STOCK MARKET EFFICIENCY IN A DEVELOPING ECONOMY: EVIDENCE FROM TURKEY

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Abstract

This paper primarily aims to test informational efficiency of the Turkish stock market with respect to *daily* changes in such variables as overnight interest rates, the US dollar, German mark, currency basket, free reserves of banks, currency in circulation, money supply aggregates defined as M1 and M2, reserve money, monetary base and central bank money. Semi-strong form efficiency is tested by using structural models in which each information variable is decomposed into its anticipated and unanticipated components by employing higher-order autoregressive integrated moving average (ARIMA) models. The paper reports significant deviations from efficient market hypothesis in the Turkish stock market for the period January 1989 to July 1995. The results of the paper have two major implications. First, domestic investors as well as foreign investors who hold approximately 25% of total tradable shares in Turkey may benefit from the empirical results of the paper to develop profitable trading strategies since all information variables are low-cost and readily accessible. This result is of particular importance to the investors of the European Community (EC) due to the Customs Union Agreement, which has been effective on 1 January 1996, between Turkey and the EC. Second, resources do not seem to be devoted to their best alternatives available; i.e., allocative efficiency appears to remain unachieved.

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I. INTRODUCTION

The theory of rational or informationally efficient stock markets developed by neoclassical economics has been extensively tested for about a quarter century.[1] Although there has been recent increase in empirical research regarding informational efficiency of emerging stock markets, a quick review of the literature of this field shows that resources seem to be primarily devoted to investigate developed markets. Since emerging markets may offer valuable opportunities for diversification beyond national borders, in our opinion, it has some merit to undertake further research concerning developing markets. This paper aims to present new empirical evidence with respect to semi-strong form efficiency of an emerging stock market of a developing country, namely Turkey.[2]

Merton (1987) states that "researchers can always benefit from efficiency tests since any rejection of hypothesis may provide them with *financial* success thanks to investment professionals ready to

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[1] For excellent surveys of efficient markets hypothesis from different perspectives, see, among others, Summers (1986), Merton (1987), Ball (1989), Fama (1991) and van Hulle *et al*. (1993).

pay for results whereas a financial failure in terms of inability to reject efficiency hypothesis leads to *academic* success through publication in academic journals. Therefore, it is understandable why academic literature generally provides empirical evidence in support of informational efficiency of stock markets" (emphasis added). The present paper attempts to overcome this criticism by removing the above tradeoff between academic success and financial success in favor of the former.

It is our belief that any findings in support of or against informational efficiency of the Turkish stock market seem potentially more appealing in recent times than ever before. Since the information variables employed in the present paper are easily and cheaply observable by both domestic and foreign investors, it may be feasible to develop profitable trading strategies if any inefficiencies are detected. Otherwise, a buy-and-hold strategy can be followed to save search and transactions costs. According to the recent agreement between Turkey and the European Community (EC), a customs union has become effective on January 1, 1996. It should also be noted that Turkey has applied for full membership to the EC in accordance with the international legislation that foresees Turkey's full membership. Although Balaban (1995a) reports that the monthly returns on the stock market index of Turkey are not significantly correlated with the correponding returns on the index of any EC members for the period 1986 to 1993, the degree of economic and financial integration between the parties is expected to increase in the near future.

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[2] For the relevance of informational efficiency in emerging markets, see, for example, Keane (1993).

The previous published research on the Turkish stock market has primarily focused on either weak-form or semi-strong form efficiency. The former group has generally employed daily observations of the stock market index (see, for example, Balaban (1995b,c,d) and Muradoğlu and Ünal (1994)). The latter has depended on monthly data regarding monetary and fiscal information variables (see, Muradoğlu and Önkal (1992), Muradoğlu and Metin (1995)) and daily data for the financial market as a whole (Balaban and Kunter (1996)). However, to our best knowledge, in international literature there is no published work using *high-frequency* data in a structural model to test semi-strong form efficiency of the Turkish stock market. The primary aim of this paper is to fill this gap by employing daily observations of some monetary variables. We believe that using high-frequency data may prevent loss of information stemming from aggregation of data, an issue is of particular importance to a highly volatile emerging stock market.

II. DATA AND METHODOLOGY

We employ daily data for the period January 1989 to July 1995. The independent variable is the Istanbul Securities Exchange (ISE) Composite Index (CI), an equally weighted index calculated according to closing prices of common shares and published by the ISE. Our information variables are overnight interest rates (OVN) in the Turkish Interbank Money Market, free market selling rates of the US dollar (USD) and German mark (DM), currency basket (FX),[3] free reserves of banks (FRB), currency in circulation (CIC), money supply aggregates defined as M1 and M2, reserve money (RM), monetary base (MB) and central bank money (CBM). The data source for all variables is the Central Bank of the Republic of Turkey (CBRT). It should also be noted that, to our knowledge, daily observations of OVN, FX, FRB, CIC, RM, MB and CBM are used for the first time to test informational efficiency of the Turkish stock market.

We use the first differences of logarithm of all variables except OVN described as follows:

$$DL(.)_t = \log (.)_t - \log (.)_{t-1} \quad (1)$$

where D and L denote the first difference and logarithm of variable (.), respectively. Time index is shown by t. For OVN, we use first difference; i.e., DOVN, since this variable is expressed in percentages in our data source where the others are entered in levels. Any series constructed in this way is found stationary; i.e., integrated of order one, according to the so-called *Augmented Dickey-Fuller* test for which formal results are not provided here to save space but available upon request.

Under efficient market hypothesis (EMH), an information variable *itself* cannot be considered to be a legitimate factor since economic variables can be forecast with some error by economic agents. Therefore, for a variable to be a legitimate factor to test semi-strong-form efficiency of a stock market, it is needed to be decomposed into its anticipated and unanticipated components. Clearly speaking, EMH requires that (Hancock (1989)),

i. neither *contemporaneous* nor *lagged* values of *anticipated* component of a variable should be significantly different from zero,

ii. *lagged* values of *unanticipated* component of a variable should not be significantly different from zero.

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[3] Currency basket is equal to one US dollar and one-and-half German mark.

Note that EMH does not bring any restriction on contemporaneous values of unanticipated component of an explanatory variable.

The econometric literature provides researchers with two broad areas of methods, among others, to decompose an economic variable into its components as anticipated and unanticipated. The first method is to employ structural models such as a classical linear regression where other economic variables are regressors (see, for example, Hancock (1989), Muradoğlu and Önkal (1992)). The second way is to depend on time-series models such as an autoregressive integrated moving average (ARIMA) model where past values of a variable itself are used (see, among others, Abaan (1991) and Singh (1993)). Regardless of way used, predictable part refers to anticipated component whereas residuals are considered to be unanticipated component.

In this paper, ARIMA(p,1,q) models are employed to decompose our information variables into their anticipated and unanticipated components. For each policy variable, the following model is estimated:

$$DL(.)_t = \alpha + \sum_{i=1}^{p} \beta_i \, DL(.)_{t-i} + \sum_{j=1}^{q} \eta_j \, \varepsilon_{t-j} + \varepsilon_t \qquad (2)$$

where p and q denote the number of autoregressive and moving average terms, respectively.

Our models are higher-order to overcome the problem of serial correlation, a common issue in daily data. *Akaike Information Criterion* is used to decide on lag structure of each model. We do not present here the results of our ARIMA models to save space but they are available upon request.

We first run the following ordinary least squares (OLS) regressions for each variable separately to detect whether there is any inefficiency with respect to a *single* variable:

$$DLCI_t = \gamma + \sum_{i=0}^{10} \theta_i EDL(.)_{t-i} + \sum_{i=0}^{10} \psi_i UDL(.)_{t-i} + \sum_{j=1}^{2} \mu_j DLCI_{t-j} + v_t \quad (3)$$

where EDL(.) and UDL(.) refer to the changes in anticipated and unanticipated components of the information variable (.), respectively. The first two lags of DLCI are used to remedy the problem of serial correlation. v_t is the error term with the standard OLS assumptions.

We use significant contemporaneous and lagged values of each independent variable obtained from (3) in ten multiple regressions described as follows:

$$DLCI_t = \delta + \lambda_i V_i + \sum_{j=1}^{2} \phi_j DLCI_{t-j} + u_t \quad (4)$$

where V_i's are the chosen contemporaneous and/or lagged value(s) of changes in anticipated and/or unanticipated component(s) of information variable(s) from (3). The OLS assumptions also apply.

A common problem in tests of market efficiency is issue of joint hypothesis. The authors are aware that they test a joint hypothesis: stock market is efficient with respect to information variable(s) employed and aggregate stock returns are generated by the same variable(s).

III. EMPIRICAL RESULTS

The empirical results obtained from (3) are provided in Table 1a, 1b and 1c. At least one contemporaneous or lagged value of anticipated or unanticipated changes in all variables except free reserves of banks is found statistically significant. As previously noted, those significant lags are used in (4). Neither contemporaneous nor lagged values of changes in anticipated and unanticipated components of free reserve of banks are significant. Significant figures for M2 from (3) appear to have no effect in (4). Therefore, these variables are omitted in the rest of the analysis.

The empirical results of the multi-variable structural models (4) are presented in Table 2a and 2b. The lagged values of both *anticipated* and *unanticipated* changes in overnight interest rates have a *negative* effect on daily stock market returns (equation 1). This result, which is consistent with our expectations, does not change when other information variables are added to the model. In our opinion, this negative effect stems from substitution effect between demand for stocks and bonds. Note that the significant lags of overnight interest rates are six and seven which are considered to reflect developments in interest rates of weekly repurchasing agreements.

The first and second lagged values of *unanticipated* changes in German mark *positively* affect stock market returns (equation 3 and 5). A *positive* effect also stems from the first and second lagged values of *unanticipated* changes in currency basket together with the ninth lagged value of *anticipated* change both in the US dollar and currency basket (equation 2, 4 and 5). These results are also in accordance with our expectations. The above effects can be seen as a result of currency substitution in Turkey.[4] Turkish investors can be said to tend to hold foreign currencies and/or foreign currency denominated assets in their portfolios to hedge fluctuations in their purchasing power. As such, when Turkish lira depreciates, especially unexpectedly, they convert their foreign assets into Turkish lira and increase their demands for Turkish lira denominated assets including stocks.

Our results show that German mark has a stronger effect on the Turkish stock market compared to the US dollar. This can be due to that investors tend to hold more German mark than the US dollar since the former appreciated about 70% against the latter for the period January 1986 to November 1995. Note that German mark holdings of Turkish investors have always remained higher than the US dollar and any other foreign currency holdings during the last decade (see, the Central Bank of the Republic of Turkey (1995)).

It is expected that changes in monetary aggregates should have a positive effect on stock market returns in the short run. Such a *positive* effect in this study is found for the contemporaneous value of *anticipated* changes in currency in circulation (equation 6), the first and seventh lagged values of *unanticipated* changes in M1 definition of money supply (equation 7), the third lagged value of *anticipated* changes in reserve money (equation 8), and the fourth lagged value of *unanticipated* changes in monetary base (equation 9). This positive effect is consistent with the assumption that some of excess liquidity flows into the stock market. On the other hand, some lagged values of changes in some monetary aggregates have a *negative* effect on stock market returns. For example, the first lagged value of *unanticipated* changes in currency in circulation (equation 6), the

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[4] See Selçuk (1994) for a detailed analysis of currency substitution in Turkey.

tenth lagged value of *anticipated* change in M1 (equation 7) and the fifth lagged value of *unanticipated* changes in central bank money (equation 10) *negatively* affect the stock market. In our opinion, this negative effect may first stem from that the CBRT intervenes into the money and foreign exchange markets to control liquidity in the system. For example, when there is excess liquidity, the CBRT sells bonds through open market operations or increases interest rates. As such, investors decrease their stock holdings to cover their shortage of liquidity. A second reason for negative effect may be due to that investors perceive increases in monetary aggregates as a signal of future inflation, and in turn, depreciation of Turkish lira. Therefore, from the point of investors, it seems reasonable to increase their foreign currency holdings and decrease their demand for stocks in the long run.

It should be noted that the first and second lagged values of the stock market index are found significant in all regressions. This result, together with the previous ones, implies that the Turkish stock market is neither weak form nor semi-strong form efficient.

IV. CONCLUSION AND FURTHER RESEARCH

The empirical results of this paper show for the first time that the Turkish stock market is not informationally efficient with respect to *daily* changes in some monetary variables. Put differently, aggregate stock prices in Turkey do not fully reflect publicly available information employed in this study. In addition, our results are consistent with the previous research findings which report inefficiency with respect to monthly data (see, for example, Muradoğlu and Önkal (1992), and Muradoğlu and Metin (1995)).

These results have two major implications. First, investors can at least have a chance to develop profitable trading strategies by using anticipated and unanticipated changes in our information variables as long as the reported inefficiencies remain in the market. In other words, under the theory of *financial interior decorator*, it may be possible for investment professionals to construct portfolios in accordance with investors' preferences and tolerance for risk. The same also applies to foreign investors who have already full access to the Turkish stock market. Note that foreign investors hold approximately 25% of total tradable shares in Turkey. It is expected that foreign portfolio holdings as well as direct investments in Turkey increase in the near future thanks to the recently signed Customs Union Agreement with the EC countries.

Even though the reported inefficiencies in this paper may die as time passes, we believe that new ones emerge in a country with a highly inflationary developing economy. If potential researchers pursue *academic* success rather than *financial* success emphasized by Merton (1987), any inefficiencies can be made publicly available as soon as they are detected.

The second implication is that resources in Turkey do not seem to be devoted their best alternatives available. In other words, Turkish stock market has not been successful enough to channel scarce funds into their best productive areas. Thus, allocative efficiency appears to remain unachieved. In our opinion, this may make stock market policies quesitonable in resource allocation in developing countries.

The results of this paper can be extended in several ways. Within a nonexhaustive list, a fruitful area of research can be to test whether the reported results are valid for individual stocks and portfolios. Another useful investigation can be subperiod analysis of the findings of the present paper. Finally, different methodology can be employed to check whether the reported inefficiencies are valid.

Table 1a Determination of significant lags of components of information variables

Lag	DOVN	DLUSD	DLDM	DLFX
ANTICIPATED				
0	-0.4936E-4 [a]	-0.48801**	-0.17694	-0.097098
	-0.579	-1.992	-0.635	-0.467
1	0.3945E-4 [b]	0.045711	-0.18945	-0.15071
	0.455	0.211	-0.584	-0.674
2	-0.9223E-4	0.048281	-0.087018	0.070813
	-1.054	0.205	-0.269	0.319
3	-0.9530E-4	-0.24573	0.094934	-0.12734
	-1.092	-1.028	0.275	-0.570
4	0.7557E-4	-0.045570	-0.027195	0.049453
	0.962	-0.190	-0.075	0.224
5	-0.7058E-5	-0.091548	-0.32571	-0.17017
	-0.091	-0.379	-0.906	-0.768
6	-0.1571E-3**	0.30084	0.39986	0.15130
	-2.056	1.266	1.123	0.695
7	-0.8123E-5	-0.025620	0.15714	0.19760
	-0.106	-0.114	0.489	0.943
8	0.6836E-4	0.10845	0.070257	0.10558
	0.920	0.524	0.254	0.546
9	-0.5608E-4	0.56921***	0.54819**	0.51534***
	-0.785	2.812	2.011	2.696
10	0.6716E-4	-0.29220	-0.12193	-0.15975
	1.072	-1.610	-0.565	-0.977

[a] Regression coefficient; [b] calculated t-value; [c] constant. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively, in two-tailed tests, based on *t*-statistic for the difference of the coefficient from zero.

Table 1a (Continued)

Lag	DOVN	DLUSD	DLDM	DLFX
UNANTICIPATED				
0	-0.3738E-4	-0.054111	-0.0093835	-0.066487
	-1.121	-0.782	-0.141	-0.884
1	-0.5463E-4	0.11322	0.19599**	0.14468 *
	-1.320	1.407	2.562	1.676
2	-0.1452E-4	0.095212	0.14616 *	0.15598 *
	-0.337	1.283	1.742	1.719
3	-0.4964E-4	-0.035649	0.0058877	0.029655
	-1.087	-0.376	0.061	0.297
4	0.5865E-4	-0.16975	-0.15134	-0.11613
	1.286	-0.191	-1.464	-1.151
5	-0.2389E-4	-0.070589	-0.031618	-0.050168
	-0.521	-0.761	-0.299	-0.491
6	-0.5406E-4	0.12308	0.17146	0.14418
	-1.188	1.300	1.618	1.407
7	-0.1680E-3***	-0.12338	-0.097220	-0.086354
	-3.496	-1.275	-0.922	-0.837
8	-0.2470E-4	-0.077530	-0.085440	-0.17307 *
	-0.516	-0.800	-0.825	1.662
9	0.5129E-4	0.038372	0.010684	-0.013616
	1.111	0.402	0.105	-0.131
10	-0.3843E-4	-0.13564	0.0012951	-0.046424
	-0.845	-1.450	0.013	-0.458
CONS[c]	0.0019701**	0.0023302**	0.0014421	0.0014879
	2.429	2.989	1.345	1.399
DLCI(-1)	0.24230***	0.23983***	0.23512***	0.23796***
	8.964	8.930	8.745	8.854
DLCI(-2)	-0.07996***	-0.079927***	-0.079790***	-0.077501***
	-2.869	-2.969	-2.968	-2.885

Table 1b

Lag	DLM1	DLM2	DLMB	DLCBM
ANTICIPATED				
0	-0.031240	0.86882 *	-0.17002	-0.42289
	-0.197	1.689	-1.435	-1.483
1	0.039547	-0.28968	0.080911	0.39215
	0.257	-0.553	0.688	1.391
2	0.30154 *	0.90301 *	0.084778	0.31769
	1.924	1.729	0.721	1.244
3	-0.17259	-0.68046	-0.044773	-0.22166
	-1.153	-1.204	-0.382	-0.878
4	0.040713	0.43751	-0.017606	-0.10128
	0.274	0.917	-0.151	-1.591
5	-0.19435	-0.56714	0.030455	0.35812
	-1.357	-1.074	0.247	1.384
6	-0.072162	0.26340	-0.072314	-0.12961
	-0.505	0.491	-0.670	-0.548
7	-0.15012	0.17079	0.056182	-0.026742
	-1.064	0.335	0.522	-0.113
8	0.15967	0.10709	-0.17234	-0.37291
	1.161	0.219	-1.603	-1.580
9	-0.079176	-0.18572	0.11873	0.24545
	-0.583	-0.379	1.101	1.052
10	-0.22679 *	0.033829	0.0071526	0.11590
	-1.855	0.087	0.069	0.524

Table 1b (Continued)

Lag	DLM1	DLM2	DLMB	DLCBM
UNANTICIPATED				
0	0.016999	-0.11973	0.037452	0.030425
	0.274	-0.828	1.108	0.799
1	-0.034467	-0.27144	-0.0011583	0.040496
	-0.479	-1.292	-0.033	0.945
2	0.12112	0.10131	-0.039748	-0.0066600
	1.615	0.463	-1.149	-0.152
3	-0.077192	-0.43788 *	-0.019381	-0.055795
	-1.038	-1.931	-0.558	-1.283
4	0.047274	0.055539	0.068785**	0.028162
	0.634	0.230	1.980	0.240
5	-0.059160	-0.26132	-0.073326**	-0.10686**
	-0.744	-1.069	-1.964	-2.270
6	0.023064	0.0092871	-0.053552	-0.0073406
	0.260	0.037	-1.438	-0.157
7	0.19768**	0.24895	0.0093186	0.011260
	2.337	1.034	0.250	0.240
8	0.085924	-0.056319	-0.024333	-0.053758
	1.000	-0.245	-0.653	-1.143
9	0.049806	-0.087844	0.0043823	0.0034064
	0.581	-0.398	0.118	0.067
10	0.10826	-0.093780	-0.017954	-0.021485
	1.237	-0.437	-0.462	-0.403
CONS	0.0022496**	0.002726	0.0023030***	0.0023597***
	2.445	0.206	2.649	2.665
DLCI(-1)	0.24326***	0.24236***	0.24513***	0.24792***
	9.074	9.013	9.103	9.217
DLCI(-2)	-0.086877***	-0.085470***	-0.077890***	-0.082544***
	-3.236	-3.177	-2.891	-3.069

Table 1c

Lag	DLRM	DLFRB	DLCIC
ANTICIPATED			
0	-0.021751	0.004376	0.356720**
	(-0.137)	(0.240)	(2.262)
1	0.237900	-0.008320	-0.073497
	(1.233)	(-0.467)	(-0.287)
2	-0.065332	0.030131	-0.210990
	(-0.332)	(1.289)	(-0.776)
3	0.322210	0.001387	0.028147
	(1.598)	(0.065)	(0.104)
4	-0.044389	0.036713	0.525900**
	(-0.221)	(1.542)	(2.074)
5	0.021488	-0.005243	-0.447110**
	(0.107)	(-0.266)	(2.086)
6	-0.148000	0.031856	-0.040959
	(-0.709)	(1.445)	(-0.177)
7	0.197990	-0.016180	0.317280
	(1.001)	(-0.089)	(1.331)
8	-0.330920	0.006625	-0.122810
	(-1.938)*	(0.388)	(-0.513)
9	0.351030	0.001143	-0.136020
	(2.171)**	(0.084)	(-0.923)
10	-0.140280	0.002974	0.110590
	(-1.068)	(0.386)	(1.122)

Table 1c (Continued)

Lag	DLRM	DLFRB	DLCIC
UNANTICIPATED			
0	0.012755	-0.003035	0.037107
	(0.330)	(-1.053)	(0.919)
1	-0.022296	0.004105	-0.220700**
	(-0.574)	(0.315)	(-2.141)
2	-0.025359	-0.003114	0.057940
	(-0.638)	(-0.223)	(0.380)
3	-0.002415	0.020636	0.188500
	(-0.055)	(1.145)	(1.257)
4	0.057415	0.014375	0.068907
	(1.311)	(0.855)	(0.460)
5	-0.040316	0.028599	-0.415310***
	(-0.916)	(1.589)	(-2.880)
6	-0.045545	0.008480	0.190140
	(-1.023)	(0.556)	(1.347)
7	-0.006792	0.018887	0.164960
	(-0.149)	(1.198)	(1.106)
8	0.002591	0.005896	-0.091212
	(0.057)	(0.450)	(-0.610)
9	0.069698	0.003630	-0.025877
	(1.510)	(0.333)	(-0.176)
10	0.000035	-0.003788	0.168360
	(0.001)	(-0.495)	(1.529)
CONS	0.002302**	0.002038**	0.001770**
	(2.514)	(2.416)	(2.042)
DLCI(-1)	0.240750***	0.242670***	0.239250***
	(8.957)	(9.016)	(8.907)
DLCI(-2)	-0.085748***	-0.081671***	-0.080624***
	(-3.194)	(-3.033)	(-3.001)

Table 2a Multi-variable structural models

Variable	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
Constant	0.00206**	0.00123	0.00184**	0.00153**	0.00133
	2.554	1.483	2.281	1.852	1.600
$UDOVN_{t-7}$	-0.00016***	-0.00016***	-0.00016***	-0.00016***	-0.00016***
	-4.227	-4.150	-4.226	-4.216	-4.216
$EDOVN_{t-6}$	-0.00015**	-0.00014*	-0.00012*	-0.00016**	-0.00013*
	-2.245	-1.942	-1.751	-2.359	-1.867
$UDLFX_{t-1}$	-	0.12276*	-	-	-
		1.693			
$UDLFX_{t-2}$	-	0.12397*	-	-	-
		1.652			
$EDLFX_{t-9}$	-	0.42210***	-	-	-
		3.311			
$UDLDM_{t-1}$	-	-	0.17197***	-	0.16681**
			2.589		2.516
$UDLDM_{t-2}$	-	-	0.12561*	-	0.12715*
			1.889		1.917
$EDLUSD_{t-9}$	-	-	-	0.38685***	0.38030***
				2.732	2.692
$DLCI_{t-1}$	0.24118***	0.23461***	0.23794***	0.23765***	0.23441***
	9.089	8.845	8.968	8.959	8.837
$DLCI_{t-2}$	-0.07957***	-0.08124***	-0.07981***	-0.07975***	-0.07993***
	-3.000	-3.074	-3.016	-3.014	-3.028
R^2	0.0667	0.0754	0.0721	0.0710	0.0762
F[a]	26.051	17.307	19.152	22.400	17.496
LM[b]	0.060	0.525	0.113	0.524	0.507

The top and bottom numbers are the regression coefficient and calculated *t*-value. ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels, respectively, in two-tailed tests, based on *t*-statistic for the difference of the coefficient from zero. [a] *F*-statistic. [b] Lagrange multiplier test statistic for serial correlation.

Table 2b

Variable	Equation 6	Equation 7	Equation 8	Equation 9	Equation 10
Constant	0.00147*	0.00151*	0.00151*	0.00116	0.00148*
	1.768	1.797	1.824	1.396	1.778
$UDOVN_{t-7}$	-0.00015***	-0.00017***	-0.00016***	-0.00016***	-0.00015***
	-4.043	-4.482	-4.171	-4.326	-4.179
$EDOVN_{t-6}$	-0.00013*	-0.00013**	-0.00013*	-0.00013*	-0.00012*
	-1.884	-1.983	-1.936	-1.904	-1.807
$UDLDM_{t-1}$	0.17347***	0.15875**	0.15934**	0.16171**	0.17485***
	2.613	2.400	2.407	2.441	2.635
$UDLDM_{t-2}$	0.12876*	0.11780*	0.12108*	0.12409*	0.13426**
	1.944	1.776	1.829	1.873	2.022
$EDLUSD_{t-9}$	0.38714***	0.35571**	0.36851***	0.36754***	0.38274***
	2.744	2.521	2.613	2.603	2.711
$UDLCIC_{t-1}$	-0.08843*	-	-	-	-
	-1.728				
$EDLCIC_{t}$	0.14039***	-	-	-	-
	2.679				
$UDLM1_{t-2}$	-	0.12327**	-	-	-
		2.002			
$EDLM1_{t-10}$	-	-0.21002**	-	-	-
		-2.196			
$EDLRM_{t-3}$	-	-	0.25623***	-	-
			2.695		
$UDLMB_{t-4}$	-	-	-	0.07261**	-
				2.176	
$UDLCBM_{t-5}$	-	-	-	-	-0.07731*
					-1.893
$DLCI_{t-1}$	0.22908***	0.23495***	0.23140***	0.23561***	0.23584***
	8.624	8.881	8.736	8.893	8.896
$DLCI_{t-2}$	-0.08144***	-0.07865***	-0.08269***	-0.07840***	-0.08258***
	-3.088	-2.985	-3.137	-2.973	-3.127
R^2	0.0797	0.0814	0.0856	0.0787	0.0780
F	14.457	13.383	16.286	15.942	15.785
LM	0.873	0.567	0.392	1.392	0.240

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