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Economic determinants of trading volume in futures markets *

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In this paper, we test first, the hypothesis that the volume of trade in futures markets follows a random walk process. Next, we examine the role of several monthly macroeconomic variables and find that these variables have a statistically significant impact on the trading volume. The economic consequences of our findings indicate that futures traders, futures exchanges, regulatory agencies and others associated with futures markets activities act rationally in watching closely these macroeconomic variables.

1. Introduction

Volume of trade is an important piece of information for futures traders, futures exchanges and regulatory agencies. Actually, volume data are useful in measuring the growth or decline of futures contracts, in estimating the potential impact of new contracts, and in explaining the success or failure of futures contracts [see, i.e. Carlton (1983)].

The empirical relationship between trading volume of futures contracts and price variability has been studied, among others, by Cornell (1981), Tauchen and Pitts (1983), Grammatikos and Saunders (1986), and Garcia, Leuthold and Zapata (1986). Several studies have examined other determinants of volume such as Carlton (1984), who emphasized the role of inflation, and Martell and Wolf (1987), who considered several factors, such as, rate of unemployment, inflation, market performance, riskfree interest rate, etc. Most of these studies have found positive relationships between volume, price variability and inflation.

In this paper we examine the behavior of trading volume for several futures contracts. Our first hypothesis is that the volume of trade in futures markets follows a random walk. Next, we postulate than the random behavior of volume does not imply that there are no other economic variables which statistically explain such behavior. We claim that the volume of trade in futures markets is related to several fundamental economic variables, which help explain the behavior of futures trading volume.

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2. Data

Total monthly trading volume and prices covering the 1980–1986 time period have been obtained from the Commodity Year Book, of the Commodity Research Bureau, for the following representative futures contracts:

(i) Agricultural Commodities: soybeans and corn, traded at the Chicago Board of Trade;
(ii) Metallurgical Commodities: silver and gold, traded at the New York Comex;
(iii) Financial Futures: Treasury-Bill and Treasury-Bond, traded at the Chicago Mercantile Exchange and the Chicago Board of Trade, respectively.

Monthly data for the Consumer Price Index, and Producer Price Index have been taken from the Federal Reserve Bulletin. Monthly data for the Industrial Production Index were taken from the Business Conditions Digest.

3. Random walk test

The following regression was run to test for random walk:

$$\ln V_t = B_0 + B_1 \ln V_{t-1} + \epsilon_t, \tag{1}$$

where $\ln V_t$, $\ln V_{t-1}$ = natural logarithm of the volume of trade at times t and $t-1$, respectively. (We use logarithms instead of absolute values to avoid the problem of heteroscedasticity).

The null hypothesis, $B_1 = 1$, is tested using the t-distribution suggested by Dickey and Fuller (1979). The regression results are presented in table 1. We cannot reject the null hypothesis that the logarithmic behavior of volume follows a random walk, at the 1% and 5% levels of significance. This is true for all contracts except gold.

The economic significance of this result is that current levels of trading volume incorporate all publically available information and therefore one could not predict future volume by studying past time series volume data.

4. Macroeconomic variables

Failure to reject the random walk hypothesis does not necessarily imply that the random walk process of (1) is the best way to explain the changes in the volume of trade. Indeed, as we indicated in the introduction, there are several papers that have studied the impact of economic variables in the trading volume of futures contracts. In this section we postulate that the random walk of (1) can be improved by the incorporation of several fundamental economic variables.

We implement our hypothesis by running the following regression:

$$\ln V_t = B_0 + B_1 \Delta \ln IP_t + B_2 \Delta \ln CPI_t + B_3 \Delta \ln PPI_t + B_4 \ln P_t + B_5 \,\mathrm{VAR}\, P_t + B_6 \ln V_{t-1} + \epsilon_t, \tag{2}$$

where:

V = Futures trading volume,
IP = Industrial Production Index,

Table 1
Random walk tests. Model 1: $\ln V_t - B_0 + B_1 \ln V_{t-1} + \epsilon_t$.

Futures contracts	Regression coef., t-value, std error		R^2	$H_0: B_1 = 1$
	B_0	B_1	F Pr.	t-values
Beans	1.453 [a]	0.824 [a]	0.64	
	2.57	12.06	145.55	−2.58 [c]
	0.566	0.068	0.0001	
Corn	1.896 [a]	0.768 [a]	0.58	
	3.20	10.63	112.90	−3.20 [d]
	0.593	0.072	0.0001	
Silver	0.473 [b]	0.914 [a]	0.84	
	1.88	20.34	413.88	−1.90 [c]
	0.251	0.045	0.001	
Gold	3.520 [a]	0.469 [a]	0.22	
	5.37	4.75	22.55	−5.38
	0.656	0.099	0.0001	
T-Bill	0.302	0.945 [a]	0.84	
	1.18	20.98	440.14	−1.22 [c]
	0.256	0.045	0.0001	
T-Bond	0.484 [a]	0.939 [a]	0.94	
	2.44	35.43	1255.53	−2.30 [c]
	0.198	0.027	0.0001	

[a] Significantly different from zero at the 5% level.
[b] Significantly different from zero at the 10% level.
[c] Not significantly different from one at the 5% level (using Dickey and Fuller 1979).
[d] Not significantly different from one at the 10% level (using Dickey and Fuller 1979).

CPI = Consumer Price Index,
PPI = Producer Price Index,
P = Futures price,
$\Delta \ln IP_t = \ln IP_t - \ln IP_{t-1}$,
$\Delta \ln CPI_t = \ln CPI_t - \ln CPI_{t-1}$,
$\Delta \ln PPP_t = \ln PPI_t - \ln PPI_{t-1}$,
VAR P_t = Semi-annual variance of future price, computed with the last six monthly prices and by means of moving window procedure.

The rationale for these economic variables is as follows: As we have already mentioned several studies have found a relation between volume and price and its variability. In fact, since price risk plays a key role in the hedging process, price variability has been postulated as an important explanatory variable of the volume of trade. A key motive for the existence of futures markets is economic uncertainty. Forces of inflation add new dimensions to price variability. Carlton (1983) found significant relationship between inflation and the trading volume for several agricultural futures. Two measures of inflation are used in our study: Consumer Price Index and Producer Price Index. Finally, Industrial Production is included in the regressions as an indicator of the national economic activity.

Table 2 presents the results of the multiple regressions of (2). By comparing Tables 1 and 2, we can observe an improvement in the R^2. That is, the explanatory power of (2) is better than that of

Table 2
Improving the forecasting of the volume of trade.
Model 2: $\ln V_t - B_0 + B_1 \Delta \ln IP_t + B_2 \Delta \ln PPI_t + B_3 \Delta \ln PPI_t + B_4 \ln P_t + B_5 \, VARP_t + B_6 \ln V_{t-1} + \epsilon_t$.

Futures contracts	Regression coef., t-value, std error							R^2 F Pr.	H_0: $\sum_{i=1}^{5} B_i = 0$ F
	B_0	B_1	B_2	B_3	B_4	B_5	B_6		
Beans	−3.304 [a]	4.839 [a]	−20.968 [a]	6.935 [a]	1.526 [a]	−1.366	0.211 [a]	0.83	
	−3.39	2.32	−3.17	2.14	7.45	−0.43	2.37	57.02	16.44 [c]
	0.975	2.088	6.613	3.244	0.205	3.169	0.089	0.0001	
Corn	0.990	4.987 [a]	−5.336	1.855	0.944 [a]	14.586 [a]	0.218 [a]	0.77	
	1.52	2.29	−0.76	0.54	5.88	3.93	2.19	38.54	11.15 [c]
	0.654	2.181	6.985	3.149	0.160	3.708	0.099	0.0001	
Silver	0.945 [b]	8.001 [b]	−0.489	−5.379	−0.042	−1.114	0.851 [a]	0.86	
	1.91	1.87	−0.04	−0.88	−0.31	−0.49	13.88	71.90	5.27 [c]
	0.495	4.280	12.989	6.101	0.133	2.277	0.061	0.0001	
Gold	3.176 [a]	−4.334	1.212	−7.984 [b]	0.322	21.148 [a]	0.222 [a]	0.331	
	2.75	−1.43	0.14	−1.719	1.88	2.39	2.01	5.85	8.21 [c]
	1.157	3.034	8.746	4.644	0.172	8.840	0.111	0.0001	
T-Bill	25.577 [a]	−1.379	−5.853	−2.950	−5.338 [a]	−170.606	0.736 [a]	0.882	
	3.90	−0.59	−0.71	−0.82	−3.84	−1.22	11.05	88.22	4.56 [c]
	6.561	2.352	8.292	3.597	1.392	140.459	0.067	0.0001	
T-Bond	0.253	0.120	−2.277	1.849	0.063	−0.975	0.934 [a]	0.917	
	0.35	0.05	−0.29	0.49	0.32	−0.10	18.55	130.34	0.26
	0.723	2.351	7.888	3.744	0.197	9.413	0.050	0.0001	

[a] Significantly different from zero at the 5% level.
[b] Significantly different from zero at the 10% level.
[c] Significantly different from zero at the 5% level.

(1). Moreover, the null hypothesis that the regression coefficients of the several economic variables are equal to zero, as a group, is rejected at the 5 percent level of significance for all the futures contracts, except T-bonds.

The results presented in Table 2 suggest that the empirical evidence that the trading volume follows a random walk does not mean that changes in the volume of trade are totally unpredictable. Indeed, these results allow us to conclude that the volume of trade can be explained by macroeconomic variables that describe inflation and real economic activity. Therefore, traders and exchanges act rationally by closely observing such monthly macroeconomic variables.

5. Summary and conclusion

The paper analyzes the determinants of trading volume for several agricultural, metallurgical and financial futures contracts. Dickey and Fuller tests suggest that the volume of trade follows a random walk process. However, the incorporation of several fundamental monthly economic variables in the regression equation significantly improves the explanatory power of the model. In effect, the results of regressing the trading volume on several economic variables indicate that trading volume in futures markets could be explained by macroeconomic variables. This evidence supports the hypothesis that traders and exchanges act rationally in observing and responding to changes in key monthly economic variables.

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