A DECOMPOSITION OF STOCK INDEX FUTURES MISPRICING AND THE PRICE EFFECT OF INDEX ARBITRAGE

TUSHAJ Arjan
University of Tirana, Albania

SINAJ Valentina
University of Tirana, Albania

Abstract:

The importance of the arbitrage theories and the notion of efficient evaluation for the usual market index give a strong motivation for an empirical analysis of the relationship between the current prices and lost future prices. This article developed an empirical system that attempts to characterize the dynamic interactions between these variables. The analysis in this article is motivated from the existence of interrelated markets that trade inter-convertible goods and the common future index. The importance of the mispricing prospective is a whole comprehension of future market efficiency. Mispricing series should be decomposed respectively in equivalency's relative contribution and future markets. This article attempts to get such decomposition and to bring to light on what was done in the past with the usual future index sources, the mispricing and the market efficiency.

Keywords: stock index futures mispricing, index arbitrage, market efficiency

1. A decomposition of stock index futures mispricing

The theory of the future standard price index setting is based on the concept of arbitrage and market efficiency. It is accepted generally that the future prices may fluctuate around any approximated values which are determined by the implementation costs of the future pricing patterns. If the future pricing is biased from some given values (or mispricing) then it will give arbitrageurs signals to enter the market and at the same time they buy or sell the future actives and contracts until the depreciation of these contracts is in levels within arbitrage barriers. The sustained and frequent breaking of arbitrage limits is interpreted as symptoms of inefficient evaluations of future markets and it may incorporate an inadequate supply for arbitrary services.

Consequently, the importance of the arbitrage theories and the notion of efficient evaluation for the usual market index give a strong motivation for an empirical analysis of the relationship between the current prices and lost future prices. This paper develops an empirical system that attempts to characterize the dynamic interactions between these variables.

The analysis in this paper is motivated from the existence of interrelated markets that trade inter-convertible goods (presented by a reserves index) and the common future index. There are two different traders, speculators and double-dealers who trade continuously in both markets causing the price index and future contacts to change.

In different markets the information inflows in different rates. This implies price indices and future prices to deviate temporarily from the intended relationship determined by hold model cost and such deviations are considered as mispricing. Third traders groups, arbitragers, enter the market only if the lost prices cover the trade costs. The unexpected and common activity of arbitragers discrete in time puts pressure on the future and causes prices to go again in line. This market presentation comes up with two important implications. First, the change in current and future prices induces simultaneous changes in mispricing series that comes as a result of the speculators double dealers' activity in the markets with given and future prices. Second, according to the arbitrage approach, mispricing also causes backward changes in countries and future prices. This description highlights the relationship between given prices, future prices and lost future prices which should be internalized in mispricing series model.

The previous literature on the usual index is related mainly with the measurement of mispricing series, the frequency analysis and the nature of non-arbitrageur boundary overlap. Such theories tend only to connect lost prices with future markets although that put the future market efficiency in question. For instance, Chung (1991) relates in a direct way arbitraries profits from lost future prices observed with market efficiency and its tests.

In a similar approach, Deaves (1994) emphasizes that future market efficiency can be tested only from the simple observation of lost price series. The only problem with this technique is that it fails to know all the interaction described above. Mispricing may be caused from unplanned changes in future prices or in given prices as it will be explained from the simplified scenario below. Let's take the case when the future prices are in a fair value. If private information collected first from the future markets, causing a future price change it may imply two consequences. First, mispricing result from future market movements out of fair price range. Second, assuming that future price change is permanent and results from the new information, the pure index is also the same for lost prices and it does not have the complete information.

In such cases, the real source of lost prices is the pure index inertia toward the new information. Mispricing will be vanished by subsequent adjustments of the index where the arbitrating trade causes such changes. In any case, the simple observation of the depreciation does not allow researchers to solve these two components. The

importance of the mispricing prospective is for a fully comprehension of future market efficiency. Mispricing series should be decomposed respectively in equivalency's relative contribution and future markets. Modeling the interaction between given and future prices, and mispricing, this paper attempts to get such decomposition and to bring to light on what was done in the past with the usual future index sources, the mispricing and the market efficiency.

Another aspect of mispricing that was not been examined in the past is the random effect of large lost price observations on the subsequent given and future prices. We can refer as the effect on the arbitrageur price. Dwyer, Locke and Yu (1996) argue that trade made by an arbitragers group with equal costs and who enter the market infrequently, may influence the relationships between given and future prices. Given the importance of arbitrage theory on the deviation estimation, it is interesting that from an academic framework to measure the effect on given and future prices. Furthermore, such analyses form a strong test of mispricing series decomposition: the higher the contribution of a mispricing market, the higher will be the expected price response to the arbitrageur activity.

Analyzing the mispricing decomposition and the effects on standard price index it is important to find a model that enables an appropriate feature of complex interactions between mispricing, given and future prices. Hasbrouck (1991) emphasizes that the systems which are characterized by mutual relation and combined types presented in the previous context, may be modeled by an autoregressive vector. In this framework, through the system, innovations or unexpected changes may follow and their effects on the endogenous variables may appear. In this paper the functions with impulse answering are used to show graphically the relations within the system.
An important fact in developing every framework of VAR is the placement of variables in a valuable, theoretic and logic pattern. The placement controls both the information inflow within the system and the way in which variable fluctuations in system spread and it must create a full real view of market inflow information. In order to achieve it, researchers should base on a priori expectations built from the theory or past empirical work.

As a logical start point, it would be important for the system to revise the empirical previsions of hold costs of future price models from the lost future price prospective. The accepted cost of holding the models states that fair future price value is equal to given price plus holding asset cost in maturity and even more the relative mispricing may be defined as the percentage of future price and current variation from the fair value.

Mathematically, this simple relation on the standard future index is as below:

$$f_t^* = i_t e^{(r-d)(T-t)} \qquad m_t = \left(f_t^a - f_t^* \right) / i_t$$

$$(1)$$

Where f_t^* is the fair future price value at any given time t, f_t^a is the current market price at any given time t, i_t is the index value at time t, r is the annual interest rate

from the date t to the maturity T, d is the annual dividend, and m is the relative mispricing. From the equations (1) it is evident that mispricing series in a given time t, m_t, are a function with simultaneous values of f^*, f^a and i. Obviously, changes in future and price index give simultaneous reviews in m.

Consequently, one needs to reflect this relationship in the VAR system. Furthermore, as Hasbrouck (1991) emphasizes, microstructure imperfectness causes isolated effects in variables. Indeed, most recent studies about future mispricing find out positive serial relations in mispricing. Factors such as distinct prices and isolated responses to the information are imperfectness that Hasbrouck argues may include serial dependence. Consequently, m can modeled in a flexible structure linking its value with other past and current and past values of f^a and i.

$$m_t = \eta_1 m_{t-1} + \ldots + \eta_n m_{t-n} + \varphi_0 i_t + \ldots + \varphi_n i_{t-n} + \gamma_0 f_t^a + \ldots + \gamma_n f_{t-n}^a + v_{1,t}$$

(2)

Thus, as equation (2) shows, we have a lag model. This group of theories documents that future markets shift the index of equivalences from 5 to 45 minutes under market interdependence and the period being analyzed. Furthermore, there is strong simultaneous relationship between markets. The power and the general confirmation of this theory motivate an inclusion of these effects between VAR specifics. Modeling f_t^a as an instantaneous function of current and future values of i and modeling i_t against past values f^a, then the runner nature of future markets is pulled out in the right way. In any case, we should address to the theory of arbitrage in order to build the expectations of the way m (lost price) influences f_t^a and i_t. Unexpected changes of m serve as signals to enter arbitrage markets. Their activities pressure on prices causes reviewing of f^a and i but this has a lag because of time needed to send and execute orders in every market. Therefore, f_t^a and i_t can be modeled from lagged values of m despite of expected arbitrageurs effects. Consolidating this theory, it assures reflection for the future and given prices:

$$f_t^a = \delta_0 i_t + \ldots + \delta_n i_{t-n} + \varepsilon_1 f_{t-1}^a + \ldots + \varepsilon_n f_{t-n}^a + \phi_1 m_{t-1} + \ldots + \phi_n m_{t-n} + v_{2,t}$$

(3)

$$i_t = \alpha_1 i_{t-1} + \ldots + \alpha_n i_{t-n} + \beta_1 f_{t-1}^a + \ldots + \beta_n f_{t-n}^a + \chi_1 m_{t-1} + \ldots + \chi_n m_{t-n} + v_{3,t}$$

(4)

While the above specifications of models seem to be theoretically strong, it is necessary that some cases to be go toward functional form of variables. In order to avoid fluctuations in system, we should take the other variables fixed. Thus, in this

analyze is used the first lag difference of variables. For mispricing, this enables the summary of changes in relative given and future price levels, and a review of mispricing (M), using (1) we obtain:

$$M_t = \left\{ \frac{f_t^a - i_t e^{(r-d)(T-t)}}{i_t} \right\} - \left\{ \frac{f_{t-1}^a - i_{t-1} e^{(r-d)(T-t)}}{i_{t-1}} \right\}$$

(5)

When specifying the functional forms of known and future variables, we take into consideration turbulent variables including also the non-synchronic trade and the relationship supply demand. Future prices exhibit significant negative relation with the supply demand relationship. A simple corrective way for these effects is to express the future price in terms of middle point value. Hasbrouck (1991) uses a simple hypothesis that values defined in a symmetric way around the expected value of security conditioned from all public information. The middle point value according to this hypothesis ensures an authorization for the existent security value. Consequently, formulating the first lag difference of future price as a change in the middle point value (F_t):

$$F_t = \left(q_{f,t}^b + q_{f,t}^a \right)/2 - \left(q_{f,t-1}^b + q_{f,t-1}^a \right)/2$$

(6)

Where, $q_{f,t}^b$ is the best-offered price for the future contract at any time t, and $q_{f,t}^a$ is the best-demanded price for the contract? Non-synchronic trade in component reserves of the index puts forward a real threat to the experiment because the value of reported value is a composition of the previous and a priori period information. To eliminate this problem it is used the Frino, Walter and West (2000) method that recalculate the index value using the actual demand and supply prices for all the known components. The first differences form of the middle point index (I_t) is calculated recording to the report value index function. (i_t) as :

$$I_t = i_{t-1} \left[\frac{\sum_{j=1}^{n} \left\{ s_{j,t} \cdot \left(q_{j,t}^b + q_{j,t}^a \right)/2 \right\}}{\sum_{j=1}^{n} \left\{ s_{j,t-1} \cdot \left(q_{j,t-1}^b + q_{j,t-1}^a \right)/2 \right\}} \right] - i_{t-2} \left[\frac{\sum_{j=1}^{n} \left\{ s_{j,t-1} \cdot \left(q_{j,t-1}^b + q_{j,t-1}^a \right)/2 \right\}}{\sum_{j=1}^{n} \left\{ s_{j,t-2} \cdot \left(q_{j,t-2}^b + q_{j,t-2}^a \right)/2 \right\}} \right]$$

(7)

where j is a component of the common index, s_j a number of the commons outstanding shares (holding) for the reserve. j, q_j^b and q_j^a the best supply and demand

prices respective for the share j and n the number of the shares in the index. The price index "i" is the reported value of the gained value from the exchange only from the two first observations. For the further calculation of the contemporaneous middle point index, the belated values of the middle point index are used instead of i_{t-1} and i_{t-2}.

Another problem that is expounded is the autocorrelations in the variables, which steps the assumption of the OLS technique for VAR. From the presence and correction of the autocorrelation we have that this last is present in the first difference of the mispricing, known and future return, motivates the dawns using the *ARMA (p,q)* scheme. The innovation achieved from the first series filtered (are signed as M_t^*, F_t^*, and I_t^* for the mispricing return, future and known respectively) are substituted in the equations (2), (3) and (4). Using the collected symbols the whole system VAR can be characterized as below:

$$M_t^* = \sum_{l=0}^{n}\varphi_l I_{t-l}^* + \sum_{l=0}^{n}\gamma_l F_{t-l}^* + \sum_{l=1}^{n}\eta_l M_{t-l}^* + v_{1,t}$$

(8)

$$F_t^* = \sum_{l=0}^{n}\delta_l I_{t-l}^* + \sum_{l=1}^{n}\varepsilon_l F_{t-l}^* + \sum_{l=1}^{n}\phi_l M_{t-l}^* + v_{2,t}$$

(9)

$$I_t^* = \sum_{l=1}^{n}\alpha_l I_{t-l}^* + \sum_{l=1}^{n}\beta_l F_{t-l}^* + \sum_{l=1}^{n}\chi_l M_{t-l}^* + v_{3,t}$$

(10)

The "l" parameter indicates the number of lags (time intervals) for every variable and can have values 0 till n where n has to be indicated in the empiric way.

The courier nature of the equations (8), (9) and (10) reflects a diffraction of the known and future effects in the mispricing. Leveling the separates concussion in the equation's residual (9) and (10), the functions of the impulse answer's can pursue the differential effects in the mispricing in the equations (8). In the same way, if we would have one concussion in the residual of the equations (8) is contemporaneous with arbitral signal, the answer in the known and future changes of the equations (9) and (10) inform for the arbitral effects in the prices.

Analyzing the data from the elaborate information we represent it in the table 1, where in the first column are given the number of the observations, and so on in other columns the mean (average), medium, standard deviation, minimum, maximum and the statistics value T, that are necessary for the basic assumption testing that is: mean percentage mispricing is equal to zero. (see *Table 1*)
Descriptive statistic: SPI future mispricing.(see *Table 2*)

Estimates of the multivariate vector autoregressive model for all ordinaries Index, SPI futures and mispricing: for all the observations.
The used model is:

$$M_t^* = \sum_{l=0}^{n} \varphi_l I_{t-l}^* + \sum_{l=0}^{n} \gamma_l F_{t-l}^* + \sum_{l=1}^{n} \eta_l M_{t-l}^* + v_{1,t} \qquad F_t^* = \sum_{l=0}^{n} \delta_l I_{t-l}^* + \sum_{l=1}^{n} \varepsilon_l F_{t-l}^* + \sum_{l=1}^{n} \phi_l M_{t-l}^* + v_{2,t}$$

$$I_t^* = \sum_{l=1}^{n} \alpha_l I_{t-l}^* + \sum_{l=1}^{n} \beta_l F_{t-l}^* + \sum_{l=1}^{n} \chi_l M_{t-l}^* + v_{3,t}$$

In the table 2 are presented the result of the three separated regressions included in VAR from the left to the right through table starting from mispricing innovation as an independent variable.

The auto regression vector is estimated about the whole example of data in the way to explore and interpret the estimated relationships between variables. The two lags of each variable are used in the last specification. Generally, it seems that the model catch the expected important relations between three variables. In the mispricing model, have an important positive relation between the contemporaneous future variables of the mispricing and a important negative relation between the variables of the contemporaneous index and mispricing. Recording to the mispricing theory and to a existence of the overprices in experiment, an increase of the future contract or a decrease of the price index create a immediately impact in the mispricing. It seems that has a positive serial relation in the new mispricing as it shows in the important relations with the outstanding mispricing. This is recording to the argument that non-continues arbitrary trade may review the average of the mispricing.

In the second equations, the changes of the future show important positive relations with known contemporaneous changes. The change of the index it seems that shows a limited capability to direct the future market because of the absence of the positive relations between the outstanding changes and contemporaneous future changes. The negative coefficient appears also for the first and second changes of outstanding mispricing, which can approach the upper arbitrary arguments. It seems that it needs at least one period that the information that is generated form the future market to be collected from each indexes.

The information coming from future market should collect in each index of compound variables. Furthermore, coefficients in two late changing of mispricing are positive and significant. Theoretic bases of model faced to empiric test indicating that producing significant value. There are some points in this theory that they deserve theoretic critics before application. At beginning the argumentative effects of arbitrage on above discussions could indicate only by functions of value and pulse of model. Model could approximate arbitrage effects because of difficulty of current data identification and concrete claims of arbitrary trading. The effectiveness of mispricing signals compromised by uncertainty related to costs of arbitrage transactions. If the changes in mispricing are as insufficient as exceeding these transactions costs, a researcher would not expect the arbitrage effects. However this problem could not compromise the experiment, because Neal (1996) researches proved standard index of arbitrage and resulted in estimation mispricing satisfied real arbitrage criterions. Furthermore this is a matter that covered all efforts to relate mispricing and arbitrage in missing real arbitrary trading. This matter is not specific by VAR methodology. It seems

probability to believe mispricing like authorization for entering of arbitrary trade in markets.

At second, VAR model will obtain approximation of system's dynamics because of feedback existence between variables. Results of Granger causal tests in table indicate significant level of feedback between all couple variables, but some of them included in each individual equation of system. The individual coefficients affected by specific side for each equation. However the combination of individual equations for three variables in alone system and using functions of pulse answering to differ changes between variables, we resulted in approximately and significant estimation. There is the main advantage of VAR technique and principal reason for its application. Meanwhile characteristics structure needed to model the complex actions between variables, other structural models have disadvantages because of claims to include only some variables in each equation. Adaptation of VAR method and excluding of feedback variables from individual equation seemed the smallest worse.

Finally, the estimation of VAR in full example of data could result in inexact conclusions. The superior specification of model could arrive using an autoregressive vector likely in concept with Dweyer, Locke and Yu model (1996).

2. Resolution of mispricing

It is the moment to indicate the relative contribution of known and future markets in mispricing series. To solve this problem gave two sub examples of observations for period of supper and sub price. Analyzing these sub examples could solve above problem estimating autoregressive vector. VAR as the technique of time series required observations in order to decide in equal way on time and why observations periodicity fluctuated. The same periodicity made by sub example using Peiers method (1997). This method required the normalization of different series of each price in VAR during time between previous and current observations. If R_t^i is the change of observed price in period t for series i, the change of standard price SR_t^i gave by formula:

$$SR_\tau^i = \frac{R_\tau^i}{\left[(\tau - (\tau - 1)) * 5\right]}$$

The using of standard variable for sub example of low and high price calculated autoregressive vectors. To calculate the markets contribution in mispricing, fluctuates leveled in v_2 and v_3 (respectively surplus forms of future and index equation) and their effects in other variables of system registered on pulse answering functions. Otherwise we considered if fluctuated variables would be permanent or temporarily to explain exactly these rebound. According to arguments of Chan and Lakonishok (1993), a permanent change in price is the proof of information effect. If the fluctuation is simultaneous with new information coming, it is necessary to determine which market is mispricing.

3. High price source

Referring like high price from future market could derive from the future highest price or the lowest price index. It is not probable to make the difference between two sources from observation of mispricing series. Below analysis solve the changes in mispricing inside compound changes in known and future prices in this problem. Table 3 indicates the calculation of VAR for observed sub example of high price.

Estimates of the multivariate vector autoregressive model for the index, futures and mispricing: high prices case.

The calculations of VAR for sub example of high price in Table 3 conformed large to the calculation taken from whole example (see Table 3). All directions of relations remain constant and only small change of coefficients is observed. These results are significant after they indicate the same relations between standard variables of sub example like as variables of whole example.

4. Low prices source

Meanwhile above situations detailed the contribution of known market and futures in high prices, it is not clearly that it exists the same relation for low prices. Descriptive statistics presented in Table 1 indicated that observations' distribution of low prices sloped in right side compared to slant of observations' distribution of high prices. Low prices putting is small because of their distribution and putting of low and high prices happened in different conditions of market. For instance, Yadav and Pope (1994) told in tendency of futures contracts to have the high price in increased markets and low price in decreased markets. Table 4 indicate estimation model of autoregressive vector in sub example of low prices observations (see Table 4).

Estimates of the multivariate vector autoregressive model for the index, futures and mispricing: low prices case.

According to the second equation structure (1), putting of low prices expressed a negative value. This relation is positive between simultaneous value of index and mispricing, and a negative relation between simultaneous values of futures and mispricing. Also putting of low prices indicates the serial continuous relation in missing of arbitrary activity.

5. Price index effects

Above analysis told that equivalences market contributes in mispricing because of late answering by information. Equivalences market could have a strong relation with arbitrary trade because it services to equal the content of information in two markets. It is interesting for this reason to exam the relative answers of futures and equivalences markets by arbitrary trade like a test of theory. The effect in usual price index is interesting because of significance of arbitrariness in prices putting of derived

insurance. This whole analysis followed by the fluctuation of mispricing series in analytical and graphic way.

6. Concluding Remarks

The system of autoregressive vector made to create interactions between index, futures contracts and mispricing in this article. Such system obtained some advantages to the solution of different effects in two common markets of mispricing, and also to the examination how the arbitrage affects prices in each market. Decomposing mispricing series in future and index effects contributed in prices stability. The permanent unexpected changes in futures prices gave information which it consisted on index and protracted lag. Dynamic of relation between known prices and futures is significant to divide periods with low and high price. These results are the most necessary to investigate the market efficiency, especially when we have related markets. The examination of price effect found new interesting inventions for arbitrary trading:

(1) Arbitrary indicators reply quickly (in 5 minutes) to large arbitrary signals.

(2) Initial replies of value of arbitrary trading index are large but no case of futures value. Results stress that market rules are regulating to kind index and limited instructions regularize futures contracts.

(3) Arbitrage has a large accumulative effect in futures prices more than price index in period of high prices. Against case is real for low prices.

(4) Large gains are probable to long strategy of futures or short local strategy.

(5) Local value and futures overtake quickly new equilibriums following unexpected mispricing. Autoregressive vector overtake models in interesting field of arbitrary process.

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Apendix

Table 1

Descriptive Statistics:SPI futures mispricing

	N observation	Mean	T-value	Median(%)	Std dev	Min	Max
Full sample	3750	3.11	34	0.1	0.38	-3	2.7
Overpricing subsample	2500	11.24	124	0.3	0.4	0	2.7
Underpricing subsample	1250	-9.51	-170	-0.4	0.37	-3	0

Table 2

Estimates of the multivariete vector autoregressive model for all ordinaries index, SPI futures and mispricing for full sample

Mt	Coeff	T-stat.	Ft	Coeff.	T-stat	It	Coeff	T-stat
I_t	-0.9	-234	I_t	0.9	30	I_{t-1}	0.02	0.44
I_{t-1}	-0.02	-1.7	I_{t-1}	-0.002	-0.3	I_{t-2}	0.07	3.7
I_{t-2}	0.13	24	I_{t-2}	-0.08	-4.2	F_{t-1}	0.09	4.3
F_t	0.8	234	F_{t-1}	-0.01	-1.2	F_{t-2}	-0.02	-1.3
F_{t-1}	-0.06	-14	F_{t-2}	0.04	3.2	M_{t-1}	2.08	8.2
F_{t-2}	-0.12	-25	M_{t-1}	-0.15	-4.1	M_{t-2}	0.14	6.1
M_{t-1}	0.2	35.2	M_{t-2}	-0.14	-4.4			
M_{t-2}	0.3	40.9						
			$R^2(Ft)$	0.52		$R^2(It)$	0.12	
$R^2(Mt)$	0.89		F-stat	357		F-stat	820	
F-stat	455							

Table 3

Estimates of the multivariete vector autoregressive model for the index, futures and mispricing for subsample overpricing.

Mt	Coeff	T-stat.	Ft	Coeff.	T-stat	It	Coeff	T-stat
I_t	-	-434	I_t	0.43	40	I_{t-1}	0.03	0.74
I_{t-1}	1.009	-8.7	I_{t-1}	-0.03	-0.7	I_{t-2}	0.0708	3.74
I_{t-2}	-0.05	72	I_{t-2}	-0.06	-1.2	F_{t-1}	0.04	3.3
F_t	0.18	1234	F_{t-1}	-0.02	2.2	F_{t-2}	0.02	0.3
F_{t-1}	1.1	-13	F_{t-2}	0.02	0.28	M_{t-1}	0.28	8.2
F_{t-2}	-0.07	-	M_{t-1}	-0.12	-	M_{t-2}	0.04	2.1
M_{t-1}	-0.23	54.4	M_{t-2}	-0.04	1.81			
M_{t-2}	0.27	45.2			-1.4			
	0.34	80.9	$R^2(Ft)$	0.12		$R^2(It)$	0.16	

R^2(Mt)			F-stat	457		F-stat	1820	
F-stat	0.91							
	1455							

Table 4

Estimates of the multivariete vector autoregressive model for the index, futures and mispricing for subsample underpricing.

Mt	Coeff	T-stat.	Ft	Coeff.	T-stat	It	Coeff	T-stat
I_t	-1.9	-84	I_t	0.69	31	I_{t-1}	0.22	4.4
I_{t-1}	0.12	5.7	I_{t-1}	-0.092	-1.3	I_{t-2}	-0.07	-0.7
I_{t-2}	0.013	7.4	I_{t-2}	0.032	0.72	F_{t-1}	-0.09	-4.3
F_t	0.89	254	F_{t-1}	0.27	3.62	F_{t-2}	0.12	2.3
F_{t-1}	-0.26	-7.4	F_{t-2}	-0.04	-1.8	M_{t-1}	0.48	6.2
F_{t-2}	-0.12	-8.5	M_{t-1}	-0.45	-4.1	M_{t-2}	0.o4	0.11
M_{t-1}	0.37	15.2	M_{t-2}	0.014	0.89			
M_{t-2}	0.21	11.9						
			R^2(Ft)	0.32		R^2(It)	0.082	
R^2(Mt)	0.91		F-stat	1267		F-stat	320	
F-stat	4235							

Significant at the 0.05 level