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Stock Market Volatility

In recent months, it has not been unusual to see the value of major stock indexes, such as the S&P 500, change by as much as 3% in a single day. Unfortunately for many investors, the general direction of those changes has been downward. For some researchers in financial economics, the interesting question is: what drives the volatility itself? The evidence they have uncovered over the last few decades sheds light on the efficiency of the stock market and points to some important implications for economic forecasters and investors. In particular, it suggests that the degree of stock market volatility can help forecasters predict the path of the economy's growth; furthermore, changes in the structure of volatility imply that investors now need to hold more stocks in their portfolios to achieve diversification. In this *Economic Letter* I survey the academic literature on the properties and causes of stock market volatility, focusing on the debate on whether the stock market varies excessively, how volatility changes over time, and some of the underlying components of volatility.

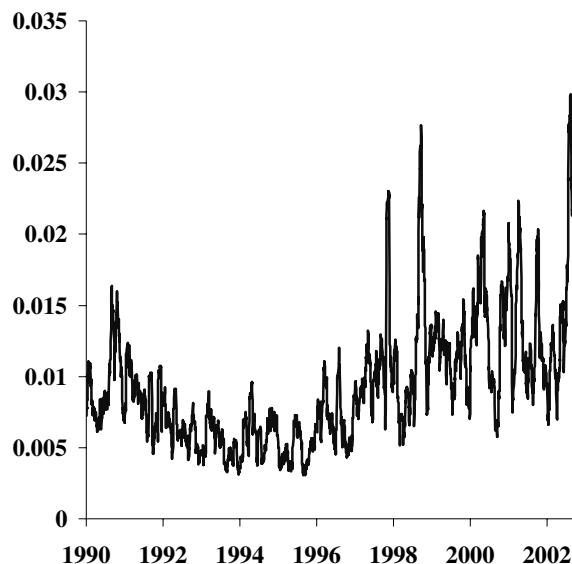
Excess stock market volatility and dividends

Stock market performance is usually measured by the percentage change in the stock price or index value, that is, the returns, over a set period of time. One commonly used measure of volatility is the standard deviation of returns, which measures the dispersion of returns from an average. Since the beginning of 1997, the standard deviation of daily returns is 1.3% for the S&P 500 Index, 2.2% for the NASDAQ, and 1.3% for the Dow Jones Industrial Average (see Figure 1).

If the stock market is efficient, then the volatility of stock returns should be related to the volatility of the variables that affect asset prices. One candidate variable is dividends. But research conducted in the early 1980s suggests that variation in dividends alone cannot fully account for the variation in prices (see LeRoy and Porter 1981 and Shiller

Figure 1

Estimates of S&P 500 conditional volatility
(St. deviation of within-month daily index returns)



1981). Prices are much more variable than are the changes in future dividends that should be capitalized into prices. Asset prices apparently tend to make long-lived swings away from their fundamental values. This fact turned out to be equivalent to the finding that, at long horizons, stock returns displayed predictability. Thus, the literature on excess volatility broached the possibility that the stock market may not be efficient.

In the excess volatility literature, the researchers understood that the dividends that are capitalized in the stock price arrive in the future and need to be “discounted” back to the present using a discount rate. In the early research it was assumed that this discount rate was constant. However, discount rates depend on investors’ preferences for risk, which could very well change over time. Therefore, stock market volatility may not be excessive if discount

rates are variable enough. Thus, the real contribution of the excess volatility literature was to call attention to the fact that corporate dividends are simply too smooth a series to account for the high volatility in prices. Subsequent research necessarily focused away from the payout policy of firms and toward the characteristics of investors and of actual stock market trading.

Persistence of stock market volatility

Stock market volatility tends to be persistent; that is, periods of high volatility as well as low volatility tend to last for months. In particular, periods of high volatility tend to occur when stock prices are falling and during recessions. Stock market volatility also is positively related to volatility in economic variables, such as inflation, industrial production, and debt levels in the corporate sector (see Schwert 1989).

The persistence in volatility is not surprising: stock market volatility should depend on the overall health of the economy, and real economic variables themselves tend to display persistence. The persistence of stock market return volatility has two interesting implications. First, volatility is a proxy for investment risk. Persistence in volatility implies that the risk and return tradeoff changes in a predictable way over the business cycle. Second, the persistence in volatility can be used to predict future economic variables. For example, Campbell, et al. (2001) show that stock market volatility helps to predict GDP growth.

Components of stock market volatility

Researchers have sought to analyze the relative importance of economy-wide factors, industry-specific factors, and firm-specific factors on a stock's volatility. This approach borrows from modern asset pricing theory and its emphasis on so-called factor models, or models that assume a firm's stock return is governed by factors such as the overall market return, the return on a portfolio of firms sampled from the same industry, or even changes in economic factors such as inflation, changes in oil prices, or growth in industrial production. If returns have a factor structure, then the return volatility will depend on the volatilities of those factors. Campbell, et al. (2001) assume the factors are the overall market return, an industry return (e.g., financial, industrial, etc.), and an idiosyncratic noise term that

captures firm-specific information. They document the important empirical fact that while volatility moves considerably over time, there is not a distinct trend upwards or downwards. More interestingly, however, since 1962, there has been a steady decline in stock market volatility attributed to the overall market factor; that is, the common volatility shared across returns on different stocks has diminished over that period. The variation ascribed to firm-specific sources, by contrast, has risen. The implication for investors, then, is that they need to hold more stocks in their portfolios in order to achieve diversification.

Conclusion

Economists have long been interested in the patterns of stock market volatility. Their research on excess volatility relative to dividends found that volatility tends to ebb and flow; subsequent research found that periods of high volatility are persistent and occur during periods of stock market declines, and that the stock market volatility associated with systematic factors has been declining over time. These academic findings may offer little consolation to today's investor for whom volatility means portfolio losses, but the research has yielded important insights into how stock market information can help forecast economic variables, and how investors can construct portfolios that can minimize volatility.

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References

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BANKS HEADQUARTERED BY REGION
JUNE 30, 2002
 (NOT SEASONALLY ADJUSTED, PRELIMINARY DATA)
 (BANKS WITH ASSETS LESS THAN OR EQUAL TO \$1 BILLION ARE DEFINED AS SMALL)

		UNITED STATES			TWELFTH DISTRICT		
		ALL	SMALL	LARGE	ALL	SMALL	LARGE
ASSETS AND LIABILITIES — \$ MILLION							
ASSETS	TOTAL	6,685,469	1,049,379	5,636,090	659,782	96,535	563,247
	FOREIGN	773,431	583	772,849	3,337	17	3,321
	DOMESTIC	5,912,038	1,048,796	4,863,242	656,444	96,518	559,926
LOANS	TOTAL	3,938,251	677,493	3,260,758	428,876	64,999	363,877
	FOREIGN	295,429	441	294,989	2,354	46	2,308
	DOMESTIC	3,642,822	677,053	2,965,769	426,522	64,953	361,569
	REAL ESTATE	1,837,039	445,306	1,391,733	230,273	42,417	187,857
	COMMERCIAL RE	528,805	169,571	359,234	81,791	23,475	58,316
	SINGLE FAMILY RES	1,005,482	181,853	823,628	107,397	7,389	100,008
	COMMERCIAL	788,317	117,449	670,868	89,316	14,224	75,091
	CONSUMER	598,227	71,198	527,030	79,849	5,839	74,010
	CREDIT CARDS	249,197	6,421	242,776	52,256	1,347	50,909
	AGRICULTURAL	46,761	30,767	15,995	5,880	1,611	4,269
	OTHER LOANS	372,477	12,332	360,145	21,205	862	20,342
INV. SECURITIES	TOTAL	1,212,027	244,761	967,266	112,502	16,894	95,608
	U.S. TREASURIES	51,144	11,581	39,563	3,362	783	2,579
	U.S. AGENCIES, TOTAL	769,229	167,701	601,528	53,796	11,283	42,513
	U.S. AGENCIES, MBS	571,704	78,410	493,294	39,057	6,217	32,840
	OTHER MBS	79,406	4,194	75,212	10,595	973	9,623
	OTHER SECURITIES	312,248	61,285	250,963	44,749	3,855	40,894
LIABILITIES	TOTAL	6,054,627	942,618	5,112,009	586,423	85,989	500,434
	DOMESTIC	5,281,179	942,035	4,339,143	583,086	85,972	497,114
DEPOSITS	TOTAL	4,410,906	861,417	3,549,489	447,143	77,395	369,748
	FOREIGN	640,646	1,274	639,372	13,647	49	13,599
	DOMESTIC	3,770,260	860,144	2,910,116	433,496	77,347	356,149
	DEMAND	491,621	117,328	374,293	51,177	12,050	39,127
	MMDA & SAVINGS	1,860,245	256,052	1,604,193	262,556	29,951	232,606
	SMALL TIME	719,553	255,953	463,601	49,766	15,029	34,737
	LARGE TIME	545,341	138,758	406,583	60,749	15,638	45,111
	OTHER DEPOSITS	153,499	92,053	61,446	9,247	4,679	4,568
OTHER BORROWINGS		580,431	48,712	531,719	65,589	5,399	60,190
EQUITY CAPITAL		619,695	106,653	513,042	73,063	10,518	62,545
LOAN LOSS RESERVE		74,980	9,832	65,148	8,752	1,295	7,457
LOAN COMMITMENTS		5,177,362	647,988	4,529,375	867,967	349,686	518,281
TIER1 CAPITAL RATIO		0.101	0.136	0.096	0.114	0.131	0.112
TOTAL CAPITAL RATIO		0.130	0.148	0.127	0.141	0.144	0.141
LEVERAGE RATIO		0.080	0.096	0.077	0.093	0.103	0.091
LOAN LOSS RESERVE RATIO		1.904	1.451	1.998	2.041	1.993	2.049
QUARTERLY EARNINGS AND RETURNS — \$ MILLION							
INCOME	TOTAL	135,096	19,982	115,115	14,067	2,189	11,878
	INTEREST	91,013	16,197	74,816	9,756	1,607	8,148
	FEES & CHARGES	7,592	1,124	6,468	647	77	571
EXPENSES	TOTAL	98,834	15,443	83,392	9,444	1,649	7,795
	INTEREST	31,726	5,597	26,129	2,333	422	1,911
	SALARIES	24,888	4,433	20,455	2,430	507	1,924
	LOAN LOSS PROVISION	10,771	885	9,887	1,203	160	1,044
	OTHER	31,449	4,527	26,921	3,477	561	2,916
TAXES		11,349	1,222	10,127	1,652	185	1,467
NET INCOME		23,687	3,265	20,422	2,874	348	2,526
ROA (% ANNUALIZED)		1.453	1.266	1.488	1.786	1.483	1.838
ROE (% ANNUALIZED)		15.289	12.244	15.923	15.736	13.241	16.156
NET INTEREST MARGIN (% ANNUALIZED)		3.636	4.112	3.547	4.612	5.047	4.538
ASSET QUALITY — PERCENT OF LOANS							
NET CHARGEOFFS (% ANNUALIZED)							
	TOTAL	1.074	0.370	1.220	1.171	0.813	1.235
	REAL ESTATE	0.142	0.077	0.162	0.062	0.079	0.058
	COMMERCIAL	1.825	0.764	1.978	2.141	1.404	2.279
	CONSUMER	3.014	1.575	3.189	3.447	4.868	3.335
	CREDIT CARDS	5.855	9.326	5.764	4.639	15.005	4.364
	AGRICULTURAL	0.370	0.228	0.633	0.537	0.494	0.553
PAST DUE & NON-ACCRUAL							
	TOTAL	2.626	2.197	2.716	2.143	2.205	2.132
	REAL ESTATE	1.877	1.843	1.888	1.392	1.403	1.390
	CONSTRUCTION	2.095	1.968	2.142	2.862	1.755	3.315
	COMMERCIAL	1.666	1.691	1.655	1.171	1.208	1.156
	FARM	2.573	2.308	3.198	3.508	4.602	2.896
	HOME EQUITY LINES	0.888	0.827	0.895	0.858	0.591	0.891
	MORTGAGES	2.323	2.088	2.381	1.297	1.890	1.258
	MULTI-FAMILY	0.815	0.980	0.770	0.426	0.440	0.422
	COMMERCIAL	4.000	2.951	4.152	3.473	3.319	3.502
	CONSUMER	3.424	3.123	3.461	2.980	5.056	2.817
	CREDIT CARDS	4.564	8.079	4.471	3.646	11.222	3.446
	AGRICULTURAL	2.421	1.910	3.369	4.147	2.277	4.853
NUMBER OF BANKS		7,949	7,560	389	560	484	76
NUMBER OF EMPLOYEES		1,723,638	386,411	1,337,227	160,821	36,976	123,845

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INTEREST RATES ON LOANS											
TYPE OF LOAN		MAY 2000	AUG 2000	NOV 2000	FEB 2001	MAY 2001	AUG 2001	NOV 2001	FEB 2002	MAY 2002	AUG 2002
COMMERCIAL and INDUSTRIAL LOANS											
TOTAL	U.S.	7.78	8.28	8.15	7.19	6.22	5.61	3.89	3.66	3.60	3.64
	DISTRICT	7.42	7.90	7.85	7.04	5.94	5.22	3.58	3.36	3.77	3.74
BY RISK RATING:											
MINIMAL RISK	U.S.	6.82	7.42	7.54	6.23	6.01	4.50	2.97	2.10	2.61	3.20
	DISTRICT	6.19	7.25	6.66	6.54	4.98	4.46	2.88	2.59	2.79	1.26
LOW RISK	U.S.	7.15	7.55	7.57	6.54	5.44	4.81	3.08	3.41	2.86	2.81
	DISTRICT	6.99	7.65	7.68	6.53	5.42	4.66	3.14	2.91	3.18	3.31
MODERATE RISK	U.S.	7.97	8.41	8.33	7.28	6.38	5.57	4.25	3.89	3.84	3.73
	DISTRICT	7.57	8.06	8.04	7.51	6.35	5.54	3.84	3.48	4.35	4.51
OTHER	U.S.	8.63	8.95	8.85	7.97	6.82	6.16	4.31	4.01	4.00	4.01
	DISTRICT	7.57	8.00	7.79	7.70	6.64	6.35	4.39	3.98	4.55	4.13
BY MATURITY/REPRICING INTERVAL:											
DAILY	U.S.	7.21	7.74	7.84	6.88	5.94	5.15	3.67	3.10	3.12	3.43
	DISTRICT	7.59	7.94	7.85	7.22	6.03	5.33	3.91	3.71	3.65	4.55
2 TO 30 DAYS	U.S.	7.60	8.18	7.60	6.94	5.80	5.84	3.66	3.61	3.46	3.13
	DISTRICT	7.37	7.83	7.78	6.96	5.87	5.16	3.47	3.25	3.71	3.48
31 TO 365 DAYS	U.S.	8.04	8.13	8.04	7.22	5.90	5.42	3.94	3.74	3.44	3.54
	DISTRICT	7.05	7.70	7.68	6.39	5.47	4.72	3.23	2.88	3.24	3.48
OVER 365 DAYS	U.S.	8.37	8.84	8.37	8.48	7.61	7.02	6.09	5.66	6.01	5.38
	DISTRICT	4.64	8.72	9.03	7.36	7.70	7.30	5.08	5.71	6.82	5.36
CONSUMER, AUTOMOBILE	U.S.	9.21	9.82	9.63	9.17	8.67	8.31	7.86	7.50	7.74	5.95
	DISTRICT	9.23	9.87	9.87	9.94	9.34	8.34	8.54	8.32	9.20	8.92
CONSUMER, PERSONAL	U.S.	13.88	13.85	14.12	13.71	13.28	13.25	12.62	11.72	12.57	11.28
	DISTRICT	14.89	13.25	13.25	13.67	12.48	13.22	12.45	14.39	12.36	13.07
CONSUMER, CREDIT CARD	U.S.	15.39	15.98	15.99	15.66	15.07	14.60	14.22	13.65	13.55	13.37
	DISTRICT	15.76	16.16	16.25	16.94	15.54	15.28	15.01	13.21	13.34	13.08

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