Liquidity constraints and the demand for assets: an application to the festivity effect

Karim M. Abadir and Laura Spierdijk*

Imperial College London and University of Twente

ABSTRACT: The liquidity patterns of investors provide a new common framework to explain the autocorrelation of returns, as well as some calendar anomalies. Festivities are occasions around which liquidity constraints are particularly relevant, leading to a "festivity effect". This effect refers to a pre-festivity quiet period of negative or no returns and, once the occasion is over, a post-festivity period of positive returns. Considering data from Muslim countries with well-established stock markets, we demonstrate this effect around the festive month of Ramadan which occurs every year at a different time of the Western calendar. The result can therefore not be attributed to a fixed-calendar effect.

KEYWORDS: Liquidity constraints, autocorrelation of returns, festivity effect, January effect, anomalies. (*JEL* Classification: G14, G15)

Corresponding author: Karim Abadir, Tanaka Business School, Imperial College London, South Kensington Campus, London SW7 2AZ, UK (k.m.abadir@imperial.ac.uk or l.spierdijk@ewi.utwente.nl)

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1 Introduction

Liquidity plays a role in the pricing of financial assets. There is an increasing body of evidence and explanation for this, mostly coming from the microstructure literature; e.g., see the survey by Easley and O'Hara (2003). The focus has been mainly on the liquidity of the asset directly, rather than on the liquidity constraints facing market participants. The latter's indirect role has been less prominent and more recent. For example, McGrattan and Prescott (2001) show how changes in borrowing constraints can explain the long-standing Mehra-Prescott equity premium puzzle; see also Mehra and Prescott (2003).

In this paper, we focus on the liquidity of investors, showing how her rational behavior subject to liquidity constraints provides a common framework to explain a number of patterns in the demand for (hence returns on) assets that may otherwise appear to be 'inefficient'. The model gives rise to periods of seeming underreaction and others of seeming overreaction, with persistence (autocorrelation) in each type of period. It also uncovers new anomalies and contributes to the explanation of older ones such as the January effect. Festivities such as Christmas and New Year are periods where liquidity changes dramatically, contributing to the January effect.

The January effect may be due to alternative factors, such as the end of the tax year which occurs at a fixed date in the Western (i.e., Gregorian) calendar in all countries. Therefore, we study a festivity that occurs every year at a different date. In particular, we consider Muslim Ramadan that follows a different calendar from the Gregorian one. Ramadan occurs about 11 days earlier every year, gradually moving from summer to winter and so on. This provides us with a means of testing whether price patterns occurring around the times of festivities are a genuine effect, or whether they

are a fixed-calendar effect.

Considering data from Muslim countries with well-established markets, we find that anomalies exist around festive times and that they follow the patterns that our theoretical model predicts. For example, we find that index returns tend to be negative before festivities (when investors liquidate positions or can spare little to invest in the market), and positive after the festivities (when re-investment takes place).

The anomalies we uncover reflect economically significant effects. For example, we find excess returns of as much as 4% on a weekly basis. However, as market participants start detecting these effects, they may move over time to earlier calendar locations. We find this by means of recursive least squares (RLS) in the market with the longest track record in our sample. As Schwert (2003) indicates, anomalies could also be arbitraged away and disappear once they are pointed out.

The setup of this paper is as follows. Section 2 introduces a simple model to illustrate the effect of changes in the liquidity constraint of an individual investor. In Section 3, we discuss Muslim Ramadan as a festivity that moves over time relative to the Western calendar. We also give a brief overview on the markets we analyze. In Section 4, we consider the literature related to this festivity. We also summarize the literature on other effects that are relevant to the topic of this paper. This leads us to Section 5, where we report the results of the empirical analysis. Finally, we conclude the paper with some comments in Section 6.

2 Liquidity constraints and the demand for assets

We introduce a graphical two-period model to illustrate the effect of liquidity constraints on an individual investor. Let c_t and c_{t+1} denote consumption flows (in real terms) during periods t and $t+1$. These are the axes in Figure 1. Point E is the endowment point at which all income is consumed in the period where it occurs. Borrowing to finance additional current consumption can be undertaken at a rate i_b, leading to the solid line to the right of point E with slope $-1-i_b$. The person may consume less than is earned in period t, investing the balance to finance future consumption. This gives rise to the solid line to the left of point E with slope $-1-i_f$, where i_f is a risk-free rate of return over a one-period horizon. We observe that i_b for individuals is typically higher than i_f, and we call this a liquidity or borrowing constraint. The two solid lines form the budget constraint, which would be a straight line if $i_f = i_b$. The difference between the two rates is a fact, even in the most developed financial markets. For example, UK mortgage rates for individuals with a good credit rating are currently about 2% over the LIBOR rate of 4.5%, quite a substantial top-up in the best cases of credit-worthiness. The other extreme case of not being able to borrow is one whereby $i_b = \infty$, and the budget line to the right of point E is vertical. We assume that the investor is a price taker, so i_f and i_b are exogenously given to her.

The individual maximizes lifetime utility by choosing the highest indifference curve that still touches the budget line. In the traditional case of a straight budget line, a slight change in preferences leads to a reallocation of consumption.[1] This is not so here. In Figure 1, we see that the individual

[1] We exclude the unrealistic case of a corner solution along one of the axes, whereby no

can end up being at the kink point E, for a range of different preferences illustrated by two alternative indifference curves, U_F and U_P. The former indicates a relatively higher preference for future consumption c_{t+1} over present consumption c_t at point E, given the relative slopes (marginal rates of substitution) of U_F and U_P at E. However, this difference has no effect on asset allocation in the two cases: for both types of preferences, E remains optimal and all earnings are consumed in the period where they occur. Intuitively, the spread between borrowing rates and the return on treasuries (or other risk-free equivalents) acts as a penalty on credit market activity and on the reallocation of income to consumption in another period. We can also present this analysis in terms of i_b and i_f, highlighting further the likelihood of E being the equilibrium point. When maximizing utility, three possibilities exist for the maximum point:

1. if the slope of U at that point lies in the interval $(-1 - i_b, -1 - i_f)$, then the solution point must be E;

2. if the slope is exactly equal to $-1 - i_b$, then the solution will either be at E or along the portion of the budget line to the right of E;

3. if the slope is exactly equal to $-1 - i_f$, then the solution will either be at E or along the portion of the budget line to the left of E.

Again, it is assumed that no corner solutions arise (see footnote 1), so that the slope cannot be outside the closed interval $[-1 - i_b, -1 - i_f]$. The length of the interval is equal to the spread $i_b - i_f$.

There is another case where E remains the equilibrium point in spite of changes occurring. Now suppose that preferences are fixed, but that i_f

consumption is undertaken in one of the periods.

increases. The dashed line becomes the new budget constraint to the left of E in Figure 2. The highest level of utility is still achieved at point E, entailing no changes to the asset allocation of this individual. This seeming underreaction will persist until there is a larger increase in i_f, for example up to the level given by the dotted line. At this point, the optimal current consumption declines from C to C', the rest of current income being invested. A higher level of utility is achieved at U'. In practice, both parts of the solid line move in the same direction. Nevertheless, this simple illustration and the one in Figure 1 have interesting implications.

First, investors do not react to changes in market conditions until a certain level of i_f is reached (and similarly for i_b). After this level, a slight increase in i_f will lead to increased investment, which may seem like an overreaction, given the earlier inaction. If enough individuals act in this way, then changes in individual demands for financial assets will build up and have an impact on aggregate demand: market prices and returns (denoted by r_t henceforth) will be affected accordingly. Market overreaction and return autocorrelations have been documented, for example, in De Bondt and Thaler (1985, 1987), Chopra et al. (1992) and Daniel et al. (1998). Our Figure 2 implies periods of persistent below-average reactions followed by periods of above average responses, and this will give rise to positive serial correlation in the short run (often called momentum) followed by negative serial correlation in the medium run. This is because the autocorrelation of the market return with its k-th lag is

$$\rho_k \equiv \mathrm{E}\left[\left(r_t - \mu\right)\left(r_{t-k} - \mu\right)\right], \tag{1}$$

where $\mu \equiv \mathrm{E}\left(r_t\right)$ is the mean of the stationary returns series. If a negative value of $(r_t - \mu)$ coincides, on average, with a negative value of $(r_{t-1} - \mu)$, then $\rho_1 > 0$. A similar reasoning applies to establishing negative autocor-

relation at long lags. Note that, if these changes in market conditions are calendar-related, they can also give rise to a succession of significant seasonal dummy variables in the dynamic evolution of r_t, with these dummies switching from positive to negative or vice-versa.

Second, a festive period is one where current consumption is more valued than usual, and this has an effect on the slope of the whole indifference map. Let t be the period of festivity and pre-festivity lumped together, and $t+1$ be the post-festivity period. Then, one unit of consumption becomes less valued than usual in $t+1$ relative to t, and the indifference map becomes much steeper than usual, with the equilibrium point moving further to the right where liquidity constraints are more binding (steep part of the budget line). This means that the current demand for financial assets is less than usual at t and more than usual at $t+1$. If i_f and i_b differ substantially, the kink at E will be more pronounced and the adjustment will be less smooth than in the case of a straight budget line ($i_f = i_b$). Therefore, this festivity effect is more likely to occur in countries with financial markets that are less developed, in the sense of accessibility of credit markets, ease of margin trading, etc. In some of the countries that we will consider, mortgage laws do not even exist as yet. However, the festivity effect can also occur in developed markets. For example, Ariel (1987) finds that the two weeks starting with the last day of each month, and in particular the first few days of these two weeks, provide significant positive excess returns compared to the rest of the month.[2] The same finding holds even more dramatically for the two weeks that follow Christmas and New Year festivities. Furthermore, Hensel and

[2]The last day of the month happens to coincide with the time of most salary payments. According to the analysis of this section, some of these are then invested in the markets, leading to excess demand and excess returns relative to the rest of the month.

Ziemba (1996) show how abnormal returns can be earned by exploiting this anomaly around the turn of the month. Such effects can be detected by seasonal dummy variables, rather than autocorrelations as in the previous paragraph.

3 The Ramadan festivity and Middle-Eastern markets

The Islamic year is based on a lunar calendar, referred to as the Higri or Hijri calendar. This calendar contains twelve months that start with the new moon. Since a lunar month contains only 29.53 days, the Islamic year is approximately eleven days shorter than the Gregorian year. Ramadan is the ninth month of the Muslim calendar. During the entire month of Ramadan, able adults are supposed to fast while the sun shines. At the end of the day, a lavish meal breaks the fast, including special expensive dishes that are not consumed on a daily basis in other months. It is well documented that food prices increase substantially before and during the month of Ramadan, thus making the budget constraints of most individuals even more binding than usual. In terms of the graphs of Section 2, the whole budget line shifts inwards towards the origin, since the axes are in terms of real (not nominal) consumption. The end of Ramadan is followed by the feast of Eid al-Fitr, which lasts three days.

We study four predominantly Muslim countries: Egypt, Jordan, Pakistan, and Turkey; see Table 1. We analyze the impact of Ramadan on index prices. Ramadan lasts for four weeks, so that it is possible not only to analyze before and after the festivity, but also what happens during the festivity period itself.

The trading platforms we consider have witnessed substantial growth during recent years and belong to the most important ones of the regions. Other prominent exchanges (e.g., Saudi Arabia, Kuwait, Iran) certainly merit attention, but are excluded from the analysis because no data were available in Datastream. Incidentally, none of the markets under consideration are from oil-rich countries where the concentration of wealth is very high. Table 2 provides some stock market statistics for the exchanges under consideration, including market capitalization (total dollar value of domestic shares outstanding), total value traded (total value of the shares traded), turnover ratio (ratio of total value traded to market capitalization), and the total number of stocks listed on the exchanges. All figures apply to the end of the year 2004 and are obtained from the web sites of the Federation of Euro-Asian Stock Exchanges (Egypt, Jordan, Pakistan, Turkey).

The Istanbul Stock Exchange (ISE) is the largest in terms of market capitalization. It also features relatively high turnover, which can be regarded as a measure of stock market liquidity. As for the Egyptian market, the Financial Times reported growth of 94% in dollar terms, making it "the best performing bourse in the world during the last two years".[3] In 2004, the Egyptian Financial Group Index (EFGI) rose by 110%. The Karachi Stock Exchange in Pakistan, although smaller than the Turkish and Egyptian trading platforms, is characterized by extremely high turnover and has been repeatedly ranked among the best performing exchanges in the world by Business Week and USA Today.

We focus on the most widely quoted stock indexes for each case. By

[3]See http://weekly.ahram.org.eg/2004/723/ec1.htm for details on Egypt, and http://www.menafn.com/updates/research_center/Regional/Weekly/jord300105.pdf for Arab markets, including Egypt.

focusing on indexes, we avoid the issues of price limits for individual stocks. For example, for much of the sample period, Egypt had price limits on each stock, so that it stopped trading for the whole day once the limit of $\pm 5\%$ was reached; for example, see Osler and Tooma (2004). The aggregate index is less sensitive to these irregularities than individual stocks. Such irregularities would bias estimates, if not accounted for. They introduce complications that would be interesting to study, but which are tangential to the objectives of our paper.

4 Related studies

This section consists of two parts. We review the literature on the effect of festivities in these markets, also considering the literature on the effects of other holidays on stock prices beyond these markets. Then, we summarize existing interpretations of other effects, which may have a bearing on festivities.

4.1 Literature relating to festivities

The literature has paid relatively little attention to the impact of festivities on stock returns. The few studies that exist do not consider the weeks before and after these festivities. The motivation for studying these periods follows from the analysis of liquidity constraints that we have introduced. As we shall see, these periods produce important patterns, more so than the festive period itself.

Husain (1998) analyzes the Pakistani stock market and demonstrates that volatility is significantly lower during the weeks of Ramadan. He does not find any significant changes in average returns during Ramadan. Comparable

results are established by Seyyed, Abraham, and Al-Hajji (2005) for the Saudi Arabian stock market. They analyze several sector indexes in this market and show that volatility and trading activity drop significantly during Ramadan. Similar to Husain, they do not find any significant effects in average returns *during* Ramadan.[4]

Alper and Aruoba (2001) analyze various macroeconomic variables in Turkey. They show that the usual seasonal adjustment procedures based on fixed holidays often fail to remove all seasonality when the series are subject to moving holidays like Ramadan. However, the stock indexes that they analyze do not exhibit any significant Ramadan periodicities. On the other hand, Oğuzsoy and Güven (2004) consider the ISE in the couple of days before and after the feast of Eid al-Fitr, and find a substantial positive effect two days before the feast. They do not consider other periods around Ramadan nor other festivities, and they do not estimate autocorrelations and their potentially distorting effects on inference (t-ratios).

An issue that is related to festivities is the behavior of stock indexes around the holy days of religions. Frieder and Subrahmanyam (2004) analyze the S&P500 index and NYSE trading volumes around open-market religious holidays, focusing on the Jewish High Holy Days of Rosh Hashanah and Yom Kippur and the Christian holy day of St. Patrick's. They show that volume drops on Rosh Hashanah and Yom Kippur, with prices tending to increase during the two days that precede Rosh Hashanah and St. Patrick's.

Also related to festivities is the pre-holiday effect. Lakonishok and Smidt

[4]Less well documented evidence for Ramadan effects in average returns is given in a recent IMF country report on Pakistan (2004), where it is noticed that prices tend to increase during Ramadan. Additionally, various Arab investment web sites such as http://www.adcci.gov.ae:90/public/media/Magazines/jan_2000/stock_market_.htm report that stocks prices show distinct behavior around Ramadan.

(1988), Ariel (1990), and Cadsby and Ratner (1992) show that pre-holiday returns are higher than usual. However, the holiday effect is not about festivities in particular. Two differences come to mind. First, festivities are more than just a holiday. They occur infrequently and are expensive, emphasizing the relevance of the budget constraint setup of Section 2. Second, in a case where the pre-festivity effects is positive in Section 5, recursive estimates show that it only became significant in the recent past, which may be due to market participants learning about the post-festivity effect and taking advantage of it earlier.

4.2 Existing interpretations of related effects

There exists a vast literature documenting the role of moods and cultural factors on investments. Generally, when people are in an optimistic mood, they feel confident and want to buy assets. This causes prices to rise. Similarly, when people have a pessimistic state of mind, they are less confident. A tendency to sell assets ensues, leading to price decreases. A typical example is highlighted in the literature on the relation between weather-induced mood and equity returns. Saunders (1993), Hirshleifer and Shumway (2003), and Kamstra, Kramer, and Levi (2002) all find that stock returns increase with sunshine. Another issue that is more closely related to the subject of this paper is discussed in Frieder and Subrahmanyam (2004). Stock returns tend to be negative after Yom Kippur (which is solemn), whereas they tend to be positive after Rosh Hashanah (which is joyful). Stulz and Williamson (2003) consider interesting comparative cultural features and their effects on creditor's rights. See also Nofsinger (2003).

Various explanations have been given for the January effect, including window dressing and the tax-loss selling hypothesis. Window dressing is

a phenomenon related to institutional trading and applies to institutional investors who want to get rid of low-return stocks before the reporting date in December. In January they simply buy back those stocks to maintain the original portfolios, resulting in higher returns in January relative to the other months of the year. However, Odean (1998) shows that the opposite behavior (profit-taking) is more prominent. Also, although window dressing might play a role, institutional investment plays a much smaller role in the markets we consider than in developed markets.[5]

Finally, one might wonder whether effects related to Ramadan are merely caused by seasonal effects in returns. However, seasonality is not an issue here, since Ramadan occurs almost two weeks earlier every year, relative to the Gregorian calendar. Over the years 1985–2004, Ramadan took place in the months of October to May, so seasonality that has a fixed location in the Gregorian calendar cannot account for Ramadan effects. Nevertheless, we include dummies for the weeks of January in the analysis, to account for possible January effects.

5 Empirical findings

Weekly closing prices for the stock indexes are obtained from Datastream. The names of the stock indexes, the sample periods, and the number of observations are displayed in Table 3. Logarithmic returns are obtained from the index prices. Corresponding to each weekly return, we construct dummies for

[5] For example, see http://www.exchange-handbook.co.uk/articles_story.cfm?id=43108 for information on this aspect from the Middle East Exchange Handbook; also http://www.fibv.com/WFE/home.asp?action=document&menu=266&nav=ie for the World Federation of Exchanges.

the Ramadan weeks using an Excel add-in called CalendarMath.[6] This program has been double-checked by comparing the generated Ramadan weeks to some known Ramadan dates in the past. We also construct dummy variables for the four weeks preceding the festivities as well as for the four weeks that follow the event. For $j = 1, \ldots, 4$, these will be denoted by "befRam$j$" for week j before Ramadan, "Ram$j$" for week j of Ramadan, "aftRam$j$" for week j after Ramadan. We construct dummy variables for the weeks of January (for the January effect), denoting week j by "Jan$j$". Finally, the Jordanian series contains three strong outliers: on 08/10/90, 05/03/02, and 05/10/02. We create dummies for these, to avoid their distorting influence on the estimation of the other parameters.

Returns are regressed by least squares on their lags, as well as

$$\text{befRam}j,\ \text{Ram}j,\ \text{aftRam}j,\ \text{Jan}j, \quad \text{for } j = 1, 2, 3, 4 \tag{2}$$

and the relevant outlier dummies. Thus, the regression takes the form

$$r_t = \alpha_0 + \sum_{j=1}^{p} \rho_j r_{t-j} + \sum_{j=1}^{d} \alpha_j D_{j,t} + \varepsilon_t \tag{3}$$

where $D_{j,t}$ is the value of dummy j (e.g., "Ram1") at time t. The Akaike and Schwarz information criteria indicate that $p \leq 4$ is optimal for our data set. We report heteroskedasticity and autocorrelation consistent (HAC) t-ratios in parentheses, which takes care of inference in the presence of omitted heteroskedasticity of unspecified form (including ARCH-type).[7] We remove

[6] http://www.geocities.com/couprie/calmath/index.html

[7] We find evidence of asymmetric EGARCH volatility in these series. A few dummies are significant in such a specification as well. Volatility tends to drop near the feast of Eid al-Fitr, an indication of reduced activity. The analysis of Section 2 has direct implications for the patterns in returns, but only indirectly for volatility, which explains the focus of Section 5.

insignificant coefficients when the p-value exceeds 10% and we do not report the coefficients of Jordan's outlier dummies in the table.

The results in Table 4 are as expected from Section 2. First, all markets have positive autocorrelations in returns at short lags of within a month. The total contribution of each dummy to expected returns is given by

$$\mu_k \equiv \frac{\alpha_k}{1 - \sum_{j=1}^{p} \rho_j}, \quad k = 0, 1, \ldots, d, \tag{4}$$

where $\sum_{j=1}^{p} \rho_j < 1$ since the return series are stationary. For example, Table 4 indicates that in Pakistan the average additional return from week 1 after Ramadan is

$$\frac{0.013}{1 - 0.20 - 0.062} \approx 0.018. \tag{5}$$

Second, all countries have a strong post-Ramadan effect, taking place in the first week after Ramadan is over ("aftRam1"). Their effect on average returns is economically substantial relative to the weekly average (compare the line for "aftRam1" to the first line of the table).

Third, before and during the month of festivities, Section 2 leads us to expect little activity or even some liquidation of assets to finance consumption. Two confirming findings arise from the table. We find that, during Ramadan, none of the dummies are significant except the one for the second week in Turkey's case. This tends to confirm the results of Husain (1998) and Seyyed et al. (2005), who find no effect by looking at the month of Ramadan itself. We also find that Jordan and Pakistan have negative effects before Ramadan. Of the four countries, these two are the ones with smaller markets (see Table 2) and where investors are more likely to liquidate some positions.

The only exception to our expectations was Turkey's positive coefficient in week 2 of Ramadan ("Ram2"). We investigate the evolving dynamics of

this coefficient by RLS, and we display the results in Figure 3. We find that this effect only became significant at the turn of the century. Hence, when market participants started noticing the positive after-Ramadan effect, they began taking advantage of it at an earlier stage. This interpretation is confirmed by Figure 4, where the positive coefficient for week 1 after Ramadan ("aftRam1") exhibits a downward trend to near the insignificance boundary.

The negative effect in the fourth week after Ramadan ("aftRam4") in Egypt is an indication of a correction to the larger positive jump in the first week after Ramadan ("aftRam1"). We also find that the first two weeks of January have a positive impact on the markets in Table 4, with the exception of Egypt where the effect happens later in week 3. This is because approximately 18% of Egypt's population are Orthodox Christians who celebrate Christmas on 7 January (it is a national holiday in Egypt for this reason), two weeks later than the Western Christmas of 25 December. This delay to the January effect is predicted by our theoretical model. It also illustrates the effect of yet another festivity.

6 Concluding comments

This paper provides a common framework to explain some liquidity-induced phenomena like autocorrelation patterns in stock returns and some calendar anomalies. Our method contributes to interpreting well-known anomalies like the January effect, in terms of the festivities of Christmas and New Year. More generally, it allows us to predict a new class of anomalies that we call the "festivity effect". This effect refers to a quiet pre-festivity period of negative or no returns, and an active post-festivity period of positive returns. We establish the significance of this effect around the Muslim Ramadan festivity.

Since this festivity takes place every year at a different time of the Western calendar, we are able to classify the findings as genuine festivity effects rather than year-end effects caused by tax-loss motives or window dressing.

As with any theory, it may be that these empirical findings (autocorrelation, Ramadan effect, January effect, and Orthodox Christmas effect) each have a different explanation. However, it is a good indication of the reliability of a theory when, within a simple and realistic framework, it is able to provide explanatory and predictive power for a variety of different phenomena. Our approach is not limited to the effects discussed in this paper. Other anomalies may be interpreted and/or uncovered by our method in the future.

Since emerging markets have witnessed increased interest from both individual and institutional investors during recent years, it is also important to address the economic value of the effects found in this paper. We show that Ramadan currently exert substantial impact on index returns. For instance, Ramadan can even contribute an additional 4% to weekly index returns. Therefore, the influence of these festivities on index returns deserves the attention of investors.

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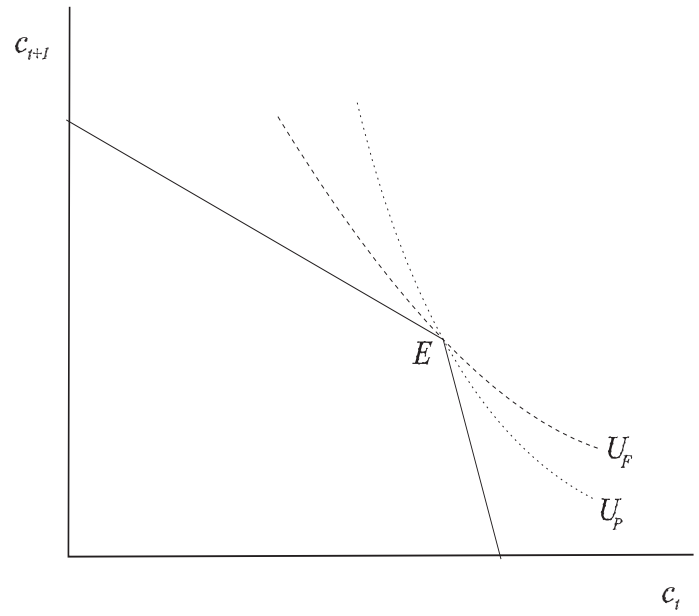

Figure 1: Alternative indifference curves, U_F and U_P, the former reflecting relatively higher preference for future consumption c_{t+1} over present consumption c_t at endowment point E, yet this difference has no effect on asset allocation: E remains optimal and all earnings are consumed in the period where they occur.

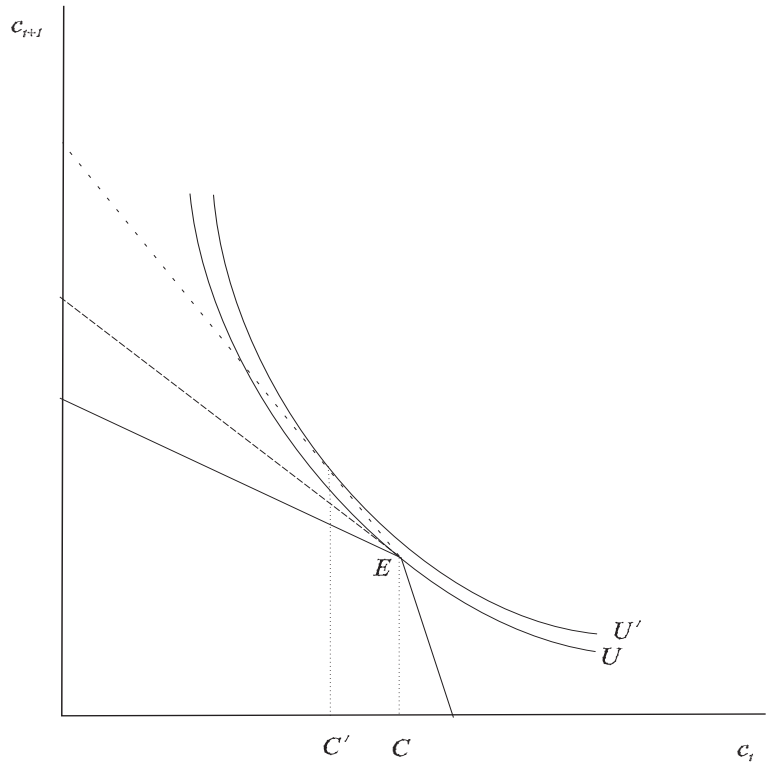

Figure 2: Changing returns and their effect on consumption (c_t and c_{t+1}) and asset allocation, with E as the point of endowment and U, U' as two indifference curves.

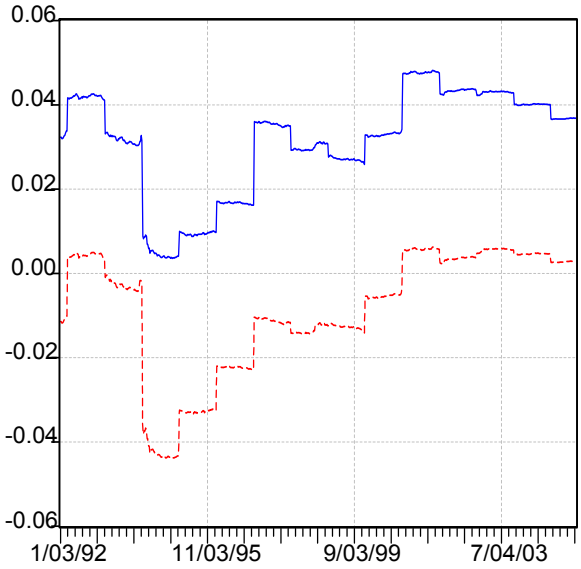

Figure 3: Recursive parameter estimates for Turkey's "Ram2" (solid line) and their 10% critical value or lower bound (dotted line).

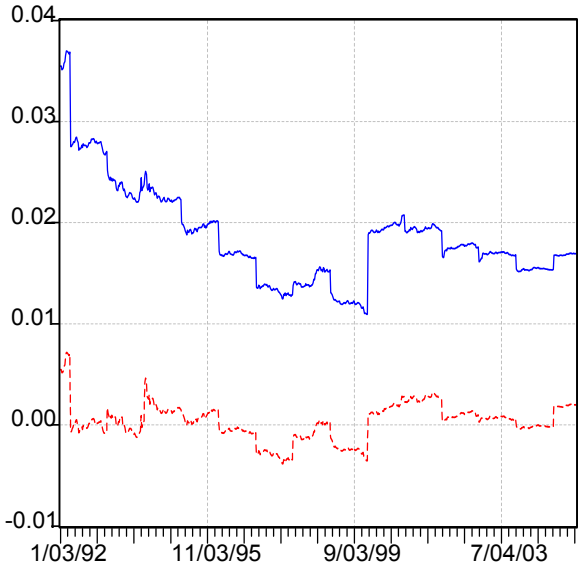

Figure 4: Recursive parameter estimates for Turkey's "aftRam1" (solid line) and their 10% critical value or lower bound (dotted line).

Table 1: Percentage of Muslims in the countries.

	% Muslims
Egypt	82
Jordan	95
Pakistan	97
Turkey	99

Sources: Encyclopædia Britannica (Macropædia whenever the percentage is stated explicitly there, Micropædia otherwise).

Table 2: Statistics on the stock exchanges, end 2004.

	capitalization (billion $)	value traded (billion $)	turnover (%)	companies (#)
Cairo & Alexandria Stock Exchanges	38	5	14	795
Amman Stock Exchange	18	5	29	212
Karachi Stock Exchange	29	74	256	661
Instanbul Stock Exchange	98	147	149	297

In this table, "capitalization" is defined as the dollar value of the total number of domestic shares outstanding at the end of 2004, "value traded" refers to the total dollar value of all shares traded in 2004, "turnover" is the ratio of value traded to market capitalization, and "companies" gives the number of companies listed on the exchange.

Table 3: Sample description.

	start sample	# obs.
Egypt: Hermes General	3/21/1997	431
Jordan: MSCI Jordan	1/1/1988	911
Pakistan: Karachi SE 100	6/23/1989	835
Turkey: ISE National 100	1/8/1988	910

Table 4: Regression of returns, r_t.

r_t	Egypt	Jordan	Pakistan	Turkey
constant	0.0053	0.0016	–	0.0053
	(2.09)	(2.30)		(2.06)
r_{t-1}	–	0.088	0.20	–
		(2.57)	(4.59)	
r_{t-2}	–	–	0.062	0.11
			(1.80)	(2.57)
r_{t-3}	0.098	0.088	–	–
	(1.80)	(2.08)		
befRam3	–	−0.0069	−0.012	–
		(−1.85)	(−1.72)	
Ram2	–	–	–	0.037
				(1.78)
aftRam1	0.020	0.0035	0.013	0.017
	(2.45)	(2.20)	(2.18)	(1.86)
aftRam4	−0.013	–	–	–
	(−1.68)			
Jan1	–	0.012	0.028	0.042
		(1.99)	(3.55)	(4.24)
Jan2	–	–	–	0.048
				(2.50)
Jan3	0.028	–	–	–
	(1.74)			

This table reports the regression estimates for (3), for four countries in the Middle-East. The t-values are in parentheses and are based on heteroskedasticity and autocorrelation consistent (HAC) standard errors. Estimates are only reported when their p-value is less than 10%, but Jordan's outlier dummies are not reported. The other regression variables are defined as follows. Lagged returns are denoted by r_{t-j} for $j = 1, 2, 3, 4$. The dummies for the j-th week before, during, and after Ramadan are named, respectively, befRam$j$, Ram$j$, and aftRam$j$ for $j = 1, 2, 3, 4$. The variables Jan$j$ for $j = 1, 2, 3, 4$ represent dummy variables for the j-th week of January.