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The (A)symmetric Transmission Mechanism in Jordan

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Abstract

This paper is carried out to investigate adopting inflation targeting in Jordan. The interest rate pass-through channel is assessed to underline the possibility and challenges to target inflation when a country imports the credibility of low inflation from abroad. The interest rate pass through is examined within its intermediate lag of action to shed light on the effectiveness of monetary policy. The Johansen approach is performed to estimate the long-run degree of pass-through along with the speed of adjustment to disequilibrium. The dynamic model of Hendry and Doornik (1994) is employed to connect the short-run and long-run, and to estimate the mean lag of adjustment under (a)symmetric market response. The empirical findings suggest that the interest rate pass-through in Jordan is weak and slow and the symmetric mean lags in the loan and deposit market are highly sticky. In addition, an asymmetric adjustment is found in the loan market, where banks are faster to decrease their interest rates following a change in official interest rates, the behaviour which can be explained by the collusive pricing hypothesis. Comparing the results to the two inflation targeters: New Zealand and the UK, the study suggests that Jordan has to move to a more resilient exchange rate arrangement before committing to the lite-form of inflation targeting.

JEL codes: C32, E40.

Keywords: Passthrough, monetary policy, nonlinearties, Jordan.

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1 Introduction

It was widely believed among the advocates of activist policies that monetary policy could keep productivity and unemployment close to their full-employment levels. The principle of 'policy activism' was based on the tenet that the nexus between inflation and unemployment, known as the Philips curve, could be utilised to achieve a long-run low unemployment. However, the activist policies failed to deliver the promises of low unemployment and rather resulted in high inflation rates. The activism was challenged in different aspects; the most important one was the dynamics of market expectations of future policy outcomes. Both Milton (1968) and Phelps (1968) state that the trade-off between inflation and unemployment is transitory, and in the long run, due to adjustments to market agents' wage settings, the only macroeconomic variable that can be controlled by the central bank is the inflation rate (Bernanke et al. (1999)). Two decades later, namely in December 1989, New Zealand led the world to a new monetary framework called Inflation Targeting (IT), with one focused objective of monetary policy, that is, price stability. The need for a low-inflation framework which could suppress inflation and provide the leverage over the discretionary intentions of policy makers encouraged a number of middle and high income countries to follow IT. The movement to IT was supported by the failure of other monetary anchors such as monetary aggregates in the mid-1980s and the pegged exchange rate in the early 1990s.[1]

In effect, IT is based upon announcing a forward-looking medium inflation forecast, either in a range or point form. The announcement of the policy target allows the market agents to perceive the direction of monetary policy and act in accordance with the path of inflation target. It is thought that central banks under IT could prolong the effect of the main monetary instrument, i.e. interest rates, the benefit which works out to settle the market expectations (Thornton (2012)). This is why it is widely believed that IT is an inflation expectation anchor (Mishkin (2004)), which leads to decrease inflation uncertainty, and eliminates the volatility of inflation rates (Drew and Karagedikli (2008)). Indeed, with the privilege of establishing a clear link with the public, and making the economic information available for the market, inflation targeters are ranked among the most transparent central banks in the world (Eijffinger and Geraats (2006)).

In fact, the achievement of the announced quantitative inflation target requires an effective monetary policy. This effectiveness is determined by the magnitude and speed at which monetary policy affects retail interest rates to reach the final goals. As a matter of fact, the traditional interest rate monetary channel started cropping its popularity with the introduction of IT to be a vital channel through which an inflation target can be achieved (Gigineishvili (2011)).

[1] A nominal anchor is a nominal variable that is the target of monetary policy, which restricts the price level to a certain value.

The successful implementations of IT across developed and emerging market countries have led monetary authorities and researchers to question adopting this strategy.[2] However, one of the challenges that faces countries which seek to adopt IT is how to forecast inflation or rather, how to achieve the target. This is because IT relies primarily on how inflation is sensitive to monetary shocks and how monetary instruments are effective in bringing inflation back to the target. Therefore, adopting IT, particularly in developing and emerging market economies, requires intensive considerations of the economic conditions to assess whether they could be able to follow this low inflation framework, or what kind of reforms should be implemented in order to successfully manage the transition to IT. From the inflation targeters' experience, there are some key features associated with IT framework, agreed among economists to be preconditions for adopting the framework. These preconditions are: central bank independence, transparency, credibility, the existence of a well-developed financial market, and the presence of a stable and predictable relationship between inflation and monetary instruments. The focus of this paper is the latter, i.e. the transmission mechanism. So, this study assesses the interest rate pass-through channel when a country faces a macroeconomic trilemma of exchange rate stabilisation.

Jordan is a small open economy, which relies on foreign aid, and experienced a fragile monetary history, the factors which make the economy highly vulnerable to internal and external shocks. During the late 1960s, Jordan witnessed a continuous depreciation of its exchange rate due to internal and regional circumstances. The major internal source was the inappropriate easy monetary policy, accompanied with government dominance to ease fiscal policy laxity, which took place at the end of the 1960s and lasted until the early 1990, when the monetary policy started adopting an intermediate target M2. This was the first step to improving the ability of the Central Bank of Jordan (CBJ) to achieve its monetary goals and develop its autonomy. However, the political external disturbances, especially the 1967 Arab-Israeli War, had more severe effects on the economy, as Jordan lost its primary port, Jaffa port, part of its land in the Jordan Valley and essential markets of its exports and imports (Hamarneh (1994)). This was followed by a drop in oil prices, simultaneous with the 1982 first Persian Gulf War, which dried up the main sources of aid, remittances and foreign money flows (Maziad (2009)). The outcome of all these problems, known in the Jordanian history as the dinar crisis, was a remarkable depreciation of the Jordanian currency and the distortion of economic policies, which reached its peak between 1988 and 1989. However, the procedures taken after the crisis were reforming and enhancing the monetary policy autonomy and restoring the market credibility, especially when the CBJ proved its effectiveness in coping with the 1990 second Gulf War. During the reform process, a decision was taken in 1995 to peg the exchange rate to the US dollar. Undoubtedly, fixing the exchange rate enables the CBJ to improve its credibility and builds the base for attracting investments from domestic and global markets.

[2] The central banks that exited from IT are Finland, Spain and Slovakia, to join the eurozone.

Nevertheless, the subsequent dollar depreciations in early 2002, and the 2008 financial crisis (Ghanem (2010)), as well as the difficult economic conditions of Jordan after the 2003 Iraq War and the Arab Spring raise skepticism on the stability and sustainability of the pegged exchange rate system. Many economists in Jordan, especially after the 2008 financial crisis, advised the CBJ to change its monetary anchor; however, the policy makers argued that the pegged exchange rate to the US dollar has played an important role in improving the credibility of the currency. They also pointed out that the level of foreign reserves has been increased unprecedentedly, as the current regime worked out to attract investment (the CBJ's 2010 annual report). Moreover, the CBJ's own view according to the IMF's evaluation report (1989-2004) is that " there is no reason to fix a system that is not broken". Nonetheless, the IMF's executive directors suggest that Jordan should move towards a more flexible exchange rate regime and focus on maintaining the price stability as a leading objective. Furthermore, in 2010, the bank underwent a considerable reduction in international reserves and enormous fiscal deficit, which present a direct threat to the pegged exchange rate system and necessite building the credibility of monetary policy domestically.

Therefore, in the light of these reasons we are motivated to underline the challenge to adopt inflation targeting, which requires a domestically built reputation for the goal of price stability, in a country with a fixed exchange rate system. In order to support our analysis, the current interest rate pass-through for Jordan is compared to two inflation targeters, considerd as models: New Zealand and the UK, in their first days of implementing the framework, provided that the UK was targeting the exchange rate during the period under examination; i.e. 1985-1992. As we aim at assessing the possibility for adopting IT in Jordan, we focus on the early days of IT for both inflation targeters, given that the shift to a high IT form is most likely to be gradual for an emerging market country with a fixed exchange rate regime. Moreover, the two inflation targeters have implemented many enhancements to solidify their anchor; some of these needed a decade to apply.

We find a weak and sluggish response of retail interest rates on loans and deposit, as well as an asymmetric adjustment in the loan market. On balance, comparing the results to the two inflation targeters, we conclude that Jordan is not yet ready to adopt any form of IT.

The paper is organized as follows: Next section explains briefly the issue of the interest pass-through in Jordan. Section 3, describes the econometric methodology, whilst section 4 and 5 present the results and conclusions, respectively.

2 The Interest Rate Pass-Through in Jordan.

It is important to examine the effectiveness of monetary policy in achieving the key macroeconomic goals. In fact, the interest rate pass-through channel is one way through which the effectiveness of monetary objectives of maintaining price stability and/or inducing output growth can be achieved. In fact, monetary policy has different channels known as monetary policy transmission mechanism, and the importance of each channel varies across countries, economies and time (Amarasekara (2005)). Nevertheless, there is a consensus among economists that the interest rate pass-through channel (IRPTC) is the main, most widely used channel across countries. This channel is designed to convey the policy message, that is, to influence domestic demand and output, through affecting retail interest rates. In other words, in case of expansionary monetary policy, lowering official interest rates should be transmitted to retail interest rates to encourage investment and consumption (Karagiannis et al. (2010)).

In effect, the monetary policy accounts for one side of the whole transmission process; the part of inducing the change. The other side of sending that change to the public is represented by the financial intermediaries, and their role is as essential as central bank's. For monetary policy to be effective and highly credible in the market, a change in official interest rates should be completely and quickly reflected into changes in retail interest rates.

To understand to how extent monetary policy affects investment and consumption to meet the monetary policy goals, measuring the size and speed at which official impulses are transmitted could reflect the effectiveness of monetary policy. In this study, we focus on assessing the monetary policy transmission within its intermediate lag of an action. Practically, there are three time lags between taking an action to when the macro variables react to official changes. The first lag, or the central bank inside lag, lies between the time when an action is taken and when it is pragmatically implemented. The intermediate lag is the time lag from when an action is taken by commercial banks to when spending decisions are affected. The third lag, or outside lag, occurs in the last part of the chain, reflecting the time needed for macroeconomic variables to assimilate the changes transmitted through the monetary policy conveyers (Amarasekara (2005)).

Inflation targeting countries employ the interest rate channel to achieve the long run objective of price stability along the other intermediate targets. Hence, our aim is to assess the effectiveness of the current IRPTC in Jordan by examining whether the degree of pass-through is complete and quick and comparing the results to the two inflation targeters models over their first year of IT. Therefore, we first test whether the degree of pass-through is complete and quick. An effective monetary policy means that a one percent change in official interest rates, which could initially be exerted to money market interest rates, leads promptly to a one percent change in retail interest rates. In fact, the degree of pass-through could reflect the market structure. In the presence of incomplete pass-through, the market reflects a high degree of imperfect competition (De Bondt, 2002), switching costs, information asymmetries (Sander and Kleimeier (2004)), or reliance on long-term capital market funds (Bredin et al. (2002)). In any of these cases, the pass-through is described as sticky.

In addition, the symmetric behaviour of financial intermediaries can be an indicator of market efficiency. In an efficient market, retail interest rates respond indifferently to changes in the official interest rates, while the mismatching response in loan and deposit markets occur due to market concentration or consumer sophistication (Karagiannis et al. (2010)). Hence, we also examine the (a)symmetric behaviour of the financial market.

3 Methodology

Since many economic variables are found to be cointegrated of order one, examining the relationship between two economic variables in first difference will invalidate their long run nexus. In principle, a random linear combination of two series of the same order will also be cointegrated of that order, and the problem of spurious regression may arise (Harris (1995)). Nevertheless, if we have two cointegrated series of order one, the residuals of the regression will be stationary I(0), and inference by means of standard hypothesis testing would be valid. So, the partial adjustment model, which identifies the relationship between retail interest rates and official interest rates, where the latter is assumed to be weakly exogenous, can be represented as follows:

$$rr_t = \propto_0 + \propto_1 mm_t + u_t \quad (1)$$

rr is the price charged for given loans, or offered to depositors by commercial banks, $\propto_0$ is constant markup or markdown on retail interest rate, mm is the official or money market interest rate set by central banks, and u_t is the error term. Money market interest rates could also be seen as banks marginal cost of funding, which reflects the marginal yield of free-risky assets (Weth (2002)). In a perfect competitive financial market, prices set by commercial banks should equal marginal costs, represented in our study by official or money market interest rates. Therefore, the derivative of retail interest rates with regard to money market rates should equal one (De Bondt (2002)). In most cases, α_1 lies between zero and one. The value of one implies a complete pass-through, which means that retail interest rates are perfectly elastic to changes in money market interest rates. However, it is rare that α_1 would be one, owing to market power, information asymmetries, switching costs, adjustment costs, possibility to access different source of finance or adverse customer reaction. In addition, because of information asymmetries, an overshooting in the pass-through, that is, $\alpha_1 > 1$, might also occur in a situation where banks behave irrationally in compensating their default risk (De Bondt (2002)), by increasing their interest rates instead of decreasing the supply of loans (Aziakpono and Wilson (2010).

Studying the stickiness in prices or retail interest rates has received heavy attention in the literature, which came initially from studying the pass-through of industrial organisation prices in concentrated markets (Hofmann and Mizen (2004)), utilising different error correction models. In this study, we use the Johansen approach (Johansen (1991)) to estimate the long run degree of pass-through along with the speed of adjustment to disequilibrium. The Johansen general equation of vector error correction form is as follows:

$$\Delta Z_t = \mu + \pi Z_{t-1} + \sum_{i=1}^{p-1} \Gamma \Delta Z_{t-i} + u_t \quad (2)$$

$$\pi = \alpha\beta \quad (3)$$

Where Z_t is a vector of jointly endogenous variables and π contains information about the long run relationships between the variables.[3] In accordance, the Johansen reduced rank regression of the long run relationship is identified in the equation 3, in which α represents the speed of adjustment to disequilibrium and β is a matrix of long run coefficients. In our study, β reflects the magnitude of pass-through, while α shows the speed at which retail interest rates respond to changes in official interest rates.

According to the equation 2 and 3, Johansen suggests that the reduced rank of π contains a number of cointegrating vectors exist in β: $r \leq (n-1)$. To specify the number of r, Johansen puts forward to test two ratios of maximised likelihood functions, known as the maximal eigenvalue, or λ-max statistic, and the trace test. In order to look for (n-1) cointegrating relationships, the non-stationarity should be ensured. So, Augmented Dickey and Fuller (1979) (ADF) test is carried out to test whether the series is level or first difference stationary.

After obtaining the long run equilibrium, we examine the existence of asymmetries over an interest rate cycle. Hence, we employ the dynamic model, which connects both the short and the long run using the error correction term. The following equation represents the full system of Hendry and Doornik (1994), which identifies the conditional dynamic model when the money market interest rate is weakly exogenous:

$$\Delta rr_t = \delta_0 + \delta_1 \Delta mm_t + \delta_2 \sum_{q=1}^{q} mm_{t-q} + \gamma \sum_{i=1}^{i} rr_{t-i} + \lambda ect_{t-1} + \varepsilon_t \quad (5)$$

Δ denotes the first difference of the retail and money market rates. δ_1 and δ_2 represent the short run pass-through and the parameters of the lagged exogenous variable, respectively. γ is the coefficient of the lagged endogenous interest rates. λ refers to the speed of adjustment when retail interest rates adjust symmetrically to money market rates changes. $ect_{t-1} = rr_{t-1} - \alpha_0 - \alpha_1 mm_{t-1}$ is the residual of the long run relationship obtained from the equation 5 by the Johansen approach at a time (t-1). The

[3] Note that, according to Johansen equation, no restriction is imposed. Nevertheless, in our analysis, money market interest rate is considered exogenously determined.

sign of λ should be negative to ascertain stationarity. q and i are the optimal lag length determined by the information criteria. ε_t is the white noise error term. The simple model of equation 5 is:

$$rr_t = \propto_0 + \propto_1 mm_t + \lambda ect_{t-1} + \varepsilon_t \qquad 6$$

According to the equation above, the mean lag (Hendry and Doornik (1994)) can be seen as:

$$ML = (\delta_1 - 1)/\lambda \qquad 7$$[4]

The mean lag of the equation 7 measures the degree of stickiness for symmetric error correction model, where high ML reflects a slow or sticky response to changes in money market interest rates. This, in our analysis, reflects the short run lag, i.e. months, needed for a full long run equilibrium adjustment.

In practice, banks would respond differently to official interest rates changes in a pursuit of maximising their profit by widening the spread between interest rates on deposit and that on loans. However, this behaviour depends mainly on the level of market competition. In a weak competitive market, banks incline to respond to decreasing their interest rate on deposit quicker than on loans (Weth (2002)), whereas a high competitive market adds to the welfare of households and investors (Van Leuvensteijn et al. (2008)).

In order to explain why the market reacts asymmetrically to changes in official interest rates, Hannan and Berger (1991) point out that firms in oligopolistic markets have major price rigidity, and therefore their deposit interest rates are stickier upward. A similar view of noncompetitive pricing behavior is argued by Neumark and Sharpe (1992). From both studies, two hypotheses are put forward to explain asymmetries: the bank concentration, or bank's collusive pricing hypothesis, and the consumer behaviour hypothesis. The latter exhibits 'the degree of consumer sophistication with respect to capital market" (Karagiannis et al. (2010)). In other words, this means that sophisticated consumers are able to hinder the market power and thereby, deposit markets will respond slower following a decrease in money market rates and quicker following an increase. On the other hand, the bank concentration pricing hypothesis suggests that banks can exercise their market power by adjusting their interest rates quicker downward on deposit and upward on loans. Hence, in order to see if interest rate is rigid upward or downward, we incorporate two dummy variables depending on whether retail interest rates are above or below their long-run equilibrium level. This approach is followed by Scholnick (1996) and Ozdemir (2009). However, we do not follow their specification of the dynamic equation. We do not remove the lagged of retail and money market rates as in the study

[4] In a simple dynamic model, a mean lag measures the time needed for the regressand to converage to its long-run equilibrium level, and depends on the magnitude of $(\delta_1 - 1)$. For further details, see Hendry (1995).

of Scholnick (1996) nor we do omit the intercept from the main equation 12 as in Ozdemir (2009). We spilt the ect into two series:

$ect^{+} = ect \; if \; ect > \mu$ 8

$ect^{+} = 0 \; if \; ect < \mu$ 9

$ect^{-} = 0 \; if \; ect < \mu$ 10

$ect^{-} = 0 \; if \; ect > \mu$ 11

Where μ is the mean of ect. Consequently, after including the two dummy variables to equation 5, the new equation is presented as:

$$\Delta rr_t = \delta_0 + \delta_1 \Delta mm_t + \delta_2 \sum_{q=1}^{q} mm_{t-q} + \gamma \sum_{i=1}^{i} rr_{t-i} + \lambda_1 ect_{t-1}^{+} + \lambda_2 ect_{t-1}^{-} + \varepsilon_t \quad 12$$

λ_1 represents the speed of adjustment when retail interest rates are above their equilibrium level, and the opposite for λ_2.

Our methodology to examine the asymmetries in the financial market could also be seen as a threshold autoregressive error correction model followed by Enders and Siklos (2001) and Enders and Chumrusphonlert (2004). They include two dummy variables to capture the changes, when the error term is above and below its long run equilibrium level; however, they set the threshold value, μ in our case, to zero.

Retail interest rates are said to be adjusted symmetrically if the coefficient of ect^{+} is not statistically different from the coefficient of ect_{t-1}^{-}. Hence, a Wald test is conducted to test the equality between the two coefficients: $\lambda_1 = \lambda_2 = 0$.The asymmetric hypothesis can be rejected if the P-value is less than the level of significance. As explained by the bank's collusion hypothesis, if $\lambda_1 > \lambda_2$, the response in deposit market is quicker downward than upward, while if $\lambda_2 > \lambda_1$, the change in loan rate is faster downward than upward. It is assumed, according to equations 5-7, that retail interest rates behave indifferently with respect to decrease or increase in official interest rates. The following equations show the mean adjustment lag when retail interest rates respond asymmetrically to money market interest rates changes (Liu et al. (2008)):

$ML^{+} = (\delta_1 - 1)/\lambda_1$ 5.13

$ML^{-} = (\delta_1 - 1)/\lambda_2$ 5.14

For equations 6 and 12, we conduct the general-to-specific approach (GTA), to obtain the parsimonious form of the conditional error correction model equations. We remove all insignificant coefficients of the lagged exogenous and endogenous interest rates, according to the F-test. Nevertheless, we report the results of the general and the specific model.

4 Data Collection and Description

All data on Jordanian official, money market interest rates, and retail interest rates are obtained from the CBJ's statistictics database. For our comparison purpose, the series of New Zealand's deposit interest rate, and British interest rates on lending and deposit are extracted from International Monetary Funds/ International Financial Statictic, whereas, the remaining series: the RBNZ's bill rate-30 and 60 days, its interest rate on housing loan and deposit, and British certificates of deposit, are collected from the released statistics of the central banks.

All the series represent monthly data from January to December. However, we allow the time prior to IT for the two inflation targeters models to be compared to the recent period for Jordan. In accordance, as IT has been adopted in 1990 by the RBNZ and in 1992 by the BoE, we cover the span 1985-1990 and 1985-1992 for New Zealand and the UK, respectively. For Jordan, the years between 1995 and 2011 are covered. Table 1 illustrates each country's retail and money market interest rate utilised in the analysis.

Table 1: Money market and retail interest rates.

Jordan	
Official and money market interest rate	
Redisc	Rediscount rate
Repo	Interest rate on repurchase agreement
Retail interest rate	
Deposit	Weighted average interest rate on demand deposit
Loan	Weighted average interest rate on loans and advances
New Zealand	
Money market interest rate	
TB-30	Bank bill yield-30 days
TB-60	Bank bill yield-60 days
Retail interest rate	
Housing	Floating first mortgage new customer housing rate
Deposit	Six-month term deposit rate
UK	
Money market interest rate	
CD	Monthly average of Sterling certificates of deposit interest rate- 3 months.
Retail interest rate	
Lending	Lending interest rate
Deposit	Interest rate on deposit

5 Results

We test for the order of integration of the variables by the mean of the well-known ADF, the results, shown in Table 2 point out the possibility of a long run of order one relationship between each retail interest rate and money market rate. A constant is added to the test equation, and the lag length of the test is determined by the Schwarz information criterion.

Table 2: Unit root test (Levels-First Difference)

Series	NO. Observations	Level (t-statistics)	Prob.	First difference (t- statistics)	Prob.
		Jordan			
loan	204	-0.408	0.904	-17.648	0.000
Deposit	204	-0.713	0.839	-16.035	0.000
Rediscount	204	-1.206	0.671	-7.399	0.000
Repurchase agreement	204	-0.904	0.760	-11.726	0.000
		New Zealand			
TB-30	72	-1.953	0.306	-9.751	0.000
TB-60	72	-1.871	0.343	-3.277	0.000
Housing	72	-1.357	0.598	-3.277	0.019
Deposit	72	-1.158	0.687	-6.670	0.000
		UK			
CD	96	-1.245	0.651	-7.714	0.000
Lending	96	-1.258	0.646	-6.875	0.000
Deposit	96	-2.241	0.192	-11.503	0.000

Post to the 2003 Iraq War, Jordan's official interest rates increased rapidly until the 2008 financial crisis as can be seen from Figure 1. Apparently, money market interest rates do not respond to changes in domestic inflation rates. The official interest rates reflect the changes in the Fedral Fund Interest Rate (FFIR), depicted in Figure 2, given that Jordan follows a pegged exchange rate to the US dollar. In addition, in Figure 3, the mark-up of the interest rate on loans and the mark-down of the interest rate on deposit increased markedly during the financial crisis onwards. This could be due to the cost-minimisation pursuit of the banking sector in Jordan.

Figure 1: Jordan, rediscount rate, Repo rate, and inflation*.

*Inflation rate is calculated based on the consumer price index taken from the CBJ's database.

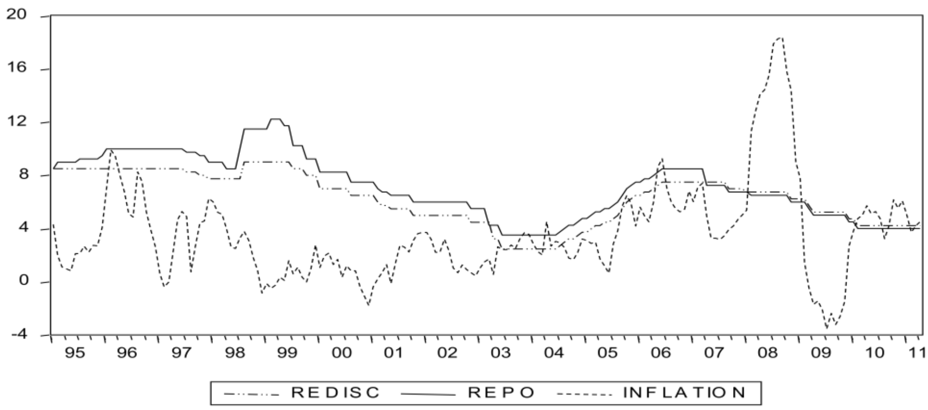


Figure 2: Jordan: rediscount rate, Repo rate, and Federal Reserve rate*.

*FFIR: Federal Reserve interest rate obtained from the database of the Federal Reserve

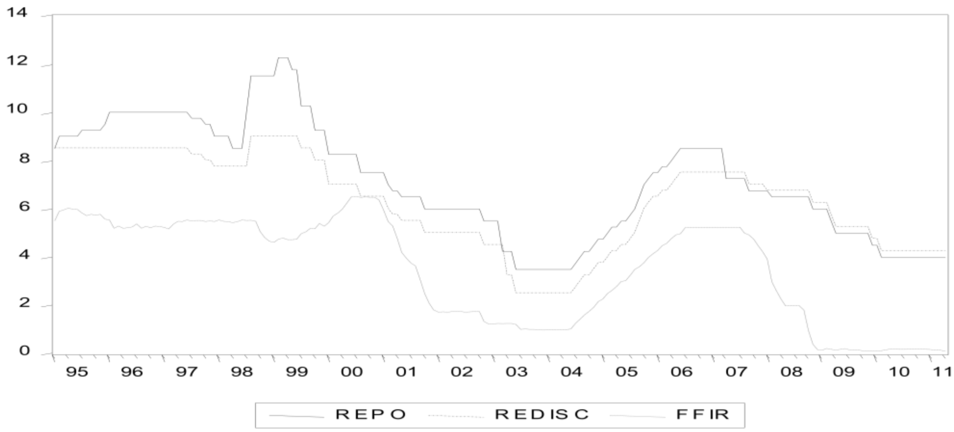
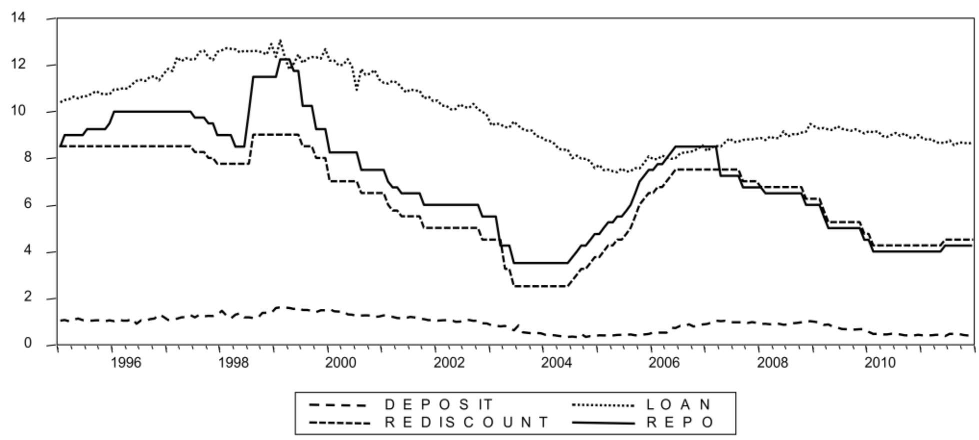


Figure 3: Jordan: rediscount rate, Repo rate, interest rates on loan and deposit.



In all cases, the series are found to be stationary on first difference, which comprises the first step to look for a cointegrating relationship. The optimal lag length is determined based on the Schwarz information criterion to ensure that the residuals are all Gaussian. Table 3 shows the optimal lag length of the relationship between each retail and money market interest rate.

Using the Johansen approach, a cointegrating relationship is found between each official interest rate and retail interest rate, except between the British CD and deposit.[5] Both Johansen maximum likelihood tests confirm that we cannot reject the hypothesis of one cointegrating vector, as given in Table 3.

Table 2: Trace and Max-Eigen tests.

Series	lags	Trace statistic	%5 critical value	Max-Eigen statistic	0.05 critical value
		$r \leq 1$		$r \leq 1$	
Jordan					
Rediscount/Deposit	2	28.592*	20.261	19.947*	15.892
Rediscount/loan	1	32.401*	20.261	26.397*	15.892
Repo/ Deposit	3	30.484*	20.261	23.840*	15.892
Repo/loan	1	23.282*	20.261	20.945*	15.892
New Zealand					
Series	**lags**	**Trace statistic**	**%5 critical value**	**Max-Eigen statistic**	**0.05 critical value**
		$r \leq 1$		$r \leq 1$	
Housing/TB-30	2	23.809*	20.261	20.206*	15.892
Deposit/TB-30	1	20.347**	15.494	17.535**	14.264
Housing/TB- 60	2	22.286*	20.261	19.163*	15.892
Deposit/TB-60	1	20.244**	15.494	17.614**	14.264
UK					
Series	**lags**	**Trace statistic**	**0.05 critical value**	**Max-Eigen statistic**	**0.05 critical value**
		$r \leq 1$		$r \leq 1$	
Lending/CD	1	45.276**	15.494	43.547**	14.264
Deposit/CD	…		No cointegration		

Notes: Standard errors are in parentheses. *significant at 5% level according to Osterwald-Lenum (1992) critical values of model 2 (Constant in the cointegration space). **significant at 5% level according to Osterwald-Lenum (1992) critical values of model 3 (Constant in the cointegration space and linear trend in the data).

Intuitively, official interest rates affect retail interest rates, but not vice versa. Therefore, money market interest rates should be treated as weakly exogenous. This implies that the speed of adjustment

[5] Even in the short run, the relationship between the two interest rates is found to be weak with money market coefficient equals 0.40.

or α for official interest rates in equation 3, should not be significantly different from zero. This is to ensure that the past disequilibria have no remaining effects on official interest rates. The results, shown in Table 4, indicate that all α of official interest rates are weakly exogenous.[6] The estimated β, which indicates the degree of pass-through, varies in Jordan from incomplete to overshooting. This might reflect the imperfect competition in the Jordanian banking sector. However, due to the lack of information released by the CBJ which explain the market structure behaviour, such as the commercial banks' market share of all mortgages issued, it is not possible to infer whether or not market power exists. In general, for Jordan, the degree of pass-through indicates that the changes in money market interest rates are not fully absorbed by retail interest rates. Furthermore, the overshooting response of retail interest rates, with respect to changes in rediscount rate, indicates that banks in Jordan behave irrationally due to information asymmetries. Nevertheless, as it is clear from the results, the repo rate has the most significant impact on the loan interest rate; a unit change in repo rate is reflected after one lag by 0.85 changes in loan rate. However, overall, the degrees of pass-through from all money market interest rates to deposit interest rates is weak.

In New Zealand, all betas point out that the bill rates changes are not completely reflected in retail rates changes. However, these results might not be optimal owing to the fact that bank bill rate was not the RBNZ's main monetary instrument. The main monetary interest rate between 1985 and 1990 was the overnight interbank cash rate, which is found to be level stationary.[7] Nevertheless, according to Liu et al. (2008), IRPTC in New Zealand is still, even after the introduction of the official cash rate in 1999, incomplete for all retail interest rates, but some: floating mortgage rate, the base lending rate, and the 6-months deposit rate. This was attributed to the low household savings, and the reliance of the banking sector on international markets to finance their supply for mortgages. The complete pass-through occurred only for the British case, where the magnitude of pass-through is close to one.

In fact, for Jordan, the results provide evidence that the money market instruments are not effective in inducing changes in retail interest rates. This might be due to the existence of market power, information asymmetries, switching costs, and the openness to the world financial markets. In addition, although repo rate, as noticed earlier, appears to be effective, the structure of the banking market in Jordan is underdeveloped.

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[6] For the Jordan case, saving deposit interest rate was found to be first difference stationary; however, their market rates' α (money market; Redisc and Repo) are significantly different from zero. Therefore, we exclude this retail rate from our analysis although the Granger causality test indicates that the causality runs from the money rates to saving rates.

[7] Bill rates are the only cointegrated of order one series found to match our targeted period (1985-1990). The cointegrating relationship between the interbank-overnight rate and deposit is found to be starting from the year 1994.

Table 3: Cointegration test

Official/retail	lags	β	α(retail) 'normalised'	α(money market)
Jordan				
Official/retail	**lags**	β	**α(retail) 'normalised'**	**α(money market)**
Rediscount/Deposit	2	0.204 (0.027)	-0.073 (0.018)	-0.120 (0.064)
Rediscount/loan	1	1.088 (0.161)	-0.0415 (0.007)	-0.010 (0.009)
Repurchase/Deposit	3	0.173 (0.017)	-0.102 (0.020)	-0.077 (0.108)
Repurchase/loan	1	0.848 (0.129)	-0.043 (0.009)	-0.005 (0.014)
New Zealand				
Official/retail	**lags**	β	**α(retail) 'normalised'**	**α(money market)**
Housing/TB- 30	2	0.657 (0.086)	-0.082 (0.027)	0.283 (0.164)
Deposit/TB-30	1	0.715 (0.125)	-0.157 (0.038)	0.166 (0.135)
Housing/TB- 60	2	0.634 (0.082)	-0.097 (0.030)	0.152 (0.159)
Deposit/TB-60	1	0.700 (0.118)	-0.173 (0.041)	0.116 (0.113)
UK				
Official/retail	**lags**	β	**α(retail) 'normalised'**	**α(money market)**
Lending/CD	1	1.012 (0.011)	-0.620 (0.298)	0.237 (0.366)

Note: Standard errors are in parentheses.

Table 5 provides the results of the dynamic model estimated for all cases. The symmetric and asymmetric dynamic model of equations 5 and 12 are estimated, respectively, before and after dropping the insignificant lagged values of exogenous and endogenous variables. The parsimonious results of both equations do not give any noteworthy difference compared to the general results. We conduct a Wald test to examine the asymmetries. For each case, we test the hypothesis if λ_1 is not different from λ_1 and reject it if the F test's critical value is less than the calculated one. Generally, in most cases, we could not reject the equality between λ_1 and λ_2.

We find an asymmetric response in the Jordanian loan market, when the monetary instrument is the repo rate, at 10% level of significance. The asymmetric result shows that banks respond quicker to decreasing their interest rates on loan. It would be possible to interpret this as consumers sophistications as suggested by the consumer behaviour hypothesis. In particular, we think that the commercial banks' marketing endeavour plays the role in providing consumers with various easy access options, and thus lowering their switching costs. Moreover, even when we assume no asymmetries in the loan market, the symmetric MLs of the loan rate to changes in rediscount and repo rates are slow; in both cases the banks need more than twenty months to converge to the long run equilibrium, while the deposit market shows no asymmetries, and rather a faster mean lag, i.e. 10-13 months. Generally, the results reveal that even if there are no asymmetries in the market, substantial lags are needed in the short run, reflecting a sluggish response to changes in the CBJ's interest rate instrument. In addition, it is clear that the changes in the retail market rates in Jordan are not mainly due to changes in the money market rates. Adjusted R^2 for the loan and deposit market are very low, i.e. 20%. This questions the efficiency of the monetary policy in Jordan in handling the changes in the domestic market.

Interestingly, the asymmetric behaviour is not observed in the deposit market of Jordan but of New Zealand. The deposit interest rate in the latter is found to be sticky upward, which is compatible with the collusive hypothesis. The quickest response with no asymmetries among all cases is found in the UK; the lending rate was adjusted within the same month with respect to changes in CD rate. While New Zealand needed eight to nine months for its retail rate to converge to the long run equilibrium.

The IRPT results for Jordan are not promising. With a low degree of pass-through, asymmetries in the loan market and high mean lags, supporting with low R^2, the results indicate that the monetary policy in Jordan is ineffective. On balance, comparing its results to our two reference cases in their period prior to IT, we can conclude that the IRPTC in Jordan needs to be thoroughly solidified.

6 Conclusions

From the experience of developed and emerging market economies in adopting IT, there are some features found to characterise ITers, and agreed to be preconditions for other countries aiming at successfully adopting the framework. Our main aim is to assess the effectiveness of monetary policy in Jordan through examining the interest rate pass-through, and compare this to two inflation targeters: New Zealand and the UK, in their first year of implementing the framework; i.e. 1990 for New Zealand and 1992 for the UK.

We examine the interest rate pass-through, using data on official interest rates and retail interest rates obtained from the central bank of Jordan’s statistical database for the monthly span from 1995 to 2012. The cointegration between the official interest rates and retail interest rates provide evidence that the interest rate pass-through in Jordan is sluggish and weak, and vary from incomplete pass-through to overshooting. We employ the full system of Hendry and Doornik (1994) which connects the short run with the long run adjustments under symmetric and asymmetric market response. An asymmetric response is found in the loan market. The asymmetric result shows that banks respond quicker to decreasing their interest rates on loan, which could be attributed to the existence of a high degree of consumer sophistication. However, as no information is released by the central bank of Jordan concerning the market structure, it is not possible to infer whether or not market power exists. The symmetric mean lags of the loan rate with respect to changes in official interest rates are slow; in all cases the banks need more than twenty months to converge to the long run equilibrium. By contrast, no asymmetries are found in the deposit market, and rather, we find a faster mean lag, i.e. 10-13 months. Comparing the results for Jordan to the two inflation targeters, our findings provide evidence that with a weak and sluggish interest rate pass-through, as well as asymmetry in the loan market, the monetary policy in Jordan under the pegged exchange rate regime to the US dollar is dependent and ineffective. This suggests that Jordan has to move to a more resilient exchange rate arrangement before committing to the lite-form of inflation targeting.

Table 5: short-run dynamic symmetric/asymmetric results

Jordan

Money market ''Rediscount''	**Retail ''Deposit rate''**		**GTS ''Deposit rate''**	
Constant	-0.061	-0.065	-0.059	-0.062
	(0.015)	(0.022)	(0.014)	(0.022)
Δrediscount	-0.002	-0.002	dropped	dropped
	(0.020)	(0.020)		
Δrediscount $_{t-1}$	-0.006	-0.007	dropped	dropped
	(0.020)	(0.020)		
Δrediscount $_{t-2}$	0.073	0.072	0.072	0.072
	(0.020)	(0.021)	(0.020)	(0.020)
Δdeposit $_{t-1}$	-0.284	-0.284	-0.286	-0.286
	(0.065)	(0.065)	(0.064)	(0.064)
Δdeposit $_{t-2}$	-0.131	-0.132	-0.131	-0.132
	(0.066)	(0.066)	(0.065)	(0.065)
Symmetric ect	-0.075		-0.072	
	(0.018)		(0.017)	
Symmetric ML	13			
above equilibrium		-0.081		-0.079
		(0.040)		(0.039)
Below equilibrium		-0.077		-0.075
		(0.024)		(0.023)
ML^+		12		
ML^-		13		
R^2	0.232	0.232	0.231	0.231
Adjusted R^2	0.208	0.204	0.215	0.211
F-statistics	9.75	8.33	14.75	11.75
Wald test $P(F^*>F_c)^*$		0.853		0.856

Money market ''Rediscount''	**Retail ''Loan rate''**		**GTS ''Loan rate''**	
Constant	0.242	0.137	0.237	0.135
	(0.051)	(0.067)	(0.049)	(0.067)
Δrediscount	0.010	0.016	dropped	dropped
	(0.060)	(0.060)		
Δrediscount $_{t-1}$	-0.033	-0.031	dropped	dropped
	(0.061)	(0.061)		
Δloan $_{t-1}$	-0.369	-0.368	-0.369	-0.368
	(0.064)	(0.064)	(0.040)	(0.064)
Symmetric ect	-0.041		-0.040	
	(0.008)		(0.007)	
Symmetric ML	24			
above equilibrium		-0.027		-0.027
		(0.009)		(0.009)
Below equilibrium		-0.017		-0.017
		(0.014)		(0.014)
ML^+		36		
ML^-		58		
R^2	0.208	0.203	0.207	0.202
Adjusted R^2	0.192	0.183	0.199	0.190
F-statistics	13.00	10.02	26.06	16.75
Wald test $P(F^*>F_c)^*$		0.131		0.137

Money market ''Repo''	**Retail ''Deposit rate''**		**GTS ''Deposit rate''**	
Constant	-0.073	-0.039	-0.077	-0.043
	(0.015)	(0.012)	(0.014)	(0.011)
Δrepo	0.007	0.011	dropped	dropped
	(0.013)	(0.014)		
Δrepo $_{t-1}$	-0.041	-0.040	-0.040	-0.039
	(0.014)	(0.015)	(0.014)	(0.014)
Δrepo $_{t-2}$	0.035	0.036	0.038	0.039
	(0.014)	(0.015)	(0.015)	(0.015)
Δrepo $_{t-3}$	0.023	0.023		
	(0.015)	(0.015)		
Δdeposit $_{t-1}$	-0.304	-0.314	-0.270	-0.282
	(0.067)	(0.068)	(0.064)	(0.065)
Δdeposit $_{t-2}$	-0.158	-0.152	-0.145	-0.141
	(0.066)	(0.068)	(0.064)	(0.065)
Δdeposit $_{t-3}$	-0.064	-0.061		
	(0.655)	(0.067)		
Symmetric ect	-0.102		-0.108	
	(0.021)		(0.019)	
Symmetric ML	10			
above equilibrium		-0.037		-0.041
		(0.018)		(0.018)
Below equilibrium		-0.058		-0.063
		(0.014)		(0.013)

Money market ''Repo''	**Retail ''Loan rate''**		**GTS ''Loan rate''**	
Constant	0.382	0.185	0.373	0.184
	(0.081)	(0.074)	(0.080)	(0.074)
Δrepo	0.033	0.026	dropped	dropped
	(0.043)	(0.043)		
Δrepo $_{t-1}$	-0.049	-0.044	dropped	Dropped
	(0.043)	(0.043)		
Δloan $_{t-1}$	-0.350	-0.347	-0.356	-0.352
	(0.064)	(0.064)	(0.009)	(0.064)
Symmetric ect	-0.046			
	(0.009)			
Symmetric ML	21			
above equilibrium		-0.026		-0.025
		(0.008)		(0.007)
Below equilibrium		-0.018		-0.018
		(0.010)		(0.010)

ML^+		27			ML^+		37		
ML^-		17			ML^-		54		
R^2	0.277	0.253	0.267	0.242	R^2	0.202	0.202	0.195	0.197
Adjusted R^2	0.247	0.218	0.248	0.219	Adjusted R^2	0.186	0.181	0.187	0.185
F-statistics	9.173	7.187	14.24	10.36	F-statistics	12.48	9.93	24.23	16.22
Wald test $P(F^*>F_c)$*		0.141		0.134	Wald test $P(F^*>F_c)$*		0.087**		0.094**

<u>New Zealand</u>

Money market ''TB-30''	**Retail ''Housing rate''**		**GTS ''Housing rate''**		**Money market ''TB-30''**	**Retail ''Deposit rate''**		**GTS ''Deposit rate''**	
Constant	1.202	1.027	1.136	0.855	Constant	0.209	0.441	0.190	0.453
	(0.287)	(0.391)	(0.196)	(0.284)		(0.105)	(0.151)	(0.099)	(0.141)
ΔTB-30	0.079	0.074	0.054	0.072	ΔTB-30	0.024	-0.008	dropped	dropped
	(0.018)	(0.020)	(0.014)	(0.019)		(0.035)	(0.038)		
ΔTB-30 $_{t-1}$	-.005	-0.001	dropped	dropped	ΔTB-30 $_{t-1}$	-0.025	-0.011	dropped	dropped
	(0.018)	(0.019)				(0.039)	(0.039)		
ΔTB-30 $_{t-2}$	-0.008	-0.008	dropped	dropped	Δdeposit $_{t-1}$	0.126	0.093	dropped	dropped
	(0.015)	(0.015)				(0.108)	(0.107)		
Δhousing $_{t-1}$	-0.125	-0.122	dropped	dropped					
	(0.104)	(0.104)							
Δhousing $_{t-2}$	0.308	0.297	dropped	0.298					
	(0.104)	(0.106)		(0.101)					
Symmetric ect	-0.107		-0.102		Symmetric ect	-0.161		-0.149	
	(0.025)		(0.017)			(0.039)		(0.033)	
Symmetric ML	9				Symmetric ML	7			
above equilibrium		-0.093		-0.077	above equilibrium		-0.258		-0.263
		(0.032)		(0.231)			(0.060)		(0.055)
Below equilibrium		-0.083		-0.068	Below equilibrium		-0.044		-0.040
		(0.043)		(0.033)			(0.068)		(0.053)
ML^+		10			ML^+		4		
ML^-		11			ML^-		22		
R^2	0.491	0.495	0.375	0.482	R^2	0.259	0.306	0.229	0.295
Adjusted R^2	0.442	0.437	0.357	0.449	Adjusted R^2	0.213	0.251	0.218	0.274
F-statistics	10.00	8.55	20.45	14.90	F-statistics	5.68	5.64	20.55	14.25
Wald test $P(F^*>F_c)$*		0.508		0.470	Wald test $P(F^*>F_c)$*		0.037*		0.011*

Money market ''TB-60''	**Retail ''Housing rate''**		**GTS ''Housing rate''**		**Money market ''TB-60''**	**Retail ''Deposit rate''**		**GTS ''Deposit rate''**	
Constant	1.369	1.452	1.062	1.155	Constant	0.275	0.449	0.271	0.448
	(0.316)	(0.373)	(0.224)	(0.296)		(0.112)	(0.136)	(0.104)	(0.136)
ΔTB-60	0.099	0.101	0.099	0.101	ΔTB-60	0.009	-0.015	dropped	dropped
	(0.020)	(0.021)	(0.026)	(0.020)		(0.045)	(0.045)		
ΔTB-60 $_{t-1}$	-0.014	-0.016	dropped	dropped	ΔTB-60 $_{t-1}$	-0.017	-0.017	dropped	dropped
	(0.020)	(0.020)				(0.050)	(0.049)		
ΔTB-60 $_{t-2}$	-0.014	-0.013	dropped	dropped	Δdeposit $_{t-1}$	0.012	0.106	dropped	dropped
	(0.019)	(0.019)				(0.107)	(0.105)		
Δhousing $_{t-1}$	-0.111	-0.106	dropped	dropped					
	(0.101)	(0.103)							
Δhousing $_{t-2}$	0.327	0.333	0.350	0.359					
	(0.102)	(0.104)	(0.095)	(0.098)					

Symmetric ect	-0.113		-0.088		Symmetric ect	-0.174		-0.173	
	(0.026)		(0.018)			(0.041)		(0.034)	
Symmetric ML	8				Symmetric ML	6			
above equilibrium		-0.119		-0.094	above equilibrium		-0.251		-0.250
		(0.029)		(0.022)			(0.054)		(0.048)
Below equilibrium		-0.123		-0.099	Below equilibrium		-0.063		-0.064
		(0.035)		(0.029)			(0.066)		(0.059)
ML^+		8			ML^+		4		
ML^-		7			ML^-		16		
R^2	0.536	0.538	0.521	0.523	R^2	0.280	0.327	0.262	0.313
Adjusted R^2	0.491	0.485	0.499	0.493	Adjusted R^2	0.236	0.275	0.251	0.292
F-statistics	11.97	10.15	23.62	17.56	F-statistics	6.33	6.24	24.53	15.49
Wald test $P(F^*>F_c)$*		0.671		0.628	Wald test $P(F^*>F_c)$*		0.033*		0.024*

UK

Money market "Certificates of deposit"	**Retail "Lending rate"**		**GTS "Lending rate"**	
Constant	-0.089	-0.072	-0.085	-0.070
	(0.021)	(0.029)	(0.019)	(0.027)
Δcd	0.755	0.756	0.752	0.753
	(0.031)	(0.032)	(0.030)	(0.030)
Δcd_{t-1}	0.002	0.001	dropped	dropped
	(0.083)	(0.083)		
$\Delta lending_{t-1}$	-0.028	-0.029	dropped	dropped
	(0.078)	(0.078)		
Symmetric ect	-0.801		-0.776	
	(0.111)		(0.074)	
Symmetric ML	0.31			
above equilibrium		-0.951		-0.889
		(0.201)		(0.170)
Below equilibrium		-0.732		-0.716
		(0.136)		(0.110)
ML^+		0.26		
ML^-		0.33		
R^2	0.890	0.891	0.890	0.890
Adjusted R^2	0.885	0.885	0.887	0.887
F-statistics	181.48	145.00	372.67	247.40
Wald test $P(F^*>F_c)$*		0.376		0.461

Notes: *, ** denote significance at 5% and 10%, respectively. GTS: General to specific approach.

*Tests for autocorrelation and heteroscedasticity confirmed that the models lack from heteroscedasticity and autocorrelation problems. CUSUM and recursive estimation tests also indicated no problems of instability or parameter constancy; the results are available upon request.

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