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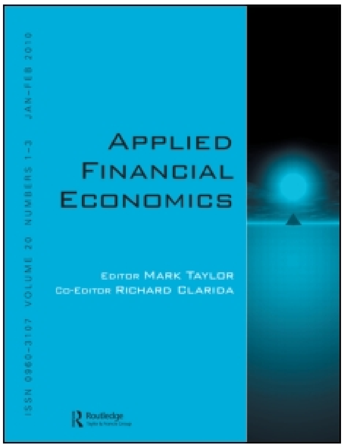

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Stock returns and real activity: is there still a connection?

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Stock returns and real activity: is there still a connection?

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Several studies published in the early 1990s found that a large fraction of stock return variations can be explained by future values of measures of real activity in the United States by using data samples from the 1950s to the 1980s. This paper presents evidence that the relation does not hold up any more during the most recent stock market boom since the early 1980s indicating that stock returns ceased to lead real economic activity. Therefore, the current stock market boom seems to be fundamentally different from the first stock market boom after World War II from the late 1940s to the mid-1960s, when the stock market was clearly leading real activity. A possible explanation of our results is the existence of bubbles or fads which make movements of stock prices more independent from subsequent changes in real activity.

I. INTRODUCTION

Since the early 1980s stock prices are raising almost continuously in the United States which led to the second persistent bull market after World War II. The first high growth period lasted from about 1949 to the mid-1960s and was closely connected to the high economic growth of the 1950s and 1960s. Therefore, economists had no trouble in explaining the first persistent bull market by standard valuation models according to which stock prices are determined by market fundamentals. But the present growth period is more troublesome and many times the question has been asked whether stock prices can still be explained by fundamentals, as in the 1949–1965 high growth episode, or, whether prices deviate from fundamental values and are, for example, governed by speculative bubbles or fads. Of course, bubbles are mainly discussed in relation to the 1987-mini crash, but recent price increases, which drove stock markets to historically high levels in terms of the price-dividend ratio or the stock market-to-GDP ratio, make many analysts doubt about their fundamental justification.

In general, it is a highly controversial issue whether stock prices accurately reflect the underlying fundamentals. Numerous tests that have been done since the early 1980s mainly proved one thing: it is a futile attempt to directly test for deviations from fundamental values, as for example caused by speculative bubbles, because bubbles cannot be distinguished from unobserved fundamentals (Hamilton and Whiteman, 1985).[1] Even the most extreme sequences of sustained price raises with following price crashes could, at least principally, have been driven by some unobserved fundamental factor and only look irrational from an *ex post* perspective. And if there are *ex ante* possibilities of successful projects that fail to be realized *ex post*, this (unobserved) fundamental factor may not be detected by an econometrician's analysis with hindsight and lead to a misspecification of fundamentals (Ahmed *et al.*, 1997).

[1] This is even true if one tests for bubbles in closed end funds where the 'unobserved or misspecified fundamental' problem is not supposed to apply (Ahmed *et al.*, 1997) because the fundamental value should equal the net asset value of the constituent assets (corrected for various factors). Consequently, as Ahmed *et al.* argue, the fund price and the underlying net asset value should move together if there is no bubble, otherwise, if closed end funds sell for a discount or a premium, that must be a bubble. But the defenders of market efficiency would certainly argue that it is precisely because of an unobserved or misspecified fundamental factor if prices of closed end funds do not move together with the underlying net asset values.

Therefore, economists also came up with fundamental explanations of the most famous bubble episodes such as ‘tulip mania’ or the ‘south sea bubble’ (Garber, 1990) and the main question is how far one is willing to stretch the term ‘fundamental factor’ in order to make these episodes look rational from an assumed *ex ante* perspective, that traders were supposed to have during these episodes.

Even though it seems to be impossible to prove whether stock prices deviate from fundamental values, standard valuation models and the theory behind these models have certain implications which are empirically observable. If stock prices reflect fundamentals there should be a close relation to expected future real activity. The fundamental value of a firm’s stock equals the expected present value of the firm’s future payouts (dividends), if these expectations take all currently available information into account. And future payouts must ultimately reflect real economic activity as measured by industrial production or GDP (Shapiro, 1988). Under these circumstances, the stock market is a passive informant of future real activity (Morck *et al.*, 1990) as stock prices react immediately to new information about future real activity well before it occurs. Consequently, stock prices should lead measures of real activity as stock prices are built on expectations of these activities, and the absence of any correlation between stock returns and future production growth rates would therefore suggest that stock prices do not accurately reflect the underlying fundamentals.

Several earlier studies (e.g. Barro, 1990; Fama, 1990; Schwert, 1990; Chen, 1991; Lee, 1992) found that a large fraction of stock return variations could be explained by subsequent values of measures of real activity in the United States, indirectly suggesting that, in the longer run, stock prices reflected fundamentals, at least until the mid-1980s. Peiro (1996) confirmed this result for several other industrial countries using changes in stock prices instead of returns. Moreover, recent research finds evidence for an asymmetry in the predictability of industrial production growth rates by stock returns (e.g. Estrella and Mishkin, 1996; Domian and Louton, 1997). According to this research, negative stock returns are followed by sharp decreases in industrial production growth rates, while only slight increases in real activity follow positive stock returns. Consequently, stock returns should be especially powerful in predicting recessions particularly one to three quarters ahead.

This paper will test whether the traditionally close relation between GDP or industrial production and stock prices, which has been found by earlier studies, still holds up during the recent stock market boom which started in the early 1980s. All of the studies mentioned above (Barro, 1990; Fama, 1990; Schwert, 1990; Chen, 1991; Lee, 1992) analyse quite large samples over several decades and the recent stock market boom hardly influences the results presented there. Therefore, we separately run regressions over subsamples covering the first stock market boom from the late 1940s to the mid-1960s and the current stock market boom in order to find out whether things are different this time.

II. STOCK RETURNS AND FUTURE GROWTH RATES OF PRODUCTION AND GDP

In this section, we will basically run the same regressions as in Fama (1990) for different time periods. The results in Fama (1990) showed that stock returns were actually significant in explaining future real activity for the whole period from 1953 to 1987. Monthly, quarterly and annual stock returns were highly correlated with future production growth rates. According to the reported regressions past stock returns were significant in explaining current production growth rates and, conversely, future production growth rates were significant in explaining current stock returns. Additionally, Fama (1981, 1990) found the degree of correlation between stock returns and future production growth rates to be increasing with the length of the time period for which returns were calculated. Variations of annual returns were explained quite well by future production growth rates while they only explained a small fraction of monthly returns. The explanation offered by Fama (1990) is that information about a certain production period is spread over many previous periods. Therefore, short horizon returns only explain a fraction of future production growth rates but this fraction gets larger, the longer the time horizon of returns. In other words, annual returns should be more powerful in forecasting future production growth rates than quarterly returns and quarterly returns more powerful than monthly returns. The argument simply takes care of the fact that not all information about future production becomes publicly known over a short time period. Information is rather disseminated over longer time periods as production activities actually take place.

In this section we will focus on the extent to which Fama’s results hold up in different sample periods. Our purpose here is to test, whether the results also hold up in the latest stock market growth period from the early 1980s till now. In order to do so, we will run regressions for the whole period from 1953 to 1995 and compare the results to regressions over subsamples from 1953 to 1965 (the first stock market growth period) and 1984 to 1995 (the current stock market growth period).

The exact starting and end points for the two high growth periods are chosen based on the following considerations. The first high growth episode is not fully covered by our tests as it started around 1949 but, as outlined in Fama (1990) starting the test period in 1953 avoids the weak wartime relations between stock returns and real

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Table 1. *Unit root tests* (*quarterly data*)

	ADF test statistics (Lags)		
	1953–1995	1953–1965	1984–1995
Stock returns	−9.680** (1)	−4.772** (1)	−5.778** (1)
Production growth rates	−8.057** (3)	−5.939** (3)	−4.005** (1)
GDP growth rates	−6.296** (4)	−4.651** (3)	−3.527* (1)

Notes: There is an intercept (but no trend) included in the test equations. The inclusion of a time trend does not lead to significant coefficients in case of all variables. The calculated ADF test statistics are compared with the critical values from MacKinnon (1991). The appropriate lag length in the tests was determined according to the following strategy proposed by Doornik and Hendry (1994). We started with a maximum of four lags. Lags were then dropped one at a time. The highest lag length that led to a significant last coefficient (according to *t*-statistics) was then selected for the ADF test.

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activity due to the Korean war. Based on data on quarterly real stock prices (S&P 500 index) we choose the fourth quarter of 1965 as the end of the first high growth period. Stock prices did not reach their peak level until the fourth quarter of 1968. But between 1966 and 1968 stock prices fluctuated considerably and it was only in the fourth quarter of 1968, when stock prices were again above the level of the fourth quarter of 1965. For the second high growth episode, the data on quarterly real stock prices (S&P 500 index) suggests 1982 or 1984 as possible starting dates. In 1982, stock prices started to rise again after having decreased for several years. But they came down once more in 1983/1984 and really took off in 1984. We choose 1984 as the starting point of the second high growth period based on the results of Chow breakpoint tests in the following regressions of stock returns on production and GDP growth rates, which suggest a structural break in 1984 rather than in 1982.

As with Fama (1990) the following tests use continuously compounded real returns from the Center for Research in Security Prices (CRSP). Monthly real returns are monthly, continuously compounded nominal returns adjusted by the monthly inflation rate of the US Consumer Price Index (CPI). Quarterly and annual returns are calculated from the continuously compounded monthly real returns. Production growth rates are measured as the growth rate of the seasonally adjusted total industrial production index ($1992 = 100$) from the Federal Reserve Board.

Before running the regressions, we test for stationarity of all variables involved. Table 1 gives the results of the Augmented Dickey–Fuller (ADF) unit root tests for quarterly stock returns, and the quarterly production and GDP growth rates. The results of the ADF tests displayed in Table 1 indicate that all variables are stationary. For the return as well as for the growth variables the null hypothesis of a unit root can be rejected according to Augmented Dickey–Fuller tests. This is true for the 1953–1995 sample and for the 1953–1965 and 1984–1995 subsamples.

First, in addition to the regressions run in Fama (1990) we use Granger causality tests in order to find out whether past stock returns significantly improve the prediction of production growth rates as they should according to standard valuation models. The results of these tests provide preliminary evidence, whether stock returns still predict future production growth rates.

As expected, the null hypothesis that stock returns do not Granger cause production growth can be strongly rejected for the whole period from 1953 to 1995 with monthly as well as quarterly data (Table 2). The same is true for the subsample from 1953 to 1965, except in the case of including four lags in the test with quarterly data. However, there is no evidence for any causal relationship between stock returns and production growth for the period from 1984 to 1995 no matter whether we look at monthly or quarterly data. Therefore, Granger causality tests already indicate that the relation between stock returns and future production growth broke down after 1984. The following tests, which are basically the same as in Fama (1990) further support this preliminary finding.

The first test in Fama (1990, p. 1096) was a regression of current monthly production growth rates on past monthly stock returns. As indicated above, information about a certain production period is likely to be spread over many previous periods and, therefore, several past returns should have explanatory power. The estimated regression is:

$$IP_{t+1} = a + \sum_{k=0}^{11} b_k R_{t-k} + \varepsilon_{t+1} \quad (1)$$

where IP_{t+1} is the monthly production growth rate from t to $t+1$ and R_{t-k} is the continuously compounded monthly value weighted return from $t-k-$ to $t-k$. The results are displayed in Table 3.

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Table 2. *Granger causality tests (H_0: Stock returns do not Granger cause production growth)*

		Obs	F-Statistic	Probability
Monthly data:				
Sample: 1953:01 1995:12	Lags: 3	515	3.96370	0.00823
	Lags: 6	515	4.31622	0.00029
Sample: 1953:01 1965:12	Lags: 3	156	4.23733	0.00661
	Lags: 6	156	3.24813	0.00505
Sample: 1984:01 1995:12	Lags: 3	143	0.35699	0.78415
	Lags: 6	143	0.58808	0.73936
Quarterly data:				
Sample: 1953:1 1995:4	Lags: 2	171	16.8336	2.2E-07
	Lags: 4	171	8.67725	2.3E-06
Sample: 1953:1 1965:4	Lags: 2	52	5.10416	0.00986
	Lags: 4	52	1.26497	0.29849
Sample: 1984:1 1995:4	Lags: 2	47	1.21454	0.30706
	Lags: 4	47	0.88593	0.48162

Table 3. *Regressions of monthly production growth rates on past monthly returns*

Sample: 1953:01 1995:11 Included observations: 515			Sample: 1953:01 1965:12 Included observations: 156			Sample: 1984:01 1995:11 Included observations: 143		
Variable	b	$t(b)$	Variable	b	$t(b)$	Variable	b	$t(b)$
Const	0.001	2.39	Const	0.000	−0.01	Const	0.002	3.11
R_t	0.008	0.86	R_t	0.029	0.94	R_t	−0.012	−1.15
R_{t-1}	0.025	2.53	R_{t-1}	0.097	3.14	R_{t-1}	−0.000	−0.05
R_{t-2}	0.025	2.53	R_{t-2}	0.021	0.69	R_{t-2}	0.009	0.86
R_{t-3}	0.034	3.40	R_{t-3}	0.033	1.11	R_{t-3}	0.008	0.80
R_{t-4}	0.029	2.98	R_{t-4}	0.068	2.19	R_{t-4}	−0.000	−0.01
R_{t-5}	0.030	3.05	R_{t-5}	0.055	1.77	R_{t-5}	0.008	0.79
R_{t-6}	0.024	2.46	R_{t-6}	0.017	0.55	R_{t-6}	0.018	1.71
R_{t-7}	0.014	1.41	R_{t-7}	0.021	0.68	R_{t-7}	−0.004	−0.36
R_{t-8}	0.021	2.17	R_{t-8}	0.004	0.14	R_{t-8}	−0.007	−0.68
R_{t-9}	0.026	2.68	R_{t-9}	−0.002	−0.06	R_{t-9}	−0.004	−0.43
R_{t-10}	0.014	1.38	R_{t-10}	−0.012	−0.40	R_{t-10}	0.022	2.14
R_{t-11}	0.012	1.19	R_{t-11}	0.024	0.79	R_{t-11}	0.008	0.75
Adjusted R^2		0.12	Adjusted R^2		0.11	Adjusted R^2		0.00
S.E. of regression		0.01	S.E. of regression		0.01	S.E. of regression		0.01
Chow breakpoint test:		0.11						

Note: The monthly production growth rate is from t to $t+1$. R_{t-k} is the continuously compounded monthly value weighted real return from $t-k-$ to $t-k$. The Chow breakpoint test gives the significance level of the log likelihood test for the first month in 1984 that the coefficients from estimation using the 1953–1983 and the 1984–1995 subsamples are identical.

The results for 1953–1995 shown in Table 3 are close to those for 1953–1987 in Fama (1990), which show that up to 10 lags of the one-month return are significant in explaining the current stock return. In the 1953–1965 subsample the forecasting power of past returns is smaller and only up to 5 lags have forecasting power, however, the adjusted R^2 (0.11) is almost the same as the adjusted R^2 over the full sample (0.12). The picture changes dramatically if we test for the 1984–1995 subsample. The adjusted R^2 drops to zero and not even one of the estimated coefficients is significant at the 5% level according to t-statistics. Since 1984, variations of past monthly returns are completely uncorrelated with variations of monthly production growth rates.

Further regressions of production growth rates on stock returns in Fama (1990) use quarterly rather than monthly returns and test for their explanatory power of monthly, quarterly and annual production growth rates. The estimated equations are

$$IP_{t-T} = a + \sum_{k=1}^{8} b_k R_{t-3k+3} + \varepsilon_{t-T} \tag{2}$$

where IP_{t-T} is the production growth rate from period $t-T$ to t, and, therefore, depending on T, denotes the monthly ($T=1$), quarterly ($T=3$) or annual ($T=12$) production growth rate and R_{t-3k+3} is the stock return for the quarter from $t-3k$ to $t-3k+3$. The regressions for annual data use overlapping quarterly observations. The results are displayed in Table 4.

Analogously to Equation 2, we also run regressions of quarterly and annual real GDP growth rates on past quarterly returns (Table 5).

Again, the results for 1953–1995 shown in Table 4 are close to those for 1953–1987 in Fama (1990, p. 1098, Table II) and the forecasts improve with the time horizon over which production growth is calculated. However, no matter whether we regress monthly, quarterly or annual production growth rates on past returns, they do not possess any explanatory power over the subsample from 1984 to 1995. The maximum adjusted R^2 is 0.15 for annual production growth rates but not even one coefficient with a positive sign is significant in any equation at the 5% level. Furthermore, Chow breakpoint tests indicate a significant subsample instability in 1984 for all regressions, which adds further evidence to our finding that stock returns stopped to forecast real activity since the early 1980s. Regressions over the subsample from 1953 to 1965, on the other hand, lead to quite similar results as regressions over the whole sample from 1953 to 1995. Consequently, the two stock market growth periods appear to be fundamentally different, as the first stock market growth period seems to have been driven by expectations of real activity, while there is no evidence for such a relation during the second growth period.

The results of further regressions that use quarterly and annual real GDP-growth rates (Table 5) are very close to the regressions of production growth rates on past returns. There is absolutely no relation between past returns and real GDP-growth rates (adjusted $R^2=0$), while the relation is especially strong over the subsample from 1953 to 1965. The absence of any correlation between stock returns and production or GDP growth rates over the subsample from 1984 to 1995 can also be demonstrated by regressions of monthly, quarterly or annual returns on leads of quarterly production or GDP-growth rates (results not reported here).[3] Future production growth rates (and GDP-growth rates) are not significant in explaining variations in stock returns since 1984. Therefore, our finding that Fama's results do not hold up any more since 1984 are quite robust over different time horizons over which returns and growth rates are calculated no matter whether one uses production or real GDP growth rates.

III. POSSIBLE EXPLANATIONS[3]

A plausible explanation of our results would be the existence of (positive) bubbles or fads, which, if one accepts the explanation, were a persistent phenomenon on the stock market since 1984. From this point of view, the 1987 episode was just an extreme price fluctuation in a market, where bubbles constantly evolve and may also crash from time to time. However, as already mentioned in the introduction to this paper, this cannot directly be proved because bubbles cannot be distinguished from unobserved fundamental factors, which could also be the cause of our finding. But to explain the absence of a significant correlation between stock returns and future real activity over more than a decade (1984–1995) with a model based on fundamentals will not be an easy task.

Of course, as outlined in Barro (1990) and Fama (1990), stock returns and production growth rates may also be both affected by other variables such as interest rates and not all changes in stock returns are caused by information on future cash flows in production. A fall in the interest rate (and therefore the rate that is used to discount future cash flows) can cause an increase in stock prices as well as an increase in future production. And raising stock prices increase wealth which may stimulate future demand for consumption and investment goods. These nonmutually exclusive hypotheses also suggest a correlation between future production growth rates and current stock returns without invoking the concept of the fundamental value of stock prices. But, they further support the argument that stock prices should lead real activity.

While the emergence of speculative bubbles is a plausible explanation of the breakdown of the relation between stock returns and subsequent real activity during the 1980s, this finding may also be explained by other factors. We will briefly sketch two further potential sources of explanation: monetary policy and increasing globalization. However, as will be outlined in this section, they provide no strong argument in order to explain the results presented in Section II.

Changes in monetary policy (or monetary shocks) through changes in nominal interest rates or inflation rates, may be a potential cause for our finding as there is a lot of evidence that monetary policy exerts large effects on stock returns (e.g. Patelis, 1997; Thorbecke, 1997). But these effects should not disturb the relation between stock returns and real activity as, according to theory, monetary policy influences stock returns by increasing future cash flows or by decreasing the discount factors at which those cash flows are capitalized. The effect on stock returns

[2] In Fama (1990) the results of these regressions are shown in Table 3, p. 1099.
[3] A more detailed description can be found in Binswanger (1999).

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Table 4. *Regressions of monthly, quarterly and annual production growth rates on past quarterly stock returns*
Sample: 1953:01 1995:11

Monthly production growth rates Included observations: 515			Quarterly production growth rates Included observations: 171			Annual production growth rates Included observations: 168		
Variable	b	$t(b)$	Variable	b	$t(b)$	Variable	b	$t(b)$
Const	0.00	2.56	Const	0.00	2.67	Const	0.02	2.86
R_t	0.01	1.89	R_t	−0.02	−1.00	R_t	−0.09	−2.59
R_{t-3}	0.03	5.49	R_{t-3}	0.05	3.29	R_{t-3}	0.01	0.31
R_{t-6}	0.02	4.42	R_{t-6}	0.09	5.50	R_{t-6}	0.11	2.84
R_{t-9}	0.02	3.91	R_{t-9}	0.06	3.69	R_{t-9}	0.19	5.60
			R_{t-12}	0.04	2.43	R_{t-12}	0.24	6.63
						R_{t-15}	0.22	6.95
						R_{t-18}	0.12	4.10
						R_{t-21}	0.05	1.64
Adjusted R-squared		0.12	Adjusted R-squared		0.27	Adjusted R-squared		0.41
S.E. of regression		0.01	S.E. of regression		0.02	S.E. of regression		0.04
Chow breakpoint test		0.01	Chow breakpoint test		0.05	Chow breakpoint test		0.03

Sample 1953:1 to 1965:12

Monthly production growth rates Included observations: 156			Quarterly production growth rates Included observations: 52			Annual production growth rates Included observations: 49		
Variable	b	$t(b)$	Variable	b	$t(b)$	Variable	b	$t(b)$
Const	−0.00	−0.09	Const	0.00	0.14	Cont	0.01	0.39
R_t	0.04	2.71	R_t	0.00	0.09	R_t	−0.17	−1.71
R_{t-3}	0.04	2.28	R_{t-3}	0.13	2.54	R_{t-3}	0.08	0.71
R_{t-6}	0.03	2.06	R_{t-6}	0.12	2.29	R_{t-6}	0.21	1.48
R_{t-9}	0.00	0.22	R_{t-9}	0.07	1.42	R_{t-9}	0.33	2.28
			R_{t-12}	0.00	0.06	R_{t-12}	0.32	2.27
						R_{t-15}	0.19	2.45
						R_{t-18}	0.09	0.87
						R_{t-21}	0.02	0.17
Adjusted R-squared		0.11	Adjusted R-squared		0.20	Adjusted R-squared		0.33
S.E. of regression		0.01	S.E. of regression		0.02	S.E. of regression		0.06

Sample 1984:1 to 1995:11

Monthly production growth rates Included observations: 143			Quarterly production growth rates Included observations: 47			Annual production growth rates Included observations: 47		
Variable	b	$t(b)$	Variable	b	$t(b)$	Variable	b	$t(b)$
Const	0.00	3.93	Const	0.01	4.03	Const	0.02	2.07
R_t	−0.01	−2.03	R_t	−0.03	−1.85	R_t	−0.06	−1.32
R_{t-3}	0.00	0.32	R_{t-3}	−0.01	−0.71	R_{t-3}	−0.07	−1.17
R_{t-6}	0.01	0.91	R_{t-6}	0.01	0.61	R_{t-6}	−0.05	−0.60
R_{t-9}	0.00	0.63	R_{t-9}	0.01	0.62	R_{t-9}	0.01	0.07
			R_{t-12}	0.01	0.73	R_{t-12}	0.06	0.98
						R_{t-15}	0.11	1.61
						R_{t-18}	0.09	1.71
						R_{t-12}	0.06	1.78
Adjusted R-squared		0.01	Adjusted R-squared		0.03	Adjusted R-adjusted		0.15
S.E. of regression		0.01	S.E. of regression		0.01	S.E. of regression		0.03

Note: The production growth rate is from period $t - T$ to t, and, therefore, depending on T, denotes the monthly ($T = 1$), quarterly ($T = 3$) or annual ($T = 12$) production growth rate. R_{t-3k+3} is the continuously compounded value weighted real return for the quarter from $t - 3k$ to $t - 3k + 3$. The t's for the slopes in the monthly and quarterly regressions use standard errors. The t's for the slopes in the annual regressions with overlapping quarterly observations, use standard errors that are adjusted for heteroscedasticity and residual autocorrelation by using the method of Newey and West (1987). The Chow breakpoint test gives the significance level of the log likelihood test for the first period in 1984 that the coefficients from estimation using the 1953–1983 and the 1984–1995 subsamples are identical.

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Table 5. *Regressions of quarterly and annual GDP growth rates on past quarterly stock returns*
Sample 1953:1 1995:4

Quarterly GDP-growth rates Included observations: 171			Annual GDP-growth rates Included observations: 47		
Variable	b	$t(b)$	Variable	b	$t(b)$
Const	0.00	5.70	Const	0.02	4.94
R_t	0.01	1.30	R_t	−0.01	−0.32
R_{t-3}	0.05	4.96	R_{t-3}	0.05	3.09
R_{t-6}	0.05	4.69	R_{t-6}	0.10	5.06
R_{t-9}	0.02	1.90	R_{t-9}	0.12	6.66
R_{t-12}	0.02	2.29	R_{t-12}	0.13	7.50
			R_{t-15}	0.09	5.95
			R_{t-18}	0.05	2.50
			R_{t-21}	0.02	0.99
Adjusted R-squared		0.25	Adjusted R-squared	0.34	
S.E. of regression		0.01	S.E. of regression	0.03	
Chow breakpoint test		0.13	Chow breakpoint test	0.09	

Sample 1953:1 1965:4

Quarterly GDP-growth rates Included observations: 52			Annual GDP-growth rates Included observations: 47		
Variable	b	$t(b)$	Variable	b	$t(b)$
Const	0.00	1.87	Const	0.02	1.84
R_t	0.01	0.22	R_t	−0.06	−1.34
R_{t-3}	0.10	4.21	R_{t-3}	0.08	1.33
R_{1-6}	0.05	2.20	R_{t-6}	0.12	1.67
R_{t-9}	0.04	1.80	R_{t-9}	0.19	3.04
R_{t-12}	0.01	0.59	R_{t-12}	0.19	3.19
			R_{t-15}	0.06	1.31
			R_{t-18}	0.05	1.64
			R_{t-21}	0.00	−0.01
Adjusted R-squared		0.35	Adjusted R-squared	0.45	
S.E. of regression		0.01	S.E. of regression	0.03	

Sample 1984:1 1995:4

Sample: 1984:1 1995:3 Included observations:			Annual GDP-growth rates Included observations: 46		
Variable	b	$t(b)$	Variable	b	$t(b)$
Const	0.00	4.13	Const	0.02	2.16
R_t	−0.01	−0.72	R_t	−0.00	−0.12
R_{t-3}	0.02	1.51	R_{t-3}	0.00	−0.05
R_{t-6}	0.01	0.74	R_{t-6}	0.00	0.04
R_{t-9}	0.01	0.98	R_{t-9}	0.03	0.63
R_{t-12}	0.01	1.17	R_{t-12}	0.06	1.34
			R_{t-15}	0.06	1.31
			R_{t-18}	0.05	1.64
			R_{t-21}	0.05	1.58
Adjusted R-squared		−0.00	Adjusted R-squared	0.00	
S.E. of regression		0.01	S.E. of regression	0.02	

Note: The GDP growth rate is from period $t - T$ to t, and, therefore, depending on T, denotes the quarterly ($T = 3$) or annual ($T = 12$) GDP growth rate. R_{t-3k+3} is the continuously compounded value weighted real return for the quarter from $t - 3k$ to $t - 3k + 3$. The t's for the slopes in the monthly and quarterly regressions use standard errors. The t's for the slopes in the annual regressions with overlapping quarterly observations, use standard errors that are adjusted for heteroscedasticity and residual autocorrelation by using the method of Newey and West (1987). The Chow breakpoint test gives the significance level of the log likelihood test for the first period in 1984 that the coefficients from estimation using the 1953–1983 and the 1984–1995 subsamples are identical.

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is supposed to be through effects on real activity and, in fact, supports the hypothesis that monetary policy has real effects at least in the short run (Thorbecke, 1997).[4] If monetary policy has effects on the real economy, it influences the fundamental value of stocks and the positive relation between stock returns and subsequent real activity should persist. If monetary policy has no real effects, it should not affect stock returns at all, as long as investors' behaviour is driven by fundamentals, and the positive relation between stock returns and subsequent real activity should also persist. Therefore, there is no reason why changes in monetary policy should disturb the relation between real activity and stock returns unless investors are not driven by fundamentals or act irrationally on changes in monetary policy, which again, would speak in favour of the existence of speculative bubbles.

These theoretical considerations are supported by the results presented in Fama (1990) and Schwert (1990) showing that the strong relations between future production and returns are also found in regressions that include variables (and shocks to these variables) which are supposed to track time-varying expected returns such as the dividend yield, the term spread or the default spread. These variables, which are frequently used as predictors of future asset returns can be interpreted as indicators of the underlying macroeconomy (the business cycle) or, in the case of interest rate spreads, also as indicators of monetary policy (Patelis, 1997). In other words, rational variations of stock returns as a reaction to changes in the underlying macroeconomy or to changes in monetary policy do not significantly affect the relation between stock returns and future production according to the results presented in Fama (1990) and Schwert (1990).

A further hypothesis that may explain the breakdown of the relation between stock returns and subsequent real activity would be that globalization of the financial markets causes expectations of future cash flows to be less related to domestic markets. Instead they would be more related to the expected development of the world markets where the big transnational companies, whose share prices dominate stock indices, sell most of their products. Also positive expectations do not necessarily stimulate domestic production, because goods and services are produced abroad. However, it is difficult to associate increasing globalization with the changes in the relation between real activity and stock returns especially during the 1980s. There was a large increase in the ratios of imports and exports (goods and services) to GDP in the 1970s, but during the 1980s, the ratio of imports to GDP remained more or less the same, while the ratio of exports to GDP declined in the first half of the 1980s and then increased again. If we look at net foreign investments of US companies in relation to GDP there was no increase during the 1980s also which would suggest a change in the relation between stock returns and real activity.[5] Therefore, we are inclined to argue that increasing globalization does not provide a sufficient explanation for the results, although this has to be confirmed by further empirical tests.

IV. CONCLUSION

Regressions of stock returns on measures of real activity over the period from 1953 to 1995 seem to confirm previous findings of Fama (1990) and others: a large fraction of stock return variations can be explained by future values of measures of real activity in the United States. However, things look quite different if the regressions are run over a subsample covering the recent boom on the stock market since the early 1980s. The paper presents evidence that there is a breakdown in the relation between stock returns and future real activity in the US economy since the early 1980s. This result holds up no matter whether one uses monthly, quarterly or annual real stock returns or whether real activity is represented by production growth rates or real GDP growth rates. Current stock returns do not seem to contain significant information about future real activity as before. However, because the 1984–1995 period, which we found to be characterized by the absence of a relation between stock returns and future real activity, is rather short we cannot be sure yet whether the result should be interpreted as a temporary aberration or whether it is of a permanent nature. The difference to the results of regressions over the 1953–1965 subsample that represents the first high growth period is obvious when correlations between stock returns and subsequent real activity were

[4] Also the well-documented negative relation between real stock returns and inflation is, as commonly acknowledged, in fact caused by real activities. The standard explanation was given by Fama (1981), who introduced the 'proxy hypothesis' that the negative relations between stock returns and inflation are proxying for positive relations between stock returns and real activity. The explanation implies that the variation in money demanded in response to variation in real activity is accommodated through offsetting variation in inflation rather than through offsetting variation in money growth, which is the case during periods when monetary policy is either neutral or counter-cyclical. In a recent study, Graham (1996) found that the only period where the FED followed a procyclical monetary policy was from 1976 to 1982. Monetary policy was counter-cyclical from 1953 to 1975 as well as from 1982 to 1990 and both periods are characterized by a negative relation between real stock returns and inflation. Therefore, the evidence presented in Graham (1996) provides no explanation of the fading relation between stock returns and real activity over the 1984–1995 subsample.

[5] Furthermore, foreigners do not own a large share of US stocks. The percentage of US stocks owned by foreigners fluctuated between 5 and 8% during the 1980s and 1990s according to the flow of funds accounts of the United States (Table L.214). The percentage slightly increased during the 1980s, but the increase is marginal as compared to the increase in stockholding by US institutional investors (especially mutual funds and pension funds).

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significant, while the present high growth period is characterized by an absence of these correlations, that according to Schwert (1990) used to hold for the whole century.

We consider the existence of (positive) speculative bubbles or fads to be the most likely explanation of our finding (Binswanger, 1999). However, a direct proof for this hypothesis cannot be offered because of the impossibility to distinguish bubbles from unobserved fundamental factors. Therefore, it must remain a matter of faith in the concept of the fundamental value whether the speculative bubbles hypothesis is accepted or not. We find it difficult to offer other convincing explanations for the results presented in this paper. Further potential sources of explanation, such as the effects of monetary policy or the increasing globalization, do not provide strong arguments that would explain why a breakdown between stock returns and subsequent real activity occurred during the 1980s.

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