains very weak and investment opportunities continue to be limited. As a consequence, it is quite common for economic agents in Kuwait to turn to foreign investment opportunities. While the behaviour of exchange rates and exchange rate policies have serious implications on business activities and the overall health of the economy in general, they do have even weightier implications in an economy whose general features are similar to Kuwait's economy. Indeed, as an open economy characterised by an abundance of liquidity and limited investment opportunities, the exchange rate in the Kuwaiti economy plays a particularly significant role in the arbitrage process between domestic and foreign investment opportunities. Therefore, any major exchange rate volatility linked to the so-called Monday effect or otherwise, would have significant implications in this type of setting.

The domestic currency in Kuwait is freely convertible and the exchange rate is set based on a basket peg consisting of the major currencies. Therefore, the exchange rate is determined in accordance with variations in the index relative to a basket of these currencies. Everyone in the country is conscious that the US dollar is the predominant currency in the basket, (although neither the rest of the currencies that make up the basket, or their relative weights in it are public knowledge). Moreover, the economy's key macro aggregates are denominated in US dollars. Consequently, the US dollar demeanor against major currencies in international markets impacts significantly the real purchasing power of oil revenues, the value of imports, and the value of assets invested abroad.

As mentioned earlier, the Kuwaiti economy is a fairly open economy. In particular, it is very much connected to the US economy. However, as open as the Kuwaiti economy may be, financial sector transactions with the rest of the world are subject to some regulations. Also, the ability to transact with the rest of the world is affected by the current sequencing of the working days in Kuwait. As the case in most Muslim countries, the working week starts on Saturday and extends to Wednesday. Thursday is a non-working day for the vast majority of economic sectors, except mostly for the financial sector including banking. Friday is a non-working day for almost all sectors including banking. This reduces the overlap of working days in Kuwait with most of its trading partners in major international markets to less than four full days only (i.e. Mondays, Tuesdays, Wednesdays, and possibly Thursdays). The bulk of the financial sector transactions originating from Kuwait would

come to a halt on a Thursday afternoon. The financial sector resumes working on Sunday, a holiday in most of the counterparts. Effectively, normal transacting would resume on Monday, only to last up to four days. Under these circumstances, the Monday effect is expected to be amplified by the fact that Mondays come after three to four days of non-activity, as opposed to only two days in most countries.

3. The Empirical Model

In this section, an exchange rate model compatible with the News model is estimated in to investigate the hypothesised Monday effect. It is constructed as a *GARCH(p,q)-M*, with a dependent variable reflecting excess depreciation. This dependent variable is postulated to be a function of risk premium, foreign and domestic interest rates, domestic money supply, exchange rates of major reserve currencies, as well as a dummy variable to test the hypothesised Monday effect.[2] In essence, this empirical model allows for the local exchange rate to react to foreign and domestic shocks. The precise specification of the adopted model is:[3]

$$\Delta({}_tF_{t-1} - s_t) = \lambda_0 + \lambda_1 h_t^{.5} + \lambda_2 \Delta(i_t - i_t^*) + \lambda_3 \Delta m_t + \lambda_4 \Delta s_{tDM} + \lambda_5 \Delta s_{tBP} +$$

$$\lambda_6 \Delta s_{tJY} + \lambda_7 \text{ Mond} + \varepsilon_t, \text{ where } \varepsilon_t \sim N(0, h_t), \text{ and}$$

$$h_t = \beta_0 + \beta_1 \varepsilon_{t-1}^2 + \beta_2 h_{t-1} + \beta_3 (\Delta s_{tDM})^2 + \beta_4 (\Delta s_{tJY})^2 + \beta_5 (\Delta s_{tBP})^2 +$$

$$\cdot \beta_6 \Delta(i_t - i_t^*)^2 + \beta_7 \Delta m_t^2 + \beta_8 \text{ Mond}$$

where the daily variables are described as

${}_tF_{t-1}$ = the expected forward rate at time "*t-1*" for the following period.
s_t = the price of one dollar in the Kuwaiti currency, (KD/$), and is calculated as the average daily exchange rate, based on transactions of the dealing room of the Central Bank of Kuwait with domestic and foreign banks.
h_t = the conditional variance.
i = the daily average of one month customer deposit rates denominated in Kuwaiti dinar, based on daily transactions of the banking system in Kuwait.
i^* = the one month customer deposit rates denominated in US dollar, based on daily transactions of the banking sector in Kuwait.
m_t = size of issued currency, which includes cash with local banks and currency in circulation (in million dinars).

---

[2] The inclusion of relevant variables to augment the GARCH has been advocated in the literature so as to provide more information to the estimation process; see for instance Hodrick (1989).

[3] For a discussion of some of the original articles on the GARCH models, refer to Bollerslev (1986), and Engle *et al.* (1987). Also, for a lucid discussion of ARCH models, see Bera and Higgins (1993).

s_{tBP} = the price of one British pound in US dollars, which is calculated as the average daily exchange rate, based on transactions of the dealing room at the Central Bank of Kuwait.

s_{tDM} = the average price of one dollar in Deutsche marks, (DM/$), and is calculated as the average daily exchange rate, based on transactions of the Central Bank of Kuwait with domestic and foreign banks.

s_{tJY} = the price of one dollar in Japanese yen, (JY/$), and is calculated as the average daily exchange rate, based on transactions of the dealing room of the Central Bank of Kuwait with domestic and foreign banks.

Mond = A dummy that takes the value of unity if the day corresponds to Monday and zero otherwise.

As mentioned earlier, this is a typical 'News model' that makes it possible to explain the unanticipated changes in the Kuwaiti dinar/dollar exchange rate. The dependent variable is the expected forward rate at time '*t-1*' for time '*t*' minus the actual rate at time t reflecting the unanticipated changes in the local exchange.[4] Thus, unanticipated changes in the dependent variable stem from changes in the spot rate at time '*t*'. Furthermore, if the domestic economy is small and open and with it being well integrated within world markets, then domestic variables would not be expected to explain much of the changes in the dependent variable. In fact, this framework makes it possible to test this very issue in the case of Kuwait.

The expected sign of the λ_i is unclear; it depends on the net effect of international and domestic factors on risk prevailing in the local market.[5] Higher volatility stemming from international variables is expected to lead the local currency to appreciate, as short-term Kuwaiti investments head back home to avoid the currency risk in international markets. Presumably, this would be expected to increase demand for the Kuwaiti dinar leading to its appreciation. When higher volatility stems from domestic factors, the reverse takes place as local investors look for investments elsewhere outside Kuwait increasing the demand for foreign currencies and the supply of the domestic currency. This tends to depreciate the domestic currency. Accordingly, if most of the effects related to risk premia stem from international factors, then the domestic currency should appreciate and the sign of λ_i would be positive. The reverse would take place if the risk premium is dominated by volatility stemming from domestic factors. However in this case, we expect that the more significant shocks should emanate from foreign sources. Under such circumstances, the coefficient would be expected to have a positive sign. Furthermore, it is assumed that the dollar would appreciate against the local currency when it is appreciating against other major currencies. Hence, the coefficients of the exchange rates would be expected to have negative signs.[6]

With respect to domestic variables, their statistical significance might be an issue in the context of this investigation. Indeed, there is no question that the Kuwaiti economy is a

---

4 There is no forward market for the Kuwaiti dinar. So, the forward at time *t* priced at time *t*-1 is assumed to equal S_{t-1}.

5 Pikoulakis and Mills (1994) showed that using a random walk process for exchange rates does not imply that the risk premium is necessarily equal to zero.

6 Unlike the other currencies, the British pound is expected to have a positive coefficient because it is quoted, as the number of foreign currency units per one British pound

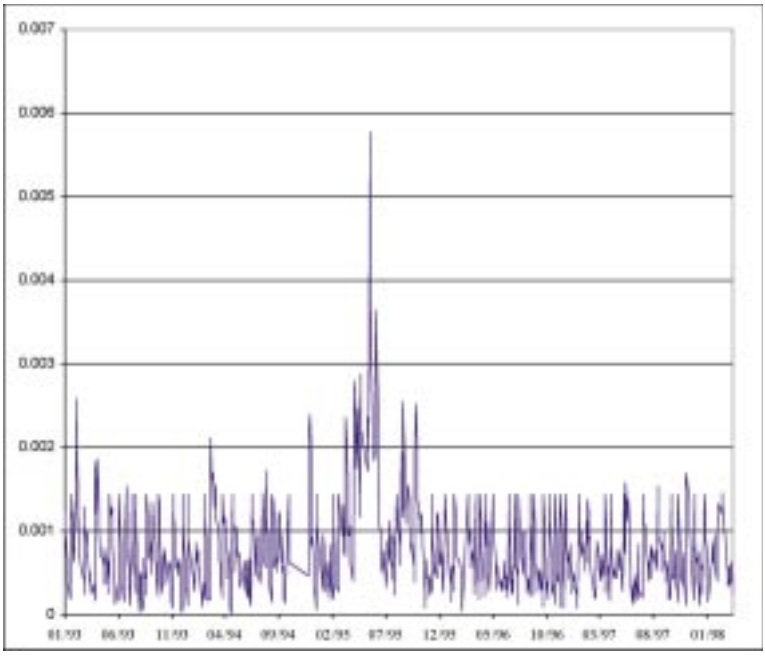

Figure 1 *: The conditional standard deviation*

fairly small one. But the verdict on the extent of the level of capital mobility in the Kuwaiti case is much less clear-cut. The country has some banking regulations that sometimes are perceived as a sticky point in the path of capital mobility. But overall, the Kuwaiti economy is small and fairly open by all standards. In which case, the expectations are such that the parameters λ_2 and λ_3 should be insignificant. Finally, in line with the literature, the domestic currency is expected to depreciate on Mondays, implying that the likely outcome for the coefficient is negative.

With respect to the variance equation, high volatilities in foreign exchange rates are expected to yield positive coefficients as higher risks in international markets are expected to increase capital inflows, leading the domestic currency to appreciate. This would happen because local investors are expected to minimise exchange rate risks. High volatilities in both the money supply and interest rate differentials are not expected to be significant, in line with the assumption used earlier. The coefficient of the volatility stemming from the Monday effect is expected to be positive reflecting the foreign source of this shock.

Accordingly, the expected signs of the coefficients of the mean and variance equations are as follows:

$$\Delta({}_{t}F_{t-1} - s_t) = \lambda_0 + \lambda_1 \overset{+}{h_t^{.5}} + \lambda_2 \Delta(i_t - i_t^*) \overset{0}{} + \lambda_3 \Delta m_t \overset{0}{} + \lambda_4 \Delta s_{tDM} \overset{-}{} + \lambda_5 \Delta s_{tBP} \overset{+}{} + \lambda_6 \Delta s_{tJY} \overset{-}{} + \lambda_7 \overline{\text{Mond}} + \varepsilon_t$$

$$h_t = \beta_0 + \beta_1 \varepsilon_{t-1}^2 + \beta_2 h_{t-1} + \beta_3 (\Delta s_{tDM})^2 + \beta_4 (\Delta s_{tJY})^2 + \beta_5 (\Delta s_{tBP})^2 + \beta_6 \Delta (i_t - i_t^*)^2 + \beta_7 \Delta m_t^2 + \beta_8 \cdot \text{Mond}$$

(+) (+) (+) (+) (+) (0) (0) (+)

4. Empirical Results

The model, as specified in the previous section, is estimated using 882 daily observations spanning the period January 1993 until March 1998.[7] Given that the error term is not expected to be normally distributed, the covariance matrix is adjusted as outlined in Bollerslev and Wooldridge (1992). This is expected to render the estimated parameters consistent given that the GARCH-M model is well specified. Note that all variables, with the exception of the dummy, are in logarithmic forms for the usual purposes. With the exception of the British pound, all other foreign exchange rates are tabulated as the number of units of the currency that is equivalent to one American dollar.

A variety of diagnostic tests were performed to ensure that the model is well specified. The optimal combination of the *p* and the *q* parameters of the GARCH are determined using the LM and the ARCH LM tests.[8] Both tests provided support for a GARCH(1,1)-M model. The use of the Akaike (1974) Information Criterion and the Schwarz (1978) Bayesian Criterion (1978) tests also support the specification advocated earlier.[9] In addition, the results show that the mean of the residuals is not significantly different from zero and the standard deviation is approximately equal to unity. The empirical distribution of the estimated residuals is fitted to different standard theoretical distributions with the logistic distribution coming out as a clear pick.[10] So overall, the diagnostic testing performed in this case seems to indicate that the model is well specified.[11] The conditional standard deviation is shown in Figure 1, revealing that the conditional standard deviation is relatively stable except for the months of March, April, May, and June of 1995. This instability is very likely attributed to the high volatility that swept the international markets in the aftermath of the Mexican financial crisis.[12]

The results of the estimation are listed in Table 1. The table indicates that higher volatility leads the domestic currency to appreciate. This implies that most of the risk

---

7 The authors thank the staff at the Central Bank of Kuwait for the provision of the relevant data.

8 This refers to the Lagrange multiplier test for autoregressive conditional heteroscedasticity in the residuals; refer to Engle (1982).

9 For detailed information about these tests, refer to Akaike (1974) and Schwarz (1978).

10 This was performed using BestFit, which is a trademark registered to Palisade Corporation, USA.

11 The testing procedure utilised the Kolmogorov-Smirnov, Anderson-Darling, and the Chi-Square goodness of fit tests, and all ranked the logistic distribution as their number-one pick. Similar to normal distribution, the logistic distribution is determined by the first two moments, but with a tendency to have a higher peak and fatter tails.

12 It is interesting to point out that unlike the Mexican crisis, the 1997 Asian economic crisis did not seem to significantly impact the behaviour of the domestic exchange rate.

Table 1: The estimated results of the GARCH (1,1)-M model

Conditional mean equation

$$\Delta({}_tF_{t-1} - s_t) = \lambda_0 + \lambda_1 h_t^{.5} + \lambda_2 \Delta(i_t - i_t^*) + \lambda_3 \Delta m_t + \lambda_4 \Delta s_{tDM} + \lambda_5 \Delta s_{tBP} + \lambda_6 \Delta s_{tJY} + \lambda_7 \text{Mond}$$

Symbol	Coefficient	Standard Error	Z-Statistic	P-value
λ_0	- 3.03 x 10^{-4}	6.17x 10^{-5}	-4.912833	0.0000
λ_1	0.502019	0.080787	6.214136	0.0000
λ_2	1.52 x 10^{-5}	3.01 x 10^{-5}	0.504766	0.6137
λ_3	5.50 x 10^{-4}	0.001846	0.297793	0.7659
λ_4	-0.093829	0.006711	-13.98118	0.0000
λ_5	0.042452	0.006624	6.408821	0.0000
λ_6	-0.046541	0.005535	-8.408644	0.0000
λ_7	-2.37 x 10^{-4}	7.93 x 10^{-5}	-2.988148	0.0028

Conditional Variance Equation

$$h_t = \beta_0 + \beta_1 \varepsilon_{t-1}^2 + \beta_2 h_{t-1} + \beta_3 (\Delta s_{tDM})^2 + \beta_4 (\Delta s_{tJY})^2 + \beta_5 (\Delta s_{tBP})^2 + \beta_6 \Delta (i_t - i_t^*)^2 + \beta_7 \Delta m_t^{\,2} + \beta_8 \text{Mond}$$

β_0	-5.67 x 10^{-8}	1.81 x 10^{-8}	-3.134136	0.0017
β_1	0.149042	0.033940	4.391315	0.0000
β_2	0.599717	0.040445	14.82799	0.0000
β_3	0.003864	9.87 x 10^{-4}	3.915362	0.0001
β_4	0.001677	5.85 x 10^{-4}	2.868405	0.0041
β_5	0.001365	9.01 x 10^{-4}	1.514457	0.1299
β_6	-3.84 x 10^{-7}	6.22 x 10^{-8}	-6.173963	0.0000
β_7	7.70 x 10^{-5}	5.83 x 10^{-5}	1.320340	0.1867
β_8	1.85 x 10^{-7}	8.67 x 10^{-8}	2.132489	0.0330

R^2=0.344 $\overline{R}^2$ = 0.332 Standard error=0.0015
Standard Deviation=0.0018

premia stem from international and not domestic variables. As expected, both the money supply and the spread between domestic and foreign interest rates are found to be insignificant. It is also found that the local currency depreciates against the dollar when the British pound, Japanese yen, or the Deutsch mark depreciate against the dollar. In other words, the dinar depreciates when the dollar appreciates against other currencies.

Furthermore, volatility does not seem to exhibit persistence as the sum of the ARCH and GARCH components amounts to 0.74 only, significantly less than unity. The evidence also shows that high volatility in the markets of the Japanese yen and Deutsch mark lead to an appreciation of the local currency against the dollar. The results also reveal that volatility

in the British pound has no impact on the domestic currency.[13] High volatility in the money supply does not impact risk premia, while high volatility in the interest rates differentials is found to be significant and negative. Hence, the high volatility is attributed to high fluctuations in the domestic interest rates.

The more important result is regarding the hypothesised Monday effect in the mean equation, namely, λ_7. It is found to be negative and significant. This implies that on average, the Kuwaiti dinar tends to depreciate on Mondays. In addition, its volatility levels tend to be higher on Mondays than during the rest of the week, leading the domestic currency to appreciate. This appreciation might be attributed to domestic agents moving their funds back to the domestic market. Thus, the Monday effect impacts the first two moments of exchange rate changes in a non-symmetric way. The net effect, however, of these opposing forces is to lead the domestic currency to depreciate, once the elements of risk are controlled for.

5. Concluding Remarks

The results of this investigation indicate clearly that the Kuwaiti currency, on average, depreciates on Mondays with an exhibition of higher volatility. This higher level of volatility tends to lead to an appreciation of the local currency. Nevertheless, the domestic currency actually depreciates once we control for risk premia. In line with the literature, it is argued that the prolonged non-trading of domestic entities with the international markets causes this increased volatility.

In addition, the results indicate that money supply does not seem to impact the first two moments of exchange rate changes. This is expected given that Kuwait is a small and fairly open market; it is an indication that the Kuwaiti economy is fairly integrated within the world economy. On the other hand, changes in interest rate differentials significantly impact the level of volatility. Higher volatilities in interest differentials lead the domestic currency to depreciate. This could be caused by domestic investors switching to the foreign currency to avoid interest rates related risks. Nevertheless, once risk is controlled for, interest rate differentials have no significant impact on the forward premium.

The evidence presented here also reveals that the local currency depreciates when the dollar is appreciating against major currencies, and the local currency appreciates when the reverse takes place. This is an indication that the domestic exchange rate follows a basket peg and is not fully pegged to the dollar. Furthermore, when the markets for foreign currencies are volatile, the local currency appreciates against the dollar. Again, this might be due to domestic investors moving their money back to Kuwaiti financial markets to avoid currency risks, which is expected to lead the domestic currency to appreciate as the demand for the local currency increases. Nevertheless, once risk is controlled for, the price of the Kuwaiti dinar against the dollar seems to exhibit the same direction of movement as the prices of other major currencies measured against the dollar.[14] Finally, the price of volatility λ_1 is

[13] This might reflect that the Kuwaiti economy trades less with Britain compared to the U. S., Japan and Germany.

[14] This study provides further evidence against the assumption that the domestic currency is fixed, as some researchers have been assuming.

found to be positive implying that the domestic exchange market is significantly impacted by risk emanating from international rather than domestic factors.

But overall, and in light of the findings in this paper, in particular with the respect to the evidence suggesting the presence of a Monday effect, it would be highly recommended that Kuwaiti policymakers consider matching the working days with those in international markets, or at least reduce the number of non-trading days. The five working days in the public sector should be re-arranged in a way that would eventually reduce the Monday effect on exchange rates. For example, working days starting on Sundays and ending Thursdays would partially accomplish this. Moreover, on the policy front, it may also be suggested to the Central Bank to be more involved in stabilising the interest rate differentials, particularly in the case of significant volatilities, so as to reduce the risk in the money market.

References

Akaike, H. 1974. A new look at the statistical model identification. *IEEE Transactions on Automatic Control* **AC-19(6)**: 716-723.

Bera, A. K. and M. L. Higgins. 1993. ARCH models: properties, estimation and testing. *Journal of Economic Surveys* **7**: 306-366.

Bessembinder, H. 1994. Bid-ask spreads in the inter-bank foreign exchange markets. *Journal of Financial Economics* **35**: 317-348.

Bollerslev, T. 1986. Generalized autoregressive conditional heteroscedasticity. *Journal of Econometrics* **31**: 307-327.

Bollerslev, T. and J. M. Wooldridge. 1992. Quasi-maximum likelihood estimation and inference in dynamic models with time varying covariance. *Econometric Review* **11**: 143-172.

Copeland, L. and P. Wang. 1993. Estimating daily seasonal in financial time series: the use of high-pass spectral filters. *Economic Letters* **43**: 1-4.

Engle, R. F. 1982. Autoregressive conditional heteroscedasticity with estimates of the variance of UK inflation. *Econometrica* **50**: 987-1008.

Engle, R. F., D. Lilien and R. Robins. 1987. Estimating time varying risk premia in the term structure: the ARCH-M model. *Econometrica* **55**: 391-407.

French, K. R. 1980. Stock returns and the weekend effect. *Journal of Financial Economics* **8**: 55-70.

Gibbons, M. and P. Hess. 1981. Day of the week and assets returns. *Journal of Business* **54**: 579-596.

Glassman, D. 1987. Exchange rate risk and transactions costs: evidence from the bid-ask spreads. *Journal of Money and Finance* **6**: 479-490.

Hertzel, M. G., C. S. Kendall and P. E. Kretzmer. 1990. The volatility of asset returns during trading and nontrading hours: some evidence from the foreign exchange markets. *Journal of International Money and Finance* **9**: 335-343.

Hodrick, R. J. 1989. Risk, uncertainty and exchange rates. *Journal of Monetary Economics* **23**: 433-459.

Jaffe, J. F., R. Westerfield and C. Ma. 1989. A twist on the Monday effect in stock prices: evidence from the U.S. and foreign stock markets. *Journal of Banking and Finance* **13**: 641-650.

Kamara, A. 1995. New evidence on the Monday seasonal in stock returns. *Working Paper* (University of Washington).

Kim, C. W. and J. Park. 1994. Holiday effects and stock returns: further evidence. *Journal of Financial and Quantitative Analysis* **29**: 146-157.

Lakonishok, J. and M. Levi. 1982. Weekend effects on stock returns: a note. *Journal of Finance* **37**: 883-889.

Lakonishok, J. and E. Maberly. 1990. The weekend effect: trading patterns of individuals and institutional investors. *Journal of Finance* **40**: 231-243.

Liano, K. and B. E. Gup. 1989. The day-of-the-week effect in stock returns over business cycles. *Financial Analysis Journal* **45**: 74-77.

Miller, E. M. 1988. Why a weekend effect? *Journal of Portfolio Management* **15**: 42-48.

Palisade Corporation: BestFit, Version 2, USA.

Pikoulakis, E. and T. C. Mills. 1994. The random walk hypothesis of the exchange rate: implications for risk premium. *Economics Letters* **45**: 203-205.

Sias, R. W. and L. Starks. 1995. The day of the week anomaly: the role of institutional investors. *Financial Analysts Journal* **51**: 58-67.

Schwarz, G. 1978. Estimating the dimension of a model. *Annals of Statistics* **6**: 461-464.